



Goukou River Estuary Estuarine Management Plan (2023 to 2027)

March 2023

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Date:

March 2023

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

Disclaimer:

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

The South Africa National Estuarine Management Protocol ('the Protocol'), promulgated in May 2013 (and amended in 2021), under the National Environmental Management: Integrated Coastal Management Act (ICMA_ Act No. 24 of 2008, as amended 2014), sets out the minimum requirements for individual Estuarine Management Plans (EMPs).

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

This revision of the Goukou River Estuary Estuarine Management Plan (EMP), including the Situation Assessment Report (SAR), is in response to the comments received during the review process only, to ensure compliance with the minimum requirements for estuarine management plans as per the Protocol. In summary, this entailed:

- Updating the terminology as per the Protocol;
- Including a summary of the Situation Assessment;
- Including map of geographical boundaries based on Estuarine Functional Zone;
- Provision of performance indicators for the management actions;
- 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 updated when new information 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. 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.

In preparation for the final EMP approval process, the draft EMP was published for public comment from 28 January to 04 March 2022 (see appendix C : stakeholder consultation report). This was followed by a formal “Comment and Response” process which reviewed and addressed all comments submitted. Minor edits were made to the EMP where appropriate. This document is the final Goukou River Estuary Estuarine Management Plan.

EXECUTIVE SUMMARY

Introduction

Estuaries are recognised as particularly sensitive and dynamic ecosystems, and therefore require above-average care in the planning and control of activities related to their use and management. For this reason, the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008, as amended by Act 36 of 2014), via the prescriptions of the South African National Estuarine Management Protocol (the Protocol), require Estuary Management Plans to be prepared for estuaries in order to create informed platforms for efficient and coordinated estuarine management.

Accordingly, the CSIR was commissioned by CapeNature to refine an initial estuary management plan (EMP) for the Goukou River estuary from 2008. The EMP comprises two essential documents. The first document, the situation assessment report prepared by the CSIR (2011), provides an account of the current state of the system and related issues, and serves as the platform for the second document, this EMP.

This current revision of the Goukou River EMP, including the Situation Assessment and the Management Plan itself, is in response to a review conducted by the National Department of Environmental Affairs: Oceans and Coasts in 2014, to ensure compliance with the minimum requirements for estuary management plans as per the Protocol.

Situation Assessment

The Goukou River estuary covers approximately 250 ha, is 19 km in length, and is part of the Still Bay Marine Protected Area (MPA) formally promulgated on 17 October 2008 (Government Gazette No. 31513). Of South Africa's approximately 300 functional estuaries, more than 70% close from time to time. The permanently open Goukou River estuary is therefore important as it represents an estuary type that is relatively rare in South Africa. Permanently open estuaries such as the Goukou River estuary are valuable as they support a wider range of marine and estuarine species than temporarily open systems. The Goukou River estuary was ranked as the 32nd most important system in South Africa in terms of conservation importance and ranked by the recent National Biodiversity Assessment, 2018, as being Highly Important.

The Still Bay MPA was declared with the intention to protect and conserve the coastal environment and the marine living resources that are found in and around Still Bay and, thereby, protect the estuary's reproductive capacity for exploited fish species and serve as a nursery to recruit estuarine-dependant fish into marine fisheries. The Still Bay MPA possesses all the ecological features typical of the warm-temperate South African south coast: abundant inter-tidal life, a productive estuary, diverse offshore fisheries, and an abundance of cetaceans. It represents many of the problems too: a town centred on an estuary, an estuary starved of freshwater, transformation and degradation of the natural system, and over-utilisation for recreational activities.

The following section provides a brief description of the identified key issues and their related potential impacts on the Goukou River estuary:

- **Floods:** Wetland in the catchment and the riparian vegetation naturally attenuate and protect against floods. The continual removal or degradation of these wetlands and the riparian vegetation poses an ever-increasing danger of substantial damage to infrastructure situated in the floodplain.
- **Droughts:** The absence of baseflow reaching the estuary during droughts can permanently damage the ecosystem health (and productivity) during extreme droughts.
- **Climate Change:** Flow changes, sea level rise and increase storminess pose a great long-term threat to the ecosystem and livelihoods in the area.
- **Road Infrastructure:** Existing road infrastructure encroaches on the Goukou River estuary and floodplain reducing its resilience to deal with development pressures.
- **Riparian Infrastructure (e.g. low-lying developments):** Saltmarshes and natural riparian vegetation in the Goukou system have been, and continue to be, degraded by developments and infrastructure in the floodplain. This encroaches on natural buffers and unique estuarine habitats along the estuary and reduces the mitigation effect that natural vegetation provides against wave action (caused by tidal action and water-skiing) and floods.
- **Instream Infrastructure (e.g. jetties and boat launching sites):** Instream infrastructure interferes with the natural hydrodynamics of the Goukou Estuarine system under high flow conditions. Artificial bank stabilization associated with instream infrastructure such as jetties introduces foreign habitats to the system.
- **Water Abstraction (e.g. direct abstraction, groundwater and fountains):** The over-allocation of water resources in the catchment deprives the Goukou River estuary of the freshwater necessary to sustain a healthy ecosystem. The decreased flow could contribute to sedimentation in the upper and lower reaches of the estuary. Freshwater fountains along the system serve as unique ground water dependent habitats that link the aquatic and terrestrial environment. Over-exploitation of groundwater resources could cause these fountains to cease providing a habitat that nurses eels.
- **Wastewater (e.g. sewage):** Poor water quality (pollutants from wastewater discharges) poses a threat to environmental and human health in the Goukou River estuary.
- **Agricultural return flow:** Pollutants (leached fertilizers and agrochemicals) from farming activities in the Goukou catchment and surrounding environs pose a threat to the Goukou River estuary ecosystem.

- **Alien vegetation in the catchment:** Alien vegetation in the Goukou Estuary catchment displaces endemic vegetation and decreases the amount of runoff reaching the estuary. Felled alien vegetation that is not removed from floodplains litters the estuary banks and surrounding beaches after floods and poses a risk to recreation activities.
- **Clearing of riparian vegetation:** The clearing of riparian vegetation to gain access to recreational areas leaves the Goukou River estuary's banks vulnerable to erosion. The burning of reeds and sedges for grazing purposes often poses a similar risk to erosion.
- **Bait collection:** Bait collection poses a threat to non-targeted species, e.g. amphipods, and can lead to the degradation of certain habitats.
- Historically, **illegal netting** was a major activity that significantly compromised the nursery function of the Goukou River estuary. At present, this aspect is deemed to be under control, but compliance needs to be verified and upheld.
- **Recreational fishing:** Overfishing in the Goukou River estuary has broader implications for the fishing industry since the estuary serves as an important breeding ground and nursery for marine species. This aspect is currently under control through firm compliance management.
- **Alien fish species:** The predatory alien fish species, e.g. *Micropterus* spp. (bass), in the Goukou River pose a threat to endemic species, especially eels and freshwater mullet that need to pass through the alien- invested coastal plain rivers to the more sheltered tributaries.
- **Hobbyists collecting tropical fish species:** Hobbyists collecting tropical fish are not seen as a serious concern at present. However, monitoring is required since, in other parts of the world, this is becoming a major concern.
- **Agriculture:** livestock grazing: Saltmarshes and natural wetlands are damaged by domestic animal grazing. This leads to reduced productivity, habitat destruction and ultimately bank erosion.
- **Power-boating and water-skiing:** Inadequate resources to manage the use of the Goukou River estuary by power boats, particularly during the peak holiday seasons, is of concern. Exceedance of the system's power-boating capacity can lead to bank erosion and endangering the safety of other recreational users.
- **Kite and wind surfing:** These activities can endanger bathers and disturb feeding birds.

Vision and Objectives

During a Stakeholder Workshop held in July 2011 in Still Bay the following vision and overarching objectives for the Goukou River estuary were formulated and accepted by everyone present:

The Goukou River estuary is conserved and improved through evidence based information as a geographical and spiritual space that sustains and nurtures biodiversity and human well-being.

This formal vision highlights the aspects of the estuary which are valued and which need to be enhanced and managed.

While the Vision is an inspirational, higher-level statement of strategic intent, key (strategic or overarching) objectives support the development of the detailed management objectives for the Goukou River Estuary EMP. These are:

OBJECTIVES		BY WHEN
Ecological	Ecological health of ecosystem is improved to Category B (moderately modified).	2024
	Ecological health of ecosystem is improved to Category A (near natural).	2033
	The Goukou River estuary fulfils its nursery function with regard to replenishing collapsed and over exploited fish resources and contributing to biodiversity targets.	2024
	Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making.	2023
Heritage	Development in and around the Goukou River estuary is guided by the cultural values and sense of place of the Still Bay environs.	2023
Socio-economic	The Estuary Forum is constituted and well resourced (human and capital) with the mandate to: <ul style="list-style-type: none">• Monitoring the implementation of the Goukou River Estuary EMP;• Facilitate effective co-operative governance; and• Serve as a communication platform to inform the local community.	2023
	The Goukou River Estuary EMP is seamlessly integrated and implemented as part of the Hessequa Integrated Development Plan and the Spatial Development Framework.	2023
	Sustainable tourism is facilitating responsible economic growth and the optimal utilisation of ecosystem services.	2023
	All estuary users and the local community are well informed, self-compliant and supportive of estuary initiatives.	2023

Spatial Zonation

The **Still Bay MPA** was gazetted in the *Government Gazette* (No. 31513) following an officially approved process run by the National Department of Environmental Affairs. **The boundaries of the MPA will therefore form the basis of the Goukou Estuarine Zonation Plan.**

Zones include:

- Areas of ecological value (estuary flood plain);
- Conservation areas;
- Marine protected area; and
- No wake zones.

Institutional Arrangements

The Protocol identifies **CapeNature** as the **Responsible Management Authority** since the Goukou River estuary forms part of the Still Bay Marine Protected Area. The RMA is responsible for the development of the Goukou River Estuary EMP as well as for the co-ordination of its implementation. This implementation function can be affected through a range of different forums and actors.

The future role of the existing Goukou EAF will need to be confirmed by the RMA, CapeNature. **It is recommended that the RMA considers the continuation of the existing stakeholder body (the Still Bay Environmental Advisory Committee (SEAC)) so as to provide an advisory service to the RMA on issues specific to the management and implementation of the EMP.**

At the July 2011 stakeholder workshop, it was agreed that it would be beneficial to integrate the EAF into the existing SEAC. If this is possible it would prevent stakeholder fatigue brought on by numerous committees for each environmental management mandate in the area. If the integration of the EAF into the SEAC is successful for the Goukou River estuary this can serve as a management model for future EMPs. At the same meeting, the independence of the SEAC was questioned since it was constituted as a municipal advisory committee. It was decided that this issue will be assessed to see whether the SEAC can take up additional mandates and serve as an independent body. A CapeNature Protected Area Advisory Committee (PAAC) is a suggested option.

Management Priorities

It was highlighted by the feedback from participants at the Stakeholder Workshop held in Still Bay (July 2011) that management needs to be focused and directed towards development and activities in and around the Goukou River estuary.

The following key sectors/categories for which management objectives had to be defined were identified:

- Water quantity and quality;
- Recreational activities;
- Living resource management;

- Land use and development (including mitigation for environmental hazards); and
- Funding and educational awareness.

	ACTION	PRIORITY
Water quantity and quality	Action 1.1: Implement and monitor the ecological water requirements of the Goukou River estuary, in line with RDM methods and taking EcoSpecs into account.	High
	Action 1.2: Develop and implement a water resource utilization plan for surface and groundwater resources (including registration & licensing).	High
	Action 1.3: Design and implement a water quality monitoring programme for Goukou River estuary, in line with RDM methods and taking EcoSpecs into account.	High
	Action 1.4: Eradicate/control invasive alien plant species from Goukou Estuary Catchment to increase flow.	High
	Action 1.5: Conserve and restore wetlands in Goukou Estuary Catchment to ensure summer baseflows.	High
	Action 1.6: Develop and implement a Water Demand Management Plan for Still Bay and surrounding towns and link to Catchment Management Strategy.	Medium
	Action 1.7: Maintain/develop sanitation and sewage treatment facilities in Still Bay East and West (including pump station(s), and freshwater purification facility).	Medium
	Action 1.8: Investigate the link between sewage spills, nutrient dynamics and algal blooms/prawn kills/diabetic shellfish poisoning (oyster die-off).	Medium
Recreational activities	Action 2.1: Determine the power boat carrying capacity (number of boats and engine size) of the Goukou River estuary and revisit zonation and bylaws.	High
	Action 2.2: Maintain compliance and monitoring of fishing activities.	High
	Action 2.3: Improve compliance and monitoring of recreational activities, especially power-boating and water- skiing.	High
Land use and development (including mitigation for environmental hazards)	Action 3.1: Ensure appropriate development in and around the Goukou River estuary through environmental authorization and implementation of IDP/SDF - considering ecosystem services and sense of place.	High
	Action 3.2: Develop appropriate coastal management lines and 1:100-year flood line for development that considers major floods and sea level rise for inclusion into the IDP/SDF.	High
	Action 3.3: Register all private and public jetties and ensure compliance with development guidelines.	High
	Action 3.4: Implement agricultural best practice specifically to reduce nutrient enriched return flow and sediment erosion from surrounding farms and catchment.	High
	Action 3.5: Develop and implement best practice guidelines for riparian protection (addressing reed removal, grazing and burning).	High
	Action 3.6: Improve access (e.g. walk ways and board walks).	Low
Living resource management	Action 4.1: Implement Goukou River Estuary EMP in conjunction with existing MPA Management Plan.	High
	Action 4.2: Monitor illegal gill netting (verifying the extent of problem) and maintain compliance in this regard.	Medium
	Action 4.3: Consolidate existing research and monitoring activities of fish resources and implement new research (e.g. SAIAB/DFEFF/CapeNature telemetry study and link between eels and fountains) to show benefits of	High

	ACTION	PRIORITY
	MPA.	
	Action 4.4: Investigate occurrence and sensitivity to pressures of estuarine invertebrates (in both open and closed bait collection areas) and update bait collection strategies and plan accordingly.	Medium
	Action 4.4: Eradicate/control (predatory) alien invasive fish species in the catchment and upper reaches of the estuary to ensure safe passage of eels and freshwater mullet.	High
Funding, education and awareness	Action 5.1: Ensure that funds generated through river management (boat launching and licenses fees) are spend on Goukou River estuary.	High
	Action 5.2: Ensure that Goukou River Estuary EAF and EMP interests are represented in other existing structures (e.g. Organised Agriculture, Aesthetics committee, MPA Forum and IDP/SDF) through shared membership or clear lines of communication.	High
	Action 5.3: Ensure financial sustainability of Goukou River Estuary EMP and Forum through securing funding from public and private sources.	Medium
	Action 5.4: Dissemination of information through electronic media (e.g. website), popular press and scientific publications.	Medium
	Action 5.5: Promoting the Goukou River estuary and MPA as a scientific reference and research site.	Medium

Institutional Arrangements

In line with the Protocol (2021), the development and co-ordination of the implementation of the EMP, and thus overall responsibility in terms of effecting estuarine management of the Goukou estuarine system, lies with **CapeNature**, i.e. the designated Responsible Management Authority (RMA).

In addition, an Estuary Advisory Forum (previously Estuary Management Forum) exists to assist the RMA. **It is recommended that the RMA considers the continuation of the existing stakeholder communication platform (the estuary forum) so as to provide an advisory service to the RMA on issues specific to the management and implementation of the EMP.**

Further to this, the forum will also serve as the hub that links all stakeholders, which in turn will serve to foster stakeholder engagement and cooperative governance. Nonetheless, the future role of the existing Goukou Estuary EAF will need to be confirmed by CapeNature.

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	INTRODUCTION	1
1.2	SUMMARY OF LEGAL FRAMEWORK	2
1.3	MANDATE AND RESPONSIBILITIES OF THE RMA	3
1.4	SCOPE OF WORK	4
1.5	COMPONENTS OF AN EMP	5
1.6	GOUKOU EMP	7
2	SUMMARY OF SITUATION ASSESSMENT	9
2.1	DESCRIPTION	9
2.2	ECOLOGICAL CHARACTERISTICS	10
2.3	KEY ISSUES	12
2.4	SUMMARY OF KEY ACTIVITIES AND ASSOCIATED PROBLEMS, IMPACTS AND CONSEQUENCES	14
2.5	SUMMARY OF EXISTING RESPONSES	16
2.6	SUMMARY OF ISSUES AND PROPOSED MANAGEMENT ACTIONS	17
2.7	OPPORTUNITIES AND CONSTRAINTS	20
3	VISION AND OBJECTIVES	22
3.1	VISION STATEMENT	22
3.2	KEY OBJECTIVES FOR GOUKOU	23
3.3	MANAGEMENT OBJECTIVES AND ACTIONS	24
4	SPATIAL ZONATION	27
4.1	GEOGRAPHICAL BOUNDARIES	27
4.2	ZONATION OF ACTIVITIES	27
5	MANAGEMENT PRIORITIES	30
5.1	WATER QUANTITY & QUALITY	30
5.2	RECREATIONAL ACTIVITIES	33
5.3	LAND USE & DEVELOPMENT (INCLUDING MITIGATION FOR ENVIRONMENTAL HAZARDS)	35
5.4	LIVING RESOURCES MANAGEMENT	38
5.5	FUNDING, EDUCATION & AWARENESS	40
6	INSTITUTIONAL ARRANGEMENTS	42
6.1	KEY ROLE PLAYERS	42
6.1.1	Estuary Management Authority	42
6.1.2	Estuary Advisory Forum	43
6.1.3	Government Departments and organs of state	44
6.2	REVIEW AND EVALUATION	44
7	MONITORING REQUIREMENTS	45
7.1	BACKGROUND	45
7.2	GOUKOU RIVER ESTUARY RESOURCE MONITORING	46
7.2.1	Existing Resource Monitoring Activities	46

7.2.2	Future Resource Monitoring Requirements	47
7.3	GOUKOU RIVER ESTUARY COMPLIANCE MONITORING	47
7.3.1	Existing Compliance Monitoring	47
7.3.2	Future Compliance Monitoring	48
7.3.3	Operational Specifications (Targets) for Goukou River estuary	48
8	RECOMMENDATIONS	52
9	REFERENCES	53
10	APPENDIX 1: MONITORING METHODOLOGY	55
10.1	CURRENT FISH MONITORING METHODOLOGY	55
10.2	FUTURE MONITORING METHODOLOGY	56
11	APPENDIX 2: RECOMMEND PERFORMANCE MONITORING PROTOCOL	59

TABLE OF FIGURES

Figure 1: The Goukou River estuary with the town of Still Bay alongside	1
Figure 2: The boundaries of the Stilbaai Marine Protected Area	3
Figure 3: A framework for integrated estuarine management in South Africa	6
Figure 4: Demarcation of the boundaries of the Goukou River Estuary EMP. The estuary floodplain is according to the 5m amsl contour	29
Figure 5: Key role players for the management of the Goukou River Estuary	42

LIST OF TABLES

Table 1: An overview of key activities and linkages to potential environmental problems if managed inappropriately	14
Table 2: Environmental impacts and socio-economic consequences potentially associated with specific problems	15
Table 3: Suggested management actions	18
Table 4: Overarching key objectives proposed for the Goukou	23
Table 5: Summary of Management Actions per category	25
Table 6: Checklist for selection of measurement parameters (from ANZECC, 2000)	46
Table 7: Ecological Specifications and Thresholds of Potential Concern for Goukou River estuary	49
Table 8: Summary of the recommended extent of protection required for the estuaries in the temperate regions of South Africa (Turpie and Clark 2007)	52
Table 9: Additional baseline surveys to improve confidence of EWR study and long term monitoring programme for the Goukou Estuary	56

ACRONYMS AND ABBREVIATIONS

amsl	Above mean sea level
C.A.P.E.	Cape Action for People and the Environment
CapeNature	Western Cape Nature Conservation Board
CARA	Conservation of Agricultural Resources Act
CFR	Cape Floristic Region
CSIR	Council for Scientific and Industrial Research
CWAC	Coordinated Waterbird Counts
DAFF	Department of Agriculture, Forestry and Fisheries
DFFE	Department of Forestry, Fisheries and Environment, (formally DAFF)
DEA	Department of Environmental Affairs (previously DEAT)
DFFE: O&C	DFFE: Oceans & Coasts Branch (formerly MCM)
DEA&DP	Western Cape Government's Department of Environmental Affairs & Development Planning
DIN	Dissolved Inorganic Nitrogen
DIP	Dissolved Inorganic Phosphorous
DM	District Municipality
DO	Dissolved Oxygen
DoT	Department of Tourism
DWS	Department of Water and Sanitation (previously DWA/F)
EAF	Estuary Advisory Forum
EFZ	Estuarine Functional Zone
EIA	Environmental Impact Assessment
EMP	Estuarine Management Plan
EWR	Ecological Water Requirements
EZP	Estuary Zonation Plan
ha	hectare
ICMA	National Environmental Management: Integrated Coastal Management Act
IDP	Integrated Development Plan
LM	Local Municipality
MCM	Directorate Marine and Coastal Management (DEA) (now DEA: Oceans & Coasts)
MPA	Marine Protected Area
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act
NGO	Non-governmental Organisation
PES	Present Ecological State
The Protocol	National Estuarine Management Protocol
RDM	Resource Directed Measures
RMA	Responsible Management Authority
SDF	Spatial Development Framework
SEAC	Still Bay Environmental Advisory Committee
TDS	Total Dissolved Salts
TPC	Threshold of Potential Concern

1 INTRODUCTION

1.1 Introduction

The C.A.P.E. Estuaries Programme was developed to ensure the conservation and sustainable utilisation of the estuarine biodiversity in the Cape Floral Region (CFR). The Programme followed a strategic, integrated approach to estuarine management. Cooperative governance is seen as a key requirement for the success of the project. The National Estuarine Management Protocol (the Protocol) (as in the National Environmental Management: Integrated Coastal Management Act [No. 24 of 2008]) is the recommended approach for establishing broad alignment of estuarine management on a national and regional scale.

The purpose of this study is to develop an Estuarine Management Plan (EMP) for the Goukou River estuary. The Goukou Estuary EMP, including all its supporting documentation, should be viewed as a “living” document to which stakeholders continuously contribute and refine through implementation.



Figure 1: The Goukou River estuary with the town of Still Bay alongside

1.2 Summary of Legal framework

Chapter 4 of the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008, as amended by Act 36 of 2014) (ICMA), 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 itself, promulgated in 2013 (and amended in 2021), provides a national policy for estuarine management and guides the development of individual EMPs. It must be ensured that the EMPs are aligned with the 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 ICMA.

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

The National Coastal Committee (the MINTEC Working Group 7) is established by the Minister, and its powers determined by notice in the Government Gazette. It is supported administratively by the National Department of Environmental Affairs, Forestry and Fisheries (DFFE). The Premier of each coastal province must identify a lead agency (organ of state) that is responsible for the coordination, monitoring and implementation of the provincial coastal management programme, monitoring the state of the environment in the coastal zone, and identifying relevant trends and priority issues. The lead agency for coastal

management is directly responsible to the MEC. Each metropolitan, district or local municipality which has jurisdiction over the coastal zone may establish a municipal coastal committee. The establishment of Municipal Coastal Committees is discretionary.

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

1.3 Mandate and responsibilities of the RMA

the Protocol identifies **CapeNature** as the **Responsible Management Authority**, in collaboration with the Hessequa Local Municipality, since the Goukou River estuary surface area forms part of the Still Bay Marine Protected Area and the adjacent land is municipal land. (Figure 2).

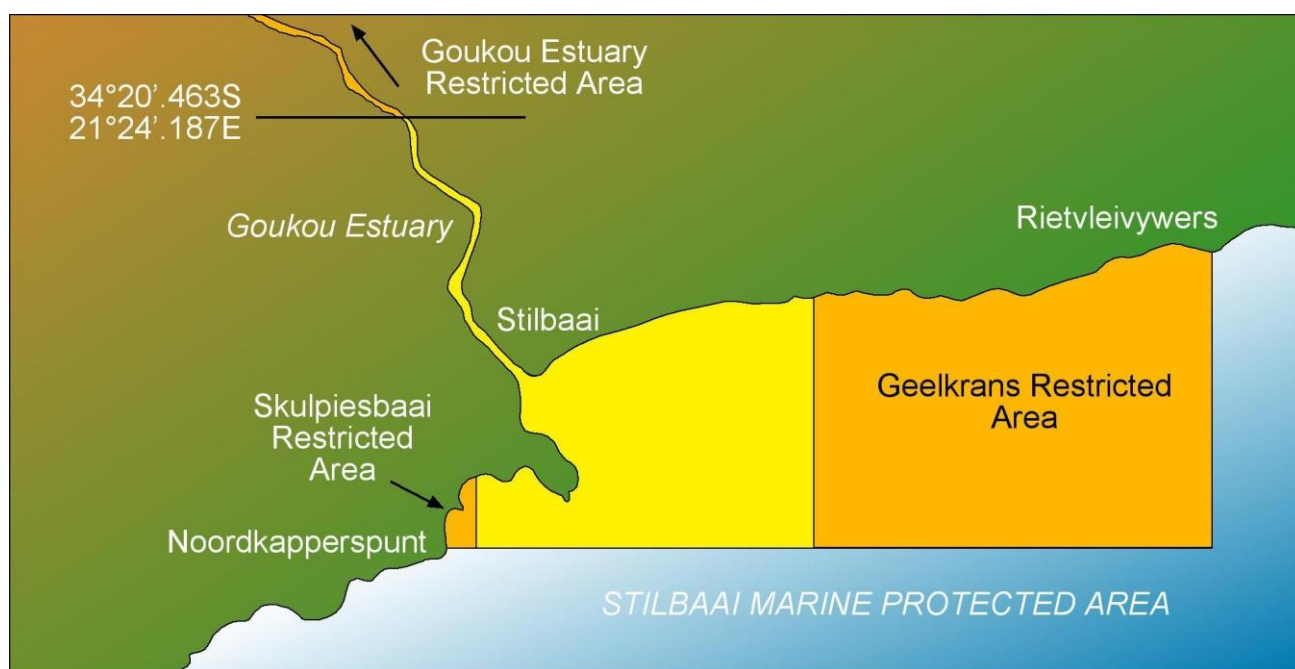


Figure 2: The boundaries of the Stilbaai Marine Protected Area

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

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

Section 9.1(1) and 9.2: *“...it **must obtain formal approval** for the EMP...” and “Once approved...the EMP shall be... **Integrated..**” and “**incorporated** into into that protected area's management plan as contemplated in section 39 of NEMPAA.”*

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

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

Coordination of the implementation actions by the RMA and its strategic partners, Garden Route District Municipality, Hessequa Local Municipality, Western Cape Provincial Government, Department of Water and Sanitation (DWS), Department of Forestry, Fisheries and Environment (DFFE)), will be supported by the Goukou River Estuary Advisory Forum (EAF) representing all key stakeholder groups on the estuary.

1.4 Scope of Work

The initial EMP for the Goukou River estuary was developed following the Generic EMP planning framework (Version 1.1) as proposed by the C.A.P.E. Estuaries Programme (CSIR 2009). This revised version brings it in line with the new and additional requirements of the Estuarine Protocol.

This project explores the strengths and weaknesses of the original framework and develops innovative approaches to overcome unforeseen constraints where reality differs from the

ideal world. Ultimately, the project must provide a practical, implementable EMP for the Goukou River estuary.

The Terms of Reference for the development of an estuarine management plan require that the following aspects be addressed:

- Preparation of a Situation Assessment Report;
- Setting the Vision & Objectives, Management Objectives and Actions for the Goukou River estuary (including an Estuary Zonation Plan); and
- Design a monitoring and evaluation programme.

Outputs are based on existing scientific information and consultation with experts. To encapsulate site-specific issues, local stakeholder workshops were conducted as part of the original EMP compilation process. The level of detail provided by the authorities and local stakeholders was dependent on their interest in, and commitment to the Goukou River EMP. Therefore, the workshops were structured and managed by means of recognized facilitation techniques (e.g. visual gathering) to elicit issues and concerns from all the stakeholders. The study also incorporated some of the issues and management objectives previously developed in 2003/4 through a Goukou River Estuary stakeholder consultation process which provided the inputs for the declaration of the Still Bay Marine Protected Area (MPA) in the Goukou River estuary that was promulgated on 17 October 2008.

1.5 Components of an EMP

Based largely on the initial Generic EMP planning framework (CSIR 2009) developed under the C.A.P.E. Estuaries Programme, the Protocol and the supporting guideline document (DEA, 2015) have identified 10 distinct components in the process of developing and implementing an EMP (Figure 3):

- Situation Assessment;
- The setting of a Vision and Objectives;
- Spatial zonation of activities, often captured in a map format;
- The identification of Management Objectives and Actions collated into action plans;
- The compilation of an integrated monitoring plan;
- Description of the institutional capacity and necessary arrangements to ensure the implementation of the plan and its constituent actions and projects
- Implementation of the project plans;
- On-going monitoring and performance evaluation; and
- Review of the EMP every 5 years.

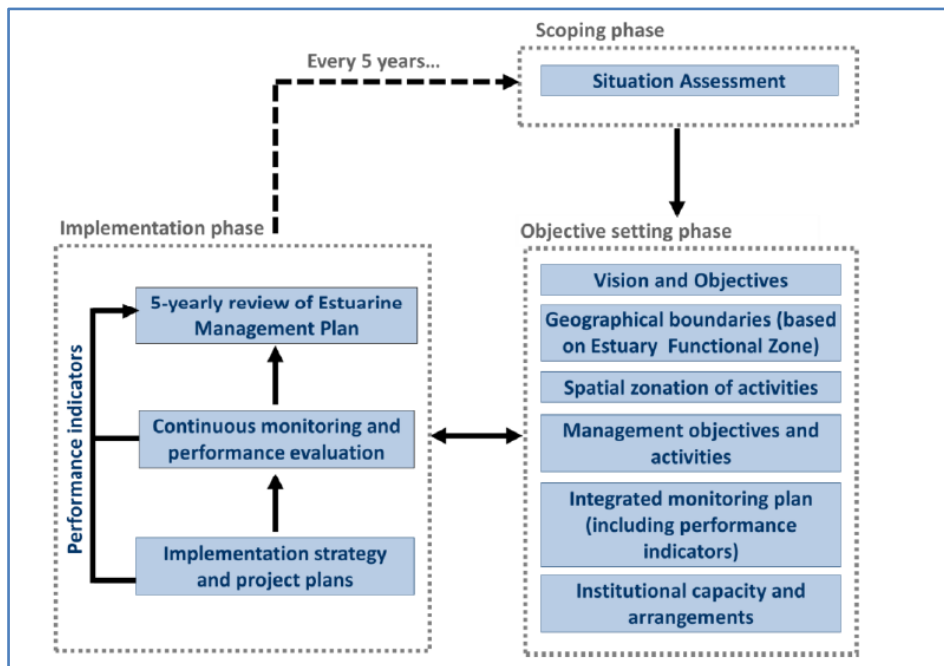


Figure 3: A framework for integrated estuarine management in South Africa

Situation Assessment (Scoping Phase). In the initial stages of developing individual EMPs, it is important to conduct a Situation Assessment mainly based on available information. Ideally, the Situation Assessment should be undertaken in consultation with a qualified team of social and natural (estuarine) scientists. Once the EMP is implemented, the Situation Assessment serves as a baseline against which the outcomes of future monitoring can be assessed.

Vision and (key) Objectives (Objective Setting Phase). The Situation Assessment provides the basis for setting a realistic and achievable Vision and Objectives for a particular system. It also provides a means to ensure that stakeholder expectations are aligned with the practical limitations, the opportunities and constraints of the ecological and socio-economic environments early in the process. The Vision should be developed in consultation with all relevant stakeholders at the initial stakeholder consultation meetings.

The overarching, or key objectives should be developed in consultation with all relevant stakeholders at the initial stakeholder consultation meetings. The key Objectives may need to be prioritised to guide prioritization of subsequent Management Objectives and associated action plans.

Management Objectives (Objective Setting Phase). The Vision and key objectives typically are achieved through a range of detailed Management Objectives. The Management Objectives previously identified for the estuaries in the CFR (CSIR, 2006) should be used as the basis for developing estuary- specific management strategies.

It is important to also consider existing initiatives (e.g. catchment management strategies, local Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs), water development services plans for the area, Ramsar/National heritage site strategies, protected area/conservation plans), as well as the local ecological and socio- economic opportunities and key threats.

Once the key sectors or categories for which Management Objectives need to be established have been identified – in consultation with stakeholders at the initial stakeholder consultation meetings – specific actions within each of these sectors or categories must be identified.

Spatial Zonation and Operational Specifications (Objective Setting Phase). Once there is agreement on the Vision, the key Objectives and detailed Management Objectives, these need to be translated into an Estuary Zoning Plan (EZIP) and Operational Specifications. The refinement and evaluation of the EZIP and determination of the Operational Specifications are the responsibility of the RMA, with refinement by the Estuary Forum.

Management Priorities and Integrated Monitoring Plan (Objective Setting Phase). For the list of priority actions identified under Management Objectives, detailed action (or implementation) plans must be prepared, specifying the required action, the performance indicator(s), responsible agent, timeframe and required resources.

Implementation Phase. Implementation of the action plans will vary from system to system depending on site-specific activities and developments. It is important that management actions are executed within established legal, policy and/or best-practice frameworks. To assist managers in this regard, numerous standards, regulations, policies, protocols and best-practice guides are available.

Continuous monitoring and evaluation (Implementation Phase). The sustainable management of estuaries can only be achieved by being based on appropriate and reliable quantitative data. The collection, processing and interpretation of such data are, however, time-consuming and costly and often require considerable scientific expertise. Currently there is no generally accepted procedure to guide South African authorities in the design and implementation of estuary monitoring programmes. Monitoring conducted is usually project-specific and discontinuous, plays little part in guiding management decisions, and is characterised by a lack of integration between the responsible authorities and management programmes pertaining to the estuary in question.

An evaluation component after a five-year period constitutes the **Review Process** during which the outcomes of the monitoring programmes can be used to prepare evaluation reports, such as annual assessment reports or five-yearly State-of-the-Estuary Reports, to inform management on the consequences and effectiveness of the process.

1.6 Goukou EMP

The Goukou Situation Assessment Report was prepared by the CSIR (2011) using available information and the insights developed during site visits and stakeholder workshops. The Situation Assessment Report included the following:

- Legal requirements relevant to the Goukou River estuary;
- An overview of the biophysical environment;
- Requirements stipulated in existing management strategies;
- A description of the socio-economic environment;
- Identification of current issues; and
- Detail on gaps in the knowledgebase and future research needs.

The present EMP contains:

- Scoping Phase: Summary of the Situation Assessment (Scoping Phase);
- Objective Setting Phase:
 - Vision and Objectives;
 - Detailed Management Objectives;
 - Estuary Zonation Map (EZP), including the geographic boundaries, and Operational Objectives;
 - Management Priorities (including action plans for implementation);
 - Institutional Arrangements; and
- Implementation Phase: Monitoring and Evaluation programme.

The roles and responsibilities of the various institutions involved with the management of the Goukou system are also provided.

This Goukou River EMP, including all its supporting documentation, should be viewed as a “living” document to which stakeholders are continuously contributing and refining through implementation.

Important to note is that the EMP for Goukou River Estuary is NOT an isolated plan! To be effective and sustainable the EMP must be embedded in overarching national, regional and local plans. For example, at the local level the Goukou River Estuary EMP must be embedded in the local IDP and the SDF.

Also, this EMP is not a “new” management initiative, it merely aims to provide a structured approach through which to integrate and optimize the numerous (often sector-based) management initiatives already being implemented (or should be implemented) in the area under different legal mandates.

2 SUMMARY OF SITUATION ASSESSMENT

2.1 Description

The catchment, tributaries and estuary of the Goukou River fall under the jurisdiction of the Hessequa Local Municipality (LM). The Goukou River estuary covers approximately 250 ha, is 19 km in length, and is part of the Still Bay Marine Protected Area (MPA) formally promulgated on 17 October 2008 (Government Gazette No. 31513). Of South Africa's approximately 300 functional estuaries, more than 70% close from time to time. The permanently open Goukou River Estuary is therefore important as it represents an estuary type that is relatively rare in South Africa. Permanently open estuaries such as the Goukou River estuary are valuable as they support a wider range of marine and estuarine species than temporarily open systems. The Goukou River estuary was ranked as the 32nd most important system in South Africa in terms of conservation importance.

The Goukou River lies within a climatic region which receives rain almost uniformly spread throughout all seasons with peaks in autumn and spring. The mean annual precipitation, for the overall catchment is 482 mm, while that of the upper catchment is 634 mm (Carter & Brownlie 1990). The mean annual runoff (MAR) of the Goukou River has been estimated at $106.42 \times 10^6 \text{ m}^3$. The biggest flood peak on record for the Goukou River, 358 m^3/s , was recorded on 25 January 1981, estimated as a 1:20 year flood. The 1:100 year flood has been estimated at about 1 400 m^3 (Carter & Brownlie 1990).

The only large dam in the Goukou catchment is the Korentepoort Dam with a capacity of $8.3 \times 10^6 \text{ m}^3$ and is situated on the Vet River northwest of Riversdale. The dam was constructed during 1963-1965 to supply water to the Korente-Vet River Irrigation canal as well as water for the town of Riversdale (Carter & Brownlie 1990). The lack of more measured runoff data for the Goukou catchment is an issue that should be addressed to get a better understanding of the current situation.

In the past (1960), fears have been expressed of siltation in the lower catchment area and estuary. Studies conducted at the time, however, showed that sedimentation of the lower river and estuary would be unlikely provided that the historic flood regime is maintained (Carter & Brownlie 1990).

Several examples of implements and shell middens dating back to the Middle and Late Stone Ages have been found along the coast adjacent the Goukou River mouth. The abundance and type of implements found in and around Still Bay has led to this area being designated as a Stone Age industry location. In 1972, a human skeleton was discovered immediately to the west of the river mouth, estimated at the time to be from 2 000 years earlier (Carter & Brownlie 1990).

It was previously believed that the 'viswywers' in Still Bay, Noordkapper Point and the area west of Morris Point were remnants from prior inhabitants of the coast adjacent to the Goukou River mouth dating back to the period of the Strandlopers (Carter & Brownlie 1990). They are now believed to be built by 18th and 19th century settlers who copied similar but smaller structures they found upon arrival to the area.

Fossil formations have also been discovered on farms in the area, but little is known of their palaeontological value (Carter & Brownlie 1990).

Wooden cottages constructed in the 1900s, as well as the 'boat houses' at 'Die Braak' have been identified as features of distinctive character that warrant preservation from an architectural perspective (Carter & Brownlie 1990).

The Still Bay MPA was declared with the intention to protect and conserve the coastal environment and the marine living resources that are found in and around Still Bay and, thereby, protect the estuary's reproductive capacity for exploited fish species and serve as a nursery to recruit estuarine- dependant fish into marine fisheries. The Still Bay MPA possesses all the ecological features typical of the warm-temperate South African south coast: abundant inter-tidal life, a productive estuary, diverse offshore fisheries, and an abundance of cetaceans. It represents many of the problems too: a town centred on an estuary, an estuary starved of freshwater, transformation and degradation of the natural system, and over-utilisation for recreational activities.

2.2 Ecological characteristics

The hydrodynamic regime of the Goukou River estuary is governed mainly by tidal action and river inflow. The system is flood tide dominated with the flood tide being of significantly shorter duration than the ebb tide. The tide ranges from about 1.0 m at spring tide to about 0.5 m at neaps. The lower reaches of the estuary (below the bridge) are well flushed by seawater during each tidal cycle, while the middle reaches tend to form a high retention zone, especially above the sand bank at the caravan park which acts as a significant constriction to tidal flows. In summer, the upper reaches of the estuary can be nearly stagnant in the absence of river inflow, while they can be well-flushed by river water during periods of high flow.

The middle reaches of the system are characterised by areas of deeper water (> 2 m MSL) which acts as retention areas for saline and nutrient-rich water. The mouth (and lower reaches) of the system can become somewhat constricted during prolonged periods of low river flow. This reduces the tidal action and associated tidal flushing. This obstruction to tidal flows is normally removed as soon as river inflow increases, and sediments are carried from the lowermost reaches of the mouth.

Besides river flow, the main hydraulic driver in the estuary is the ocean tide. The highest water level recorded in the estuary was about 1.4 m above MSL. The lowest water level recorded in the estuary was about 0.6 m below MSL occurring during neap tides and was approximately only 7 cm above the mean low water spring tide level along the open coast. The minimum water level in the estuary is directly affected by the sill level of the estuary mouth. If the minimum water level in the estuary was to increase or decrease progressively in the long term, this would indicate that the average sill level of the estuary mouth is undergoing a net increase or decrease.

The Goukou River estuary experiences significantly different salinity penetration during winter and summer due to variation in river inflow. The difference in inflow is further amplified by the bathymetry of the estuary, with the deeper lower reaches (0-4 km from the mouth)

and upper reaches (9 -16 km from the mouth) segregated by a very shallow middle reach (at some places less than one metre deep) that flushes easily and acts as a barrier to salinity penetrations under normal river flow conditions.

During surveys conducted in the 1980s, *Zostera capensis* beds were observed on the sand banks and lower tidal flats of the Goukou River estuary where salinities were similar to seawater (Carter & Brownlie 1990). *Potamogeton* was only present where the salinity was lower further upstream. Saltmarshes were present along both banks of the Goukou River estuary and cover large areas along the eastern bank below the road bridge. The Goukou River estuary has a habitat richness score of three out of the eight possible estuarine habitats comprising a total of 230 ha. The floodplain area comprises an additional 140 ha. The total estuarine functional zone (EFZ) (up to 5 m amsl contour) entails approximately 370 ha (Van Niekerk and Turpie, 2012).

In total, 78 species of fish from 40 families have been recorded from the Goukou River estuary which is fairly high compared to other estuaries in the region (James & Harrison 2008). Species that breed in estuaries or estuarine residents comprise 15 % of the Goukou River estuary fish fauna which is low compared to the 20-26 % for cool temperate west coast estuaries and 23 % for all the other estuaries in this warm temperate region from Mossel Bay to Plettenberg Bay (James & Harrison 2008, Lamberth et al. 2008). Including all estuarine breeders, entirely estuarine-dependent species comprise 27 % of the ichthyofauna, lower than approximately 40 % for all other estuaries in the region, similar to the 24 – 33 % for west coast systems and much higher than the 9 % for KwaZulu-Natal estuaries (Bennett 1994, James & Harrison 2008, Lamberth et al. 2008). This is mostly a function of the estuary being permanently open, a strong marine influence and the associated seasonal occurrence of marine vagrants in the system.

The Goukou River estuary is an important habitat for birds; 52 species have been recorded by the Co-ordinated Waterbird Count (CWAC).

The Goukou River estuary was, at the time of drafting the situation assessment, in a moderately altered state, i.e. Category C. The degradation of the system's health was largely attributed to:

- Significant reduction in the freshwater inflow to the system;
- Increase in the nutrient and sediment load to the system;
- Loss of estuarine and riparian habitat (i.e. loss of buffers); and
- Overexploitation of fish in the system.

The estuarine health index score of the Goukou River is 69, translating into a Present Ecological State (PES) of Category C, yet still identified as a moderately modified system. The Goukou River estuary was rated as a 'Highly Important' system, however due to flow related and non-flow related impacts the estuary cannot be fully restored to a Category A ecological state (DWS, 2015). As the Goukou River estuary is in a Marine Protected Area it should be in a much better condition, but it is highly unlikely that the flow reduction, nutrient loading from agriculture, and habitat loss in the system can be alleviated. It was concluded that the Best Attainable State and thus Recommended Ecological Category (REC), is a system that is largely natural with few modifications (i.e. Category B). The recommended

ecological flow scenario for the Goukou Estuary was the present inflow, with restoring 50 % of the base flow (MAR 101.69 million m³) (DWS, 2015).

Recreational boating in the Goukou River estuary is a major activity, and despite the speed limits in certain zones, boating enthusiasts still ignore these rules. Van Riet (1990) calculated the carrying capacity for speed boating and water-skiing in the Goukou River estuary to be 15-30 boats, this was excluding other recreational activities such as swimming and fishing. Boating, especially power-boats have been seen as a major threat to the environment, particularly to the nesting birds and bank erosion (van Riet, 1990). Furthermore, other recreational users such as swimmers could not safely use the estuary because of the dangers posed by boating (CSIR, 2005).

2.3 Key issues

Through stakeholder consultation a number of key issues have been identified as threatening (or potentially threatening) to the Goukou River estuary ecosystem. These issues contribute to an array of problems and associated environmental impacts with socio-economic consequences. It is important to address these issues to prevent any further irreparable damage to the system.

The following section provides a brief description of the identified key issues and their related potential impacts on the Goukou River estuary:

- **Floods:** Wetland in the catchment and the riparian vegetation naturally attenuate and protect against floods. The continual removal or degradation of these wetlands and the riparian vegetation poses an ever-increasing danger of substantial damage to low-lying infrastructure.
- **Droughts:** With no ecological water reserve established for the Goukou River and Estuary no baseflow reaches the estuary during droughts which can permanently damage the ecosystem health (and productivity) during extreme droughts.
- **Climate Change:** Flow changes, sea level rise and increase storminess pose a great long-term threat to the ecosystem and livelihoods in the area.
- **Road Infrastructure:** Existing road infrastructure encroaches on the Goukou River estuary and floodplain reducing its resilience to deal with development pressures.
- **Riparian Infrastructure (e.g. fences and low-lying developments):** Saltmarshes and natural riparian vegetation in the Goukou system have been, and continue to be, degraded by low-lying developments and infrastructure. This encroaches on natural buffers and unique estuarine habitats along the estuary and reduces the mitigation effect that natural vegetation provides against wave action (caused by tidal action and water-skiing) and floods.
- **Instream Infrastructure (e.g. jetties and boat launching sites):** Instream infrastructure interferes with the natural hydrodynamics of the Goukou system under high flow conditions. Artificial bank stabilization associated with instream infrastructure such as jetties introduces foreign habitats to the system.

- **Water Abstraction (e.g. direct abstraction, groundwater and fountains):** The over-allocation of water resources in the catchment deprives the Goukou River estuary of the freshwater necessary to sustain a healthy ecosystem. The decreased flow could contribute to sedimentation in the upper and lower reaches of the estuary. Freshwater fountains along the system serve as unique ground water dependent habitats that link the aquatic and terrestrial environment. Over-exploitation of groundwater resources could cause these fountains to cease providing a habitat that nurses eels.
- **Wastewater (e.g. sewage):** Poor water quality (pollutants from wastewater discharges) poses a threat to environmental and human health in the Goukou River estuary.
- **Agricultural return flow:** Pollutants (leached fertilizers and agrochemicals) from farming activities in the Goukou catchment and surrounding environs pose a threat to the Goukou River estuary ecosystem.
- **Alien vegetation in the catchment:** Alien vegetation in the Goukou catchment displaces endemic vegetation and decreases the amount of runoff reaching the estuary. Felled alien vegetation that is not removed from floodplains litters the estuary banks and surrounding beaches after floods and poses a risk to recreation activities.
- **Clearing of riparian vegetation:** The clearing of riparian vegetation to gain access to recreational areas leaves the Goukou River estuary's banks vulnerable to erosion. The burning of reeds and sedges for grazing purposes often poses a similar risk to erosion.
- **Bait collection:** Bait collection poses a threat to non-targeted species, e.g. amphipods, and can lead to the degradation of certain habitats.
- Historically, **illegal netting** was a major activity that significantly compromised the nursery function of the Goukou River estuary. At present, this aspect is deemed to be under control, but compliance needs to be verified and upheld.
- **Recreational fishing:** Overfishing in the Goukou River estuary has broader implications for the fishing industry since the estuary serves as an important breeding ground and nursery for marine species. This aspect is currently under control through firm compliance management.
- **Alien fish species:** The predatory alien fish species, e.g. *Micropterus* spp. (bass), in the Goukou River pose a threat to endemic species, especially eels and freshwater mullet that need to pass through the alien- invested coastal plain rivers to the more sheltered tributaries.
- **Hobbyists collecting tropical fish species:** Hobbyists collecting tropical fish are not seen as a serious concern at present. However, monitoring is required since, in other parts of the world, this is becoming a major concern.

- **Agriculture:** livestock grazing: Saltmarshes and natural wetlands are damaged by domestic animal grazing. This leads to reduced productivity, habitat destruction and ultimately bank erosion.
- **Power-boating and water-skiing:** Inadequate resources to manage the use of the Goukou River estuary by power boats, particularly during the peak holiday seasons, is of concern. Exceedance of the system's power-boating capacity can lead to bank erosion and endangering the safety of other recreational users.
- **Kite and wind surfing:** These activities can endanger bathers and disturb feeding birds.

2.4 Summary of key activities and associated problems, impacts and consequences

An overview of key activities and linkages to potential environmental problems if managed inappropriately are as follows:

Table 1: An overview of key activities and linkages to potential environmental problems

CATEGORY	ACTIVITY	PROBLEM								
		Siltation	Physical habitat alteration/ destruction	Alteration of salinity regime	Eutrophication	Toxic chemical pollution	Microbial contamination	Littering	Suspended solids	Direct Alteration of biomass/species
Environmental Hazards	Floods	X	X					X	X	X
	Droughts	X	X	X			X			
	Climate change	X	X	X					X	X
Land Use and Infrastructure	Road infrastructure (roads, crossings and culverts)	X	X	X					X	
	Riparian infrastructure (fences and low-lying developments)	X	X	X					X	
	In-stream infrastructure (jetties and boat launching sites)	X	X							
Water Quantity & Quality	Water abstraction (groundwater, direct abstraction and fountains)	X	X	X	X					X
	Wastewater (sewage)				X	X	X		X	X
	Agricultural return flow				X	X	X			
	Alien vegetation infestation in catchment	X	X	X	X			X		X
Exploitation of	Clearing of riparian vegetation		X						X	X
	Bait collection		X						X	X

	Illegal Gill Netting								X
	Recreational fishing						X		X
	Alien fish species								X
	Hobbyists collecting tropical fish								X
	Agriculture: livestock grazing of riparian zone	X	X		X			X	X
Recreational Activities	Power-boating and water-skiing		X			X		X	
	Kite and wind surfing		X						

Table 2: Environmental impacts and socio-economic consequences potentially associated with specific problems

ENVIRONMENTAL IMPACTS AND SOCIO-ECONOMIC CONSEQUENCES	PROBLEM								
	Siltation	Physical habitat alteration/destruction	Alteration of salinity regime	Eutrophication	Toxic chemical pollution	Microbial contamination	Littering	High Suspended solids	Direct Alteration of biomass/species
<u>ENVIRONMENTAL IMPACTS</u>									
Modification/loss in species composition	X	X	X	X	X	X		X	X
Smothering of benthic communities	X	X		X			X	X	
Entanglement of organisms (e.g. birds)							X		
Chronic effects on biota			X	X	X	X		X	
Mortality (acute effects) on biota			X	X	X	X		X	
Opportunistic/Nuisance/Harmful algal blooms			X	X					
Anoxic conditions				X					
Pathogenic infections in biota				X	X	X			
<u>PUBLIC HEALTH & SAFETY</u>									
Human health and safety risks through recreational activities		X		X	X	X			
Human health risk through ingestion of contaminated seafood				X	X	X			
<u>FOOD SECURITY & POVERTY</u>									
Loss in quality of seafood products				X	X	X		X	X

ENVIRONMENTAL IMPACTS AND SOCIO-ECONOMIC CONSEQUENCES	PROBLEM								
	Siltation	Physical habitat alteration/destruction	Alteration of salinity regime	Eutrophication	Toxic chemical pollution	Microbial contamination	Littering	High Suspended solids	Direct Alteration of biomass/species
Loss of fisheries resources and revenue		X	X	X	X	X		X	X
<u>OTHER SOCIO-ECONOMIC IMPACTS</u>									
Loss of aesthetic value (e.g. for tourism)	X	X		X		X	X	X	X
Loss of coastal real estate, public facilities and recreational potential		X		X		X	X	X	X

2.5 Summary of Existing Responses

In many instances activities that pose a threat to the ecological and socio-economic ecosystem services provided by the Goukou River estuary are governed by specific legislation. Also, there are a number of existing management actions or responses aimed at mitigating or minimising such threats. A summary of the estimated severity of the impacts, as well as the status of existing legislation and management initiatives pertaining to specific activities is provided below. Note that this is not an absolute rating but rather a qualitative evaluation to enable prioritization of management actions.

A summary of (negative) impacts on the Goukou River estuary (depicted as High = Large circle; Medium = medium circle; Low = small circle) and the status ("response") of existing legislation and management initiatives (depicted as Good = Large circle; Average = medium circle; Weak = small circle) pertaining to identified activities is provided below:

CATEGORY	ACTIVITY	"IMPACT"		"RESPONSE"	
		Ecological Impact Severity	Socio-Economic Impact Severity	Legislation	Management Responses
Environmental Hazards	Floods	●	●	●	●
	Droughts	●	●	●	●
	Climate change	●	●	●	●
Land Use and Infrastructure Development	Road infrastructure (roads, crossings and culverts)	●	●	●	●
	Riparian infrastructure (fences and low-lying developments)	●	●	●	●

CATEGORY	ACTIVITY	"IMPACT"		"RESPONSE"	
		Ecological Impact Severity	Socio-Economic Impact Severity	Legislation	Management Responses
	In-stream infrastructure (jetties and boat launching sites)	●	●	●	●
Water Quantity and Quality	Water abstraction (groundwater, direct abstraction and fountains)	●	●	●	●
	Wastewater (sewage)	●	●	●	●
	Agricultural return flow	●	●	●	●
	Alien vegetation infestation in catchment	●	●	●	●
Exploitation of Natural Resources	Clearing of riparian vegetation	●	●	●	●
	Bait collection	●	●	●	●
	Illegal gill netting	●	●	●	●
	Recreational fishing	●	●	●	●
	Alien fish species	●	●	●	●
	Hobbyists collecting tropical fish	●	●	●	●
	Agriculture: livestock grazing of riparian zone	●	●	●	●
Recreational Activities	Power-boating and water-skiing	●	●	●	●
	Kite and wind surfing	●	●	●	●

2.6 Summary of Issues and Proposed Management Actions

The following management actions are suggested to address the issues identified in the Goukou River estuary. These actions are dealt with more in-depth in the Estuarine Management Plan. It is recommended that an Estuary Forum as part of the existent Still Bay Environmental Advisory Committee is established to oversee the implementation and overall management of the EMP. **It is recommended that the CapeNature Governance Tool is used to manage the process of EMP implementation.**

Table 3: Suggested management actions

ISSUE	PROPOSED MANAGEMENT ACTIONS FOR FURTHER CONSIDERATION
Floods	<ol style="list-style-type: none"> 1. Wetlands in the catchment, endemic riparian vegetation in the floodplains and saltmarshes on the estuary banks should be conserved for their mitigation of erosion of the estuary banks by wave action and attenuating floods. The establishment of a Coastal Management Line can address this issue.
Droughts	<ol style="list-style-type: none"> 2. The ecological water requirement ("reserve") should be implemented with immediate effect to ensure that the estuary receives the minimum baseflow needed to sustain a healthy system. The required amount of water should be released at all times.
Climate change	<ol style="list-style-type: none"> 3. There is not much that can be done locally to mitigate the causes of global climate change. However, a climate change strategy and action plan has been compiled for the Western Cape to this regard. This document can serve as a guide for climate mitigation measures to be implemented in and around the Goukou River estuary. Enforcing a Coastal Management Line and allocating freshwater flows will ensure that the Goukou River estuary is buffered as much as possible against climate pressures.
Road infrastructure (roads, crossings and culverts)	<ol style="list-style-type: none"> 4. The existing road infrastructure does not pose a major threat to the system and there is not much that can be done to mitigate existing impacts to the estuary except to ensure that bare banks are vegetated to control sedimentation and mitigate storm water runoff. Future road infrastructure developments should be guided by the appropriate authorisation process (e.g. the EIA process) to avoid additional impacts on the system.
Riparian infrastructure (including fences and low-lying developments)	<ol style="list-style-type: none"> 5. Fencing that has been erected between the lowtide and hightide mark and thus having the potential to prevent coastal access should be identified and investigated and potentially removed. 6. No new low-lying developments should be established without the appropriate authorisation (e.g. environmental authorisation through the EIA process). Developments in this area should be restricted to essential infrastructure (e.g. bridges) 7. The establishment of the Coastal Management Line for the Western Cape Province will provide guidance on development in the Estuarine Functional Zone.
Instream infrastructure (jetties and boat launching sites)	<ol style="list-style-type: none"> 8. Stringent guidelines for the construction of new instream infrastructure and bank stabilisation (e.g. jetties and boat launching sites) should be drafted. 9. Existing instream infrastructure and bank stabilisation should be evaluated and improved, or removed, if it does not comply with the guidelines. 10. Where applicable, environmental authorisation through the appropriate process (e.g. the EIA process) should be obtained for any future instream developments. Existing developments built without the necessary environmental authorisation should be investigated and appropriate steps taken.
Wastewater (sewage)	<ol style="list-style-type: none"> 11. The discharge of untreated sewage into the system due to an over-loading of the Still Bay sewage works appears to be something of the past. However, to avoid recurrence of this situation, the sewage infrastructure should be well maintained, and sewage discharge monitored, including discharges from the water purification plant. 12. A water quality monitoring programme should be implemented and used as a detection tool for pollution resulting from sewage disposal and agricultural return flow. This programme can also be used to evaluate whether the baseflow is sufficient to sustain the system. When elevated pollutant concentrations are detected in the system the source should be detected and necessary steps taken against transgressors.

ISSUE	PROPOSED MANAGEMENT ACTIONS FOR FURTHER CONSIDERATION
Agricultural return flow	<p>13. Best farming practices with minimal chemical usage should be promoted in the catchment area.</p> <p>14. The use of agrichemicals within a set distance of the water's edge should be prohibited. The establishment of the Coastal Management Line and the maintenance of the riparian buffer zone that filters return flow from adjacent land could address this issue.</p> <p>15. As stated in action 14, water quality should be monitored to detect pollution of the system.</p>
Alien vegetation infestation in catchment	<p>16. The removal of alien vegetation in the catchment is already underway and should continue.</p> <p>17. Felled alien vegetation should be removed from the floodplain immediately to avoid it from being washed down to the estuary and sea during floods.</p>
Clearing of riparian vegetation to gain access for recreation	<p>18. In conjunction with actions 8 and 9, stringent guidelines should be formulated for the removal of any riparian vegetation for the construction of instream infrastructure. Existing cleared areas and stabilised banks should be evaluated and improved or rehabilitated where necessary.</p>
Bait collection	<p>19. The issue of bait collection has been dealt with by the Still Bay MPA regulations by prohibiting bait collection in demarcated sensitive zones. These regulations should be enforced by the authority responsible for policing this activity.</p> <p>20. To avoid over-exploitation of resource, invertebrate species should be monitored in conjunction with the water quality monitoring programme.</p>
Illegal gill netting	<p>21. Gillnetting is under control at present, but the authorities need to maintain the high compliance monitoring effort to ensure this into the future.</p>
Recreational fishing	<p>22. The proclamation of the Stilbaai MPA and an increased compliance presence have seen the catch levels in the Goukou River estuary reduced considerably.</p>
Alien fish species	<p>23. Predatory alien invasive fish in the catchment is a major concern with regards to the migration of eels and fresh water mullet. The high salinities are, however, preventing them from occurring in large numbers in the estuary. There is a need to monitor and control these fish in the catchment.</p>
Hobbyists collecting tropical fish species	<p>24. Hobbyists collecting tropical fish species are not seen as a serious concern at present, but needs monitoring as, in other parts of the world, this is becoming a major concern.</p>
Agriculture: livestock grazing of riparian zone	<p>25. Similar to management activity 16 the grazing of vegetation within a set distance from the system should be prohibited. A Coastal Management Line would address this issue.</p>
Power-boating and water-skiing	<p>28. Although there is sufficient legislation (MPA regulations and river by-laws) governing boating in the Goukou River estuary, this appears to be one of the biggest stakeholder concerns. The enforcement of the existing legislation must be addressed. The current management plan formulated by the Hessequa Municipality needs to be revised and improved to address this issue. If the municipality fails to manage the estuary successfully the mandate should be passed to an authority that is competent to do so (e.g. CapeNature). The use of funds received from boat licenses should be utilized for managing and policing the estuary. If funds are insufficient to cover the management costs the price of boat licenses should be increased.</p> <p>29. Alternative zoning measures (e.g. a time-based regulation where motorized boating is only allowed during high tides) should be investigated to see if the danger posed to boats and water-skiers by siltation in the estuary. The safety of</p>

ISSUE	PROPOSED MANAGEMENT ACTIONS FOR FURTHER CONSIDERATION
	non-consumptive uses such as bathing and canoeing and bank erosion by of boats should form part of this investigation. 30. The river by-laws should be revisited and amended to make regulations clearer and ensure that this law is in fact applicable to the Goukou River estuary.
Kite and wind surfing	31. This is not a current issue in the Goukou River estuary but in anticipation of these activities increasing it should be considered when amending the river by-laws.

2.7 Opportunities and constraints

Tourism has shown substantial growth as the demand for prime coastal and inland resorts increases, as well as the opportunities created by eco-tourism, cultural tourism and adventure tourism. The economic assessment of estuarine goods and services suggested that the particularly high tourism -recreational value associated with Goukou River estuary can be translated into tangible opportunities for local socio-economic development in support of the green economy, i.e. providing for sustainable economic development while preserving (and maximising) the estuary's values. These are also linked to the Stilbaai MPA, and can include, but are not limited to:

- Support services for eco-tourism and cultural-tourism activities, e.g. guide bird walks and cultural tours of the 'visvywers' (Ancient fish traps);
- Support services for sporting recreational activities, e.g. hire and sale of activity equipment (canoes, boats), sale of fishing tackle;
- Support services for larger events, e.g. Farm /cultural/trading stalls and small local Business opportunities associated with the Annual Touch Rugby tournament and fishing competitions;
- Construction and maintenance services, e.g. boat repairs, property maintenance; and
- Hospitality services.

However, it is vital to manage the tourism and recreational activities occurring on the Goukou River estuary as certain activities, if left uncontrolled, may lead to large-scale disturbance of the environment which in turn will impact on the conservation, tourism and subsistence value of the system.

It is important to note that the conventions, acts, ordinances and by-laws relevant to the Goukou River estuary (Section 6 below) create opportunities for local and regional growth, but at the same time place constraints on the permissible types of development and activities in the estuary and its environs.

The Hessequa Municipality also has an environmental education and training strategy that centres around the need for awareness regarding policy and legal requirements and the role that education and training play in core local government functions. Environmental education and training can contribute to poverty reduction, economic development and job creation through its role in ensuring that the natural and cultural resources, on which jobs, livelihoods and economic development depend, are managed sustainably.

Environmental training on the sustainable use of the estuary should also be included in this strategy.

Although the Goukou River estuary is deemed to be in relatively good ecological health, it has been designated a high priority system requiring rehabilitation (Turpie & Clark, 2007). The primary requirements identified in this study, together with rehabilitation needs gathered from other existing management plans and strategies, include *inter alia*:

- Water quality:
 - Eliminate all potential sources of water quality pollution;
- Water quantity:
 - Regulate water abstraction activities;
- Alien vegetation clearing:
 - Remove alien vegetation from the catchment;
- Habitat rehabilitation:
 - Restore 50 % of the flood plain and riparian habitat along length of estuary;
 - Rehabilitate peat bog system in the catchment; and
 - Implement erosion control measures at priority sites.

It should be recognized that some of the rehabilitation actions would be long term, while others may be achievable in the shorter to medium term. Such actions provide additional opportunities for employment, for example, the removal of alien plants under an eradication programme, replanting of indigenous plants, and the instatement of estuary nature wardens or compliance officers to monitor recreational use of the estuary, such boating regulations.

3 VISION AND OBJECTIVES

3.1 Vision Statement

A formal strategic vision was developed to highlight to the managers and scientists the aspects of the estuaries of the CFR that are deemed important and to communicate this to those involved in the management of estuaries. The key aspects highlighted in the strategic vision for the CFR estuaries were foremost in the minds of the stakeholders (local communities, authorities, town planners etc.) that were tasked with drafting the Goukou River EMP. The strategic vision for the CFR reads as follows:

Our estuaries are beautiful, rich in plants and animals, they attract visitors, sustain our livelihoods and uplift our spirits.

This vision translates into a formal statement that reads as follows:

The estuaries of the Cape Floral Region sustain our spiritual and economic well-being through their biophysical attributes and production of goods and services, which are made possible by the maintenance of their biodiversity and ecosystem functions (integrity).

This formal vision highlights the following aspects of our estuaries which we value and which we need to enhance and manage:

- The contribution of our estuaries to our spiritual well-being; The role that our estuaries play in our economic welfare;
- Our dependency on the goods and services that our estuaries provide;
- The importance of the biophysical attributes of our estuaries; and
- The value of maintaining the biodiversity and ecosystem function of our estuaries so that we can derive these benefits from our systems.

During a Stakeholder Workshop held in July 2011 in Still Bay the following vision and overarching objectives for the Goukou River estuary were formulated and accepted by everyone present.

The Goukou River estuary is conserved and improved through evidence based information as a geographical and spiritual space that sustains and nurtures biodiversity and human well-being.

3.2 Key Objectives for Goukou

While the Vision is an inspirational, higher-level statement of strategic intent, the key (strategic or overarching) objectives support the development of the detailed management strategies for the Goukou River EMP and answer the following questions:

1. “Why can the vision not be achieved right now?”
2. “How will you know when you have achieved the Vision and by when?”

Key objectives can typically be grouped into three broad categories, namely those addressing (a) Ecological, (b) Heritage and (c) Socio-economic values. Distilled from the Goukou River EMP Vision, Key Objectives are required for the following:

- Ecological (biodiversity, conservation and natural resource values);
- Heritage (protecting cultural, historical and archaeological values); and
- Socio-economic (funding, property, ecotourism and recreational values).

The key objectives for the Goukou River estuary were discussed at the Stakeholder Workshop held in July 2011 in Still Bay. Based on the feedback received from the participants the following overarching key objectives are proposed for the Goukou River estuary:

Table 4: Overarching key objectives proposed for the Goukou

	OBJECTIVES	BY WHEN
Ecological	Ecological health of ecosystem is improved to Category B (moderately modified).	2024
	Ecological health of ecosystem is improved to Category A (near natural).	2030
	The Goukou Estuary fulfils its nursery function with regard to replenishing collapsed and over exploited fish resources and contributing to biodiversity targets.	2024
	Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making.	2023
Heritage	Development in and around the Goukou River estuary is guided by the cultural values and sense of place of the Still Bay environs.	2023
Socio-economic	The Estuary Advisory Forum is constituted and well resourced (human and capital) with the mandate to: <ul style="list-style-type: none"> • Monitoring the implementation of the Goukou River EMP; • Facilitate effective co-operative governance; and • Serve as a communication platform to inform the local community. 	2023
	The Goukou River Estuary EMP is seamlessly integrated and implemented as part of the Hessequa Local Municipalities IDP and SDF.	2023

OBJECTIVES	BY WHEN
Sustainable tourism is facilitating responsible economic growth and the optimal utilisation of ecosystem services.	2024
All estuary users and the local community are well informed, self-compliant and supportive of estuary initiatives.	2023

The participants of the July 2011 stakeholder workshop proposed timeframes for a number of the objectives indicated above, but for others, timeframes were estimated. The validity of these timeframes will need to be revised.

3.3 Management Objectives and Actions

When setting Management Objectives and actions the following question should be answered:

“What do we need to do to achieve or maintain the key objectives?” or “What is preventing us from achieving the vision and key objectives?”

Based on the feed-back received from participants at the Stakeholder Workshops held in Still Bay in April 2010 and July 2011, the following categories for which management objectives have to be defined were identified:

- Water quantity and quality;
- Recreational activities;
- Living resource management;
- Land use and development (including mitigation for environmental hazards); and
- Funding and educational awareness.

In the following section, Management Objectives for the listed issues are proposed, based on the feed-back received from participants; however, as the Goukou River EMP is a living document which follows an adaptive management approach, it requires continuous revision and refinement. At the onset of this process (i.e. while the document is taking shape) the document will be revised regularly according to stakeholder inputs (e.g. after meetings), but once the EMP is accepted, refinement is only envisaged on an annual basis.

Provisionally, a range of management actions has been categorised into five key categories. A summary of these actions is provided below.

Table 5: Summary of Management Actions per category

CATEGORIES	ACTION	PRIORITY
1 Water quantity and quality	Action 1.1: Implement and monitor ¹ the ecological water requirements of the Goukou River estuary, in line with RDM methods and taking EcoSpecs into account.	High
	Action 1.2: Develop and implement a water resource utilization plan for surface and groundwater resources (including registration & licensing).	High
	Action 1.3: Design and implement a water quality monitoring programme for Goukou River estuary, in line with RDM methods and taking EcoSpecs into account.	High
	Action 1.4: Eradicate/control invasive alien plant species from Goukou Catchment to increase flow.	High
	Action 1.5: Conserve and restore wetlands in Goukou Estuary Catchment to ensure summer baseflows.	High
	Action 1.6: Develop and implement a Water Demand Management Plan for Still Bay and surrounding towns. Link to Catchment Management Strategy.	Medium
	Action 1.7: Maintain/develop sanitation and sewage treatment facilities in Still Bay East and West (including pump station(s), and freshwater purification facility).	Medium
	Action 1.8: Investigate the link between sewage spills, nutrient dynamics and algal blooms/prawn kills/diabetic shellfish poisoning (oyster die-off).	Medium
2 Recreational activities	Action 2.1: Determine the power boat carrying capacity (number of boats and engine size) of the Goukou River estuary and revisit zonation and bylaws.	High
	Action 2.2: Maintain compliance and monitoring of fishing activities.	
	Action 2.3: Improve compliance and monitoring of recreational activities, especially power-boating and water- skiing.	High
3 Land use and development (including mitigation for environmental hazards)	Action 3.1: Ensure appropriate development in and around the Goukou River estuary through environmental authorization and implementation of IDP/SDF - considering ecosystem services and sense of place.	High
	Action 3.2: Develop appropriate Coastal Management Line for development that considers major floods and sea level rise for inclusion into the IDP/SDF.	High
	Action 3.3: Register all private and public jetties, ensure all licenses are current and ensure new structures are compliant with development guidelines.	High
	Action 3.4: Implement agricultural best practice specifically to reduce nutrient enriched return flow and sediment erosion from surrounding farms and catchment.	High
	Action 3.5: Develop and implement best practice guidelines for riparian protection (addressing reed removal, grazing and burning).	High
	Action 3.6: Improve access (e.g. walk ways and board walks).	Low

¹ Intermediate Reserve Determination Study completed in 2015 (DWS, 2015)

CATEGORIES	ACTION	PRIORITY
4 Living resource management	Action 4.1: Implement Goukou River EMP in conjunction with existing MPA Management Plan.	High
	Action 4.2: Monitor illegal gill netting (verifying the extent of problem) and maintain compliance in this regard.	Medium
	Action 4.3: Consolidate existing research and monitoring activities of fish resources and implement new research (e.g. SAIAB/DFFE/CapeNature telemetry study and link between eels and fountains) to show benefits of MPA.	High
	Action 4.4: Investigate occurrence and sensitivity to pressures of estuarine invertebrates (in both open and closed bait collection areas) and update bait collection strategies and plan accordingly.	Medium
	Action 4.4: Eradicate/control (predatory) alien invasive fish species in the catchment and upper reaches of the estuary to ensure safe passage of eels and freshwater mullet.	High
5 Funding, education and awareness	Action 5.1: Ensure that appropriate finances are invested in compliance and enforcement capacity on the estuary, linked to municipal bylaws relating to boating	High
	Action 5.2: Ensure that Goukou River Estuary EMP interests are raised in other existing forums (e.g. Organized Agriculture, Aesthetics committee, MPA Forum and IDP/SDF) through shared membership or clear lines of communication.	High
	Action 5.3: Ensure financial sustainability of Goukou EMP and RMA through securing funding for priority actions from appropriate government departments.	Medium
	Action 5.4: Dissemination of information through electronic media (e.g. website), popular press and scientific publications.	Medium
	Action 5.5: Promoting the Goukou River estuary and MPA as a scientific reference and research site.	Medium

The final prioritisation of actions needs to be undertaken by the RMA, in consultation with stakeholders and the Goukou River EAF. Factors to consider in the selection of priority actions are:

- Severity of the ecological or socio-economic impact in relation to the Vision and Key Objectives; and
- Availability of resources, both financial and human resources.

High priority actions as listed above are further elaborated below (Management Priorities).

4 SPATIAL ZONATION

4.1 Geographical Boundaries

The Estuary Zonation Plan (EZP) provides a means of geographically transposing the aims of the Management Objectives for a particular estuary, where applicable.

The following needs to be demarcated on an EZP:

- **Geographical boundaries (e.g. estuary functional zone according to the 5m amsl contour)** of the estuary also indicating important habitat (e.g. open water, main channel and flood plains);
- **Areas of ecological** (Ramsar boundaries; sensitive ecosystems), **heritage** (archaeological, historical and cultural sites) and **socio-economic** (fisheries; recreation areas; bird watching sites) **value**;
- **Zones depicting the areas where certain types of activities/developments** will be allowed or where certain activities/developments will not be allowed (i.e. the traditional estuary zonation map)
- Approved existing and future **developments/activities**, where feasible.

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

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

This 5m topographic contour encapsulates the Estuarine Functional Zone (EFZ), which in turn is defined by 2014 EIA Regulations (GNR 985) as “the area in and around an estuary which includes the open water area, estuarine habitat (such as sand and mudflats, rock and plant communities) and the surrounding floodplain area...” It should be noted that the 5m contour line is being used as a surrogate for the 1:100 year floodline where a 1:100 year floodline has not yet been determined. It is recognized that the use of the 5m contour line in the upper reaches is not as accurate as the 1:100 year floodline.

4.2 Zonation of Activities

The **Still Bay MPA** was gazetted in the *Government Gazette* (No. 31513) following an officially approved process run by the DEA. **The boundaries of the Still Bay MPA and its spatial expression (restricted zones etc.) will therefore form the basis of the Goukou Estuary Zonation Plan as it covers the estuary to a point 15km upstream (34° 17'.792 S; 021° 18'.592 E).** That said, all estuarine management plans are designed to be “living documents” which can be amended to accommodate changing circumstances. Therefore, should the boundaries of the MPA be changed for any reason, similarly the Goukou River Estuary EMP and related EZP would also have to be amended to take cognizance of the changes.

Likewise, although discussions regarding the change of the existing ski-zones are in process, the present ski-zone demarcation is taken as the default until clarity has been reached on this issue.

A summary of the Goukou River EZP based on existing national and local by-laws is provided in Figure 4 overleaf. Areas of ecological value are indicated by the red estuary flood plain boundary delineated by the 5m amsl contour. Areas indicated in green highlight conservation areas, while the MPA is demarcated in light blue. Orange areas demarcate no wake zones.

However, several of the existing activities are incompatible with the proposed zoning. Consequently, it is important that the RMA and CapeNature re-assesses this situation in order to produce a map that will depict the approved existing and future development/activities within the boundaries of the EMP.

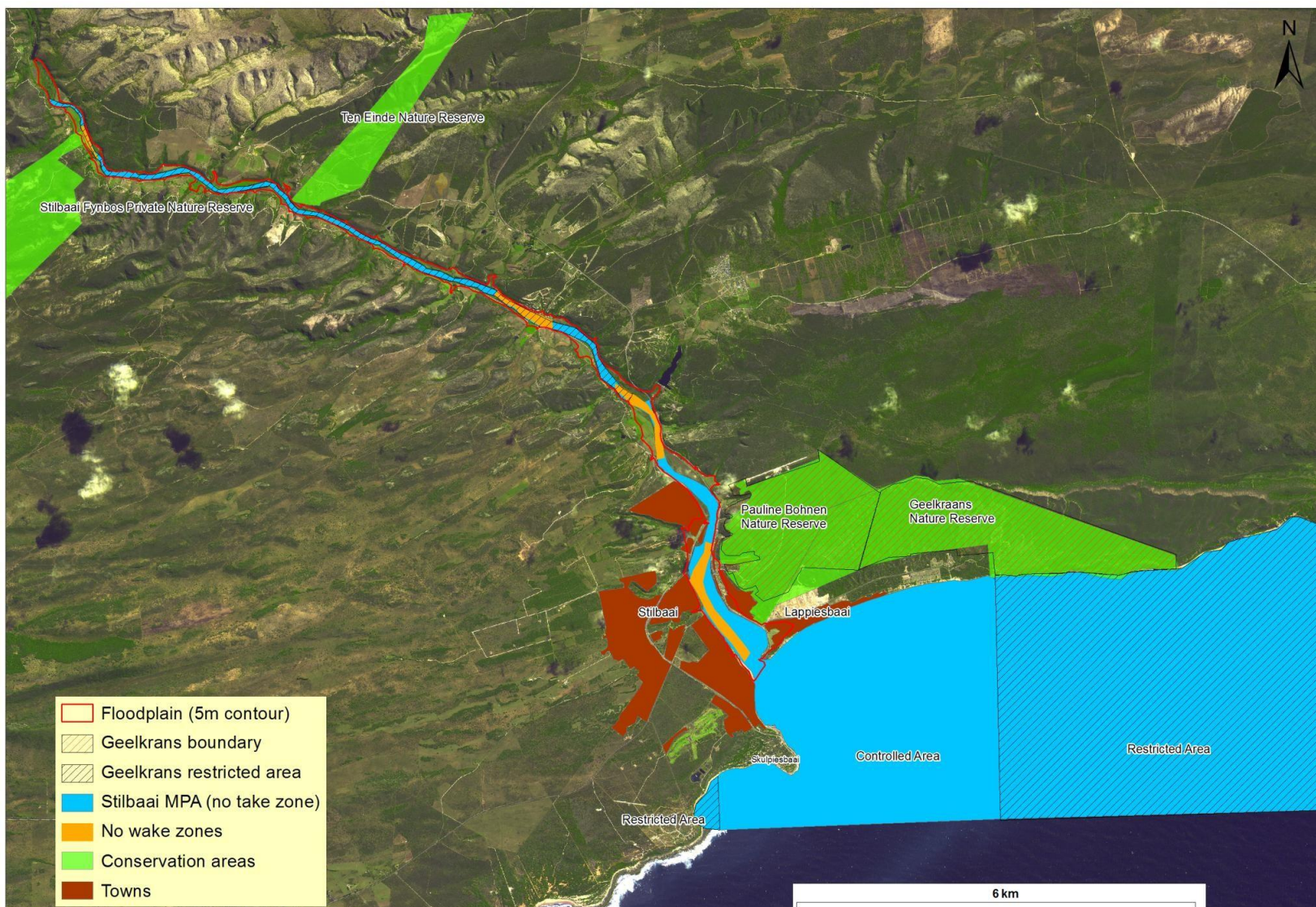


Figure 4: Demarcation of the boundaries of the Goukou River EMP. The estuary floodplain is according to the 5m amsl contour

5 MANAGEMENT PRIORITIES

When setting the detailed Management Objectives, the following question should be answered “What do we need to do to achieve or maintain the overarching Objectives?” or “What is preventing us from achieving the Vision and Objectives?”

It was highlighted by the feedback from participants at the Stakeholder Workshop held in Still Bay (July 2011) that management needs to be focused and directed towards development and activities in and around the Goukou River estuary. The following key categories for which management objectives had to be defined were identified:

- Water quantity and quality;
- Recreational activities;
- Living resource management;
- Land use and development (including mitigation for environmental hazards); and
- Funding and educational awareness.

In the following section, Management Objectives (categories) for the listed issues as well as related management actions are proposed. However, these objectives need to be revisited and refined by the RMA, CapeNature, in consultation with stakeholders (see Section 6).

5.1 Water Quantity & Quality

ACTION 1.1: Implement and monitor the ecological water requirement (EWR) of the Goukou River estuary, in line with RDM methods and taking EcoSpecs into account.

An intermediate confidence ecological water requirement study was completed in 2015 and included an evaluation of the freshwater input to the estuary, estuarine hydrodynamics, water quality, sediment processes, microalgae, vegetation, invertebrates, fish and birds of the Goukou River estuary. It is the legal instrument used to allocate the freshwater required to maintain (or improve) an aquatic ecosystem in South Africa. The EWR and EcoSpecs determined during the study must be implemented and monitored. The EcoSpecs are provided in Section 7.3.3.1

Related Main Objective(s)	<ul style="list-style-type: none"> • Ecological health of ecosystem is improved to Category B (moderately modified) and in the long term to Category A (near natural). • The Goukou River estuary fulfils its nursery function with regard to replenishing collapsed and over exploited fish resources and contributing to biodiversity targets • Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making. • Sustainable tourism is facilitating responsible economic growth and the optimal utilisation of ecosystem services.
Indicator(s)	Ecological water requirements implemented and monitored to ensure compliance
Relevant legislation	National Water Act (No 36 of 1998)
Responsible agent	Department of Water and Sanitation
Estimated Budget	R1.5 million

Timeframe	Within 5 years (3 years from inception)
Priority	High

ACTION 1.2: Develop and implement a water resource utilisation plan for surface and ground water resources (including registration & licensing).

The assessment of the current (and proposed) freshwater utilisation in the Goukou catchment and surrounding estuary environs should be done in parallel to Action 1.1. This study will provide the basis for the EWR assessment, as well as being informed by the final ecological flow allocation to the aquatic environment, which can constrain current and future water allocations. The evaluation should also include the utilisation of the fountains which serve as sensitive eel habitats and an additional freshwater resource for the estuary.

Related Main Objective(s)	<ul style="list-style-type: none"> • Ecological health of ecosystem is improved to Category B (moderately modified) and in the long term to Category A (near natural) • The Goukou River Estuary fulfils its nursery function with regard to replenishing collapsed and over exploited fish resources and contributing to biodiversity targets • Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making • Sustainable tourism is facilitating responsible economic growth and the optimal utilisation of ecosystem services • Development in and around the Goukou River estuary is guided by the cultural values and sense of place of the Still Bay environs
Indicator(s)	<ul style="list-style-type: none"> • Water resource utilisation plan developed and implemented (including monitoring and compliance) • Database developed and maintained • All water uses and users are registered and licensed
Relevant legislation	National Water Act (No 36 of 1998)
Responsible agent	Department of Water and Sanitation
Estimated Budget	R 200 000?
Timeframe	1 year but adapted within 5 years with EWR results.
Priority	High

ACTION 1.3: Design and implement a water quality monitoring programme for Goukou River estuary, in line with RDM methods and taking EcoSpecs into account.

The water quality monitoring programme should address salinity, nutrients, bacteriology and toxic substances (opposite outlet of water purification plant, upper reaches as well as opposite stormwater outlets), and should be undertaken on a regular basis.

Related Main Objective(s)	<ul style="list-style-type: none"> • Ecological health of ecosystem is improved to Category B (moderately modified) and in the long term to Category A (near natural) • Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making
Indicator(s)	<ul style="list-style-type: none"> • Water quality programme developed and implemented

	<ul style="list-style-type: none"> Regular, documented monitoring undertaken Database of results maintained Regular reports produced, inclusive of recommendations Recommendations implemented
Relevant legislation	National Water Act (No 36 of 1998) Municipal Systems Act (No 32 of 2000)
Responsible agent	Department of Water and Sanitation Hessequa Municipality
Estimated Budget	R200 000
Timeframe	1 year, but adapted within 5 years with EWR results
Priority	High

ACTION 1.4: Eradicate/control invasive alien plant species from the Goukou Estuary catchment to increase flow.

This is an ongoing action that requires the continuous support of the EAF to ensure that adequate resources are allocated to the Goukou Estuary catchment.

Related Main Objective(s)	<ul style="list-style-type: none"> Ecological health of ecosystem is improved to Category B (moderately modified) and in the long term to Category A (near natural) The Goukou River estuary fulfils its nursery function with regard to replenishing collapsed and over exploited fish resources and contributing to biodiversity targets Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making
Indicator(s)	<ul style="list-style-type: none"> Alien vegetation eradication programme developed and implemented Deployment of staff to the area Alien vegetation cover greatly reduced Ongoing maintenance i.t.o. vegetation removal
Relevant legislation	Conservation of Agricultural Resources Act (No 43 of 1983)
Responsible agent	DFFE DFFE (Working for Wetlands) Department of Water and Sanitation CapeNature
Estimated Budget	R5 million
Timeframe	Ongoing
Priority	High

ACTION 1.5: Conserve and restore wetlands in Goukou catchment to ensure summer baseflows.

This is an ongoing action that required the continuous support of the EAF to ensure that adequate resources are allocated to the Goukou catchment.

Related Main Objective(s)	<ul style="list-style-type: none"> Ecological health of ecosystem is improved to Category B (moderately modified) and in the long term to Category A (near natural).
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	<ul style="list-style-type: none"> Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making.
Indicator(s)	<ul style="list-style-type: none"> Fine scale GIS map developed indicating areas requiring priority rehabilitation and restoration identified Long term budget estimated and funding sourced Rehabilitation and restoration programme developed and implemented Investigate mechanisms for obtaining conservation protection (e.g. stewardship programme, etc.)
Relevant legislation	Conservation of Agricultural Resources Act (No 43 of 1983)
Responsible agent	DFFE DFFE (Working for Wetlands) Department of Water and Sanitation CapeNature
Estimated Budget	R5 million
Timeframe	Ongoing
Priority	High

5.2 Recreational Activities

ACTION 2.1: Determine the power boat carrying capacity (number of power boats and engine size) of the Goukou River estuary and revisit zonation and bylaws.

This assessment should focus on aspects relating to the number of boats, engine size, keel shape, zonation, time based management system, sedimentation, bank erosion and safety. Findings should be incorporated into an updated EZP (and by-laws if need be).

Related Main Objective(s)	<ul style="list-style-type: none"> Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making Sustainable tourism is facilitating responsible economic growth and the optimal utilisation of ecosystem services All estuary users and the local community are well informed, self-compliant and supportive of estuary initiatives
Indicator(s)	<ul style="list-style-type: none"> Carrying capacity study undertaken Results and recommendations published Zonation plan revised (if necessary) Appropriate permit regulations and by-laws amended/developed in line with recommendations
Relevant legislation	South African Maritime Safety Authority Act (No. 5 of 1998) National Water Act (No. 36 of 1998)
Responsible agent	Hessequa Municipality CapeNature Department of Water & Sanitation
Estimated Budget	R150 000
Timeframe	1 years
Priority	High

ACTION 2.2: Maintain compliance and monitoring of fishing activities.

This is an ongoing action that required the continuous support of the EAF to ensure that adequate resources are allocated to the Goukou River estuary.

Related Main Objective(s)	<ul style="list-style-type: none"> The Goukou River estuary fulfils its nursery function w.r.t. replenishing collapsed and over exploited fish resources and contributing to biodiversity targets.
Indicator(s)	<ul style="list-style-type: none"> Database of licensed and illegal users maintained Ongoing patrols of all fishing groups and vessels Illegal users/uses convicted and appropriately penalised Improved compliance with fishing regulations and municipal by-laws in terms of zonation Improvement in populations of targeted species
Relevant legislation	Marine Living Resources Act (No. 18 of 1998) Biodiversity Act (No. 10 of 2004)
Responsible agent	CapeNature DFFE: Branch Fisheries
Estimated Budget	R150 000?
Timeframe	Ongoing
Priority	High

ACTION 2.3: Improve compliance and monitoring of recreational activities, particularly for power- boating and water-skiing.

It is important that the authority responsible for enforcing the regulations on the estuary is well resourced (financially and with well-equipped manpower) to successfully fulfil their duties.

Related Main Objective(s)	<ul style="list-style-type: none"> Sustainable tourism is facilitating responsible economic growth and the optimal utilisation of ecosystem services. All estuary users and the local community are well informed, self-compliant and supportive of estuary initiatives.
Indicator(s)	<ul style="list-style-type: none"> All watercraft licensed Launch site register(s) in place Increased monitoring of permits and licenses Improved compliance with regulations and municipal by-laws in terms of zonation
Relevant legislation	South African Maritime Safety Authority Act (No. 5 of 1998)
Responsible agent	CapeNature Hessequa Local Municipality
Estimated Budget	R 150 000
Timeframe	Ongoing
Priority	High

5.3 Land Use & Development (including mitigation for environmental hazards)

ACTION 3.1: Ensure appropriate development in and around the Goukou River estuary through environmental authorization and implementation of IDP/SDF - considering ecosystem services and sense of place.

The EMP provides an avenue through which the vision of the local community (and government) for the Goukou River estuary can be formalised and incorporated into the local IDP/SDF.

Related Main Objective(s)	<ul style="list-style-type: none"> Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making. Development in and around the Goukou River estuary is guided by the cultural values and sense of place of the Still Bay environs. The Goukou River EMP is seamlessly integrated and implemented as part of the Hessequa Integrated Development Plan and the Spatial Development Framework.
Indicator(s)	<ul style="list-style-type: none"> Spatial zonation and prescription of the Goukou River EMP captured in the IDP and SDF Goukou River EAF registered as an Interested & Affected Party for all development and rezoning applications Database of all new developments and comment made by Goukou River EAF through EIA process Developments tabled at EAF meetings Construction sites monitored for compliance with environmental authorisation and approved environmental management plan
Relevant legislation	Municipal Systems Act (No. 32 of 2000) National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008) National Environmental Management Act (No. 107 of 1998)
Responsible agent	Hessequa Municipality DFFE: Oceans and Coast Western Cape Department of Environmental Affairs and Development Planning
Estimated Budget	-
Timeframe	1 year
Priority	High

ACTION 3.2: Develop appropriate coastal management lines for development that considers major floods and sea level rise for inclusion into the IDP/SDF.

Coastal management lines and flood lines need to be determined through sound engineering techniques. Aspects such as increased flooding, increased storminess and sea level rise need to be included in this assessment to ensure adaption to climate change. Coastal management lines and flood lines need to be incorporated into EMP, SDF and Coastal Management Programmes for the area.

Related Main Objective(s)	<ul style="list-style-type: none"> Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making. The Goukou River Estuary EMP is seamlessly integrated and implemented as part of the Hessequa Integrated Development Plan and the Spatial Development Framework.
Indicator(s)	<ul style="list-style-type: none"> Coastal management lines and 1;100 year floodlines developed and gazetted Coastal management lines and 1:100 year floodlines incorporated into IDP & SDF Development excluded from sensitive areas, including EFZ Applicable building controls applied to high risk areas
Relevant legislation	Municipal Systems Act (No. 32 of 2000) National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008)
Responsible agent	Hessequa Municipality DFFE: Oceans and Coast Western Cape Department of Environmental Affairs and Development Planning CapeNature
Estimated Budget	R 200 000
Timeframe	1 year
Priority	High

ACTION 3.3: Register all private and public jetties and ensure compliance with development guidelines.

This action is currently being undertaken by CapeNature in collaboration with DEA&DP.

Related Main Objective(s)	<ul style="list-style-type: none"> Development in and around the Goukou River estuary is guided by the cultural values and sense of place of the Still Bay environs.
Indicator(s)	<ul style="list-style-type: none"> All jetties and slipways registered i.t.o. Seashore Act (No. 21 of 1935) Database/register of jetties and slipways developed & maintained Systematic & efficient collection of license fees Regular monitoring to ensure building controls/development guidelines are applied
Relevant legislation	National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008) National Environmental Management Act (No. 107 of 1998)
Responsible agent	Cape Nature Western Cape Department of Environmental Affairs and Development Planning
Estimated Budget	-
Timeframe	Ongoing
Priority	High

ACTION 3.4: Implement agricultural best practice, specifically to reduce nutrient enriched return flow and sediment erosion from surrounding farms in the catchment.

This is an ongoing action that requires the continuous support of the EAF to ensure that adequate resources are allocated to the Goukou Estuary Catchment and estuary environs.

Related Main Objective(s)	<ul style="list-style-type: none"> Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making. Development in and around the Goukou River estuary is guided by the cultural values and sense of place of the Still Bay environs.
Indicator(s)	<ul style="list-style-type: none"> Agricultural best practice guidelines developed and published Farmers and local communities made aware of such guidelines Agricultural best practise implemented
Relevant legislation	Conservation of Agricultural Resources Act (No 43 of 1983)
Responsible agent	DFFE Department of Water & Sanitation CapeNature
Estimated Budget	-
Timeframe	Ongoing
Priority	High

ACTION 3.5: Develop and implement best practice guidelines for riparian protection (addressing reed removal, grazing and burning).

While general best practice guidelines exist for riparian buffer protection it is recommended that these be adapted for the Goukou River estuary to ensure that riparian owners understand the urgency of the matter and increase self-compliance in the region.

Related Main Objective(s)	<ul style="list-style-type: none"> Development in and around the Goukou River estuary is guided by the cultural values and sense of place of the Still Bay environs. Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision making
Indicator(s)	<ul style="list-style-type: none"> Areas, volumes and seasonality for reed harvesting and burning determined Grazing areas and capacity determined Protocols for reed management and grazing developed, implemented, monitored and enforced Cattle farmers and local landowners made aware of such protocol
Relevant legislation	Conservation of Agricultural Resources Act (No 43 of 1983)
Responsible agent	DFFE Department of Water & Sanitation CapeNature
Estimated Budget	R50 000
Timeframe	1 year
Priority	High

5.4 Living Resources Management

ACTION 4.1: Implement Goukou Estuary EMP in conjunction with existing MPA Management Plan

To ensure an efficient utilisation of local resources and the achievement of the objectives of both the EMP and MPA the two overlapping plans must be coordinated. Any conflicting objectives, strategies or action plans identified should be resolved at the outset, bearing in mind that both the EMP and the MPA must operate within the law and their respective mandates.

Related Main Objective(s)	<ul style="list-style-type: none"> The Goukou River Estuary EMP and MPA is seamlessly integrated and implemented as part of the Hessequa Integrated Development Plan and the Spatial Development Framework. The Goukou River estuary fulfils its nursery function with regard to replenishing collapsed and over exploited fish resources and contributing to biodiversity targets.
Indicator(s)	<ul style="list-style-type: none"> Goukou River Estuary EAF registered as an Interested & Affected Party for the MPA Active representation of MPA management on Goukou River EAF Regular (quarterly) meetings with minutes, with MPA management authority including Goukou River estuary issues
Relevant legislation	Marine Living Resources Act (No. 18 of 1998) National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008) Biodiversity Act [No. 10 of 2004]
Responsible agent	DFFE CapeNature
Estimated Budget	-
Timeframe	1 year
Priority	High

ACTION 4.2: Monitor illegal gill netting (verifying the extent of problem) and maintain compliance with fisheries laws and regulations.

This action is currently being undertaken by CapeNature but needs some support from DFFE to confirm estimates of the extent of the problem.

Related Main Objective(s)	The Goukou River estuary fulfils its nursery function with regard to replenishing collapsed and over exploited fish resources and contributing to biodiversity targets.
Indicator(s)	<ul style="list-style-type: none"> Deployment of additional compliance officers/conservancy rangers Additional patrols undertaken Database of offenders developed and maintained Extent of gill netting significantly reduced/eradicated
Relevant legislation	Marine Living Resources Act (No. 18 of 1998) National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008) Biodiversity Act [No. 10 of 2004]
Responsible agent	DFFE: Branch Fisheries CapeNature DFFE: Oceans and Coast

Estimated Budget	R100 000
Timeframe	Ongoing
Priority	High

ACTION 4.3: Consolidate existing research and monitoring of fish resources and implement new research (e.g. SAIAB/DFFE/CapeNature telemetry study and eel study) to show benefits of MPA.

There is an urgent need to consolidate and analyse existing fish data. In addition, information is also required on the use of the estuary by recreational fish species through a joint SAIAB/DFFE/CapeNature telemetry (electronic tagging) study. A study is also required to look at the distribution of the fountains, the distribution and occurrence of eels in the catchment, and the role groundwater and the fountains play in sustaining this vulnerable fish species.

Related Main Objective(s)	<ul style="list-style-type: none"> The Goukou River estuary fulfils its nursery function with regard to replenishing collapsed and over exploited fish resources and contributing to biodiversity targets. All estuary users and the local community are well informed, self-compliant and supportive of estuary initiatives.
Indicator(s)	<ul style="list-style-type: none"> Research projects devised and executed Results and recommendations published Mitigation measures implemented
Relevant legislation	Marine Living Resources Act (No. 18 of 1998) National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008) Biodiversity Act [No. 10 of 2004]
Responsible agent	DFFE: Branch Fisheries Department of Water & Sanitation Department of Science & Technology CapeNature
Estimated Budget	R200 000
Timeframe	Ongoing
Priority	High

ACTION 4.4: Eradicate/control of (predatory) alien invasive fish species in the catchment and upper reaches of the estuary to ensure safe passage of eels and freshwater mullet.

Predatory invasive alien fish act as barriers (similar to dams or weirs) to the migration of estuary associated fish species into the catchment. It is critical that a plan of action be developed to control/ eradicate this additional pressure on the already vulnerable eel and freshwater mullet utilising the estuary.

Related Main Objective(s)	<ul style="list-style-type: none"> The Goukou fulfils its nursery function with regard to replenishing collapsed and over exploited fish resources and contributing to biodiversity targets.
Indicator(s)	<ul style="list-style-type: none"> Alien fish species eradication programme devised and implemented Alien fish species and abundance decreased on annual basis
Relevant legislation	Marine Living Resources Act (No 17 of 1998)
Responsible agent	DFFE CapeNature

	WWF Private parties?
Estimated Budget	R1 million
Timeframe	Within 3 years (2010-2012)
Priority	High

5.5 Funding, Education & Awareness

ACTION 5.1: Ensure that appropriate finances are invested in compliance and enforcement capacity on the estuary, linked to municipal bylaws relating to boating

Goukou River estuary management is underfunded. One clear avenue through which revenue can be raised is the funds generated from Goukou River estuary related activities. These funds should be allocated to the management of the system.

Related Main Objective(s)	The Estuary Forum is constituted and well resourced (human and capital) with the mandate to: <ul style="list-style-type: none"> • Monitor the implementation of the Goukou River EMP • Facilitate effective co-operative governance • Serve as a communication platform to inform the local community
Indicator(s)	<ul style="list-style-type: none"> • Financial plan developed • Sufficient and effect use of funding • Line of reporting/communication agreed • Quarterly finance report developed
Relevant legislation	Municipal Systems Act (No. 32 of 2000) National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008)
Responsible agent	CapeNature Hessequa Municipality
Estimated Budget	-
Timeframe	1 year
Priority	High

ACTION 5.2: Ensure that Goukou River EAF and EMP interests are represented in other existing structures (e.g. Organised Agriculture, Aesthetics Committee, MPA Forum, IDP/SDF) through shared membership or clear lines of communication.

The Goukou River EAF should serve as a communication platform that provides an avenue for disseminating information and formalising the vision of the local community for the Goukou River estuary. Where possible formal links should be created through membership of either the EAF or existing management structures to facilitate this flow of information and feedback on actions.

Related Main Objective(s)	The Estuary Forum is constituted and well resourced (human and capital) to: <ul style="list-style-type: none"> • Monitor the execution the Goukou River EMP; • Facilitate effective co-operative governance; and • Serve as a communication platform to inform the local community. • Ensure all estuary users and the local community are well informed, self-compliant and supportive of estuary initiatives.
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Indicator(s)	<ul style="list-style-type: none"> • Active membership/participation of Goukou River EAF members at local committee meetings and forums • Goukou River estuary issues included on meeting agenda(s) • Minutes of meetings distributed to EAF members
Relevant legislation	Municipal Systems Act (No. 32 of 2000) National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008)
Responsible agent	Goukou EAF Hessequa Municipality
Estimated Budget	-
Timeframe	Ongoing
Priority	High

6 INSTITUTIONAL ARRANGEMENTS

6.1 Key Role Players

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 Goukou River Estuary must be explored and implemented.

Co-management and effective governance has already been identified as the keystone to the efficient and effective management of the Goukou River Estuary. The CapeNature Governance Tool will incorporate management objectives and monitor, track and report on actions over time.

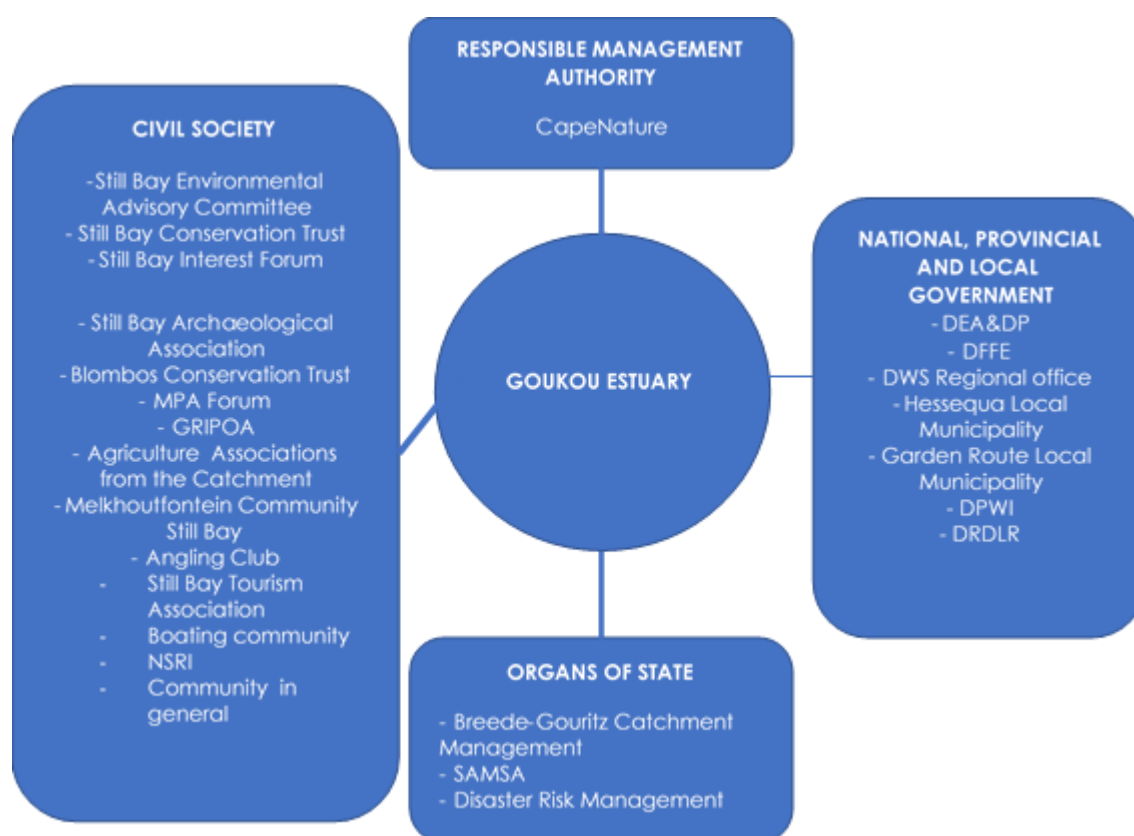


Figure 5: Key role players for the management of the Goukou Estuary

6.1.1 Estuary Management Authority

As detailed earlier, the Protocol identifies **CapeNature** as the **Responsible Management Authority**, in collaboration with the Hessequa Local Municipality, since the Goukou River estuary surface area forms part of the Still Bay Marine Protected Area and the adjacent

land is municipal land. The RMA is responsible for the development of the Goukou River EMP as well as being responsible for the co-ordination of its implementation. This implementation function can be affected through a range of different forums and actors. The RMA must also assume the responsibility of chairing the advisory forum meetings (See below.)

The vision, key objectives, and management objectives should guide the development of the Estuary Zoning Plan (EZP) and associated Operational Specifications. There is an existing EZP for the Goukou River estuary developed as part of the MPA declaration process and previous exiting zonation (See Section 4 above). This zonation will form the basis of the Goukou River EZP. The refinement and evaluation of the Goukou River EZP (and associated Operational Specifications) are the responsibility of the RMA (CapeNature), in collaboration with the EAF.

6.1.2 Estuary Advisory Forum

According to the Protocol, the **role of the Estuary Advisory Forum (EAF)** 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 (see EAF guidelines document developed by DEA&DP in 2020). The broader **community** will be able to voice concerns and raise issues via the EAF. This includes Ratepayers' Associations, NGO's, community groups, conservancies, etc., as well as representatives from surrounding industry and agriculture. Any representatives are obliged to raise issues identified by their constituents and to provide feedback to the constituents. Importantly, the EAF will not represent or supplant the individual positions of its members unless specifically mandated to do so.

The future role of the existing Goukou EAF will need to be confirmed by the RMA, CapeNature. **It is recommended that the RMA considers the continuation of the existing stakeholder body (the Still Bay Environmental Advisory Committee (SEAC)) so as to provide an advisory service to the RMA on issues specific to the management and implementation of the EMP.** The RMA should thus chair the committee meetings.

At the July 2011 stakeholder workshop, it was agreed that it would be beneficial to integrate the EAF into the existing SEAC. If this is possible it would prevent stakeholder fatigue brought on by numerous committees for each environmental management mandate in the area. If the integration of the EAF into the SEAC is successful for the Goukou River estuary this can serve as a management model for future EMPs. At the same meeting, the independence of the SEAC was questioned since it was constituted as a municipal advisory committee. It was decided that this issue will be assessed to see whether the SEAC can take up additional mandates and serve as an independent body. A Protected Area Advisory Committee (PAAC) can also be considered.

It was agreed that government departments should be represented on the EAF by delegates mandated by the respective department to do so. Each government representative on the forum will be tasked by the forum to convey the EAF's resolutions to his/her department and report back to the EAF on behalf of the department. Moreover, representatives from the authority/ies who have executive powers within the specific sector

should also be present. This ensures that recommendations are executed, and resources are made available for priority tasks or activities. This also streamlines the flow of information and decreases the turnaround time of required interventions. Competent natural or social scientists ideally should be acting in an advisory role to assist with the development of the EMP. Where there is a lack of local expertise in specific technical domain/s, the EAF should alert the responsible authority and request its support.

6.1.3 Government Departments and organs of state

The successful implementation of the EMP relies on the contribution of a number of governmental role players, including:

- Hessequa Municipality: Responsible for fulfilling municipal roles, legislative support (bylaws);
- Garden Route District Municipality: Responsible for fulfilling municipal roles relating to 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, research and monitoring (e.g. DEA&DP);
- Relevant National government departments, especially DWS (via the regional office), DFFE and the Department of Rural Development and Land Reform (DRDLR); and
- Organs of State: BGCMA, CSIR, SAHRA, etc.

The DFFE is generally responsible for national standardisation of estuarine management and approval of provincially compiled EMPs. Direct involvement in individual estuaries, such as the Goukou River Estuary, will occur via existing forums for intergovernmental coordination. These forums will have the management of the Goukou River estuary on their agendas from time to time, and include:

- The **Garden Route District 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.

The integration of the Goukou River Estuary EMP into other management initiatives in the area, e.g. the IDP and SDF of the Hessequa Municipality needs to be stressed as this will determine the ultimate success of the EMP. It is the responsibility of the EAF to ensure this happens.

6.2 Review and Evaluation

This EMP should be reviewed and updated on a five-yearly basis from the date it is approved and adopted to ensure that objectives and targets are being achieved. An audit should be undertaken alongside the review and evaluation to determine and grade the success

and failures with the implementation of the management plan according to the specified performance indicators (Appendix 2). The audit should ultimately be the responsibility of the RMA and the Goukou River EAF. A MPA METT will be implemented in line with DFFE timeframes.

The review will involve revisiting the Situation Assessment Report 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 procedure.

7 MONITORING REQUIREMENTS

7.1 Background

Sustainable management of estuaries can only be achieved through the collection of appropriate and reliable quantitative data. However, the collection, processing and interpretation of such data are often time-consuming and costly exercises, and often require considerable scientific expertise. Presently there is no generally accepted protocol to guide South African authorities in the design and implementation of estuary monitoring programmes. Consequently, monitoring is project specific and discontinuous, plays little part in guiding management decisions and is retarded by a lack of integration between responsible authorities and programmes.

It is important to note the difference between resource monitoring (both baseline measurement and long-term) and compliance programmes, in the context of the development and implementation of EMPs:

- **Resource monitoring** refers to monitoring programmes through which long-term data sets are collected to establish natural variability and trends as a result of human interference. Baseline measurement programmes (or surveys) usually refer to shorter-term or once-off, intensive investigations of a wide range of parameters to obtain a better understanding of ecosystem (estuarine) functioning (usually part of Situation Assessment and Evaluation and the Objective-Setting Phase). While long-term monitoring programmes refer to on-going data-collection programmes that are done to evaluate continuously the effectiveness of management strategies/actions designed to maintain a desired environmental state so that responses to potentially negative impacts, including cumulative effects, can be implemented in good time (usually fits into the Monitoring component). The emphasis here is mainly on the latter.
- **Compliance monitoring** is related to specific activities or developments in and around estuaries. The primary aim of these monitoring programmes is to establish whether the operation of such activities and developments complies with pre-determined limits, and/or with the ecological and socio-economic objectives of the estuarine environment on which it may have an impact.

It is important that scientifically sound reasons are provided for the selection of specific indicators in a particular study area. Before choosing a particular indicator as a monitoring parameter of ecosystem health, it is important to also assess it against the following criteria (McGwynne & Adams, 2004; ANZECC, 2000):

- Is sensitive to potential impacts;
- Response will reflect the overall ecological condition or integrity of the estuary;
- Approaches to sampling and data analysis will be standardised;
- Response can be measured rapidly, cheaply and reliably; Response has some diagnostic value;
- Provides a representative view of environmental (biophysical, social and institutional) conditions and pressures, and societal responses;
- Is reliable and robust yet sensitive enough to provide an early warning of unacceptable change;
- Is scientifically credible;
- Is simple, cost effective, easy to understand and practicable;
- Shows trends over time;
- Provides a basis for local, regional and national comparisons;
- Has a threshold or limit of acceptable change that can serve as an end-point; and
- Has relevance to policy and management needs.

A useful checklist that can be used to assist in the selection of suitable indicators, in general, is provided in Table 6 (ANZECC, 2000).

Table 6: Checklist for selection of measurement parameters (from ANZECC, 2000)

Relevance	Does the measurement parameter reflect directly on the issue of concern?
Validity	Does the measurement parameter respond to changes in the environment and have some explanatory power?
Diagnostic value	The measurement parameter must be able to detect changes and trends in conditions for the specified period. Can the amount of change be assessed quantitatively or qualitatively?
Responsiveness	Does the measurement parameter detect changes early enough to permit a corrective management response, and will it reflect changes due to the manipulation by management?
Reliability	Is the measurement parameter measurable in a reliable, reproducible and cost-effective way?
Appropriateness	Is the measurement parameter appropriate for the time and spatial scales that need to be resolved?

7.2 Goukou River Estuary Resource Monitoring

7.2.1 Existing Resource Monitoring Activities

There is very little baseline ecological information available on the Goukou River estuary. It is of the utmost importance to develop an in-depth understanding of how the ecology functions. The following abiotic and biotic components are being monitored:

- **DWS Water level recorder:** The DWS has a permanent water level recorder in Goukou River estuary that monitors water levels continuously. It is of the utmost importance that this monitoring continues.
- **Water Chemistry:** Salinity and temperature profiles are collected at 0.5 m depth intervals. Sampling is conducted at stations distributed geographically along the entire estuary at fixed intervals. Typically, a representative number of stations for large estuaries is between 10 and 15. Sampling stations should also be selected along cross sections.
- **Co-ordinated Waterbirds Counts:** The Coordinated Waterbird Counts (CWAC) was launched in 1992. The objective of CWAC is to monitor South Africa's waterbird populations and the conditions of the wetlands which are important for waterbirds. This is being done by means of a programme of regular mid-summer and mid-winter censuses at a large number of South African wetlands and estuaries including the Goukou River estuary, at regular six-monthly intervals.
- **Fish:** Samples are taken bi-annually (summer and winter). The temporal scales are set to address recruitment patterns as well as species distribution within habitats in different seasons. See Appendix 1 for the fish monitoring methodology.

7.2.2 Future Resource Monitoring Requirements

The following abiotic and biotic components need to be surveyed and monitored. See Appendix 1 for proposed monitoring methodology.

Abiotic components that need to be addressed are:

- Hydrology;
- Sediment dynamics;
- Hydrodynamics; and
- Water Quality.

Biotic components that need to be addressed are:

- Microalgae;
- Macrophytes; and
- Invertebrates (including zooplankton, benthic invertebrates and macrocrustaceans)

The Situation Assessment Report highlighted significant uncertainties regarding the interaction between water chemistry and biota (e.g. microalgae, macrophytes and fish). These components should be investigated in detail and monitoring as speedily as possible.

7.3 Goukou River Estuary Compliance Monitoring

This section provides a brief summary of the compliance monitoring currently occurring on and around the Goukou River estuary. It also provides summarized recommended compliance monitoring actions.

7.3.1 Existing Compliance Monitoring

Existing compliance monitoring includes:

- Number of boats on the Goukou River estuary;
- Number of fishers on the Goukou River estuary;

- Number of offences, arrests and convictions for contravening regulations stipulated in the Marine Living Resources Act (No 18 of 1998); and
- Number of jetties (registered and unregistered).

7.3.2 Future Compliance Monitoring

Recommended compliance monitoring includes:

- Number of bait collectors and the method of bait extraction (suction pump, spade, fork, tin), rate of bait removal, and the number of licensed collectors;
- Number of boats with permits;
- Number and volume of sewage spilled/discharged into the river (Riversdale) and Goukou River estuary; and
- Number of registered water users in catchment and volume of water being abstracted.

7.3.3 Operational Specifications (Targets) for Goukou River estuary

Operational specifications mainly constitute the following (e.g. derived from legislation, regulations or best practice guides):

- The measurable targets (or thresholds of potential concern) applicable to areas of ecological, heritage and socio-economic value of the estuarine environment (as highlighted in the Strategic Objectives); or
- Measurable critical limits applicable to activities/developments or activity/development zones in and around the estuary (as highlighted in Management Strategies).

Thresholds of potential concern (TPC) are defined as measurable end points related to specific abiotic or biotic indicators that if reached, triggers management action. Thresholds of potential concern should be defined such that they provide early warning signals of potential non-compliance with ecological specifications. This concept implies that the indicators (or monitoring activities) selected as part of a long-term monitoring programme need to include biotic and abiotic components that are particularly sensitive to ecological changes associated, in particular, with changes in river inflow into the system.

The EZP, together with the Operational Specifications, is the “blueprint” against which any existing or future initiative, development or activity in the estuary is measured. The action plans and environmental impact assessment (EIA) studies are required to use the “blueprint” to derive targets and limits, rather than each developing their own, which may be inconsistent or conflicting.

While the overarching EZP provide comprehensive geographical information covering all the aspects, it may be more appropriate to extract the relevant information from the comprehensive plan and to produce “customised EZPs” for the different action plans. For example, compliance officers in municipalities may be more interested in a map that highlights the zones where certain types of activities/developments will be allowed/prohibited (e.g. the traditional EZP), while tourism concerns may be more interested in the demarcation of areas of ecological and heritage value

7.3.3.1 Ecological Targets for Goukou River estuary

The following ecological specifications for the Goukou River estuary, and the associated TPCs, are representative of an Ecological Category B/A. **The specifications and the associated TPCs are the products of the intermediate Ecological Water Requirement study (DWS, 2015).**

Table 7: Ecological Specifications and Thresholds of Potential Concern for Goukou River estuary

COMPONENT	ECOLOGICAL SPECIFICATION	THRESHOLD OF POTENTIAL CONCERN (TPCs)
Hydrology	<ul style="list-style-type: none"> Maintain flow regime as per recommended ecological flow Ensure the persistence of freshwater seepage sites in the lower and middle reaches of the estuary. 	River inflow: <ul style="list-style-type: none"> < 0.3 m³/s for more than 1 month a year < 1.0 m³/s for more than 3 months a year Maintain water levels in fountains (determine trough baseline study)
Hydro-dynamics	<ul style="list-style-type: none"> Maintain connectivity with marine environment Maintain connectivity with terrestrial environment through the presence of fountains and seeps 	<ul style="list-style-type: none"> Average tidal amplitude < 20% of present observed data from the water level recorder in the estuary near the mouth during low flows (summer) Loss of wet riparian zones
Sediment dynamics	<ul style="list-style-type: none"> Flood regime to maintain the sediment distribution patterns and aquatic habitat (instream physical habitat) for biota No significant changes in sediment grain size and organic matter distribution patterns for biota No significant change in average sediment composition and characteristics No significant change in average bathymetry 	<ul style="list-style-type: none"> Average sediment composition in any survey (% fractions) along estuary change from that of the Present State (2014 baseline, to be measured) by 30% Average organic fraction in sediment along length of estuary > 5% Average bathymetry along main channel in the middle and lower reaches (10 km upstream) change by 30% in any survey from that of the Present State (2015 baseline, to be measured) (system expected to significantly fluctuate in terms of bathymetry between flood) Average bathymetry along main channel in the upper reaches (above 10 km from the mouth – above Zone C) change by 10% in any survey from that of the Present State (2015 baseline, to be measured)
Water Quality	Salinity distribution not to exceed TPCs for biota (see below)	<ul style="list-style-type: none"> Salinity > 0 at head of estuary Average salinity in Zone D > 5 Average salinity in Zone C > 20 Average salinity 9.5 km upstream from mouth > 20 more than 3 months of the year Salinity in interstitial water at seep sites > 20 Salinity > 40 in saltmarsh sediments (linked to decrease in moisture and drying of floodplain habitat)

COMPONENT	ECOLOGICAL SPECIFICATION	THRESHOLD OF POTENTIAL CONCERN (TPCs)
	System variables (pH, dissolved oxygen and turbidity) not to cause exceedance of TPCs for biota (see below)	<p>River inflow:</p> <ul style="list-style-type: none"> 6.0 < pH > 8.0 (black water system) Dissolved oxygen (DO) < 5 mg/l Suspended solids > 5 mg/l (low flow) <p>Estuary:</p> <ul style="list-style-type: none"> Average turbidity > 10 NTU (low flow) Average 6.0 < pH > 8.5 (increasing with increase in salinity) Average DO < 5 mg/l
	Inorganic nutrient concentrations (NO ₃ -N, NH ₃ -N and PO ₄ -P) not to cause in exceedance of TPCs for macrophytes and microalgae (see below)	<p>River inflow:</p> <ul style="list-style-type: none"> NO_x-N > 150 µg/l over 2 consecutive months NH₃-N > 20 µg/l over 2 consecutive months PO₄-P > 20 µg/l over 2 consecutive months <p>Estuary (except during upwelling or floods):</p> <ul style="list-style-type: none"> Average NO_x-N > 150 µg/l single concentration > 200 µg/l Average NH₃-N > 20 µg/l during survey, single concentration > 100 µg/l Average PO₄-P > 20 µg/l during survey, single concentration > 50 µg/l
	Presence of toxic substances (e.g., trace metals and pesticides/herbicides) not to cause exceedance of TPCs for biota (see below)	<p>River inflow:</p> <ul style="list-style-type: none"> Trace metals (to be confirmed) Pesticides/herbicides (to be confirmed) <p>Estuary</p> <ul style="list-style-type: none"> Concentrations in water column exceed target values as per South African Water Quality Guidelines for coastal marine waters (DWAF, 1995) Concentrations in sediment exceed target values as per WIO Region guidelines (UNEP/Nairobi Convention Secretariat and CSIR, 2009)
Microalgae	<ul style="list-style-type: none"> Maintain a low median phytoplankton biomass Maintain a high median intertidal benthic microalgal biomass Prevent formation of localised phytoplankton blooms 	<ul style="list-style-type: none"> Median phytoplankton chlorophyll a (minimum 5 sites) exceeds 3.5 µg/l Median intertidal benthic chlorophyll a (minimum 5 sites) exceeds 42 mg/m² Site specific chlorophyll a concentration exceeds 20 µg/l and cell density exceeds 10 000 cells/l
Macrophytes	<ul style="list-style-type: none"> Maintain the distribution of macrophyte habitats, particularly the submerged macrophytes, salt marsh, reeds and sedges Maintain pockets of reeds in lower and middle reaches (linked to freshwater seepage sites) Maintain the reed and sedge stands in the upper reaches of the estuary 	<ul style="list-style-type: none"> Greater than 20% change in the area covered by salt marsh, reeds and sedges (2014 survey). Loss of submerged macrophytes (e.g., <i>Stukenia pectinata</i>, <i>Zostera capensis</i>) over a three year period Decrease in cover of reeds at the freshwater seepage sites in the lower and middle reaches of the estuary

COMPONENT	ECOLOGICAL SPECIFICATION	THRESHOLD OF POTENTIAL CONCERN (TPCs)
	<ul style="list-style-type: none"> Rehabilitate 20% of the floodplain habitat by removing agriculture and invasive plants Maintain the integrity of the riparian zone 	<ul style="list-style-type: none"> (linked to salinity in interstitial water > 20 for three months) Increase in bare areas in the salt marsh (linked to a decrease in moisture and increase in salinity in sediment – i.e., drying of floodplain habitat) Loss and die-back of reeds fringing the estuary in the upper reaches (linked to salinity being > 20 for three months) Invasive plants (e.g., <i>Acacia cyclops</i>, prickly pear) cover > 5% of total floodplain area Unvegetated, cleared areas along the banks caused by human disturbance
Invertebrates	<ul style="list-style-type: none"> Maintain rich populations of the mudprawn <i>Upogebia africana</i> on mudbanks in the middle estuary (Zones A and B) Maintain rich invertebrate communities associated with the REI zone in the upper estuary (zooplankton and benthos) 	<ul style="list-style-type: none"> Mudprawn density should not deviate from average baseline levels (as determined in the eight visits undertaken quarterly in the first two years) by more than 25% in each season. The dominant species in the zone (zooplankton and benthos) should not deviate from average baseline levels (as determined in the eight visits undertaken quarterly in the first two years) by more than 40% in each season
Fish	<p>Fish assemblage should comprise the 5 estuarine association categories in similar proportions (diversity and abundance) to that under the reference (see 2015 EWR report). Numerically assemblage should comprise:</p> <ul style="list-style-type: none"> Ia estuarine residents (50-80% of total abundance) Ib marine and estuarine breeders (10-20%) Ila obligate estuarine-dependent (10-20%) Ilb estuarine associated species (5-15%) Ilc marine opportunists (20-80%) Ili marine vagrants (not more than 5%) IV indigenous fish (1-5%) V catadromous species (1-5%) <p>Category Ia species should contain viable populations of at least 4 species (including <i>G.aestuaria</i>, <i>Hyporhamphus capensis</i>, <i>Omobranchus woodii</i>).</p> <p>Category Ila obligate dependents should be well represented by large exploited species especially <i>A. japonicus</i>, <i>L. lithognathus</i>, <i>P. commersonii</i>, <i>Lichia amia</i>.</p> <p>REI species dominated by both <i>Myxus capensis</i> and <i>G. aestuaria</i>.</p>	<ul style="list-style-type: none"> Ia estuarine residents < 50% Ib marine and estuarine breeders < 10% Ila obligate estuarine-dependent < 10% Ilb estuarine associated species < 5% Ilc marine opportunists < 20% Ili marine vagrants > 5% IV indigenous fish < 1% V catadromous species < 1% (also linked to presence of freshwater seepage areas) Ia represented only by <i>G. aestuaria</i>. Ila exploited species in very low numbers or absent REI species represented only by <i>G. aestuaria</i>, <i>Myxus capensis</i> absent
Birds	The estuary should contain a diverse avifaunal community that includes representatives of all the original taxonomic groups (see 2015 EWR report). Tern roosts should be seen at the estuary on a regular basis. Apart from gulls,	<ul style="list-style-type: none"> Numbers of birds other than gulls, terns and regionally increasing species fall below 120 for three consecutive counts

COMPONENT	ECOLOGICAL SPECIFICATION	THRESHOLD OF POTENTIAL CONCERN (TPCs)
	terns and regionally increasing species such as Egyptian Goose, the estuary should generally support more than 200 birds.	<ul style="list-style-type: none"> Numbers of waterbird species drop below 15 for three consecutive counts

7.3.3.2 Conservation Targets

As part of the development of a regional conservation plan for the cool and warm temperate estuaries, Turpie and Clark (2007) recommended that the Goukou River estuary forms part of the set of estuaries that needs to be protected to meet biodiversity targets in South Africa. The conservation plan stipulates that 50% of the terrestrial marginal area be included as a no-development area and that the Recommended Ecological Water Requirement Category be a B or C (see Table 8).

Table 8: Summary of the recommended extent of protection required for the estuaries in the temperate regions of South Africa (Turpie and Clark 2007)

RECOMMENDATION	VALUE
Extent of sanctuary protection	Half
Extent of undeveloped margin	50%
Minimum water requirement (ecological category)	A/B

8 RECOMMENDATIONS

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

- The EMP highlights that the spatial zonation of activities in and around the estuary have not been finalised. It is therefore critical that the zonation addressed by the RMA and CapeNature in the next EMP review in order to produce a map that will depict the approved existing and future development/activities within the boundaries of the EMP.
- Future revisions of the zonation plan should also consider flexible recreational use areas as well as peak user days regulations.

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10 APPENDIX 1: MONITORING METHODOLOGY

10.1 Current Fish Monitoring Methodology

Samples are taken bi-annually (summer and winter). The temporal scales are set to address recruitment patterns as well as species distribution within habitats in different seasons. Also, at the time of sampling, the state of the estuary must be representative of the season in which samples are collected, as indicated by the extent of saline intrusion and the state of the mouth.

The following specifications are used to do the monitoring.

A suitable seine net would be a 30 m X 2.0 m X 15 mm multifilament bar mesh in the wings and a 5 mm bar mesh in the purse. Seine nets should be 30 m long and 2 m in depth. The cod end (bag and purse) and the wings 5.0 m to either side should be 5.0 mm bar mesh, whereas the remaining 15 m of each wing may be 15 mm bar mesh. This is required to adequately sample „faster moving“ species. The net should be weighted such that it sinks below the surface when set in water deeper than 2 m (i.e. the distance between the lead and cork lines). A light net makes it more difficult to obtain a representative sample from weedy and sandy areas, e.g. flatfish species tend to burrow in the sand and escape under a light seine.

Monofilament gill nets should comprise at least three different mesh sizes between 40 - 150 mm stretch mesh. Monofilament gill nets should comprise at least four nets (or panels) of which one net comprises 44, 48, 51 and 54 mm mesh, and an additional three nets made in the range 75 - 150 mm stretched mesh (e.g. 75, 100 and 145 mm stretched mesh). If time permits either fyke nets or longlines should be used to sample eels in the upper reaches of the estuary.

At each sampling station the following data need to be recorded:

- Species present;
- Number of each species; and
- Size frequency distributions in total length.

The system needs to be sampled from the mouth to approximately 15 km upstream. Stations (seine samples) should be spaced at 500 m intervals for the first two km and thereafter at one km intervals. A standard practice could be to divide the estuary length by ten.

If possible, sampling stations must be representative of the salinity zones including:

- 0 – 10 ppt.
- 20 ppt.
- 20 – 30 ppt.
- 30 –35 ppt. (at least one station should be in this range). It has been found that this salinity range supports a substantially different species composition than that found, for example in the range 20-30 ppt.

Within each salinity zone, the following habitat representatives should be sampled:

- Submerged macrophytes (e.g. *Zostera* beds);
- Sandy/muddy/rocky areas (representing different food sources); and
- Near or in saltmarsh areas.

10.2 Future Monitoring Methodology

As per the Reserve Determination Study (DWS, 2015), the following long-term monitoring programme is recommended. Items in bold will help to improve confidence of EWR study; priority components are highlighted in grey.

Table 9: Additional baseline surveys to improve confidence of EWR study and long term monitoring programme for the Goukou Estuary

Action	Spatial Scale	Temporal Scale
Hydrodynamics		
Measure freshwater inflow into estuary	Near the head (station H9H5 too far upstream, new station is required)	Continuous
Aerial photographs (spring low tide)	Entire estuary	Baseline, then every 3 years
Sediment Dynamics		
Monitoring berm height using appropriate technologies	Mouth	Quarterly
Bathymetric surveys: Series of cross section profiles and a longitudinal profile	Entire estuary; collected at fixed 500 m intervals, but in more detail in mouth including berm (every 100 m). Vertical accuracy at least 5 cm	Baseline, then every 3 years (and after large resetting event)
Collect sediment grab samples (at cross section profiles) for analysis of particle size distribution (and ideally origin, i.e. microscopic observations)	Entire estuary; 50m intervals at mouth and 1000m intervals elsewhere	Baseline, then every 3 years
Water Quality		
Collect data on conductivity, temperature, suspended solids, pH, inorganic nutrients (N, P and Si) and organic content (TP and Kjeldahl N) in river inflow	Near head of estuary (station H9H5 too far upstream, new station is required)	Monthly, continuous
Collect samples for pesticides/herbicide and metal accumulation in river inflow	Near head of estuary (station H9H5 too far upstream, new station is required)	Baseline, then seasonally or when contamination is expected
Collect in situ continuous salinity data with mini Conductivity-Temperature Depth(CTD) probe at a depth of about 1m	3 sites - 5 km, 10 km from the mouth head and near head of estuary	Continuous
Record longitudinal in situ salinity and temperature pH, DO, turbidity profiles	Entire estuary (17 stations)	Seasonally every year

Action	Spatial Scale	Temporal Scale
Collect surface and bottom water samples for inorganic nutrients (and organic nutrient) and suspended solid analysis, together with the in situ salinity, temperature, pH, dissolved oxygen and turbidity profiles	Entire estuary (10-17 stations)	Quarterly for first 2 years , then every three years (high flow and low flow) or when significant change in water quality expected
Measure pesticides/herbicides and metal accumulation in sediments (for metals investigate establishment of distribution models – see Newman and Watling, 2007)	Entire estuary, including depositional areas (i.e. muddy areas)	Baseline , then every 3-6 years
Microalgae		
<ul style="list-style-type: none"> Record relative abundance of dominant phytoplankton groups, i.e. Flagellates, dinoflagellates, diatoms, chlorophytes and blue-green algae Chlorophyll-a measurements taken at the surface, 0.5 m and 1 m depths, under typically high and low flow conditions using a recognised technique, e.g. Spectrophotometer, HPLC, fluoroprobe. Intertidal and subtidal benthic chlorophyll-a measurements (four replicates each) using a recognised technique, e.g. Sediment corer or fluoroprobe. 	Along length of estuary minimum five stations	Quarterly for first two years, then low flow surveys every three years,
Macrophytes		
<ul style="list-style-type: none"> Ground-truthed maps to update the map produced for 2013 and to check the areas covered by the different macrophyte habitats. Record boundaries of macrophyte habitats and total number of macrophyte species in the field Assess extent of invasive species within the 5 m contour line Check for loss of reed and sedge area in the middle/upper reaches Check for increase in bare areas in supratidal salt marsh habitat from mapping Measure macrophyte and sediment characteristics along transects in main salt marsh areas. Percentage plant cover measured in duplicate 1 m² quadrats along the transects and an elevation gradient from the water to the terrestrial habitat Duplicate sediment samples collected in three zones along each transect to represent the different supratidal salt marsh zones. Analysed in the laboratory for sediment moisture, organic content, electrical conductivity, pH and redox potential. In the field measure depth to water table and ground water salinity 	Entire estuary for mapping (transect sites in the middle and lower reaches)	Summer survey three years
Invertebrates		
<ul style="list-style-type: none"> Collect duplicate zooplankton samples at night from mid-water levels using WP2 nets (190 um mesh) along the estuary at five sites. Collect grab samples (five replicates) (day) from the bottom substrate in mid-channel areas at same sites as zooplankton (each sample to be sieved through 500 um). Collect sled samples (day) at same zooplankton sites for hyper benthos (190 um) Collect sediment samples using the grab for particle size analysis and organic content (at same sites as zooplankton) Intertidal invertebrate hole counts using 0.25 m² grid (five replicates per site). Establish the species concerned using a prawn pump (Zones A and B) 	Minimum of five sites along length of entire estuary For intertidal counts – minimum of five sites	Every two years mid-summer

Action	Spatial Scale	Temporal Scale
<ul style="list-style-type: none"> Collect sediment samples using the grab for particle size analysis and organic content (at same sites as zooplankton) Three replicate hole counts of <i>Upogebia africana</i> at three intertidal sites in Zone B 		
Fish Community		
Record species and abundance of fish, based on seine net and gill net sampling:	Entire estuary (17 stations)	Summer and winter survey every three years
Bird Community		
Undertake counts of all non-passerine waterbirds, identified to species level.	Entire estuary: Seven sections, mouth, mouth to jetty, jetty to bridge, bridge to powerlines, powerlines to MPA, MPA to ski zone and ski zone to head of estuary	Annual and winter summer surveys

11 APPENDIX 2: RECOMMEND PERFORMANCE MONITORING PROTOCOL

OBJECTIVES	BY WHEN	PERFORMANCE INDICATOR	LEGISLATION	RESPONSIBLE AGENT
<u>Ecological</u>				
Ecological health of ecosystem is improved to Category B (moderately modified).	2026	<ul style="list-style-type: none"> Ecological water requirements determined, implemented and monitored to ensure compliance Water resource utilisation plan developed and implemented (including monitoring and compliance) 	National Water Act Conservation of Agricultural Resources Act Marine Living Resources Act ICMA Municipal Systems Act	DFFE DWS CapeNature DEA (incl. WfW) Hessequa LM
Ecological health of ecosystem is improved to Category A (near natural).	2036	<ul style="list-style-type: none"> All water uses and users are registered and licensed Water quality programme developed and implemented, database maintained and regular monitoring reports produced 		
The Goukou River estuary fulfils its nursery function with regard to replenishing collapsed and over exploited fish resources and contributing to biodiversity targets.	2026	<ul style="list-style-type: none"> Effective compliance monitoring system in place including ongoing patrols, conviction of offenders and updated database, particularly in terms of illegal gillnetting Improved compliance with fishing regulations and municipal by-laws in terms of zonation Alien fish species eradication programme implemented, resulting in a decrease in the no. of alien species and their abundance on an annual basis Improvement in populations of targeted species Extent of gill netting significantly reduced/eradicated Critical research studies commissioned to assist management decisions 	Marine Living Resources Act ICMA Biodiversity Act	DFFE CapeNature WWF Private parties (?) DST
Further degradation of the Goukou River estuary health and ecosystem services is halted through strategic interventions guided by informed decision-making.	2023	<ul style="list-style-type: none"> Alien vegetation is eradicated through an ongoing monitoring & removal programme Degraded habitats and areas are effectively rehabilitated/restored to perform ecosystem functions Critical estuarine habitats are afforded protection Carrying capacities for recreational activities are established and enacted through revised zonation, regulations and by laws Protocols for reed management and grazing developed, implemented, monitored and enforced to ensure riparian protection 	National Water Act Conservation of Agricultural Resources Act Marine Living Resources Act ICMA Biodiversity Act	DFFE DEA DWS CapeNature Hessequa LM Goukou River EAF

<u>Heritage</u>				
Development in and around the Goukou River estuary is guided by the cultural values and sense of place of the Still Bay environs.	2023	<ul style="list-style-type: none"> All private and public jetties are licensed and comply with development guidelines Agricultural best practice guidelines developed and published and disseminated to farmers and local communities Protocols for reed management and grazing developed, implemented, monitored and enforced to ensure riparian protection 	Protected Areas Act National Heritage Act Conservation of Agricultural Resources Act National Water Act	DEA SAHA DFFE DWS
<u>Socio-economic</u>				
The Estuary Forum is constituted and well resourced (human and capital) with the mandate to: <ul style="list-style-type: none"> • Monitor implementation of the Goukou EMP; • Facilitate effective co-operative governance; and • Serve as a communication platform to inform the local community. 	2023	<ul style="list-style-type: none"> Active membership/participation of Goukou River EAF members at local committee meetings and forums Goukou River estuary issues included on meeting agenda(s) Minutes of meetings distributed to EAF members Financial plan developed indicating sources and effective use of funding for estuarine management purposes, captured in quarterly finance reports which are disseminated to EAF members. Active representation of MPA management authority on Goukou River EAF 	ICMA / The Protocol Municipal Systems Act	All parties
The Goukou River EMP and MPA is seamlessly integrated and implemented as part of the Hessequa Integrated Development Plan and the Spatial Development Framework.	2023	<ul style="list-style-type: none"> Spatial zonation and prescriptions of the Goukou EMP and the MPA captured in the municipal IDP and SDF Goukou River EAF registered as an Interested & Affected Party for all development and rezoning applications Database of all new developments and comment made by Goukou River EAF through EIA process Goukou River EAF registered as an Interested & Affected Party for the MPA Regular minuted meetings of MPA management authority which specifically include Goukou estuary issues Development excluded from highly sensitive areas, and applicable building controls applied to high risk areas Coastal management lines and 1:100 year floodline developed and gazetted, and incorporated into IDP & SDF 	ICMA All relevant environmental laws	All relevant government departments DEA&DP CapeNature Goukou River EAF Hessequa LM Eden DM

Sustainable tourism is facilitating responsible economic growth and the optimal utilisation of ecosystem services.	2023	<ul style="list-style-type: none"> Carrying capacities for recreational activities are established and enacted through revised zonation, regulations and by laws All watercrafts licenses and launch site register in place Improved compliance with regulations and municipal by-laws in terms of zonation 	ICMA Municipal Systems Act South African Maritime Safety Authority Act	Hessequa LM DEA CapeNature DWS
All estuary users and the local community are well informed, self-compliant and supportive of estuary initiatives.	2023	<ul style="list-style-type: none"> Improved compliance i.t.o. recreational activities, particularly for power- boating and water-skiing Improved compliance i.t.o. fishing activities Active membership/participation of Goukou River EAF members at local committee meetings and forums 	Biodiversity Act Marine Living Resources Act South African Maritime Safety Authority Act	CapeNature DFFE DEA Hessequa LM Goukou River EAF

