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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) (ICM Act), via the prescriptions of the National Estuarine Management Protocol (the Protocol), requires Estuarine Management Plans (EMPs) to be prepared for estuaries in order to create informed platforms for efficient and coordinated estuarine management. The Protocol, promulgated in May 2013, sets out the minimum requirements for individual EMPs.

In 2013/2014, a review was conducted by the National Department of Environmental Affairs: Oceans and Coasts (DEA, 2014) on existing EMPs to ensure, *inter alia*, the alignment of these plans with the Protocol. This revision of the Uilkraals River EMP, including the Situation Assessment Report (SAR) and the Management Plan itself, is in response to the comments received during the DEA review process only, to ensure compliance with the minimum requirements for EMPs as per the Protocol. In summary, this entailed:

- Updating the terminology as per the Protocol;
- Including a summary of the Situation Assessment;
- Including a map of geographical boundaries based on Estuarine Functional Zonation;
- Updating the management objectives and activities to include those related to management of agriculture;
- Refinement of the Estuary Zonation Plan;
- Extending the monitoring plan to explicitly include a performance monitoring plan to gauge progress towards achieving EMP objectives (i.e. using performance indicators); and
- Including a description of institutional capacity and arrangements to manage elements of EMP provided as per the Protocol.

The work of the original authors and input received from stakeholders remains largely unchanged. 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 five-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. Nonetheless, this EMP, and supporting SAR, must not be considered a once-off compilation but rather a “living document” that should be regularly updated and amended as deemed necessary.

Earlier editions of the SAR and EMP were drafted referring to the government departments in existence at the time. Where feasible, the necessary updates have been made or indicated otherwise

EXECUTIVE SUMMARY

Introduction

The efficient and coordinated management of estuaries in South Africa is undertaken in terms of the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008, as amended). The management of the Uilkraals River estuary will be undertaken by the Responsible Management Authority (RMA). The Uilkraals River estuary covers an area of 105 ha and is important in terms of its conservation value with its extensive salt marsh area, genetically distinctive species and high macrophyte diversity making it unique along the southern Cape coast. Mounting pressures threaten to reduce its value with water abstraction and storage, pollution and increasing development degrading the estuary condition.

Summary of the Situation Assessment

A summary of the situation assessment is included and details geographic and socio-economic context, the ecological characteristics and functioning of the estuary, ecosystem services, legislation and finally, management issues and the regulatory framework.

Vision and objectives

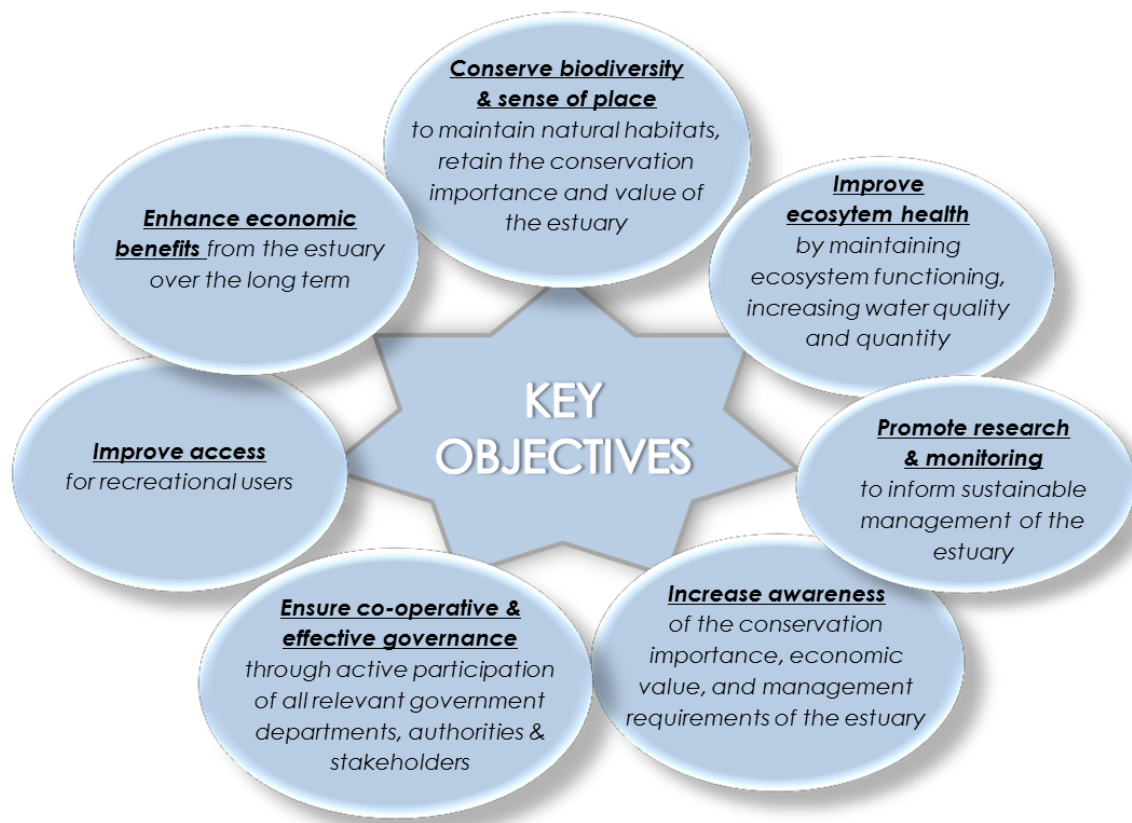
The vision and key objectives for the Uilkraals River estuary were identified as:

“The Uilkraals River estuary must be restored to a healthy, intact ecosystem with good water quality, must be accessible to all, and provide benefits to present and future generations through conservation and sustainable recreational use.”

Management Objectives

Management objectives are included as:

- Conservation of estuarine biodiversity and unique sense of place;
- Harmonious and effective governance;
- Restoration of estuary health;
- Facilitation of access;
- Research and monitoring;
- Enhanced awareness, appreciation and understanding of the Uilkraals River estuary; and
- Enhanced economic benefits delivered by the estuary & promoting ecotourism.



Spatial Zonation

Geographical boundaries are depicted, including the estuarine functional zone.; Spatial zonation in respect to this EMP currently focusses on the coastal protection zone, coastal management lines and the coastal overlay zone. It proposes the designation of the entire estuary as Special Management Area to provide additional protection for this particularly sensitive coastal area. Zonation has been identified as a key issue to be reviewed by the RMA as the current zonation does not provide specific details in respect to recreational uses.

Management Priorities

The following management priorities are identified with accompanying action plans detailing management objectives, management actions, applicable legislation, deliverables/indicators, anticipated timing, responsible agent and estimated budget.

- Conservation of biodiversity and wildness character;
- Improving of ecosystem health;
 - Restoration of the quantity of freshwater inflows;
 - Restoration of water quality;
 - Removal of alien vegetation;
 - Effective and sustainable mouth management; and
 - Sustainable / best practice agricultural practices.
- Improving access;
- Co-management and effective governance;
- Research and monitoring;
- Increasing public awareness; and
- Promoting ecotourism.

Institutional arrangements

As per the prescriptions of the Protocol, CapeNature or its assigned representative, is the RMA responsible for the development of the Uilkraals River EMP as well as being responsible for the co-ordination of its implementation. However, formal designation is yet to be confirmed. Implementation of the EMP can be effected through a range of different forums and actors. The Uilkraals River Estuary Advisory Forum provides an advisory service to the RMA on issues specific to the management and implementation of the EMP, 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.

Monitoring and evaluation

Both resource monitoring, as recommended in the reserve determination study (DWS, 2012), as well as the proposed review and evaluation of this EMP are included.

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ABBREVIATIONS

amsl	Above mean sea level
BGCMA	Breede Gouritz Catchment Management Agency
C.A.P.E.	Cape Action for People and the Environment
CARA	Conservation of Agricultural Resources Act
CML	Coastal Management Line
CMP	Coastal Management Programme
CPZ	Coastal Protection Zone
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEA: O&C	Department of Environmental Affairs: Oceans & Coasts Branch (formerly MCM)
DEA&DP	Western Cape Government's Department of Environmental Affairs & Development Planning
DM	District Municipality
DoT	Department of Transport
DPW	Department of Public Works
DRDLR	Department of Rural Development & Land Reform
DST	Department of Science and Technology
DWS	Department of Water and Sanitation (formerly DWAF)
EAF	Estuary Advisory Forum
EFZ	Estuarine Functional Zone
EIA	Environmental Impact Assessment
EIS	Estuary Importance Score
EMP	Estuarine Management Plan(s)
EZP	Estuary Zonation Plan
IAPs	Invasive Alien Plants
ICM Act	National Environmental Management: Integrated Coastal Management Act
IDP	Integrated Development Plan
LM	Local Municipality
MaintMP	Maintenance Management Plan
MAR	Mean Annual Runoff
MEC	Member of the Executive Council
MLRA	Marine Living Resources Act
MMP	Mouth Management Plan
MSA	Municipal Systems Act
NEM:PAA	National Environmental Management: Protected Areas Act
NEMA	National Environmental Management Act
NGO	Non-Government Organisation
NWA	National Water Act
ODM	Overberg District Municipality
PES	Present Ecological State
The Protocol	National Estuarine Management Protocol
PSU	Practical Salinity Units
RDM	Resource Directed Measures
REC	Recommended Ecological Category
RMA	Responsible Management Authority

SAR	Situation Assessment Report
SDF	Spatial Development Framework
SMA	Special Management Area
TPC	Thresholds of Potential Concern
UEAF	Uilkraals River Estuary Advisory Forum

1 INTRODUCTION

1.1 Background

The Uilkraals River estuary is one of 289 functional estuaries in South Africa (Turpie 2004, Turpie et al. 2010), covers an area of 105 ha and is important in terms of its conservation value. Its extensive salt marsh area (with its genetically distinctive species) and high macrophyte diversity make the Uilkraals River estuary unique along the southern Cape coast. It has been identified as an important bird area (Barnes 1996) and a desired protected area in two national conservation planning assessments (Turpie & Clark 2007, Turpie et al. 2010). However, mounting pressures threaten to reduce this value as water abstraction and storage, pollution and increasing development degrade estuary condition.

This document is a Management Plan for the Uilkraals River estuary. It was originally developed under the auspices of the Cape Action Plan for the Environment (C.A.P.E.) Estuaries Management Programme, and is designed to fulfil requirements of the National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008, as amended) (ICM Act) and the National Estuarine Management Protocol (2013) (the Protocol), published under the ICM Act.

1.2 Purpose and Scope of the Uilkraals River Estuarine Management Plan

Drawing on the Situation Assessment prepared for the Uilkraals River estuary (Anchor Environmental 2010), inputs from key stakeholders and other supporting documents prepared for the C.A.P.E. Estuaries Programme (e.g. Turpie & Clark 2007 – Cape Estuaries Classification, Prioritisation, Protection and Rehabilitation report), the Uilkraals River Estuarine Management Plan (EMP) sets out the Vision and Objectives for this estuarine system. It also identifies specific Management Objectives needed to meet these overarching objectives, and indicates the main Actions required in the next five years in order to achieve the overall vision. The Uilkraals River EMP focuses on strategic priorities only. While planning for some emergencies, e.g. floods, is part of this plan, it remains possible that unforeseen disasters could disrupt the prioritisation set out here.

A set of Management Priorities have been identified for the estuary for the next five years, which generally represent sectors of governance (e.g. conservation, water regulation, etc.), and contain detailed management actions to meet the respective objectives. Thus, each management objective will be implemented through a set of management actions, in the form of an action plan and will result in a number of deliverables.

1.3 Legal framework

Chapter 4 of the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008, as amended by Act 36 of 2014) (ICM Act), aims to facilitate the efficient and coordinated management of all estuaries, in accordance with:

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

The Protocol, promulgated in 2013, 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 Protocol and the National Coastal Management Programme (CMP) (DEA, 2014). The Protocol 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 ICM Act.

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 ICM Act 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 ICM Act 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 ICM Act.

The National Coastal Committee (the MINTEC Working Group 8) is established by the Minister, and its powers determined by notice in the Government Gazette. It is supported administratively by the National Department of Environmental Affairs. 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 an estuary advisory forum. 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, so as to facilitate cooperative management and effective governance in terms of the EMPs, as well as facilitate and monitor implementation of an EMP.

1.4 Mandate and responsibilities of the RMA

As per the prescriptions of the Protocol, CapeNature or its assigned representative, is the management authority responsible for developing and co-ordinating implementation of the Uilkraals River EMP, as the entire estuary is contained within the municipal boundary (Figure 1) and is a priority estuary featured in the Western Cape Protected Areas Expansion Strategy.

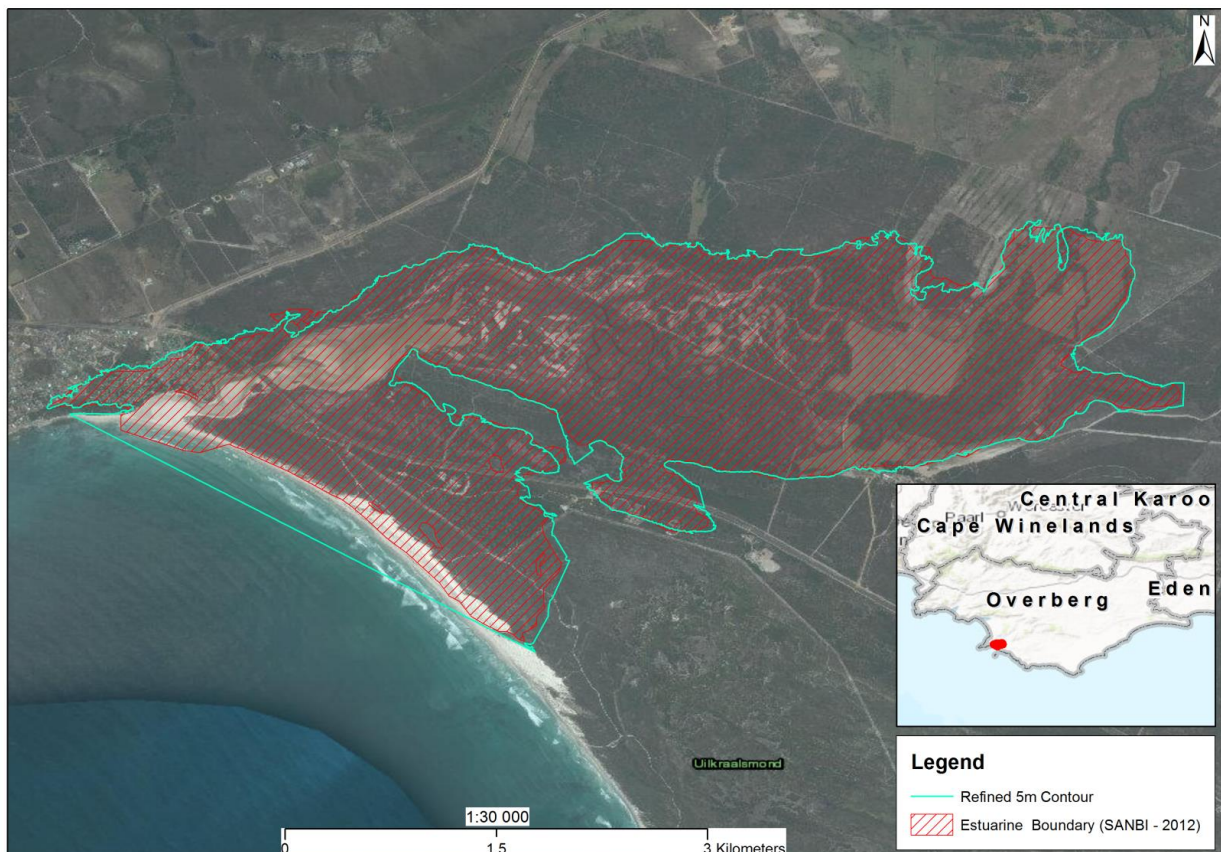


Figure 1: Location of the Uilkraals River Estuary within Overstrand Municipality

The RMA is responsible for overall co-ordination of the actions of other implementing agencies, and not the implementation actions themselves.

Section 7.3 of the Protocol indicates that:

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

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

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

Section 5(7)(e): *“The identified responsible management authority to develop the EMP needs to **budget accordingly for the development of these plans.**”*

Section 8(1): *“The responsible management authority developing an EMP must **actively engage all the relevant stakeholders** including government departments, non-government organisations and civil society in the development and implementation of the EMP.”*

Section 9.1(1) and 9.2: *“...it **must obtain formal approval** for the EMP...” and “Once approved...the EMP shall be formally adopted by the responsible management authority and signed by the head of the responsible management authority.”*

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

- a) follow a public participation process in accordance with Part 5 of Chapter 6 of the ICM Act;
- b) ensure that the EMP and the process by which it is developed are consistent with:
 - i) the Protocol; 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 ICM Act;
- c) If applicable, ensure that relevant legislation is enacted to implement the EMP; and
- d) Submit an annual report to the Minister on the implementation of the EMP, the legislation and any other matter.

Coordination of the implementation actions by the RMA and its strategic partners (Overstrand municipality, DEA, Overberg District Municipality (ODM), Western Cape Provincial Government, Department of Water and Sanitation (DWS), Department of Agriculture, Forestry and Fisheries (DAFF)), will be supported by the Uilkraals River Estuary Advisory Forum (UEAF) representing all key stakeholder groups on the estuary.

It is important to recognise that this document is designed to focus management attention at a strategic level and does not provide guidance on the day-to-day management actions required for management of the estuary. Annual Business Plans will have to be developed by the RMA and the relevant government departments and authorities, and should be guided by this EMP in that major effort should be directed towards priority activities that support its overarching objectives included in this plan.

Progress towards achieving the objectives set out in this EMP should be reviewed on an annual basis by the RMA and UEAF and focal efforts adjusted to ensure targets are met within specified timeframes. This Uilkraals River EMP will have to be revisited and updated within the next five years to reflect goals that have been achieved and to accommodate changing priorities.

2 SUMMARY OF SITUATION ASSESSMENT

Introduction

The Uilkraals River estuary is a medium to large estuary, with a total area of 105 ha, and is located on the Southern Cape Coast of South Africa. The Uilkraals River estuary is an important estuary from a conservation perspective, particularly in respect of macrophyte diversity and bird fauna. The large expanse of sand and mud flats as well as the high plant diversity within the estuary makes the Uilkraals River estuary, together with the Klein and Heuningnes Rivers estuaries, unique along the Southern Cape Coastline. The estuary faces pressure from reduced freshwater inflow due to the upstream Kraaibosch Dam, planned rural developments and increasing tourism at the estuary mouth.

Geographic and Socio-Economic Context

The Uilkraals River estuary is situated approximately 60 km northwest of Cape Agulhas and 11 km east of Danger Point on the south-west coast of South Africa. It lies within the warm-temperate biogeographic region of South Africa. The catchment lies entirely within the Western Cape Province which receives most precipitation during the winter rainfall season. The estuary is classified as a temporarily open-closed mixed blackwater system, which is relatively common along the south west and east coast. The Mean Annual Runoff (MAR) is approximately 18 Mm³, which is 20% lower than under natural conditions. The Kraaibosch Dam was built 10 km upstream of the estuary in 1999, covers a surface area of 102 ha and has a storage capacity of 5.5 Mm³. Numerous smaller farm dams are found throughout parts of the catchment too.

The total population living within the Overstrand LM, in which the Uilkraals River Catchment is located, was estimated at 74 546 in the 2007 StatsSA Community Survey. The population density was estimated at 35 people per square kilometre and the total household count was 24 485. The overall population of the Uilkraals River catchment (G40M) is a small proportion of the total for the Overstrand LM, as it contains a small urban area. Larger settlements such as Gansbaai with approximately 20 000 residents and Stanford with 8 000 residents are located outside of the boundaries of the Uilkraals River estuary catchment. Agriculture, residential development and nature conservation are the main land use activities in the catchment. The Uilkraals River estuary and surrounding areas are aesthetically beautiful and this remains a strong draw card to the estuary.

Ecological Characteristics and Functioning of the Estuary

The Uilkraals River estuary is important in terms of its conservation value. Based on an index which takes size, estuary type, rarity and biodiversity (plants, invertebrates, fish, birds) into account, the estuary was ranked 34th overall in terms of conservation importance in South Africa (Turpie et al., 2002).

Structures associated with the estuary include a bridge approximately 220 m long which crosses the river approximately 800 m from the mouth. The bridge was constructed in 1973 and replaced an old wooden footbridge (Heydorn & Bickerton, 1982). It is supported on the eastern side by a high embankment of rubble spanning almost two-thirds of the original high tide river width (Gaigher, 1984). The remaining 100 m is supported by concrete pylons, effectively halving the width of the estuary there and concentrating the river flow against the western bank (Heydorn & Bickerton, 1982). The lower reaches of the estuary used to consist of several braided channels that expanded to a single 400 m wide channel at high tide (Harrison et al., 1995b). Water in the area below the bridge is now restricted to two smaller shallow channels, the larger of which ends at the beach in front of the huts at the caravan park.

Tidal interchange was previously recorded up to 3 km upstream in a 1981 survey (Heydorn & Bickerton, 1982). In 2010, a very shallow braided channel ran across the sandflats upstream from the bridge, probably similar to former low tide conditions. The majority of the sandflats are now permanently exposed. The middle reaches of the estuary consist of a wide meandering channel across a large floodplain, surrounded by saltmarsh vegetation. The obstruction caused by the road bridge changed the circulation and hence salinity regime of the estuary.

The first time in recorded history that the Uilkraals River estuary became closed for a long period of time was in December 2008, and was thereafter followed by periods of closure and by artificial breaching. Water storage in the Kraaibosch Dam, approximately 10 km upstream from the estuary, has significantly altered the natural freshwater in-flows to the estuary while agricultural activities in the upper catchment have introduced an increased sediment load into the estuary, ultimately resulting in reduced flow over time and an increased likelihood of mouth closure of the estuary in low flow periods. Extended mouth closure events will affect the water chemistry of the estuary. The estuary is no longer flushed by the sea or freshwater as frequently as it was in the past and this could result either in hypersaline conditions or fresh conditions developing within the estuary, depending on the amount of freshwater inflows and the amount of evaporation. The hydrodynamics and mouth condition health score of 65 and the water quality health score was 64 (DWS, 2012).

Vegetation of the estuary can broadly be grouped into five types: (1) Macroalgae, which forms extensive mats that cover sand and mud flats in the lower reaches of the estuary, and is a source of concern owing to the impacts on invertebrate populations and their predators (birds). (2) Submerged macrophytes consist of eelgrass *Zostera capensis*, which forms beds in the lower reaches and provide important habitat for juvenile fishes. (3-4) intertidal and supratidal salt marsh, which is also concentrated in the lower reaches and on the floodplain area, contributes to system productivity and biotic diversity, providing important feeding areas, habitat and shelter for numerous invertebrates, birds and fish. (5) Reeds and sedges, which are not able to tolerate high salinity, occur in the middle and upper reaches of the estuary. In the 2012 reserve determination study (DWS, 2012), identified that microphytobenthos were important primary producers in this shallow water system and allocated a microalgal health score of 55.

Invertebrates found in the estuary include sandprawns and mudprawns as well as the crown and hermit crabs and shrimps. Bloodworm, while previously viable, are no longer found in the system. An Invertebrate health score of 47 was allocated (DWS, 2012).

An ichthyological survey carried out in 2006 found 11 different species of fish through seine net hauls. The Knysna sand goby is the most abundant species in the estuary, followed by harders. In all, nine species (82% of the fish species recorded from the Uilkraals River estuary) are regarded as either partially or completely dependent on estuaries for their survival. Another five of the species recorded are at least partially dependent on estuaries as a nursery area including cape sole *Heteromycteris capensis*, groovy mullet *Liza dumerilii*, blackhand sole *Soleo bleekeri*, harder *Liza richardsonii* and white stumpnose *Rhabdosargus globiceps*. The 2012 reserve determination study allocated a fish health score of 52 to the system (DWS, 2012).

The Uilkraals River estuary is an important area for waterbirds and ranked 14th in South Africa in terms of waterbird abundance in a conservation priority analysis study. Regionally, it was ranked 11th out of 65 coastal wetland systems in the south-western Cape in terms of bird numbers supported (Ryan et al., 1988). A total of 48 water-associated bird species have been recorded at the Uilkraals River estuary. Of these, 23 species are piscivorous, 21 are invertebrate-feeding and four species are herbivorous. The estuary has supported large numbers of terns and migratory waders in the past (Summers et al. 1976, Heydorn & Bickerton, 1982, Ryan et al., 1988) and has been recognised as one of the largest mainland tern roosts in the south-western Cape (Ryan et al., 1988). However, recent bird counts suggest that certain bird species visiting the estuary have decreased dramatically. Previous years have seen hundreds and even thousands of waders and terns around the estuary. In February 2010, a total of only 60 waders were counted. This is most likely due to a loss in the intertidal feeding habitat which covered the entire sandflat region below and above the causeway. The estuary also seems to have become less suitable as a tern roosting site. For the 2012 reserve determination study 9 functional groups of birds were identified and the main changes from reference condition identified as the loss of previous large numbers of migratory terns and waders. A bird health score of 24 was allocated (DWS, 2012).

In 2012, the reserve determination study (DWS, 2012) estimated the Estuarine Health Index score in its present state to be 49 which translated to a Present Ecological Status (PES) of D, which is classed as a largely modified system. This was as a result of major changes in the mouth condition, coupled with sewage-related pollution of the system. Without non-flow related impacts, the PES of the estuary was estimated to improve to a category C, i.e. moderately modified system. This suggests that non-flow impacts have played a major role in the degradation of the estuary to a D, but that flow-related impacts are the main cause of its degradation. Thus, the highest priority is to address the quantity and quality of influent water. Of the non-flow-related impacts, water quality problem as a result of sewage pollution in the estuary was found to be the most important factor that influenced the health of the system. The Estuary Importance Score (EIS) was 74, which corresponds to a rating of "Important". The estuary is designated as a desired protected area in the Biodiversity Plan for the National Biodiversity Assessment and therefore 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 Scenario 3 which entails

present day flows reaching the estuary ($\text{MAR } 29.2 \times 10^6 \text{m}^3$) coupled with removal of invasive alien plants (IAPs) from the entire catchment, keeping the mouth open deliberately and amelioration of sewage-related problems.

Ecosystem Services

Estuaries provide a range of services that have economic or welfare value. In the case of the Uilkraals River estuary, the most important of these are the recreational and tourism values of the estuary as well as the provision of a nursery area for fish. There may be additional services, such as carbon sequestration, but these are not likely to be of major value. The Uilkraals River estuary is also a popular tourist destination for local and regional South African tourists. The area surrounding the mouth of the estuary has been developed on the west bank in the form of the Uilenkraalsmond Holiday Resort, which includes the municipal caravan and camping park as well as associated recreational amenities located on the site. This establishment is generally full during the major holiday periods. Birding and recreational opportunities represent an important draw card for visitors to the estuary. The Uilkraals system has unique attributes that provide many employment and educational opportunities.

Main threats or constraints to be considered include water quantity and quality (reduction in freshwater inflows due to water storage in the catchment (Kraaibosch Dam), and a continuing increase in the demand for water; increasing nutrient enrichment due to agriculture in the catchment; and loss of important habitat area such as saltmarsh through inundation caused by increasing water levels in the estuary as the mouth remains closed); exploitation of living resources and land-use and associated disturbance (potential for residential/resort development around the estuary leading to change in sense of place and existence value, increased human disturbance of biota, and damage or loss of estuarine habitat). Opportunities to protect the health and value of the system over the medium to long term include the establishment of terrestrial and estuarine protected areas and the implementation of rehabilitation measures.

Legislation and Management Issues

The legislative framework specific to estuarine management is the Integrated Coastal Management Act and the accompanying National Estuarine Management Protocol. The Protocol provides national policy and ensures alignment by providing a national vision and objectives for achieving effective integrated management of estuaries, amongst other things. The Protocol identifies the responsible management authority per estuary, in this instance the CapeNature (or its assigned representative). General coastal policy and legislative background is then described detailing the Western Cape Coastal Management Programme, the Overberg Coastal Management Programme as well as the subsidiary Overstrand Local Management Programme.

Water quality and quantity are mainly controlled under the National Water Act 36 of 1998. This makes provision for an Environmental Reserve which stipulates the quantity and quality of water flow required to protect the natural functioning of each water resource, including estuaries. The extent to which an estuary's functioning is catered for is determined by the designated future management "class" (where classes A – F describe state of health),

called the REC, the Recommended Ecological Category. A reserve determination study for the Uilkraals River estuary has been completed (DWS, 2012). The REC for the estuary is its Best Attainable State of a B-category. The preferred scenario is Scenario 3 which entails present day flows reaching the estuary (MAR 29.2 x10⁶m³) coupled with removal of IAPs from the entire catchment, keeping the mouth open deliberately and amelioration of sewage-related problems.

Exploitation of living resources in the estuary is governed by the Marine Fisheries Policy for South Africa (1997) and the Marine Living Resources Act (1998). The policy supports sustainable use of resources and use of these resources for economic growth and development as well as ecosystem and biodiversity protection.

In respect to development planning pertaining to the Uilkraals River estuary, the Overstrand Integrated Development Plan, Environmental Management Framework as well as Integrated Development Framework are discussed.

The Uilkraals River estuary is important in terms of its conservation value. It has unique macrophyte diversity and is a very important birding site. It was included within a set of estuaries in the country identified as requiring protection in order to achieve national biodiversity protection targets. The establishment of a protected area on the Uilkraals River estuary is highly recommended and is considered highly feasible. The Uilkraals River estuary has also been identified as one in which there is a need for rehabilitation. Key management interventions identified in this respect include the restoration of the quantity of freshwater inflows; the restoration of water quality; removing significant obstructions to flow; and the removal of alien vegetation. The degree to which these factors should be managed to restore the health of the system depends largely on the vision that is developed for the estuary, and on its future protection status.

The biophysical characteristics as well as the aesthetic appeal of the Uilkraals River estuary denotes potential opportunities for local socio-economic development. Tourist development, such as accommodation, retail businesses and provision of eco-tourism activities, is likely to provide the greatest number of opportunities. However, this is an area of conflict as unsustainable development and recreational activities will lead to large-scale disturbance and transformation of the environment, overexploitation by recreational fishers, and impact on its wilderness character, for which it is highly valued. Employment opportunities can be generated from estuary rehabilitation initiatives, education programmes, and compliance and enforcement.

3 VISION & OBJECTIVES

A vision is a high-level statement which defines the strategic intent of a management intervention. The following vision was developed for the Uilkraals River estuary using stakeholder input collected from a multi-stakeholder meeting held in August 2010:

“The Uilkraals River estuary must be restored to a healthy, intact ecosystem with good water quality, must be accessible to all, and provide benefits to present and future generations through conservation and sustainable recreational use.”

Key management objectives for the Uilkraals River estuary were identified at a stakeholder workshop held in Franskraal, in August 2010. These are all set out in the form of a diagram (Figure 2). These objectives are seen to reinforce each other and none are seen as being of greater importance than any other.

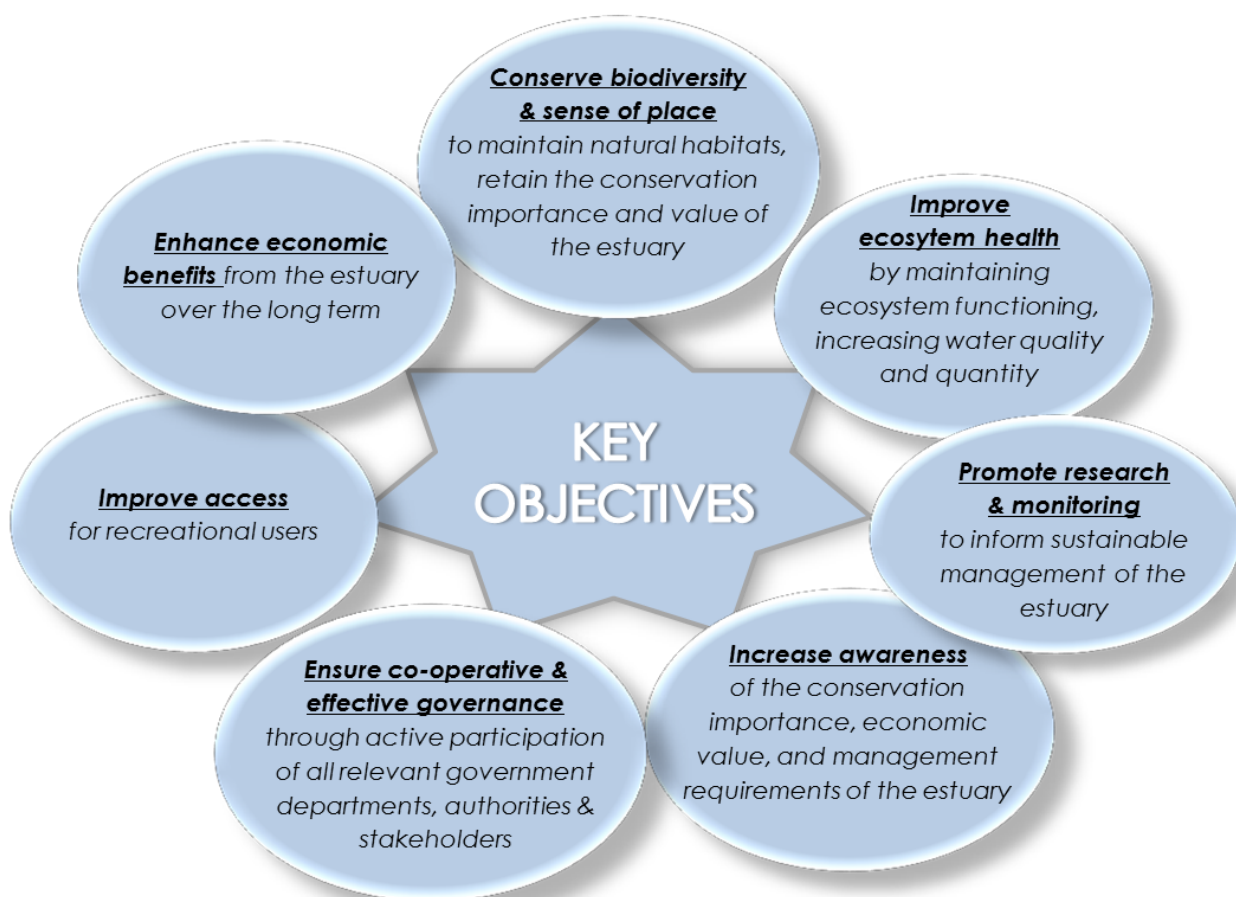


Figure 2: Key objectives for the Uilkraals River estuary

3.1 Conserve Biodiversity

Adequate protection is provided for estuarine biota to ensure persistence of populations, species, habitats and ecosystem processes. Alien vegetation is monitored and controlled. Management lines for development are defined to prevent future development from compromising the existing sense of place, cultural heritage and conservation value of the system.

3.2 Improve Ecosystem Health

The health of the estuary needs is enhanced through improvements in water quality, restoration of necessary freshwater supply, decreases in pollution, adoption of agriculture best practices in the riparian zone and the removal of alien vegetation and other measures.

3.3 Improve Access

Accessibility to the estuary for recreational user's needs is improved through the implementation of facilities (e.g. parking area, boardwalks) and amenities.

3.4 Co-operative governance

Harmonious and co-operative governance is achieved between the responsible management authority, relevant spheres of government, and the local community, such that roles and responsibilities pertaining to the management of the estuary are clearly defined, and coordination between responsible institutions are improved and maintained.

3.5 Promote Research and Monitoring

Research and monitoring must be undertaken to produce appropriate and reliable quantitative data toward sustainable management of the estuary in respect to conservation, development, resource use and other activities.

3.6 Increase Awareness

Residents and visitors are aware of the importance and economic value of the estuary, knowledgeable regarding regulations applicable to the system, and understand the rationale for management measures and interventions.

3.7 Enhance Economic Benefits

Economic benefits are enhanced through the promotion of ecotourism. The estuary is managed to maximize the value of ecosystem goods and services delivered in the long term, ensuring an equitable balance among the local, regional and national benefits.

4 MANAGEMENT OBJECTIVES

In order for each key (or overarching) objective to be achieved, a number of detailed management objectives is required. Detailed management objectives are summarised in Figure 3, with associated performance indicators outlined in Table 1. Note that some of these strategies are not mutually exclusive, e.g. conserving biodiversity and preserving ecosystem health contribute to preserving the sense of place as well as the enhancing economic benefits. Thus several aspects must be acknowledged as cross-cutting.

Targets established for conservation of estuarine biodiversity in South Africa require the establishment of a protected area that provides a sanctuary for at least 50% of all biota in the Uilkraals River estuary (Turpie & Clark 2007, Turpie et al. 2010). Zonation of the estuary will support biodiversity conservation objectives as well as assisting in the management of increasing access to recreational users.

Economic objectives and opportunities for ecotourism growth will have to be subject to coastal management lines and guidelines that safeguard the sense of place of the estuary. These guidelines will need to be integrated into regional and local development plans. Ecotourism growth will require improved access and attractive visitor facilities that draw people to the area and will also depend on future developments being sensitive to biodiversity and the sense of place.

Conservation of biodiversity will also require restoration and maintenance of ecosystem health through the provision of environmental flows, as well as rehabilitation of habitats that have been damaged, e.g. by invasive alien trees. An environmental flow assessment is needed to fully understand water use within the catchment. Improving ecosystem health will also require the adoption of agriculture best practices (sustainable agriculture) to alleviate poor water quality, habitat destruction and other disturbance to the riparian edge of the estuary. This in turn will require public awareness and harmony amongst farmers and managers of the estuary.

Biodiversity conservation will also be facilitated if public awareness is improved, which in turn will require the provision of educational material and signage. The management and monitoring of the estuary area, the freshwater inflows and development in the surrounding area will require cooperative governance among the responsible management authority, catchment management agency, conservation agencies, and local and national government. This in turn will require an Estuary Advisory Forum (EAF) that has representation amongst all relevant authorities, organisations and stakeholder groups.

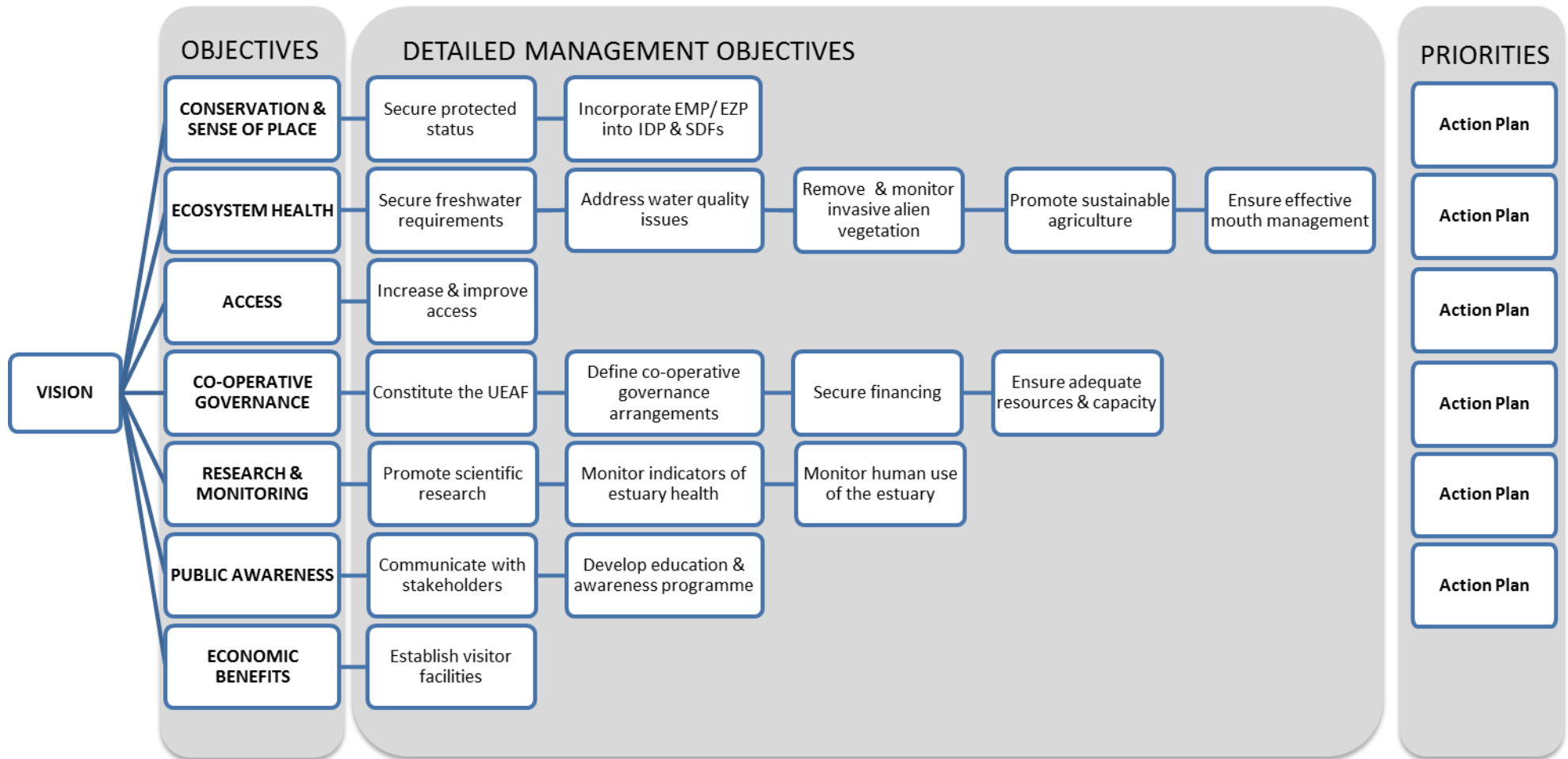


Figure 3: Management objectives to achieve overarching objectives and the Vision for the Uilkraals River estuary (adapted from Anchor 2010)

Table 1: Performance Indicators for management objectives and associated actions

Management Objective	Performance Indicators
1. Conservation of estuarine biodiversity and unique sense of place	<ul style="list-style-type: none"> • Estuarine protected area established that provides protection for at least 50% of all biota in the estuary, including salt marsh, invertebrates (bait), fish, other vegetation and birds. • Zonation plan for the estuary approved and implemented. • Equitable access provided for various user groups. • Uilkraals EMP integrated within local, district and provincial level planning documents (IDPs and SDFs). • Alien vegetation clearing and monitoring operations in place. • Future development around the estuary is constrained to ensure that it does not compromise estuary health, ecosystem functioning and/or sensitive species (e.g. no development in the 1:100 year flood line). • Future development on the estuary is constrained to ensure that it does not compromise the existing sense of place and cultural heritage resources associated with the Uilkraals River estuary.
2. Restoration of estuary health	<ul style="list-style-type: none"> • Freshwater environmental reserve for the Uilkraals River estuary implemented. • Quantity and quality of freshwater reaching the estuary adequate to restore and maintain estuary health. • Sources of pollution are identified and addressed • Sewage and storm water entering the estuary monitored and controlled. • Best practice agriculture methods are adopted. • Natural ecological patterns and processes are restored through
3. Facilitation of access	<ul style="list-style-type: none"> • Designated recreational zones are assigned. • Public amenities and controlled access is provided and maintained for all (permissible) user groups.
4. Harmonious and effective governance	<ul style="list-style-type: none"> • Uilkraals River estuary Advisory Forum convened and meets regularly, chaired by the RMA. • RMA for the Uilkraals River estuary is well capacitated. • Arrangements for co-operative governance of the Uilkraals River estuary defined and agreed to by all Government departments with a mandate to act. • Adequate capacity and resources available for implementation of the EMP amongst participating agencies.
5. Research and monitoring	<ul style="list-style-type: none"> • Adequate research and monitoring is being conducted that allows for quantification of utilisation patterns, changes in abiotic and biotic health, and benefits accruing to local communities and national economy.
6. Enhanced awareness, appreciation and understanding of the Uilkraals River estuary	<ul style="list-style-type: none"> • Functional and effective stakeholder communication, education and awareness programs are in place. • Stakeholders are sensitive to and aware of activities affecting health and functioning of the estuary, and management regulations governing use of the estuary.
7. Enhanced economic benefits delivered by the estuary & promoting ecotourism	<ul style="list-style-type: none"> • Uilkraals River estuary recognised as an important local ecotourism destination. • Quality and quantity of visitor facilities (ablutions, parking, etc.) sufficient to meet visitor expectations and requirements.

5 SPATIAL ZONATION

5.1 Geographical Boundaries

Estuarine systems are defined differently under different legislative acts in South Africa. The National Water Act (Act No. 36 of 1998) defines an estuary as “a partially or fully enclosed body of water—

- a) *which is open to the sea permanently or periodically; and*
- b) *within which the sea water can be diluted, to an extent that is measurable, with fresh water derived from land”.*

This is very similar to the definition included in the ICM Act and listing notices 1 (GN R. 983) and 2 (GN R. 984) published under the National Environmental Management Act (NEMA), Environmental Impact Assessment (EIA) Regulations (2014), which define an estuary as “a body of surface water-

- a) *that is part of a water course 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 water course is open to the sea; or*
- c) *in respect of which the salinity is measurable higher 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”.*

This definition of what constitutes estuarine habitat is considerably larger in terms of listing Notice 3 (GN R 985) published under the NEMA EIA Regulations (2014), where the definition of an estuary includes the estuarine functional zone (EFZ) as defined in the 2011 National Biodiversity Assessment (2011): Estuary Component (van Niekerk & Turpie, 2012):

“‘estuary’ means the estuarine functional zone as defined in the National Estuaries Layer, available from the South African National Biodiversity Institute’s BGIS website (<http://bgis.sanbi.org>)”.

In defining the “estuarine functional zone” and hence in the preparation of the most recent edition of the “National Estuaries Layer”, Van Niekerk & Turpie (2012) used the following definition of an estuary:

“...a partially enclosed permanent water body, either continuously or periodically open to the sea on decadal time scales, extending as far as the upper limit of tidal action or salinity penetration. During floods an estuary can become a river mouth with no seawater entering the formerly estuarine area or when there is little or no fluvial input an estuary can be isolated from the sea by a sandbar and become a lagoon or lake which may become fresh or hypersaline”.

In each case, the estuary mouth was taken as the downstream boundary or, where the mouth was closed, the middle of the sand berm between the open water and the sea. The upstream boundary was determined as the limits of tidal variation or salinity penetration. Lateral boundaries of each estuary were defined to include all associated wetlands,

intertidal mud and sand flats, beaches and foreshore environments that are affected by riverine or tidal flood events whichever penetrates furthest, and were mostly plotted as the 5 m amsl topographical contour surrounding each estuary.

For the purposes of this updated management plan, the geographical limits of the Uilkraals River estuary have been defined in accordance with the 2011 NBA (Van Niekerk & Turpie, 2012) and are shown in Figure 4. Importantly, it incorporates extensive wetland habitat associated with the Uilkraals River estuary. The terrestrial management component is defined by the extent of the Coastal Protection Zone (CPZ) as defined in the ICM Act.

The National Water Act (1998) also places some restrictions on development adjacent to water courses, which includes estuaries. This Act requires that authorisation (a water use licence) be obtained for any alterations to the bed, banks, course or characteristics of a water course (which includes changes in land use, vegetation cover, topography, soil, etc.) or the adjacent riparian habitat (defined as any flooded area adjacent to the river channel) from the Department of Water & Sanitation (DWS). The riparian habitat is considered to include everything within the 1:100-year flood line of a water course. The 1:50 and 1:100-year flood lines have not yet been delineated for the Uilkraals River estuary, however It is recommended that no further development be permitted within the 1:100-year flood line surrounding the Uilkraals River estuary.

5.2 Coastal Protection Zone and Proposed Coastal Management Line

The Uilkraals River estuary is ranked as the 34th estuary in the country in terms of conservation importance, and is significant in terms of macrophyte abundance and diversity. Protection of the biodiversity and ecological functioning of the Uilkraals River estuary is needed in order to meet the country's biodiversity conservation targets (Turpie & Clark 2007; Turpie et al. 2010) as well as well as meeting policy decisions enshrined in the National Protected Area Expansion Strategy for South Africa (DEA, 2010), to increase the area under formal protection.

Currently, conservation in estuaries is achieved through a number of different legislative Acts including the Marine Living Resources Act (Act No 18 of 1998) (MLRA), the National Environmental Management Act: Integrated Coastal Management Act, Act No 24 of 2008, as amended)(ICM Act), the National Environmental Management Act : Protected Areas Act, Act No 57 of 2003, the National Environmental Management Act : Biodiversity Act, Act No 10 of 2004), the Environment Conservation Act – Terrestrial and Marine Protected Areas, 1994 and the National Parks Act (NPA 1976). With the exception of the ICM Act, these acts are able to provide explicit protection for living and non-living resources either below the high water mark only (viz. MLRA 1998) or above the high water mark only (the rest).

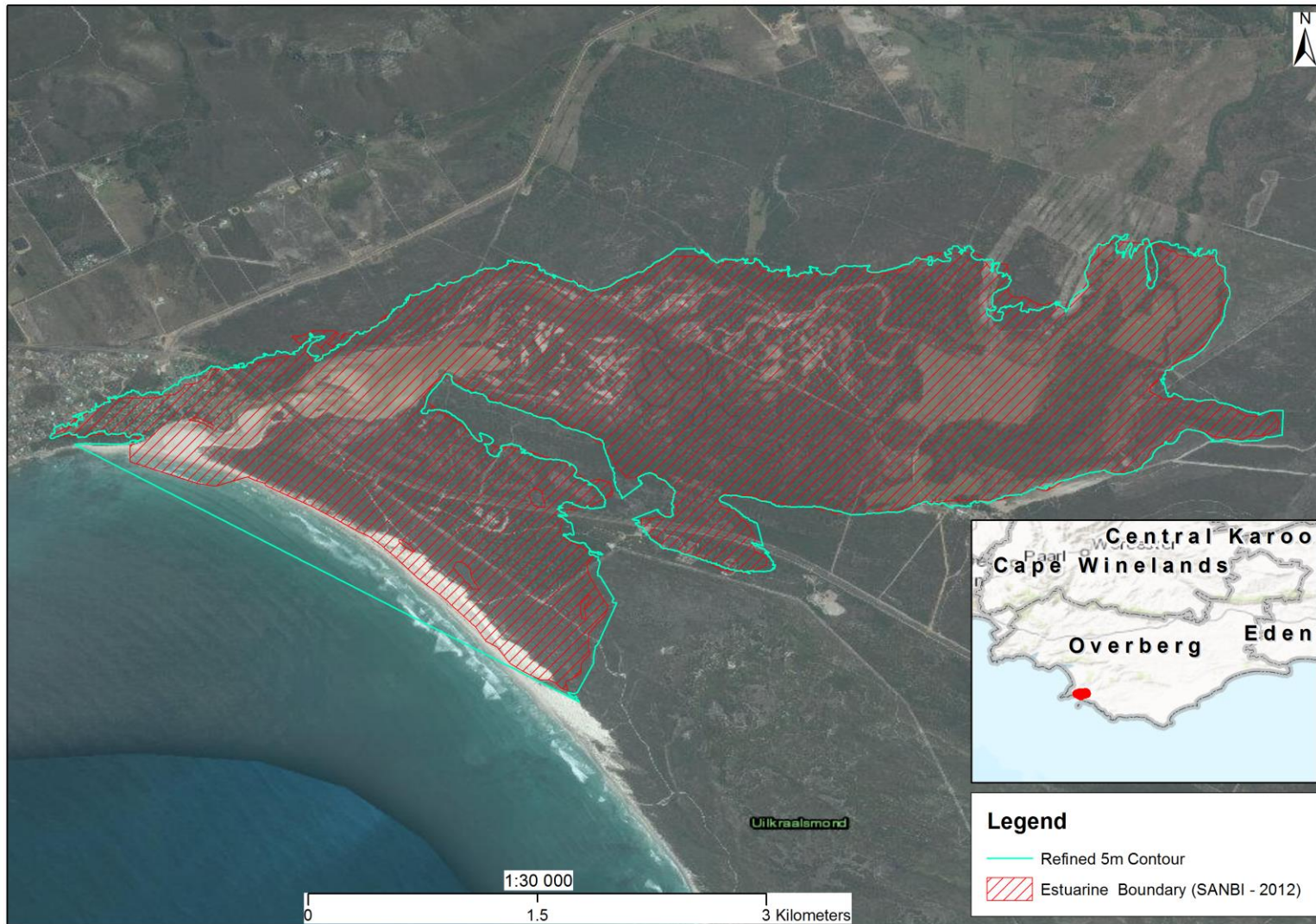


Figure 4: Map of the geographical boundaries of the Uilkraals River estuary according to 5m amsl topographical contour, and defining the EFZ (SANBI National Estuaries Layer)

The ICM Act, however, provides for various levels of protection for both aquatic and terrestrial habitats in the coastal zone both above and below the high-water mark. The following are of importance and can be effectively used in the development of a zonation plan and protection of habitats and resources in the Uilkraals River estuary:

1. The **Coastal Protection Zone (CPZ)** which comprises all land 1 000 m inland from the high-water mark zoned for agricultural or undetermined use and the wetlands, lakes, lagoons or dams situated on this land; any land within 100 m inland of the high water mark in areas zoned for residential or commercial use; the seashore and admiralty reserves which are not coastal public property; and land inundated by 1:100 year floods or storm events¹;
2. **Coastal Management Lines (CML)** are designed to protect the integrity of the Coastal Protection Zone. These lines are designed to control development in ecologically sensitive or vulnerable areas and can be used to prohibit or restrict development seawards of a particular point²;
3. **Coastal Overlay Zones** are proposed by the Western Cape Government and combine the CML and identified risk zones to depict a management scheme that can guide where development should and shouldn't take place (i.e. the CML) and how it needs to be undertaken in order to protect property, lives and the integrity of the coastal zone (i.e. the overlay zones); and
4. **Special Management Areas** are designed to provide additional protection for particularly special coastal ecosystems and biodiversity, and for control over exploitation of living and non-living resources in a particular area.

The CML and CPZ lines are indicated on Figure 5.

5.3 Zonation of Activities

A **zonation plan** was prepared for the Uilkraals River estuary in accordance with the ICM Act taking consideration of discussions with and submissions received from stakeholders engaged in the development of the Uilkraals EMP. There was strong support for improved control over recreational activities (particularly boating – which currently takes place at low levels but could well escalate in the future) on the estuary and also for the proclamation of formal conservation areas.

¹ The designated coastal risk zone or coastal protection zone was identified as the 10m amsl contour in estuaries or 1:100 year flood line, whichever is wider in the provincial Overberg CML delineation process (WCG, 2015)

² The CML was processed to extend along **estuaries**, and in developed areas along the banks of the estuary is proposed to be aligned with the lower (water side) boundary of properties with existing development or development rights. In rural areas, the CML was proposed to run along the 5m amsl contour around estuaries or landward of identified coastal (estuarine) sensitivities. Where the watercourse is defined by cadastral lines as a linear property which is wider than the 5m amsl contour, the property boundary was proposed to be used (WCG, 2015).

Spatial zonation will allow for partitioning of activities within the estuary, thus permitting their co-existence without one activity precluding or conflicting with another. It will also reduce management costs as it will focus activities in particular geographic areas and hence eliminate the need to deploy all types of management staff across the whole estuary at all times. Requirements, for which the greatest scope for conflict exists, most likely include exploitative resource use, high intensity recreation and biodiversity conservation.

5.3.1 Enhanced protection for key habitats and biota on the estuary

In addition to adopting the demarcation of the CPZ and CML around the Uilkraals River estuary (WCG, 2015)(Figure 5), it was initially proposed in the first generation EMP, that portions of the upper estuary be demarcated as a **Special Management Area (SMA)** in terms of the ICM Act. The proposed SMA extended from the road bridge up to the top of the estuary and included the banks of the estuary where sensitive and conservation-worthy estuarine vegetation (intertidal and supratidal salt marsh) occurred. This salt marsh vegetation is sensitive to trampling and grazing by livestock and is a very important roosting and winter feeding ground for wading birds and waterfowl.

However, this initial area excluded the lowest portion of the estuary (mouth area) from the core conservation zone, which is critical to the functioning of the estuary. Furthermore, the area was not delineated according to any known boundaries (e.g. the EFZ or CPZ). The boundaries of the SMA have since been updated in alignment with the EFZ (Figure 6).

Notwithstanding the above, it is evident that the updated zonation of the estuary is too broad and requires further refinement. It is thus critical that the zonation plan be reviewed by the RMA in the next EMP review in order to produce a map that is inclusive of various use zones (if necessary).

This SMA should be zoned in such a way as to satisfy the many conflicting requirements of the different user groups and stakeholders who wish to enjoy the benefits provided by the estuary. Zonation will allow for partitioning of activities within the estuary, thus permitting their co-existence without one activity precluding or conflicting with another. It will also reduce management costs as it will focus activities in particular geographic areas and hence eliminate the need to deploy management staff across the whole estuary at all times.

The following controls are proposed:

- Use of motorised vehicles should be strictly prohibited in this area;
- Pedestrian traffic should be restricted to established paths and board walks only;
- No grazing of livestock should be permitted between the months of April and October of each year; and
- The use of motorised boats should be banned from the entire estuary, given the small size of the estuary and the shallow depth of water at low tide.

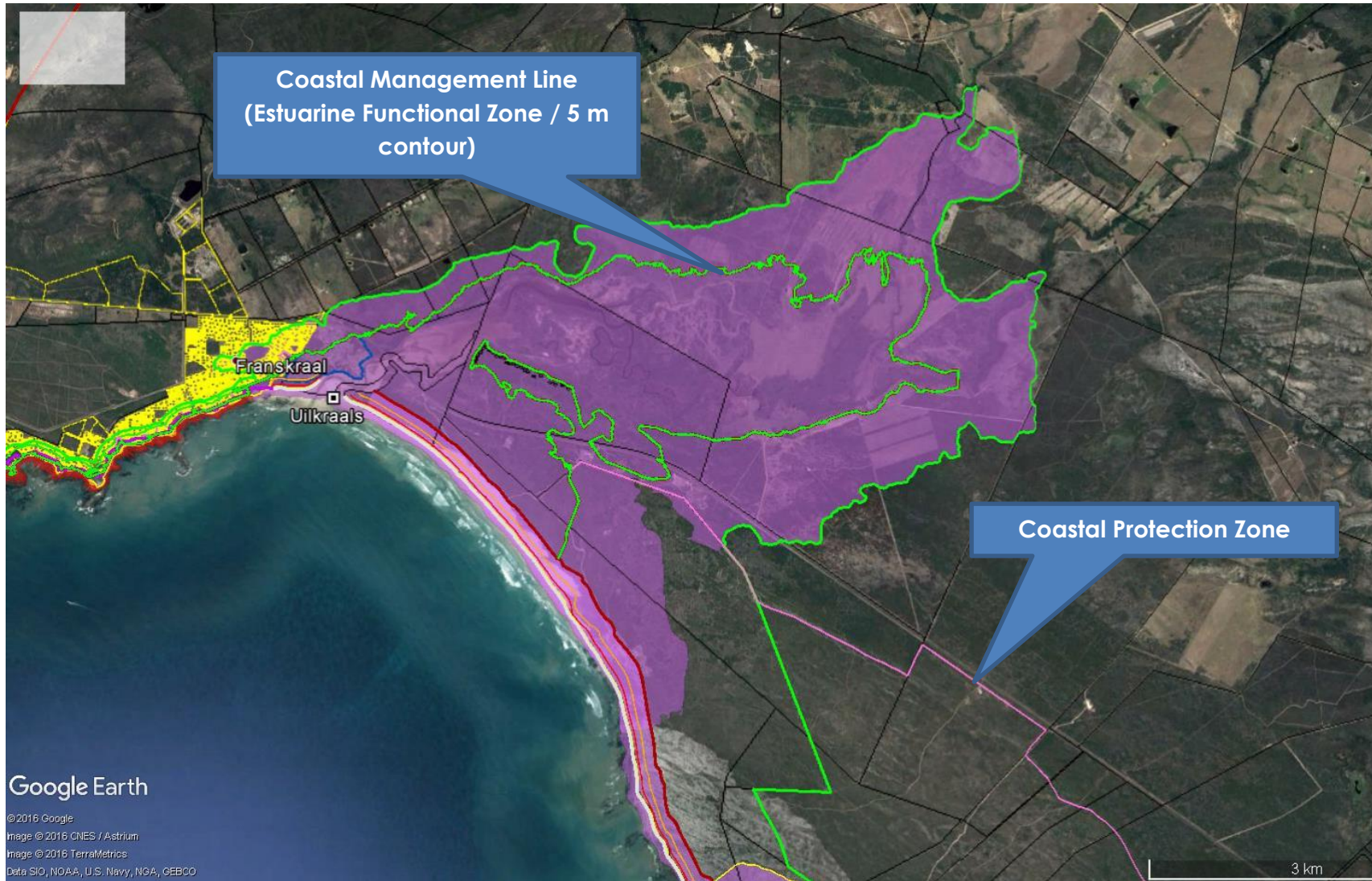


Figure 5: Geographical extent of the proposed Coastal Protection Zone as well as Coastal Management Line (WCG, 2015)

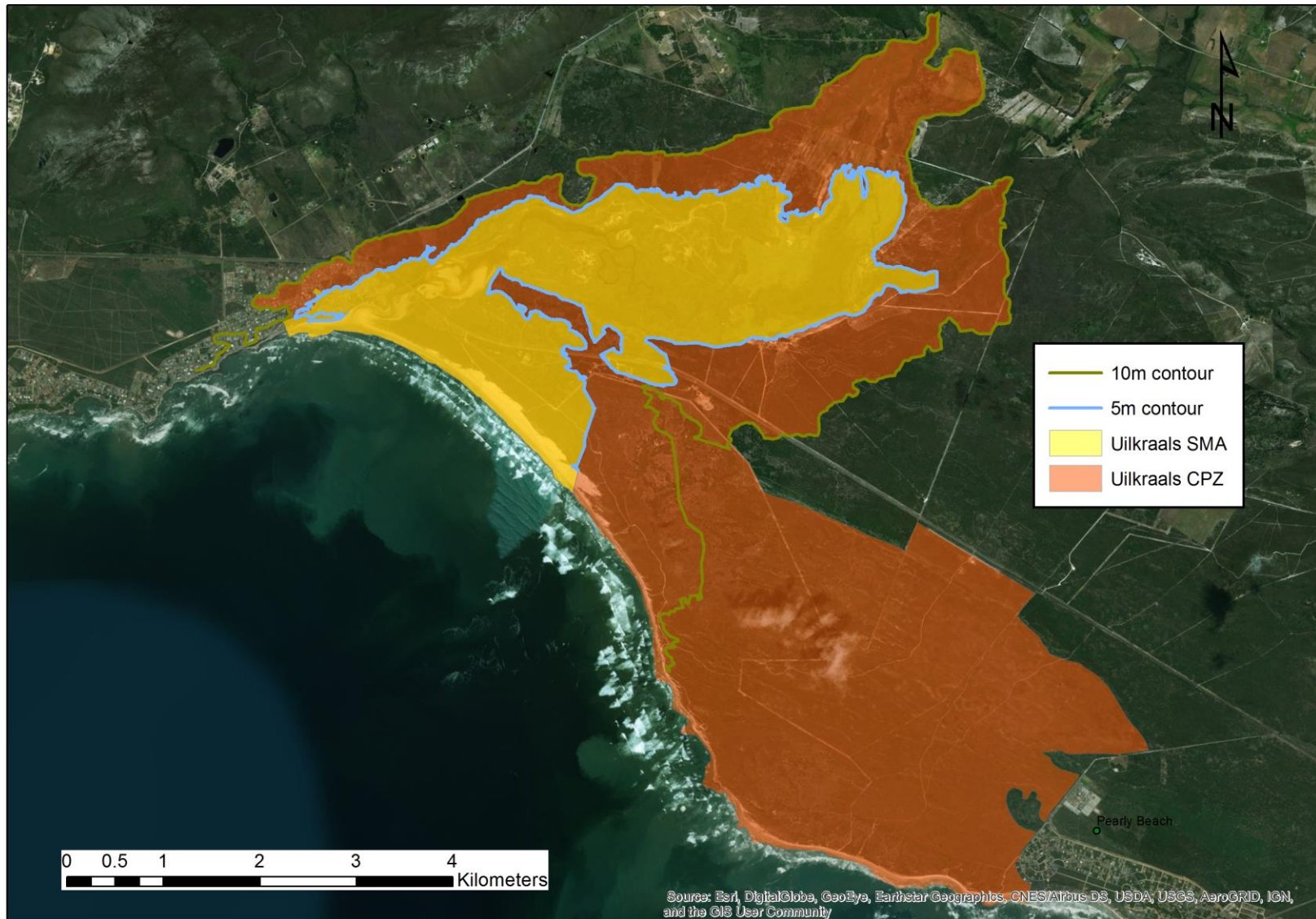


Figure 6: Updated estuary zonation plan showing the extent of the coastal protection zone (orange) and proposed special management area (yellow) according to the 5m amsl contour

6 MANAGEMENT PRIORITIES

6.1 Conservation of biodiversity and wilderness character

The Uilkraals River estuary is acknowledged as being an important estuary in South Africa from a conservation perspective. It provides habitat and food resources for a large population of resident and migrants water birds. The expansive floodplain marshes surrounding the estuary are unique along the southern Cape coast and the estuary has high macrophyte diversity. It is also relatively important as a nursery habitat for juvenile fish species.

Moreover, the Uilkraals River estuary is identified as a core estuary in the CAPE estuary conservation plan (Turpie & Clark, 2007) and in the National Estuary Biodiversity Conservation Plan (Turpie *et al.*, 2012), which recommends that 50% of its biota is protected and 75% of the estuary margin remains undeveloped. For these reasons, it is evident that a significant portion of the estuary should be set aside for biodiversity conservation through the enactment of appropriate legislation. The primary mechanism proposed is the establishment of a SMA in terms of the ICM Act; additional mechanisms could include formal stewardship agreements and establishment of conservation servitudes.

It is also important that these ideals and others contained in the vision and management objectives of this EMP be embraced by national, provincial and municipal authorities responsible for management of the Uilkraals River estuary, through the incorporation of these ideals and objectives into relevant planning documents (SDFs and IDPs). Positive steps in this respect would be the inclusion of the proposed CML and coastal overlay zone in planning documents and ensuring that development around the estuary is kept to a minimum and does not compromise biodiversity conservation, existing natural vistas, and the wilderness feel or sense of place of the estuary.

Table 2: Management Actions for Conservation of Biodiversity and Wildness Character

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Secure protected status for the Uilkraals Estuary	Establish a Special Management Area (SMA) that includes appropriate levels of protection for key habitats, and fauna and flora in the estuary.	ICM Act 2008	Joint memorandum from CapeNature DEA: O&C and UEAF, to Minister of DEA	2019	RMA UEAF CapeNature DEA:O&C	R10,000

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
	Investigate formal protection mechanisms to obtain conservation status for land parcels within or spanning the EFZ (e.g. stewardship agreements, conservation)	NEM: Protected Areas Act 2003 (NEM:PAA)	Protection mechanisms identified Stewardship agreements signed Increased area of land	2022	CapeNature	
b. Integrate both the EMP and Estuary Zonation Plan (EZP) into development planning	i. Review and update the EZP to include the mouth as well as consider alternate uses	ICM Act 2008 MSA 2000	EZP is updated	2019	RMA	
	ii. Ensure that the CML and CPZ and other developmental needs and restrictions are integrated into IDPs and SDFs		SDFs reflect requirements of EMP		Overstrand LM	

6.2 Improving of ecosystem health

Five focal areas have been identified for restoration or improving the ecosystem health of the Uilkraals River estuary:

- Restoration of the quantity of freshwater inflows;
- Improvement of water quality;
- Removal of alien vegetation;
- Effective and sustainable mouth management; and
- Sustainable / best practice agricultural practices.

The Uilkraals River estuary currently receives some 80% of the natural MAR. This reduction in flow has had a considerable impact on both mouth condition and water quality, due to the removal of base flows and floods, the reduced ability of water to dilute pollution and due to the increase in polluted return flows, storm water runoff and untreated sewage entering the estuary. The system is at present not functioning naturally, experiencing anomalous periods of prolonged mouth closure, and the natural flow regime has been modified to a large extent. The reduced flows have probably also altered the physical habitat of the estuary in that the depth and profile may have changed, and may also have affected the extent of flooding on the floodplain areas surrounding the estuary.

Mouth closure is impacting on water quality (exacerbated by elevated nutrient levels) and the development of hypersaline conditions; movements of estuary associated fish and

invertebrates therefore reducing the highly valuable nursery function; significant loss of intertidal saltmarsh habitat and associated fauna; and infrastructure in, and use of, the holiday resort located adjacent to the mouth of the estuary (Uilenkraalsmond Holiday Resort). Importantly, the closed mouth status likely to be progressive or “self-reinforcing” due to progressive sediment build up in the estuary particularly in the mouth region thereby increasing the likelihood of future closure, thus effective mouth management is urgently required to restore the health of the Uilkraals River estuary. The Mouth Management Plan (MMP) must be accompanied by an approved Maintenance Management Plan (MaintMP).

The reduction in flows will also most likely have resulted in changes to the biota of the estuary. Primary productivity by microalgae will, for example, increase owing to increased nutrient inputs and a reduction in flushing of the estuary. Plants have also most likely been affected. The distribution of brackish reeds and sedges and submerged macrophytes such as eelgrass has probably diminished as a result of changes in salinity. Abundance and composition of fish and bird communities on the estuary are also likely to have changed as a result of changes in freshwater flow, salinity, habitat and food supplies.

The clearing and monitoring of alien vegetation is also critical to the maintenance and functioning of the estuary and restoring seasonal freshwater flows.

As a means to promote sustainable agriculture and to reduce damage caused by cattle grazing, an agriculture best practice guideline and grazing protocol specific to the Uilkraals River estuary should be developed. This should provide detail on how to ensure that agriculture runoff to the estuary is reduced, thereby lowering the nutrient status of the system; and determine the permissible area for grazing, seasonality and duration of grazing activities.

Table 3: Management Actions for Restoring Ecosystem Health

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Secure adequate quantity and quality of freshwater input to restore and maintain ecosystem health and functioning	i. Implement the reserve requirements to prevent further degradation of the Uilkraals River estuary and loss of key fauna and flora in the system.	NWA 1998	Improvements in ecological health indices	once RDM signed off by DWS	DWS RMA Overstrand LM	DWS R250 000
b. Identify and address all sources and factors contributing to poor water quality	i. Review DEA&DP inventory of water quality issues and identify priority areas	NWA 1998	Water quality inventory reviewed and updated	2019	Overstrand LM RMA DWS	
	ii. Methods and mechanisms identified to mitigate pollution inputs		Sewage and storm water inputs are monitored and controlled.	2020		
	iii. Develop and implement a water quality monitoring programme taking RQOs into account, according to RDM work (See Appendices 1 and 2)	ICMA MSA 2000	Water quality monitoring programme developed and implemented Long term database developed Problem areas ring-fenced and monitored	2019		
c. Remove and monitor alien vegetation to restore seasonal base flow	i. Promote alien clearing activities in and around the estuary focussing particularly on removing alien vegetation from the estuary channel	CARA 1983 NWA 1998 NEMBA 2004	Records form alien clearing programmes (hectares cleared of alien vegetation)	2018-2021	Overstrand LM DWS DEA WfW SANBI CapeNature	DWS/DEA/ Cape Nature R1,000,000

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
			Improvements in ecological health and aesthetic indices			
d. Ensure effective mouth management	i. Adopt MMP and MaintMP for the Uilkraals River estuary	ICM Act 2008	MMP and MaintMP for the Uilkraals River estuary implemented	2018	DEA:O&C RMA CapeNature	
	ii. Implement the MMP and MaintMP for the artificial maintenance of the estuary mouth	NEMA 1998 EIA Regulations	Improvements in ecological health indices			
e. Promote sustainable agriculture	i. Develop and implement agricultural best practice guideline specifically to reduce nutrient enriched return flow and to control	CARA 1983 NWA 1998	High nutrient status is alleviated Improvements in ecological health	2018	RMA DAFF DWS	

6.3 Improve access

The primary challenge facing the future management agency of the estuary is to provide a quality experience for visitors to the estuary while at the same time managing visitors in a manner that ensures that they do not compromise the resource that attracted them in the first place.

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Increase and improve access for recreational users	i. Adopt a revised EZP and demarcate zones for all estuary uses	Municipal By-laws	EZP plan revised and adopted Recreational zones demarcated	2018	RMA Overstrand LM CapeNature	R1,000,000
	ii. Identify prime access points and appropriate type of access and facilities required	ICM Act 2008	Access profile compiled and needs identified	2018		
	iii. Access needs for Uilkraals incorporated in municipal coastal access roll out process		Uilkraal access needs acknowledged in municipal process	2019		
	iv. Provide and maintain controlled access		Sufficient appropriate access and public amenities are provided			

6.4 Co-management and effective governance

Owing to their position on the boundary between freshwater, terrestrial and marine environments, management of estuaries requires cooperation from a large number of separate national, provincial and local government agencies, each acting under a different legislative mandate. As a minimum the following national government agencies are implicated in management of the Uilkraals River estuary: Department of Environmental Affairs: Oceans and Coasts (DEA:O&C), Department of Water & Sanitation (DWS), Department of Public Works (DPW), the Department of Agriculture, Forestry & Fisheries (DAFF) and the Department of Transport (DoT). Provincial and local government agencies implicated in management of the estuary include the Department of Environmental Affairs & Development Planning (DEA&DP), CapeNature, Overberg District Municipality (DM), and the Overstrand LM.

The difficulties of ensuring a sufficiently high level of integration, cooperation and coordination amongst all of these different agencies vests with the RMA. It has been recommended that the Uilkraals River Estuary Management Forum be reconstituted as the Estuary Advisory Forum (as management will be the responsibility of the RMA), that will include representatives from all of the principal national, provincial and local government agencies, as well as key stakeholder groupings. The purpose of the Forum will be to support the RMA in an advisory capacity, as well as foster stakeholder engagement by providing a platform for stakeholders with an interest in the future of the Uilkraals River estuary to exchange information and ideas, and to reach agreement on action for the effective management of the estuary. It is essential that all these agencies work cooperatively to ensure the vision and defined management objectives can be realised. Individual agencies are required to make provision for the funding required to fulfil their obligations in the medium and long-term.

One of the first tasks for the RMA and UEAF will be to confirm the mandates, roles and responsibilities of various institutions. For example, DAFF has jurisdiction over living resources in the estuary, DWS has jurisdiction of freshwater flows to the estuary, and the Overberg and Overstrand municipalities have jurisdiction over land-use around the estuary and recreational use of the estuary. At the same time, CapeNature is responsible for management of any conservation areas (i.e. Uilkraalsmond Nature Reserve) and enforcing the MLRA. Irrespective of the role of the RMA, it is essential that all these agencies and institutions work cooperatively to ensure the vision and defined management objectives can be realised despite capacity constraints (human, infrastructure and financial resources). CapeNature as the provincial conservation agency managing the extensive Uilkraalsmond Nature Reserve, will need to work seamlessly with the RMA in terms of managing the proposed Special Management Area.

In respect to financing and securing adequate resources and capacity, the individual government agencies will need to make the necessary provisions to complete their actions within their mandates.

Table 4: Management Actions for Co-management and Effective Governance

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Reconstitute the Uilkraals River Estuary Advisory Forum (UEAF)	i. Invite representative members of stakeholders and government to be members of the advisory forum.	ICM Act 2008	Reconstituted forum A list of members of the forum and their contact details	2018	RMA	R20 000
b. Define co-operative governance arrangements for management	i. Responsible Management Authority to obtain agreement from other participating	ICM Act 2008	Signed letters of commitment from all agencies to be involved with the management	2018	Overstrand LM CapeNature DWS DAFF DEA&DP	

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
of the Uilkraals River estuary	agencies in respect of their roles and responsibilities.		of Uilkraals River estuary and the UEAF clearly outlining respective roles & responsibilities		DEA:O&C Overberg DM UEAF	
c. Secure financing	i. Individual government agencies to make provision for the necessary resources in the short, medium and long-term expenditure frameworks to create and fill posts, and acquire necessary infrastructure and resources for effective management of the Uilkraals River estuary	ICM Act 2008 NWA 1998 CARA 1983 MSA 2000	Provisions made for estuarine management in budgets and expenditure frameworks for 5 years Action plan for securing future funding	2018-	RMA Implementing agencies	R20 000
	ii. Develop a long-term financing plan					
d. Adequate resources and capacity	i. Individual agencies to acquire necessary equipment (office equip, water quality meter, boat, vehicle) for effective management		Staff & resources deployed for estuarine management	2019-	RMA Implementing agencies	R200 000
	ii. Individual agencies to identify and address training needs among staff involved in estuarine management (Overstrand LM, CapeNature, DWS, DAFF (e.g. for monitoring,		Training records			

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
	visitor regulation and assistance)					
	iii. Evaluate performance of staff, contractors and volunteers		Performance evaluations	2020-		

6.5 Research and Monitoring

This management plan has been devised based on current understanding of the functioning of the estuary. There are gaps in this understanding, and there will be an ongoing need to improve understanding through research. Monitoring and research are essential to enable the respective agencies responsible for management of the Uilkraals River estuary to adapt management plans, operational plans and activities to changing circumstances. Key focal areas for monitoring and research associated with the Uilkraals River estuary include water quantity and quality, mouth management, physical characteristics, and biodiversity.

An Ecological Reserve study has been conducted to assess more accurately the amount and change in runoff from the catchment and the river flow that is required to maintain optimal functioning. A water level recorder which continuously collects tidal variation data is also needed. The berm height and salinity should be continuously monitored and accurate run-off gauge stations in the catchment need to be installed to provide accurate and reliable data. With continued monitoring and a better understanding of water use in the catchment, management of the Uilkraals River estuary can be improved.

There has been no detailed baseline assessment of the abiotic and biotic characteristics of the estuary, and this is urgently needed. Monitoring is also critical to ascertain whether the measures that have been put in place are adequate to ensure that there is no further deterioration in the health of the estuary. The responsibility for this monitoring resides with the DWS but may be delegated to another agency. Recommended protocols for monitoring the health of the Uilkraals River estuary are included in Appendix 1. Related to this, the "*Ecological Specifications*" and "*Thresholds of Potential Concern*" (TPCs) for the Uilkraals River estuary are included as Appendix 2.

Increasing use by visitors, surrounding development, changes in freshwater supply from the catchment, and climate and sea-level change can impact on the health and ecological functioning of the estuary, as well as its value at different spatial scales. In addition to monitoring the biotic and abiotic health of the Uilkraals River estuary, it is also strongly recommended that visitor numbers, profiles, behaviour and opinions are monitored on a regular basis to gauge management effectiveness and user responses to management. Monitoring protocols for these aspects are also included in Appendix 1.

Table 5: Management Actions for Research & Monitoring

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Promote scientific research	i. Identify information gaps and develop research programme(s) aimed at gathering/consolidating data on biodiversity		Research projects	2019-	RMA UEAF CapeNature DST DWS	
	ii. Engage local research institutions and universities to collaborate on priority research projects		Scientific reports, papers and publications			
	iii. Solicit research funding support					
b. Monitor biophysical indicators of estuary health	i. Carry out monitoring programme as outlined in Appendix 2 and assess results in terms of Thresholds of Potential Concern (Appendix 3)	NWA 1998	Monitoring data and reports	2018-	DWS RMA Overstrand LM UEAF	R20,000
c. Monitor human use of estuary health	i. Carry out monitoring programme as outlined in Appendix 2		Monitoring data and reports	2018-		R50,000

6.6 Increasing Public Awareness

Effective management of the Uilkraals River estuary will be dependent on stakeholder buy-in (through adequate consultation and communication) and visitors' appreciation of the management regulations. Education is also considered to be among the most important functions provided by a protected area along with biodiversity conservation. Protected areas provide opportunities where the public are able to view species in their natural environments, and to experience ecosystems in a largely undisturbed state.

Provision of interpretive and educational material at these sites can greatly enhance this experience as it focuses attention of visitors on goods and services provided by the environment of which they may not have been aware, highlights keys aspects of the environment that are special or unique to the area, and can be used to highlight the impact of human activities on the environment. Furthermore, the better people understand the issues surrounding the management of a protected area, the more they are likely to respect the management requirements and regulations. Thus the management authority for the Uilkraals River estuary Special Management Area will need to provide state of the art service in this field.

6.7 Promoting Ecotourism

The Uilkraals River estuary is one of the most scenic of the larger estuaries along the southern Cape coast. The primary challenge facing the Responsible Management Authority of the estuary is to provide a quality experience for visitors to the estuary while at the same time managing visitors in a manner that ensures that they do not compromise the resource that attracted them in the first place.

Table 6: Management Actions for Public Awareness

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Create effective mechanisms for on- going communication with stakeholders	i. Develop an effective communication strategy	ICM Act 2008	Communication strategy	2018	RMA UEAF	R20 000
	ii. Maintain stakeholder database		Stakeholder database			
	iii. Explore alternative communications mechanisms (workshops, signage, radio etc.)		Record of Communications			
b. Develop an effective education and awareness programme for the Uilkraals that enhances visitor experiences	i. Establish a visitor centre at the estuary which will act as a focal point where visitors can go to learn more about the estuary, its conservation importance, the ecology of the system, the cultural and archaeological significance of the area, and the need for rationale behind existing management interventions		Visitor centre open to public Visitors are sensitive to and aware of activities affecting health and functioning of the estuary, and management regulations governing use of the estuary	2020	RMA Overstrand LM UEAF	R250 000
	ii. Source and/ or commission educational and informative material including signage, posters, pamphlets, and relevant literature		Posters, pamphlets, signage, literature compiled and disseminated	2019		

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
	to be housed in the visitor centre and other appropriate localities that will enhance visitor experiences.					
	iii. Encourage field excursions to the estuary by local schools, community groups, and other stakeholder groupings		Field excursions	2019-		

Table 7: Management Actions for Promoting Ecotourism

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Establish and manage visitor facilities	i. Develop appropriate nature friendly infrastructure for visitors to the estuary (ablutions, parking, bird hides, walking paths, natural trails, mountain bike trails) in collaboration with local communities and independent contractors that does not detract from sense of place of the area or impact on the environment.		Visitor infrastructure and facilities	2019-	Overstrand LM RMA UEAF	R500 000
	ii. Facilitate opportunities for commercial operators to develop visitor facilities and provide services on the estuary.		Number of tourism businesses increases			
	iii Ensure that visitor facilities are maintained in good condition at all times to maximise visitor experiences		Facilities receive good reviews			

7 INSTITUTIONAL ARRANGEMENTS

It is essential that this EMP is regarded as a strategic plan that can guide the detailing of implementation 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 action plans and the implementation thereof. Ways of empowering historically disadvantaged individuals with regards to the local management of the Uilkraals River Estuary must be explored and implemented.

7.1 Key Role Players

Co-management and effective governance has already been identified as the keystone to the efficient and effective management of the Uilkraals River Estuary. Figure 7 displays the key role players that should be included in the management of the Uilkraals River Estuary.

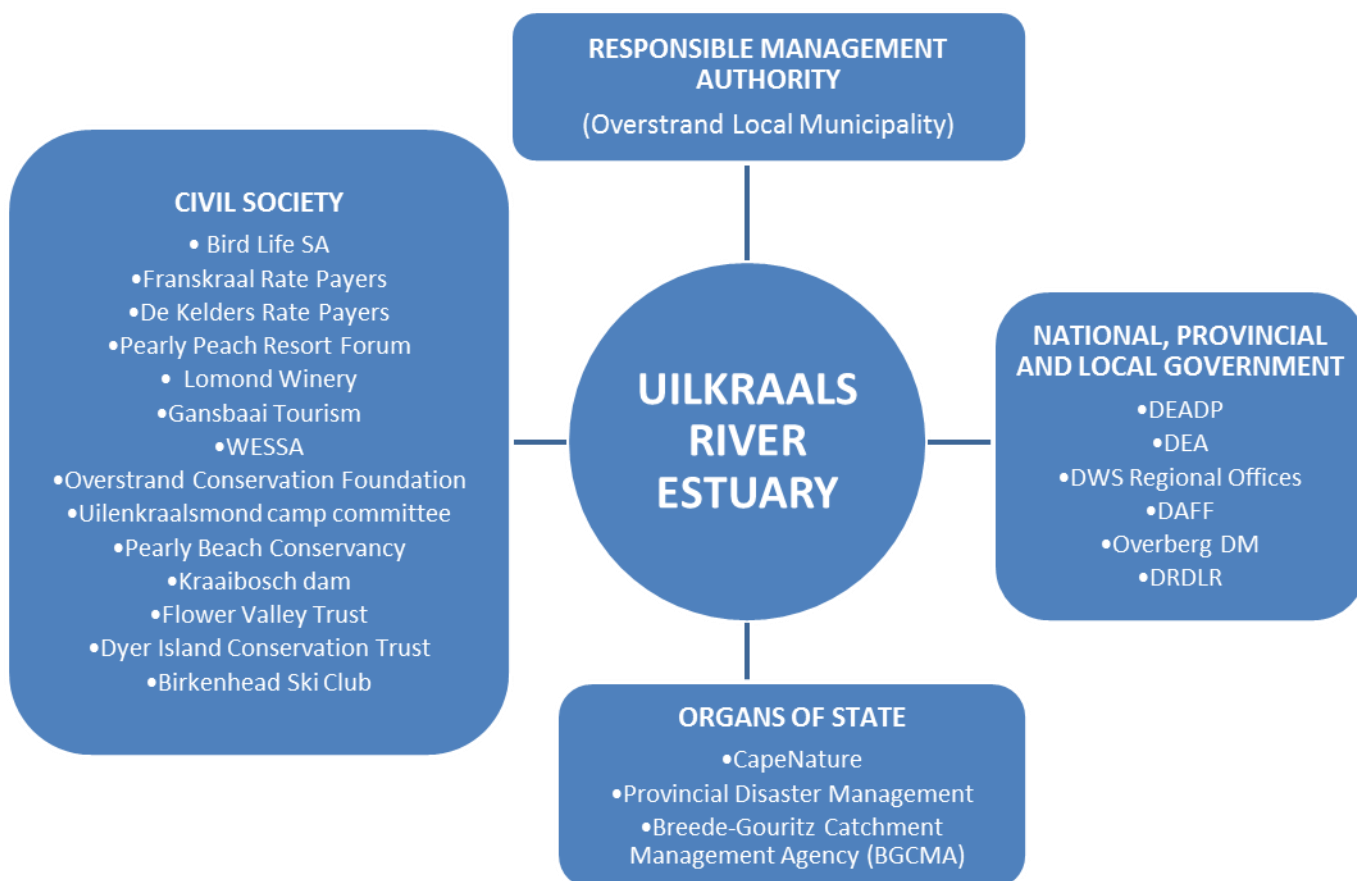


Figure 7: Key role players for the management of the Uilkraals River Estuary

7.1.1 Estuary Management Authority

The Protocol identifies CapeNature, or its assigned representative, as the RMA responsible for the development of the Uilkraals River EMP as well as being responsible for the co-ordination of its implementation. In addition, CapeNature is already responsible for the management of the Uilkraalsmond Nature Reserve. The agreed RMA and CapeNature

should come to agreement via a signed Memorandum of Understanding to co-manage the estuary. Implementation of the EMP can be affected through a range of different forums and agencies. The RMA should hold the responsibility of chairing and facilitating the Estuary Advisory Forum meetings.

It is strongly recommended that an Estuarine Management Co-ordinator be appointed given the number of estuaries within the municipal area to administer estuary-related matters at the local level.

7.1.2 Uilkraals River Estuary Advisory Forum

According to the Protocol, the role of the Uilkraals River Estuary Advisory Forum (UEAF) is interpreted as providing an advisory service to the RMA on issues specific to the management and implementation of the EMP, 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 UEAF. This includes Ratepayers' Associations, NGO's, community groups, conservancies, etc., as well as 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 UEAF will not represent or supplant the individual positions of its members unless specifically mandated to do so.

7.1.3 Government Departments and organs of state

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

- CapeNature as RMA, who is also responsible for general conservation in the region, including the Uilkraalsmond Nature Reserve, biological monitoring, compliance management and facilitating rehabilitation;
- Overstrand LM (local authority): Responsible for providing key municipal services, as well as the provision of management, technical and legislative support;
- Overberg DM: Responsible for fulfilling key municipal roles relating to *inter alia* water and sanitation, disaster management as well as the provision of management, technical and legislative support;
- Western Cape Government departments: Responsible for legislatively mandated responsibilities as well as support, including compliance, funding, and monitoring (e.g. DEA&DP, Department of Transport and Public Works, etc.);
- Relevant National government departments, especially DEA, DWS (via the regional office), DAFF, Department of Rural Development and Land Reform (DRDLR), and Department of Science and Technology (DST); and
- Organs of State, such as BGCMA.

The DEA is generally responsible for national standardisation of estuarine management and approval of provincially-compiled estuarine management plans. Direct involvement in individual estuaries, such as the Uilkraals, will occur via existing forums for intergovernmental

coordination. These forums will have the management of the Uilkraals River estuary on their agendas from time to time, and include:

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

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.

8 MONITORING AND EVALUATION

8.1 Resource Monitoring

Appendix 1 provides a list of recommended abiotic and biotic parameters to be monitored on the Uilkraals River estuary to assess changes in health of the system over time. Additional recommendations have been included for monitoring of visitor numbers, profiles and opinions, and angler catch and effort required in terms of the management plan.

8.2 Review and Evaluation

Evaluation of the EMP will become the responsibility of the RMA. This is to determine and grade the success and failures with the implementation of the management plan. This component utilises performance indicators included for the various actions, specifically the management priorities, and includes a temporal scale or the frequency of the collection of the performance data and the targets that should be achieved (Appendix 3).

Ultimately the EMP must be holistically reviewed every 5 years from the date it was adopted, ideally in line with the review cycles of the applicable IDP, SDF and/or CMP. This review is the responsibility of the RMA. This to assess whether the vision, objectives and targets are being achieved. This will involve revisiting the SAR 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.

9 RECOMMENDATIONS

The following recommendations are made to assist/ improve management of the Uilkraals River estuary:

- The EMP highlights that the initial zonation of the estuary excluded the lowest portion of the estuary (mouth area) and was not defined by any known boundaries. The updated zonation, however, is too broad and lacks detail in terms of recreational uses. It is thus critical that the zonation plan be reviewed by the RMA in the next EMP review in order to produce a map that is inclusive of various use zones (if necessary).
- Future revisions of the zonation plan should also consider flexible recreational use areas as well as peak user days regulations.

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APPENDIX 1: MONITORING

Recommended minimum monitoring requirements to ascertain impacts of changes in freshwater flow to the estuary and any improvement or reductions therein, as detailed in the Reserve Determination study (DWS, 2012) are listed below.

Ecological Component	Monitoring action	Temporal scale (frequency and when)	Spatial scale (no. Stations)
Hydrodynamics	Record water levels	Continuous	At bridge
	Measure freshwater inflow into the estuary	Continuous	At Kraaibosch dam and Boesmans above the estuary
	Aerial photographs of estuary (spring low tide)	Every 3 years	Entire estuary
Sediment dynamics	Bathymetric surveys: Series of cross-section profiles and a longitudinal profile collected at fixed 500 m intervals, but in more detailed in the mouth (every 100m). The vertical accuracy should be about 5 cm.	Every 3 years	Entire estuary
	Set sediment grab samples (at cross section profiles) for analysis of particle size distribution (PSD) and origin (i.e. using microscopic observations)	Every 3 years (with invert sampling)	Entire estuary
Water quality	Collect data on conductivity, temperature, suspended matter/turbidity, dissolved oxygen, pH, inorganic nutrients and organic content in river inflow	Monthly continuous	At river inflow
	Assess and better quantify wastewater input (e.g. nutrients and organics) from diffuse sources (e.g. caravan park, WWTW).	Once-off detailed Possibly long-term (e.g. peak seasons) if input remains significant (preferably these should be mitigated)	In stream (source/s)
	Record longitudinal salinity and temperature profiles (and any other in situ measurements possible e.g. pH, DO, turbidity)	Seasonally, every year	Entire estuary (10 stns)
	Take water quality measurements along the length of the estuary (surface and bottom samples) for system variable (pH, dissolved oxygen, suspended solids/turbidity) and inorganic nutrients in addition to the longitudinal salinity and temperature profiles	Seasonal surveys, every 3 years or when significant change in water inflows or quality expected	Entire estuary (10 stns)

Microalgae	Record relative abundance of dominant phytoplankton groups, i.e. flagellates, dinoflagellates, diatoms and blue-green algae Chlorophyll-a measurements taken at the surface, 0.5 m and 1 m depths, under typically high and low flow conditions using a recognised technique, e.g. HPLC, fluoroprobe Intertidal and subtidal benthic chlorophyll-a measurements,	Summer and winter survey every 3 years	Entire estuary (5 stns)
Macrophytes	Ground-truthed maps; Record number of plant community types, identification and total number of macrophyte species, number of rare or endangered species or those with limited populations documented during a field visit; Record percentage plant cover, salinity, water level, sediment moisture content and turbidity on a series of permanent transects along an elevation gradient; Take measurements of depth to water table and ground water salinity in supratidal marsh areas	Summer survey every 3 years	Entire estuary (5 stns)
Benthic Invertebrates	Record species and abundance of zooplankton, based on samples collected across the estuary at each of a series of stations along the estuary. Record benthic invertebrate species and abundance, based on van Veen type grab samples in subtidal and core samples in intertidal at a series of stations up the estuary, and counts of hole densities. Measures of sediment characteristics at each station	Summer and winter survey every 3 years	Entire estuary (5 stns)
Zooplankton	Record species and abundance of zooplankton, based on samples collected across the estuary at each of a series of stations along the estuary.	Summer and winter every 3 years	Entire estuary (5 stns)
Fish	Record species and abundance of fish, based on seine net and gill net sampling.	Summer and winter survey every 3 years	Entire estuary (5 stns)
Birds	Undertake counts of all water associated birds, identified to species level.	A series of monthly counts, followed by winter and summer survey every year	Entire estuary (3 sections)

APPENDIX 2: RESOURCE QUALITY OBJECTIVES

Ecological specifications and thresholds of potential concern for abiotic and biotic components of the Uilkraals River estuary produced through the Reserve Determination study (DWS, 2012).

Abiotic Component	Ecological Specification	Threshold of Potential Concern
Water quality	Salinity intrusion should not cause exceedance of TPCs for fish, invertebrates, macrophytes and microalgae (see above)	Salinity greater than 20 PSU for longer than 3 months in Zone C at Site 8 (4 km) upstream from the mouth (this would have an impact on the brackish salt marsh, reeds and sedges) Salinity greater than 35 ppt DO < 4 mg/l in more than 75% of estuary DIN and DIP concentrations > 100 µg/l and > 50 µg/l, respectively, unless from natural origin (e.g. occasional upwelling which will be indicated by low seawater temperatures)
Hydrodynamics	Maintain a flow regime to create the required habitat for birds, fish, macrophytes, microalgae and water quality	River inflow distribution patterns differ by more than 5 % from that of Scenario 1/3 (i.e. recommended flow scenario for the Uilkraals). River inflow below 0.03 m ³ /s persist for longer than 2 months Mouth closure occurs Water level in the estuary above 1.0 m MSL for 3 months.
Sediment dynamics	Flood regime to maintain the sediment distribution patterns and aquatic habitat (instream physical habitat) so as not to exceed TPCs for biota	River inflow distribution patterns of intermediate and high flows (flood components) differ by more than 10% (in terms of magnitude, timing and variability) from that of the Present State (2012) 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 2012). 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 (± 0.25 m).
Microalgae	Phytoplankton biomass, measured as water column chlorophyll-a should not exceed 10 µg l ⁻¹ . Maintain high subtidal benthic microalgal biomass during the closed mouth phase and high intertidal benthic microalgal biomass during the open phase.	Phytoplankton biomass greater than 10 µg l ⁻¹ . Deviation in benthic microalgal biomass by 20 % compared with Present State concentrations. No brackish epipelagic diatoms are found during the closed phase
Macrophytes	Maintain the distribution of plant community types i.e. Submerged macrophyte, <i>Ruppia cirrhosa</i> beds during closed mouth brackish conditions, salt marsh, <i>Salicornia meyeriana</i> marsh during open mouth conditions, <i>Phragmites australis</i> stands in the middle / upper reaches and salt marsh grasses indicative of brackish conditions.	Greater than 20 % change in the area covered by different macrophyte habitats for baseline open and closed mouth conditions.
Benthic	The estuary should have	Abundance of <i>C. kraussi</i> and <i>U. Africana</i> drops below

Abiotic Component	Ecological Specification	Threshold of Potential Concern
Invertebrates	viable populations of <i>Callinassa kraussi</i> in sandy zones and <i>U. Africana</i> in muddy zones. Breeding in both species ceases at salinities lower than 17ppt during prolonged mouth phase. In <i>U. africana</i> and export of larvae into marine and postlarvae back to estuary ceases.	50% of recorded total abundances in each season. No recruits in population recorded. (Identify zones where these are abundant based from the study and these would be where the above would be assessed)
Zooplankton	Prolonged close mouth would result in a loss of marine species (e.g. <i>Pseudodiaptomus</i> sp.) from the zooplankton community,	Absence of indicator marine species (<i>Pseudodiaptomus</i> sp.) changes by more than 50% of current levels (still to be determined).
Fish	Retain the following fish assemblages in the estuary (based on abundance): estuarine species (30-40%), estuarine associated marine species (60-70%) and indigenous freshwater species (<1%). All numerically dominant species are represented by 0+ juveniles.	Level of estuary associated marine species drops below 50% of total abundance. Level of estuarine species increases above 50% of total abundance. Occurrence of alien freshwater species in the estuary. Absence of 0+ juveniles of any of the dominant fish species.
Birds	The estuary should contain a rich avifaunal community that includes representatives of all the original groups, significant numbers of migratory waders and terns, as well as a healthy breeding population of resident waders. The estuary should support thousands of birds in summer and hundreds in winter.	Numbers of White-fronted Plovers fall below 60 during the breeding season Numbers of terns recorded in midsummer are fewer than 2000 Numbers of bird species drop below 20 for 3 consecutive counts.

APPENDIX 3: RECOMMENDED PERFORMANCE MONITORING PLAN

MANAGEMENT OBJECTIVES	PERFORMANCE INDICATOR	TIMING	LEGISLATION	RESPONSIBILITY
1. Biodiversity Conservation				
a. Secure protected status for the Uilkraals Estuary	Part of Uilkraals River estuary receives formal protection as a SMA Stewardship agreements signed with land owners	Once a year	ICM Act NEM:PAA	CapeNature, RMA, DEA
b. Integrate Uilkraals estuarine management plan into IDPs/SDFs	EMP is reflected in the local/district and coastal management line is gazetted	Every IDP/SDF review cycle	ICM Act MSA	RMA, Overstrand LM
2. Restoration of estuary health				
a. Restoration of freshwater flows and quality	Ecological health Category of C is achieved and maintained/ improved	Biannual for DWS	NWA	DWS, RMA
b. Identify and address all sources and factors contributing to poor water quality	Ecological health Category of C is achieved and maintained/ improved	Quarterly, Environmental incident	NWA, MSA, NEMA	RMA, Overstrand LM, CapeNature, DWS
c. Eradication of alien invasive species from the estuary and catchment	Increased number of tons removed/ hectares cleared	Ad hoc visual monitoring during normal daily activities Assess area every 2 year	CARA	Overstrand LM, CapeNature, DEA (WfW)
d. Ensure effective mouth management	MMP and MaintMP implemented and near-natural functioning restored Ecological health Category of C is achieved and maintained	Seasonally/ quarterly and following major natural weather events	NEMA NWA	RMA, CapeNature
e. Promote sustainable agriculture	Improvement in estuary nutrient status Degraded areas recovered Cooperative governance with local communities	Twice a year	CARA, NWA	DAFF, DWS, RMA, CapeNature
3. Improve access				
a. Increase and improve access for recreational users	Designated recreational zones assigned Public amenities and controlled access provided and maintained	Twice a year	ICM Act	Overstrand LM, RMA, CapeNature
4. Co-operative and effective governance				

MANAGEMENT OBJECTIVES	PERFORMANCE INDICATOR	TIMING	LEGISLATION	RESPONSIBILITY
a. Reconstitute the Uilkraals River Estuary Advisory Forum	Confirmed members & reconstituted UEAF	End of 1st year	ICM Act	RMA
b. Define co-operative governance arrangement	Confirmed roles & responsibilities of participating agencies	Assess every 2 years	ICM Act, NEM:PAA	RMA Key agencies
c. Secure financing	Funding is secured for next 5 years	Assess twice a year	ICM Act, NWA, CARA, MSA	RMA Key agencies
d. Ensure adequate resources and capacity	Office equipment and field equipment obtained, manned by knowledgeable and well-trained staff Ongoing training for staff Positive outcomes of staff performance appraisals	Assess twice a year		RMA Key agencies
5. Research and monitoring				
a. Promote scientific research	Increase in number of research projects and monitoring programmes	Once a year		RMA, CapeNature, UEAF
b. Monitor biophysical indicators of estuary health	Ongoing databases and reports produced	Biannual for DWS Monthly for RMA	NWA	DWS, RMA
c. Monitor human use of the estuary	Ongoing databases and reports produced	Ad hoc visual monitoring during normal daily activities	MLRA	Overstrand LM, RMA, UEAF, CapeNature
8. Increasing public awareness, appreciation and education				
a. Create mechanisms for communication with stakeholders	Widespread and effective communication to a diversity of stakeholders who are well informed through their preferred method of communication	Once a year	ICM Act	RMA, UEAF,
b. Develop education and awareness programme	Increase in number of newsletters, pamphlets, and posters; Sufficient number of public notice boards; Increase public participation in coastal/estuary/river clean ups and other initiatives. Visitor center open to public Increase in number of visiting school groups to visitor center	Once a year	ICM Act	RMA, Overstrand LM, UEAF,
7. Promoting ecotourism				
a. Establish and manage visitor facilities	Increase in number of tourists per year Increase in contribution of tourism to GDP	Once a year		Overstrand LM, RMA, UEAF,