DASSEN COASTAL COMPLEX

Western Cape, South Africa

Protected Area Management Plan 2019 – 2029

DATE APPROVED: 07 March 2019
MOST RECENT UPDATE: 28 February 2019

CapeNature | environmental affairs Department: Environmental Affairs REPUBLIC OF SOUTH AFRICA | Western Cape Government

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CITATION
CapeNature. 2019. Dassen Coastal Complex Protected Area Management Plan: 2019-2029. Western Cape Nature Conservation Board, Cape Town.

The Dassen Coastal Complex Protected Area comprises the following:

Dassen Island Provincial Nature Reserve, established as a Provincial Nature Reserve in terms of Section 6 the Nature Conservation Ordinance (Ordinance 19 of 1974), on 9 March 1988 and proclaimed in the Provincial Gazette of 18 March 1988 by Proclamation No. 23/1988.

Dassen Island Provincial Nature Reserve's boundaries were amended by the extension of the area of jurisdiction to 500 m seawards of the high water mark in terms of Section 6(1)(b) of the Nature Conservation Ordinance (Ordinance 19 of 1974), read with Sections 2 and 5(1) of the Sea Shore Act, 1935, Provincial Gazette of 22 January 1999 by Provincial Notice 5/1999.

Seal Ledges Nature Reserve, established as a Provincial Nature Reserve in terms of Section 6 the Nature Conservation Ordinance (Ordinance 19 of 1974), on 9 March 1988 and proclaimed in the Provincial Gazette of 18 March 1988 by Proclamation No. 23/1988.

Riverlands Provincial Nature Reserve, established as a Provincial Nature Reserve in terms of Section 6 the Nature Conservation Ordinance (Ordinance 19 of 1974), on 12 April 1994 and proclaimed in the Provincial Gazette of May 1994 by Proclamation No. 37/1994.

The World Wide Fund for Nature – South Africa (WWF-SA) owned property known as Pella, in the process of being declared according to Section 23 of the National Environmental Management: Protected Areas Act (Act 57 of 2003) as part of the existing Riverlands Provincial Nature Reserve, at the time of writing.

The state-owned properties earmarked for conservation and referred to as the 'Ganzekraal Conservation Area' in this management plan, in the process of being declared according to Section 23 of the National Environmental Management: Protected Areas Act (Act 57 of 2003) as the 'Ganze Craal Nature Reserve', at the time of writing.

The privately-owned farm Bokkerivier also known as Bokbaai or Buck Bay, referred to as 'Bokbaai' in this management plan, in the process of being declared according to Section 23 of the National Environmental Management: Protected Areas Act (Act 57 of 2003) as the 'Bokbaai Nature Reserve', at the time of writing.

Bokbaai was declared a Provincial Heritage Site (National Monument) according to Section 10(1) of the National Monuments Act (Act No. 28 of 1969) on 19 November 1971 in the Provincial Gazette 3309, No. 2071.

AUTHORISATION

Approval:

The Protected Area Management Plan for the Dassen Coastal Complex is approved:

TITLE	NAME	SIGNATURE AND DATE
PROVINCIAL MINISTER: Department of Environmental Affairs and Development Planning	Mr Anton Bredell	

Recommended:

TITLE	NAME	SIGNATURE AND DATE
CHAIRPERSON OF THE BOARD: Western Cape Nature Conservation Board	Prof Denver Hendricks	7/03/2019
CHIEF EXECUTIVE OFFICER: CapeNature	Dr Razeena Omar	7/3/19

Review Date: 10 years from the date of approval by the Provincial Minister of Environmental Affairs and Development Planning

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CapeNature expresses thanks to all who participated and had input into the formulation of the management plan.

The Dassen Coastal Complex management plan was prepared by the reserve management committee consisting of Natalie Hayward, Johan Visagie and Melany Duthie-Surtie, Genevieve Pence, Natasja Warnick, Graham Lewis, Helene van der Westhuyzen, Amukelani Nkuna, Martin Albertus, Morris Floris and Elbé Cloete, with written contributions and input from Scientific Services and other components within CapeNature. Spatial products and GIS analysis were provided by the GIS team, Therese Forsyth and Sheila Henning.

The management plan is a product of the Dassenberg Coastal Catchment Partnership Planning Pilot, facilitated by Genevieve Pence, Paola Mejía and Estuardo Secaira, conservation coaches of the Conservation Coaches Network, and funded by the Global Environment Facility through the United Nations Development Programme. The authors are grateful to stakeholders for their contributions.

The authors would like to express their gratitude to:

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Cover page images courtesy of City of Cape Town (primary image) and Johan Visagie (secondary image).

EXECUTIVE SUMMARY

In compliance with the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) and Chapter 4 of the World Heritage Convention Act (Act 49 of 1999), CapeNature is required to develop management plans for each of its protected areas. In developing the management plan for the Dassen Coastal Complex, CapeNature strives to establish biodiversity conservation as a foundation for a sustainable sub-regional economy providing ecosystem services, access and opportunities for all.

The Dassen Coastal Complex, situated on the West Coast of South Africa in the Greater Cape Floristic Region (the smallest and most diverse of the six global Floral Kingdoms), is home to South Africa's largest new protected area in highly-threatened and poorly-conserved lowland and coastal habitats, namely the Ganzekraal Conservation Area (this area's declaration as the 'Ganze Craal Nature Reserve' is in progress). In addition to the Ganzekraal Conservation Area, the Complex includes Bokbaai, a privately-owned conservation area and National Heritage Site, nested within Ganzekraal, the Seal Ledges island situated off-shore between Melkbosstrand and Bokbaai, the off-shore Dassen Island Nature Reserve to the northwest, approximately 10 km offshore from the coastal town of Yzerfontein, and the Riverlands Nature Reserve and Pella property situated approximately 20 km to the east towards the town of Malmesbury. The Complex supports the largest remaining intact and ecologically viable examples of several threatened lowland ecosystems, making a substantial contribution to National and International biodiversity targets, and provides protection for several threatened plants and animals, including seabirds and marine ecosystems.

The land- and seascape is unique, linking marine and coastal habitats to the inland koppies of the Dassenberg Hills across local climate gradients. It has high potential for ecological resilience and natural adaptation in the face of climate change. The Atlantis aquifer, along with its recharge catchment and associated network of seasonal wetlands and watercourses, serves as a natural water factory providing essential freshwater to the towns of Atlantis, Mamre and Pella. Dassen Island, with its important breeding habitat for the endangered African penguin and several other threatened seabirds, has overcome a history of resource extraction to embrace a future of resource conservation. The two terrestrial statutory protected areas comprising the Complex are core conservation areas within the greater Dassenberg Coastal Catchment Partnership, a landscape conservation initiative aimed at ensuring climate change resilience, water security, conservation of unique natural and cultural historic heritage, and socio-economic development.

The Complex reflects a new protected area providing opportunities to strategically and adaptively manage biodiversity towards ensuring the persistence of an intact natural climate change corridor, marine and freshwater ecosystems, and unique cultural and biological diversity of the region through: 1) the prioritised strategic management of threats; 2) improving the condition of coastal resources and natural water supply; 3) ensuring properties are legally secured and protected area design is augmented by expansion through stewardship or other effective means, including the 'zone of island

influence'; 4) cooperative governance to overcome regulatory division in the management of terrestrial, freshwater aquatic, coastal and marine natural resources by different regulating authorities; 5) managed access to check unregulated access and over-exploitation; and (6) developing infrastructure and operations to enable the transition of the Complex into a world-class nature destination.

The Complex is described in the context of its ecological, cultural historic and socio-economic situation. The management plan is a tool setting the management intent for a period of 10 years towards a desired state described as Goals. Goals underpin the Vision of a world-class nature destination with unique culture and high quality intact natural environments where abundant wildlife, wildflowers, freshwater and coastal and marine resources are conserved to inspire and educate people and to support a resilient and vibrant future. The management plan is constructed on a framework for adaptive management and defines focal conservation values and core service delivery areas where management will focus efforts to achieve the Goals. Focal values and core service delivery areas are described through a lens of value condition or health, pressures and opportunities. Condition assessments are foundational to the establishment of Goals, sensitivity analysis, zonation schemes and conservation development planning. The strategic implementation framework, guided by the conservation situation, outlines actions necessary to maintain or enhance the condition of focal values and core service delivery areas, to mitigate or reduce threats, and to harness opportunities through cooperative governance and participatory management, and to eventually attain the Goals.

The Complex represents a place of scenic beauty and rich cultural heritage, serving as a gateway to the West Coast wildflower route and to wild spaces for recreation on the outskirts of the Cape Town Metropolitan Area on the Cape West Coast. Through strategic adaptive management, the opportunity exists to address negative pressures from historic and current land uses, and to facilitate positive synergies between community, biodiversity conservation, water conservation, tourism, and socio–economic development.

The priority, or focal, natural values selected for the Complex are: the Lowland Fynbos Mosaic; Natural Wetlands; the Atlantis Aquifer; Coastal Intertidal and Inshore Systems; and the Sensitive Island Ecosystem of Dassen Island. The collective set of cultural historic heritage features (shipwrecks, burial sites, historic structures, knowledge, activities, *etc*.) inherent to the Complex, are grouped into one focal value called Cultural and Historic Heritage. Human well-being benefits flow from the Complex's natural and cultural assets. Of particular importance to the Complex are: a sense of cultural identity, water security, and nature-based livelihoods and economic opportunities.

The Dassen Coastal Complex, with its to-be-established new protected area and substantial geographical scope, will conserve its natural, cultural and human well-being values through:

- The prioritised and strategic management of the critical threats of invasive alien flora and fauna, over-abstraction of groundwater, inappropriate fire regimes and land and water pollution;
- Having disaster management and contingency plans in place to avoid or mitigate the potentially devastating effects of utility (pipeline and/or nuclear power station) failure, or a major oil pollution event at sea;
- Improving the degraded condition of coastal resources and the natural water supply;
- Ensuring legal land protection is in place where appropriate, and that protected areas are regularised, consolidated and augmented through stewardship or other effective means, including in the marine environment;
- Pursuing cooperative governance and regulation of natural resources to overcome regulatory divisions;
- Managed access for the ongoing benefit and enjoyment of everyone; and
- The responsible and sensitive development of infrastructure and associated operations as the Dassen Coastal Complex transitions into a world-class nature destination.

The management plan is structured according to five sections.

Section 1 explains the purpose of protected areas and CapeNature's approach to protected area management in the Western Cape Province, and the strategic adaptive management framework implemented to formulate the plan and guide implementation of the plan. It outlines the approach to stakeholder engagement and participatory planning and management going forward.

Section 2 describes the management intent and desired state for the Complex in terms of planning and management scope, the vision and the purpose of the Complex. This section provides a summary of focal values and key threats, and outlines the Goals, strategies and objectives for the next 10 years.

Section 3 provides an overview of the Complex in terms of location, extent and legal status. Furthermore, the Complex is described in terms of its administrative, ecological, cultural historic, socio-economic and organisational context.

Section 4 describes the planning context and approach implemented to establish focal values, and assesses the condition of focal values and threats to guide decision-making. Furthermore, the section explains how principles of adaptive management were adhered to. The results of condition and threats assessments are presented, followed by products such as sensitivity analysis, zonation scheme, access management and concept development plan that provide decision support. Products to guide conservation beyond boundaries, land use and decision making such as protected area expansion opportunities and protected area zone of influence are also provided.

Section 5 presents the strategic implementation framework outlining strategies and actions necessary to improve management effectiveness, conserve values and

achieve objectives and Goals over the 10-year management cycle. Timelines and indicators are also outlined.

The management plan was developed by the Reserve Management Committee, in collaboration with internal and external stakeholders, relying on the outputs of the Dassenberg Coastal Catchment Partnership landscape initiative planning pilot, with financial assistance from the Global Environment Facility through the United Nations Development Programme, and adaptive management framework facilitation expertise from the Conservation Coaches Network.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX 1: STAKEHOLDER ENGAGEMENT REPORT: DASSEN COASTAL COMPLEX

APPENDIX 2: LIST OF MAPS

ABBREVIATIONS

AIS	Alien and Invasive Species
APO	Annual Plan of Operations
APP	Annual Performance Plan
BCC	Benguela Current Commission
BMP-s	Biodiversity Management Plan for Species
BMS	Biodiversity Monitoring System
CAP	Conservation Action Plan
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CBD	Convention on Biological Diversity
CDF	Conservation Development Framework
CEO	Chief Executive Officer
CFE	Cape Fold Ecoregion
CFR	Cape Floristic Region
CCNET	Conservation Coaches Network
CCT	City of Cape Town
CMP	Conservation Measures Partnership
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DCC	Dassen Coastal Complex
DCCP	Dassenberg Coastal Catchment Partnership
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DEA:O&C	Department of Environmental Affairs: Oceans and Coast
DWAF	Department of Water Affairs and Forestry
DTPW	Department of Transport and Public Works
DEIC	Dutch East India Company
EIA	Environmental Impact Assessment
EMP	Environmental Management Plans/ Programme
EPWP	Expanded Public Works Programme
FPA	Fire Protection Association
GIS	Geographical Information System
GTUP	Game Translocation and Utilisation Policy
HDA	Housing Development Agency
HNCO	Honorary Nature Conservation Officer
HWC	Heritage Western Cape
IAP	Invasive Alien Plant
IAS	Invasive Alien Species
ICM	Integrated Catchment Management
ICP	Integrated Compliance Plan
IDP	Integrated Development Plan
IT	Information Technology
IUCN	International Union for Conservation of Nature
MEC	Member of Executive Council

METT-SA	Management Effectiveness Tracking Tool for South Africa
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPA	Marine Protected Area
MTEF	Medium Term Expenditure Framework
NBA	National Biodiversity Assessment
NEM:BA	National Environmental Management: Biodiversity Act
NEM:PAA	National Environmental Management: Protected Areas Act
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
NGO	Non-governmental Organisation
NHP	National Heritage Programme
NLC	National Land Cover
NPAES	National Protected Area Expansion Strategy
NSBA	National Spatial Biodiversity Assessment
NSDS	National Sustainable Development Strategy
OHSA	Occupational Health and Safety Act
PA	Protected Area
PAAC	Protected Area Advisory Committee
PAMP	Protected Area Management Plan
RACI	Responsible, accountable, consulted and informed
RHP	River Health Programme
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SAM	Strategic Adaptive Management
SANBI	South Africa National Biodiversity Institute
SANParks	South African National Parks
SANSA	South African National Survey of Arachnida
SDF	Spatial Development Framework
SMME	Small, medium and macro enterprises
SMP	Strategic Management Plan
SoBR	State of Biodiversity Report
SOP	Standard Operating Procedure
TMF	Table Mountain Fund
ToPS	Threatened or Protected Species Regulations
TOR	Terms of Reference
TPC	Threshold of Potential Concern
U-AMP	User Asset Management Plan
UCT	University of Cape Town
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WCDM	West Coast District Municipality
WCNCB	Western CapeNature Conservation Board
WCPAES	Western Cape Protected Area Expansion Strategy
WESSA	Wildlife and Environment Society of South Africa
WfW	Working for Water

WIO-COMPAS	West Indian Ocean Certification of Marine Protected Area Professionals
WMA	Water Management Area
WWF-SA	World Wild Fund for Nature - South Africa
YES	Youth Environmental Service
ZOI	Zone of Influence

1. INTRODUCTION

1.1 Purpose of Protected Area Management in the Western Cape

In compliance with the National Environmental Management: Protected Areas Act 2003 (Act No. 57 of 2003) (NEM:PAA), CapeNature is required to develop management plans for each of its protected areas. Protected area management planning is guided by the NEM:PAA, associated Norms and Standards for the Management of Protected Areas in South Africa (Government Notice 382 of 31 March 2016), regulations in terms of the NEM:PAA, and relevant requirements as set out in the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) and the National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008).

The primary reason for the declaration of protected areas is part of the strategy to manage and conserve South Africa's biodiversity. Accordingly, the object of the management plan is to ensure the protection, conservation and management of the natural and cultural historic heritage in a manner that is consistent with the objectives of the NEM:PAA, and for the purpose for which the protected area was declared.

Protected areas are also subject to the principles and provisions of relevant international treaties and conventions, national and provincial legislation and policy, and any local contractual agreements. Additionally the management planning approach and structure of the management plan is guided by international best practice (International Union for the Conservation of Nature (IUCN) World Commission on Protected Areas), the Convention on Biological Diversity (CBD) Programme of Work on Protected Areas, and the *Guidelines for the Development of a Management Plan for a Protected Area in terms of the National Environmental Management: Protected Areas Act* (Cowan & Mpongoma 2011), as well as other relevant documentation pertaining to the protected area, *e.g*. Marine Protected Area management plans.

The management plan is a strategic document that provides the primary overarching tool for the development and operation of the protected area, in keeping with CapeNature's mandate. The plan directs management at all levels. The management plan facilitates the integration of the various components and functions within the organisation and directs the enabling environment towards the achievement of protected area objectives and conservation and/or restoration of natural, cultural and other values.

In practical terms, the management plan strives to ensure that the following requirements for the effective management of protected areas are adequately addressed:

- The necessary mandate, human capacity and financial resources to implement and achieve the activities and objectives described in the management plan;
- The delivery of socio-economic benefits to local communities where possible;

- Flexibility of service delivery that encourages innovation and a wide range of government, community and non-government sector involvement;
- Performance indicators and accountability measures that provide for regular review of outcomes.

In working towards CapeNature's Vision of conserving nature for a sustainable future, CapeNature Protected Area Management strives to:

- Conserve and represent natural habitats and indigenous biodiversity including threatened species for their scientific and conservation value in the Western Cape Province;
- Conserve representative samples of significant ongoing ecological processes in the evolution and development of ecosystems and communities of plants and animals;
- Provide ecosystem services;
- Manage protected areas effectively and efficiently;
- Ensure that protected area planning and management are integrated and participatory; and
- Provide for sustainable use and equitable sharing.

1.2 Guiding Principles

The following guiding principles underpin the management plan for the Dassen Coastal Complex (hereafter referred to as the Complex):

- Articulate desired results in terms of conservation outcomes, not actions.
- Articulate how management responses will lead to desired results.
- Monitor progress towards achieving desired results.
- Consider monitoring programme design at the onset of planning.
- Consider expected outcomes of management at the outset of planning rather than at the end of implementation.
- Invest in management response appropriate to the risk.
- Adapt strategies based on lessons learnt; understanding that simply measuring effectiveness may not resolve uncertainty. Data and analyses are necessary to guide management towards doing more of what works and less of what does not work.
- Share results respectfully, honestly and transparently to facilitate learning, acknowledging that although success is not a given, learning can be, through honest appraisal of efforts.

It is important to note that while these principles are intended to guide protected area management in its work, the protected area is also subject to the principles and provisions of relevant international treaties and conventions, national and provincial legislation and policy, and any local contractual or co-management agreements.

1.3 Strategic Adaptive Management and the Planning Framework

Strategic Adaptive Management (SAM) integrates planning, management, and monitoring to provide a framework for:

- testing assumptions;
- learning through monitoring and evaluation; and
- adapting strategies or assumptions.

SAM systematically evaluates results and uses this information in a community of practice (CMP 2013). SAM thus enables management to 'change direction' when it becomes evident that management is not going in the right direction, rather than waiting until the end of a project to determine whether an intervention worked (CCNet 2012). SAM bridges management and decision science. Therefore, management intervention design elicits scientifically measurable results, the analysis of which informs future management decisions.

Protected area management planning requires a broad, holistic or strategic approach due to the many factors that influence the condition of an ecosystem outside of the manager's jurisdiction. The benefit of SAM is its application as a rigorous step-by-step process which follows a logical framework that defines the desired condition (*i.e.* goals and objectives) of the protected area, develops management options that are then implemented, and evaluates management options in relation to progress towards goals and objectives (Kingsford & Biggs 2012).

When compiling management plans, CapeNature applies the SAM framework as shown in Figure 1.1, adapted from The Open Standards for the Practice of Conservation (CMP 2013).

SAM enables CapeNature to:

- Plan to manage complexity in a changing environment towards predetermined outcomes;
- Monitor management effectiveness and adapt management actions based on tangible indicators;
- Test and evaluate predictions and outcomes of management actions;
- Learn and adapt based on evidence;
- Define and refine management processes;
- Consult and engage with stakeholders.

<u>The Planning Framework</u>

The Open Standards for the Practice of Conservation (CMP 2013) is an adaptive management framework that enables management teams to develop the most effective conservation strategies based on the best available traditional, expert and scientific information. Planning incorporates scientific information through an expert-driven process and peer reviewed science, expert participation and engagement with local inhabitants.

The Open Standards framework facilitates SAM through the identification of explicit measures of success and the incorporation of lessons learned over time. SAM is based on a foundation where natural and cultural assets / features / values identified by stakeholders as important to conserve, and representing the suite of natural and cultural historic heritage in an area using the best available knowledge, are explicitly defined. Following the methodology of the Open Standards, 'values' are termed 'conservation targets' (CMP 2013). In keeping with IUCN best practice, this management plan refers to conservation targets as 'values'.

The foundational process further assesses the health / condition (hereafter referred to as viability) of values, and identifies and ranks threats to values. This forms the basis for establishing long-term goals / desired state for values within a given timeframe. In order to meet the desired state, strategies are selected and short to medium term objectives developed to measure progress towards threat mitigation, improved status of a value, or maintained status of a value. The maintenance of healthy values delivers a range of ecosystem services crucial for human well-being.

The Open Standards follows a systematic approach comprised of five stages (Figure 1.1):

- Conceptualising the protected area (deciding what is important to conserve and what the challenges and opportunities are);
- Planning actions and monitoring (drafting the plan);
- Implementing actions and monitoring (doing the work and monitoring the work);
- Analysing and using results to adapt (deciding if what was planned is working); and
- Capturing results, sharing and learning (learning and sharing what was learnt).

Through this systematic approach, linkages between specific strategies, actions, threats, values and goals are made explicit, enabling management to define and measure success of their actions in the Complex over time.

Figure 1.1 Strategic Adaptive Management Framework adapted from The Open Standards for the Practice of Conservation (CMP 2013)

1.4 Protected Area Management Effectiveness, Monitoring and Evaluation

The IUCN defines management effectiveness evaluation as the assessment of how well a protected area is being managed – primarily the extent to which management is protecting values and achieving goals and objectives (Hockings *et al*. 2015) (see Figure 1.2). The following questions underpin management effectiveness evaluation (Leverington & Hockings 2004):

- Are protected areas effectively conserving the values for which they exist?
- Is management of these areas effective and how can it be improved?
- Are specific projects, interventions and management activities achieving their objectives, and how can they be improved?

Protected area management effectiveness evaluation is based on the World Commission on Protected Areas framework for protected area management (Hockings *et al*. 2015). The framework provides a consistent, theoretical and practical basis for assessment (Leverington *et al*. 2008). This framework is based on the idea that good protected area management follows a process that has six distinct stages or elements (Hockings *et al*. 2015):

- it begins with understanding the **context** of existing values and threats;
- progresses through **planning**;
- and allocation of resources (**inputs**);
- and as a result of management actions (**processes**);
- eventually produces products and services (**outputs**);
- that result in impacts or **outcomes**.

An assessment of individual elements and the links between these factors build a comprehensive picture of management effectiveness (Leverington *et al*. 2008).

The Management Effectiveness Tracking Tool (METT) adopted by the National Department of Environmental Affairs (DEA) and adapted to South African conditions (METT-SA), is implemented to assess management effectiveness of the protected area at the strategic level. It does not replace fine scale monitoring and evaluation of specifics; rather the assessment is informed by the results of fine scale monitoring.

Strategically, CapeNature uses METT-SA results of its statutory protected areas network to measure ecosystem health by the percentage protected area coverage (hectares) in the 'Sound Management' category (*i.e.* a METT-SA result of 67% and above) and effectiveness of protected area support mechanisms or structures.

Mechanisms for monitoring and evaluation are built into each aspect addressed by the Standard Implementation Framework (see Section 5) through the inclusion of verifiable indicators of progress. The protected area monitoring and evaluation programme monitors site level implementation of the plan, status of values and strategy effectiveness. Results contribute to the Western Cape State of Biodiversity report, produced at five-year intervals.

Furthermore, management reports annually on progress through CapeNature's strategic Performance Management System. The Performance Management System ensures that implementation of the management plan is embedded in individual staff performance agreements.

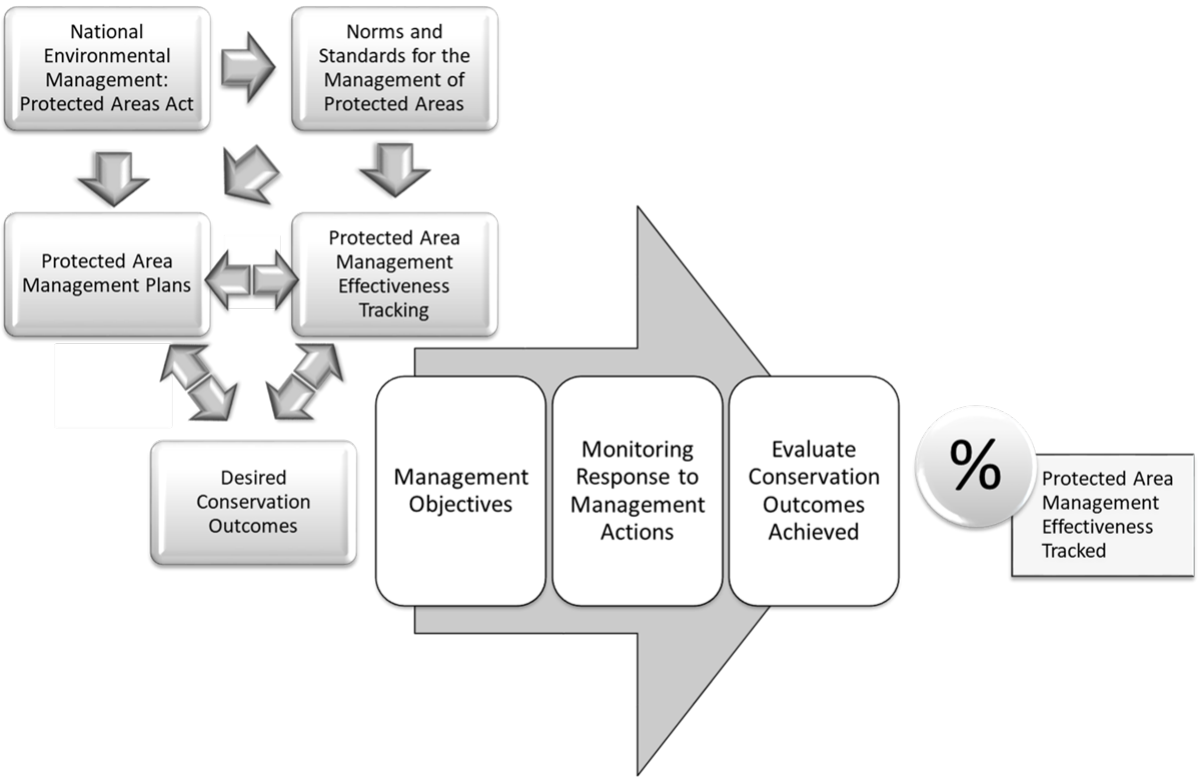

Figure 1.2 Monitoring and Evaluation Framework

1.5 Stakeholder Engagement

Participatory planning and management is needed in order to mainstream protected areas as natural solutions to emerging challenges such as climate change, disaster risk reduction, food and water security, providing benefits to human health, livelihoods and well-being (World Congress 2016). Integration of protected areas into the wider landscape is necessary and management must promote participation by relevant stakeholders.

Stakeholder engagement and understanding the context of the Complex are two key processes that informed the planning process at the outset. Stakeholder engagement identifies and engages entities in dialogue in an attempt to determine what social and/or environmental issues matter to them, to communicate the purpose of the protected area and to promote participatory planning. Stakeholder engagement promotes transparency of planning processes and outcomes. It facilitates communication, buy-in, and the derivation of new information and/or expertise from various stakeholders to fill or identify knowledge gaps. External experts can expand the knowledge base of information to include aspects that are relevant to the protected area but not necessarily areas of expertise for staff.

Stakeholder engagement is essential for sustainability, provides opportunities for learning for both the planning team and stakeholders themselves; and builds capacity and enhances responsibility.

1.5.1 Participatory Planning and Management

Stakeholder engagement essentially takes place throughout the adaptive management cycle, however, at the outset of the planning process for the Complex, a stakeholder analysis process identified relevant internal and external stakeholders, and defined the scope and purpose of engagement.

Several approaches to engaging internally and externally with stakeholders were applied, including structured facilitated workshops, meetings, site visits and the provision and circulation of information for input. Different stakeholders were engaged using varied approaches during the stages of the planning process, from gathering and sharing information, to consultation, dialogue, working groups, and partnerships. The degree of engagement was guided by the stakeholder analysis and in response to the need (*i.e.* transparency of process / expert opinion / buy-in and support, *etc*.).

The terrestrial reserves of the Complex, comprising Riverlands and Ganzekraal, represents a suite of core conservation areas managed by CapeNature within the greater Dassenberg Coastal Catchment Partnership (DCCP). The DCCP is a critical climate change corridor and landscape scale conservation initiative implemented by partners and stakeholders on the West Coast. Refer to Section 3.7.1 for spatial extent of the climate change corridor in relation to the DCCP. The DCCP focuses on the conservation and improved management of:

- Indigenous biodiversity of the Dassenberg coastal catchment area, represented by selected biodiversity features;
- Supporting ecological infrastructure such as rivers, streams, wetlands, seeps and groundwater resource of the Atlantis aquifer; and
- Cultural historic heritage features in lowland fynbos remnants, with emphasis on the natural and heritage features that stakeholders feel are important to look after.

During 2017 a series of expert-facilitated stakeholder workshops, coordinated and hosted by CapeNature, were held. A range of stakeholders representing individuals or agencies with an interest in, and / or knowledge / expertise of the landscape, and individuals or agencies with the capability to support the implementation of the DCCP were involved. Stakeholders included landowners and land managers (private and communal), and relevant land or resource management authorities. Workshops were aimed at developing a strategic framework for the DCCP to help coordinate efforts in the landscape towards a common Vision. The desired outcomes were to capacitate stakeholders in the understanding of the natural and cultural focal values in the DCCP landscape and to identify mechanisms to maintain those values over time.

The outcomes of the above-mentioned process were precursors to the site-specific management planning process for the Complex and formed the foundation for smaller working groups towards the development of the management plan. The Complex management planning process was further facilitated by the core planning team comprised of CapeNature Conservation Managers, Regional Ecologist, Ecological Coordinator, Community Conservation Managers, DCCP Coordinator and Senior

Management. A series of workshops and core planning team meetings were held with relevant internal (*e.g.* scientific services) and external stakeholders.

Key stakeholder groups engaged include:

- Communities (Grotto Bay, Empolweni, Mamre, Cochoqua Royal House Mamre, Pella, Atlantis, Riverlands, Chatsworth and Tierfontein);
- Private landowners;
- Resource managers mandated to manage the land for conservation
  - City of Cape Town (CCT): Biodiversity Management,
  - CapeNature,
  - state enterprises (Eskom),
  - private landowners;
- Government agencies mandated to support and regulate land and water management and other relevant affairs
  - Department of Agriculture, Forestry and Fisheries (DAFF): LandCare,
  - DAFF: Compliance,
  - Department of Environmental Affairs and Development Planning (DEA&DP): Integrated Coastal Management,
  - CapeNature,
  - Department of Agriculture: Rural Development,
  - Department of Rural Development and Land Reform,
  - Housing Development Agency (HDA);
- Government Agencies mandated to support and regulate heritage management
  - CCT: Environmental Management,
  - Heritage Western Cape (HWC);
- Local authorities
  - CCT,
  - West Coast District Municipality (WCDM),
  - Swartland Municipality;
- Non-government organisations (NGO)
  - The Nature Conservancy: Greater City of Cape Town Water Fund,
  - Western Cape Economic Development Partnership,
  - Table Mountain Fund (TMF),
  - Botanical Society,
  - Wilderness Foundation,
  - WWF-SA;
- Tertiary Institutions
  - Nelson Mandela Metropolitan University,
- Other interested and affected parties who support and / or work in the planning domain
  - South African National Parks (SANParks),
  - Cape West Coast Biosphere Reserve.

To date approximately 18 targeted stakeholder engagements have been initiated and facilitated with the nine above-mentioned stakeholder groupings through the following mechanisms:

Workshops

Stakeholder Workshops had the following key themes:

- Planning purpose: introducing stakeholders to planning for adaptive management; planning scope and vision;
- Conceptualisation: capacitating stakeholders in adaptive management planning; selecting focal values and assessing the condition of focal values; threats assessment and conservation situation analysis;
- Planning actions: identifying strategies; developing theories of change and developing objectives and indicators.
- Internal stakeholder engagement: scientific review and component review

Working Groups / Other Input Opportunities

In instances where specific input was required or stakeholders and / or experts were unable to participate in workshops, smaller teams engaged and / or public meetings were facilitated to:

- Share workshop outputs and progress, and test the rationale of situation analyses, for example meetings with DAFF: LandCare and WCDM related to area wide planning and land use;
- Address relevant knowledge gaps and test rationale, for example, Heritage Western Cape and the CCT were consulted to find mechanisms to address knowledge gaps in heritage knowledge highlighted during workshops; DEA&DP Integrated Coastal Management, DAFF: Compliance and WCDM were consulted to address coastal access.
- Provide opportunities for specific community engagements to reach as many individuals as possible via platforms such as the Mamre Restitution Committee and Path out of Poverty Centres (Riverlands and Chatsworth);
- Facilitate information sessions and registration of interest with community members.

The following established structures facilitate stakeholder engagement within the Complex:

Participatory management is facilitated through structures such as Protected Area Advisory Committees (PAAC) with the aim of regular interaction with stakeholders and a mechanism to evaluate stakeholder feedback and to promote good neighbour relations and influence beyond protected area boundaries.

Enhancing engagement and participation by relevant stakeholders throughout the Complex is a key focus area going forward. Current structures for stakeholder engagement include:

- The Ganzekraal Conservation Area PAAC, in the process of establishment at the time of writing.
- The Dassen Island Nature Reserve PAAC, established in 2010. Representation is largely by organisations that have an interest in the environment, *e.g.* Yzerfontein Conservancy, West Coast National Park and the National Sea Rescue Institute. Discussion points generally pertain to the status of the seabirds on the island, research, coastal clean-up and monitoring.
- The Riverlands PAAC, established in 2012, is mainly represented by community members of Riverlands and Chatsworth. Key themes include People and Parks topics such as access, environmental projects, youth development and environmental awareness. Focus areas include the involvement of youth in programmes and projects concerning the environment.
- The Western Cape Stewardship Reference Group, the Cape West Coast Biosphere Reserve and the CCT's Biodiversity Network serve as a platforms for conservation implementation by partners.
- The National People and Parks Programme implemented by CapeNature has established a regional structure in the area to enable community engagement. The primary objective is to link communities with relevant government departments that can assist with issues such as access for marine resource utilisation or for spiritual, recreational, educational, traditional and other purposes. The programme is also designed to capacitate communities with regard to relevant legislation, policies and regulations.
- Through the Comprehensive Rural Development Programme, CapeNature partners with NGOs, government departments and communities. The Council of Stakeholders is an elected structure of representatives from communities and focus areas include access, job creation opportunities, youth development, and Small, Medium and Macro Enterprise (SMME) development.
- Other platforms for engagement include the Mamre Communal Property Association, Mamre Restitution Committee, Chatsworth Flower Group, and wood harvesters and flower harvesters in neighbouring communities.

1.5.2 Stakeholder Participation Process

Section 39(3) of the NEM:PAA states that all persons who may be interested in, or affected by the management plan, are to be given the opportunity to comment on the management plan. Section 41(2)(e) requires that the management plan contains procedures for stakeholder participation including participation by the owner (where a contractual agreement exist between the owner and CapeNature), and/or any local community or interested party.

A process to initiate extensive stakeholder participation of the draft management plan was initiated by invitation to the public via the media (notifications were placed in two local newspapers); and notifications to stakeholders via e-mail and mobile applications such as WhatsApp and SMS, for interested and affected parties to register their

interest. A stakeholder register, maintained by the Reserve Management Committee, lists registered interested and affected parties.

Furthermore, the draft management plan was placed at public places such as the municipal offices in Yzerfontein and Darling, public libraries in Malmesbury, Mamre and Atlantis; at Path Out of Poverty Centres in Riverlands and Chatsworth, and at the Training Centre in Tierfontein. The draft management plan was also available at CapeNature offices at Riverlands and in Mamre, and available on the CapeNature website. Written comment was invited on the draft management plan for a period of 30 days. The stakeholder participation process was initiated on the 16th of November 2018 and was concluded on the 11th of January 2019.

Registered interested and affected parties were invited to public meetings and provided the opportunity to raise concerns and provide comment. Based on a comprehensive stakeholder engagement process report of the outcomes of the public meeting, as well as written comments and responses received, the management plan was amended where relevant, and feedback provided to registered interested and affected parties.

Please refer to Appendix 1.

2. THE STRATEGIC MANAGEMENT FRAMEWORK FOR THE DASSEN COASTAL COMPLEX

2.1 Management Intent and Desired State

The Complex is situated in the Greater Cape Floristic Region. It is the most extensive new protected area located entirely in highly threatened, and poorly conserved, habitat. It represents the largest remaining intact ecologically viable example of threatened lowland ecosystems and contributes towards national and international biodiversity targets. The Complex will be managed primarily for the protection of this unique intact land- and seascape.

The Complex aims to strategically, and adaptively, manage biodiversity towards ensuring the persistence of an intact natural climate change corridor, marine and freshwater ecosystems, and unique cultural and biological diversity of the region through: 1) the prioritised strategic management of threats; 2) improving the condition of coastal resources and natural water supply; 3) ensuring that properties comprising the Complex are legally secured and protected area design is augmented by expansion through stewardship or other effective means, including the 'zone of island influence'[1]; 4) cooperative governance to overcome regulatory division in the management of natural resources; 5) managed access to check unregulated access and over-utilisation; and (6) developing infrastructure and operations to enable the transition of the Complex into a world class nature destination.

Protected areas establish biodiversity conservation as a foundation of a sustainable economy creating access, benefits and opportunities. The planning approach aimed to assess the current condition of values as a baseline against which to measure condition over time. In the case of international conventions such as the Ramsar Convention on Wetlands, management focus is aimed at the maintenance of water-related ecosystems. Furthermore, an effectively and equitably managed natural resource base is the foundation towards CBD Aichi Target 11 and Sustainable Development Goals, with specific reference to Goals 6, 14 and 15.

The future desired state defines the ultimate outcome of management and management direction within and beyond protected area boundaries. This serves as a foundation for relevant ongoing monitoring and evaluation to assess effectiveness throughout implementation of the management plan.

Stakeholder workshops identified natural and cultural historic focal values, explicitly defined and selected for their ability to represent the full suite of biodiversity / natural and cultural historic heritage within the geographic scope of the Complex. The methodology used the rationale that effective conservation of carefully selected values will ensure the conservation of all indigenous biodiversity and cultural historic heritage within a functional landscape. This effort also relied on the Western Cape Biodiversity Spatial Plan and landscape ecology to guide conservation efforts beyond the

[1] A spatially defined area around offshore islands based on the species habitat interactions that create an associated 'zone of island influence' of biotic interactions from nutrient inputs and trophic responses from marine predators (seabirds) (Sink *et al.* 2012).

boundaries of the Complex to address pressures and opportunities in the land- and seascape and inadequacies in protected area design.

An assessment of the condition or viability of values and critical threats served as an evidence base to establish what values require to persist / survive over the long term. The outcomes of these assessments guided the formulation of the future desired state, *i.e.* Goals, and the formulation of conservation strategies with associated objectives, indicators and action plans.

2.2 Scope and Vision

2.2.1 Scope

The geographic scope for the Complex is defined as the area that supports the natural and cultural historic heritage of interest within the boundaries of the Complex. This includes Dassen Island Nature Reserve, Seal Ledges Nature Reserve (hereafter collectively referred to as Dassen Island), Riverlands Nature Reserve and the proposed Pella protected area (hereafter collectively referred to as the Riverlands Nature Reserve), the proposed 'Ganze Craal Nature Reserve' (hereafter referred to as the Ganzekraal Conservation Area), and the proposed Bokbaai Nature Reserve (hereafter referred to as Bokbaai). The Complex covers approximately 9 969.5 ha of land, approximately 20 km of coastline, two islands and the associated marine environment (See Appendix 2, Map 1). This management plan provides strategic guidance for CapeNature to manage the Complex as an integral component of the DCCP landscape.

The planning scope of the Complex is defined both conceptually and spatially, guided by existing land use plans, spatial development plans and the Western Cape Biodiversity Spatial Plan. Riverlands and Ganzekraal are core conservation areas within the DCCP, which is aimed at ensuring climate change resilience, water security, conservation of unique natural and cultural historic heritage, and socio-economic development. The DCCP focusses on creating, facilitating and coordinating synergies among community, natural and cultural heritage conservation, water conservation, tourism, and socio-economic development with a focus on:

- stakeholders within the geographic scope of the DCCP; and
- stakeholders outside the geographic scope of the DCCP who have an influence on the natural and cultural historic heritage assets within the DCCP.

2.2.2 Vision

The vision for the Complex is:
A world-class nature destination with unique culture and high quality intact natural environments where abundant wildlife, wildflowers, freshwater and coastal resources are conserved to inspire and educate people and to support a resilient and vibrant future.

2.3 Purpose

The purpose of the Complex is the foundation on which all future actions are based in keeping with the Vision, Mission and Strategic Objectives of CapeNature, and objectives of the NEM:PAA.

According to Section 17 of the NEM:PAA, the primary purpose of declaring protected areas is: to protect ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes in a system of protected areas. Each protected area in the Complex is declared for one or more of the following purposes:

a) to protect ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes in a system of protected areas;
b) to preserve the ecological integrity of those areas;
c) to conserve biodiversity in those areas;
d) to protect areas representative of all ecosystems, habitats and species naturally occurring in South Africa;
e) to protect South Africa's threatened or rare species;
f) to protect an area which is vulnerable or ecologically sensitive;
g) to assist in ensuring the sustained supply of environmental goods and services;
h) to provide for the sustainable use of natural and biological resources;
i) to create or augment destinations for nature-based tourism;
j) to manage the interrelationship between natural environmental biodiversity, human settlement and economic development;
k) generally, to contribute to human, social, cultural, spiritual and economic development; or
l) to rehabilitate and restore degraded ecosystems and promote the recovery of endangered and vulnerable species.

Under Section 23 of the NEM:PAA, the purpose of protected areas in the Complex that are currently in the process of being afforded legal status as protected areas, specifically relate to S23 subsections (2)(b)(i, ii & iii), 2(c), 2(d) and 2(e)**:**

2(b)(i)(e) Ecologically viable and representative of Critically Endangered and Endangered vegetation types with high levels of biodiversity and endemism (*e.g.* there are an estimated 200 to 300 threatened plant species of which 30% are endemic. Dassen Island supports 10 of the 15 seabirds endemic to southern Africa).

2(b)(ii) The Complex has a rich culture and history dating back many years. Early human habitation is evidenced in the landscape by shell middens, and several historical buildings still exist in the area today and several shipwrecks, gravesites.

2(b)(iii) The Complex facilitates climate change resilience. The Complex ensures long-term protection and conservation of ecologically viable areas

representative of South Africa's biodiversity in the Western Cape. It contributes to the achievement of national biodiversity targets, and long-term maintenance of large-scale ecosystem processes and services, most notably water security and nutrient cycling.

2(c)(d) Private and communal landowners in the surrounding landscape play an important role in the conservation of the natural heritage. Through stewardship, positive and proactive partnerships with private and / or communal landowners support and encourage the protection and responsible management of the natural assets in their care. Stewardship aims to ensure persistence of biodiversity and connectivity in the landscape, and protection of groundwater resources.

2(e) The Complex contains a variety of unspoilt inland and coastal spaces of scenic beauty that provide opportunities for nature-based recreation and eco-tourism opportunities for the unlocking of the socio-economic potential of surrounding communities.

2.4 Focal Values

Protected area design and planning is aimed towards the long-term maintenance of site values. A limited set of values were selected to represent and encompass the broader set of values found in, and associated with, the Dassen Coastal Complex. These 'focal values' form the basis for setting goals, carrying out conservation actions, and measuring effectiveness.

In selecting focal values, both tangible natural and cultural values were considered, including the intangible or non-material human wellbeing values derived from tangible values:

- Natural values can be species, habitats or ecological systems, which collectively represent and encompass the biodiversity of the protected area. They can include the physical, natural features from which ecosystem services flow, benefitting humans in a variety of ways.
- Cultural values are described in terms of the tangible features that collectively represent and encompass the cultural historic heritage of the Complex. They can also include the physical, cultural and/or historic features from which human wellbeing values (see below) are derived.
- Human wellbeing values are the intangible or non-material values derived from tangible values, and which collectively represent the array of human wellbeing needs dependent on natural and cultural features; they can be defined in terms of the benefits delivered to humans by healthy ecosystems, or by intact cultural or historical features. Examples include: drinking water, nature-based livelihoods, and spiritual and physical health; Table 2.1 below provides further examples.

The priority, or focal, natural values selected for the Complex are: Lowland Fynbos Mosaic; Natural Wetlands; the Atlantis Aquifer; Coastal Intertidal and Inshore System; and the Sensitive Island Ecosystem of Dassen Island. The collective set of heritage

features (shipwrecks, burial sites, historic structures, knowledge, *etc.*) known to the Complex are grouped into one focal value called Cultural and Historic Heritage.

A host of human wellbeing benefits will flow from the Complex's natural and cultural assets. Of particular importance to the Complex are: a sense of cultural identity, water security, and nature-based livelihoods and economic opportunities.

All focal values are listed below and summarised in Table 2.1. Those values considered to be 'nested' within, or that will be catered for by the conservation of the focal value, are noted. Some of the key human wellbeing values derived from the tangible natural and cultural focal values are also noted. Importantly, through a process of assessing the 'health' or viability of each focal value, its current status was determined (with the exception of two focal values due to a lack of baseline data). Since human wellbeing values are those components of wellbeing affected by the status of tangible natural or cultural values, their 'health' or status is not assessed separately, but seen as contingent upon the status of the natural and cultural focal values selected. Focal value selection and the assessment of their current status form the basis for setting goals, carrying out conservation actions, and measuring effectiveness.

See Section 4 for detail on focal value selection and viability assessment.

Table 2.1. Summary of the Dassen Coastal Complex focal values and viability as at 2018.

Focal Value	Description, nested values & associated human wellbeing values	Current Status
Lowland Fynbos Mosaic	**Description:** comprised of lowland vegetation types and associated flora and fauna species assemblages. **Nested values of note:** Strandveld, Sand Fynbos, ecotonal Renosterveld, Proteaceae, re-seeders, key threatened plant species and eco-typical game species. **Associated/Key human wellbeing value(s):** nature-based economic opportunities/livelihoods; physical and spiritual health.	Good
Natural Wetlands	**Description:** comprised of all natural seasonal rivers, streams, seeps and wetlands. **Nested values of note:** groundwater dependent ecosystems. **Associated human wellbeing value(s):** water security; nature-based economic opportunities/livelihoods; physical and spiritual health.	Good
Atlantis Aquifer	**Description:** comprised of the natural vegetated surface landscape and dune systems within the geographic scope of the Complex that recharge the underlying aquifer. Current status is based on 'Intact Natural Recharge Area'. **Associated human wellbeing value(s):** water security / drinking water.	Poor
Coastal, Intertidal and Inshore System	**Description:** comprised of natural dune systems to the outer seaward edge of the Cape Kelp Forest ecosystem (or a depth of 10 m). **Nested values of note:** Cape Kelp Forest and associated species assemblages such as abalone and West Coast rock lobster; rocky shores and mixed shores and associated macroinvertebrate communities; sandy beaches, pebble beaches and boulder beaches; Cape frontal dunes; associated sea and shorebirds; Cape Seashore vegetation. **Associated human wellbeing value(s):** nature-based economic opportunities/livelihoods; personal agency (freedom of choice); security from such as coastal erosion, storm surges, sea level rise and storm wave run up.	Fair
Sensitive Island Ecosystem	**Description:** Dassen Island comprised largely of the *Tetragonia fruticosa, Trachyandra divarticata, Urtica-Malva* communities; resident and migratory sea and shorebirds; extending offshore to the outer seaward edge of the Cape Kelp Forest ecosystem (or a depth of 30 m) within the 'zone of island influence'. Ecosystems comprise the Cape Island Shore, Cape Kelp Forest, and Cape Sandy Inner Shelf. **Nested values of note:** resident sea- and shorebirds, rocky shore macroinvertebrate species, abalone and West Coast rock lobster and the Cape Kelp Forest, threatened breeding seabirds and water birds of note: African penguin, bank cormorant, Cape cormorant, crowned cormorant, swift tern, Hartlaub's gull, Leach's storm petrel, great white pelican. **Associated human wellbeing value(s):** knowledge economy contribution; nature-based economic opportunities/livelihoods.	*Not rated*
Cultural and Historic Heritage	**Description:** comprised of tangible heritage features such as built infrastructure, shipwrecks, artefacts, burial sites. **Nested values of note:** Intangible heritage resources such as traditional practices and knowledge systems relating to, for	Good

Focal Value	Description, nested values & associated human wellbeing values	Current Status
	example, the environment and plant use; traditional access to environmental resources. **Associated human wellbeing value(s):** spiritual health and cultural identity.	

As the public entity responsible for nature conservation in the Western Cape, CapeNature delivers a suite of core services to the public towards the following outcomes: resilient ecosystems; the promotion of local economic development, job creation and skills development; growing diversified nature-based revenue streams; access to environmental education, advocacy and education, and access to natural and cultural heritage.

Through the planning process, Core Service Areas (such as access to protected areas; facilitation of green jobs; advocacy and education; applied science, research and information) articulated as outcomes of improved service delivery, were identified. Refer to Table 2.2. These are of strategic importance to the Complex and are essential to the effective execution of this management plan and achievement of Goals for the Complex. There must be mechanisms established to support these core areas and, since the Complex is relatively new, mechanisms largely facilitate socio-economic opportunities through job creation at this stage.

With the inclusion of the new Ganzekraal Conservation Area, opportunities exist to improve the degraded condition of coastal resources and the natural water supply, to pursue cooperative governance of natural resources to overcome regulatory divisions; to manage access for the ongoing benefit and enjoyment of everyone; and to promote the responsible and sensitive development of infrastructure and associated operations as the Complex transitions into a world-class nature destination. As such, mechanisms to promote key core service delivery areas have been identified.

Table 2.2. Core Service Areas of the Dassen Coastal Complex

Core Service Area	Description and Associated Benefits	Current Status
Freedom of choice & capacity to act independently, tourism & nature-based economic opportunities	Participatory planning and management via established platforms such as PAACs, volunteering or citizen science; access to environmental awareness and education opportunities; local economic development through job creation, skills development and tourism infrastructure.	Fair
Responsible utilisation of natural resources	Healthy focal natural and cultural historic values; mechanisms to facilitate evidence-based responsible management and utilisation equitably and legitimately through cooperative governance; access to capacity and skills development opportunities; access to resources; persistence of key species.	Poor

2.5 Threats

Protected area management aims to mitigate threats to values. Threats are factors or processes that threaten, erode or inhibit values and their key attributes, from within or outside the protected area. Threats can also be factors within a management authority that undermines protected area values and inhibits the pursuit of the desired state.

Threats to focal values and the relevant contributing factors or drivers of those threats need to be described in sufficient detail in order to support effective planning and management. An assessment of threats influences the direction and effectiveness of management options. Rating threats according to scope, severity and irreversibility of impact facilitates the allocation of limited resources, simplifies complex scenarios and provides a systematic decision support method to focus efforts.

Table 2.3 provides a summary of focal values for the Complex. The ratings of future threats such as utility (nuclear power station, gas and fuel lines) failure and oil pollution at sea are 'Very High' due to the magnitude of their impact. These ratings highlight the importance of contingency planning and cooperative agreements between relevant organisations. See Section 4.3 for a detailed explanation of threats assessment methods and results for lower rated significant threats.

Table 2.3. A summary of critical threats rating highlighting the natural and cultural historic values at greatest risk.

Focal Values	Critical Threats	Threat Rating
Lowland Fynbos Mosaic	Invasive alien flora; over abstraction of ground water; pollution; inappropriate fire regime; utility failure	Very High
Coastal, Intertidal and Inshore System	Invasive alien flora and fauna; pollution; unregulated utilisation of natural resources; utility failure; oil pollution	Very High
Atlantis Aquifer	Invasive alien flora; over abstraction of ground water; pollution	Very High
Natural Wetlands	Invasive alien flora and fauna; over abstraction of ground water; pollution; inappropriate fire regime	High
Sensitive Island Ecosystem	Oil pollution; pollution; unregulated utilisation of natural resources; invasive alien fauna	High
Cultural and Historic Heritage	Invasive alien flora; vandalism and weathering	High

The results of the threats rating highlighted the following key threats to the focal values of the Complex as outlined in Table 2.4 below:

- **Invasive alien flora (High):** All focal values of the Complex, with the exception of the Sensitive Island Ecosystem, are threatened by invasive alien flora. This threat is rated high due to the risk it poses to the intact threatened lowlands habitat and to the important underground water resource of the Atlantis Aquifer. Although approximately more than two thirds of the Complex is currently affected, invasive

alien flora requires sustained active management intervention to prevent it from becoming worse.

- **Over abstraction of groundwater (High):** This is a threat to the Atlantis Aquifer, Natural Wetlands and the Lowland Fynbos Mosaic. The Atlantis aquifer supplies water to the towns of Atlantis, Mamre and Pella. With the onset of a major drought in the Western Cape in 2015, planning for groundwater abstraction schemes are on the increase. Increased abstraction of groundwater is likely to introduce ecological impacts for freshwater (rivers and wetlands) and terrestrial ecosystems in the Complex. Over abstraction and the associated effects of drawdown (reduction of the hydraulic head in an aquifer / well due to pumping) and impact on groundwater-dependent ecosystems are not yet well understood. Salt-water intrusion is a notable risk. Currently an existing operational wellfield for large-scale groundwater utilisation is situated inside the Complex at Silwerstroomstrand, with plans to upscale. Furthermore, groundwater recharge is augmented artificially by means of reticulating treated grey water via a series of artificial wetlands into recharge ponds. As such, servicing and maintenance of the reticulation system and recharge ponds are crucial to prevent groundwater pollution.
- **Land and water pollution (High):** Land based pollution in the Complex predominantly results from households, construction processes and commercial enterprises. Water pollution includes nutrient-rich run-off from neighbouring properties and human settlements. Point source pollution poses very high threat to the groundwater resource of the Atlantis aquifer. Plastic pollution poses a significant threat to marine ecosystems, through ingestion by and entanglement of wildlife.
- **Inappropriate fire regime (Medium):** Too frequent or ill-timed fires have far-reaching ecological impacts. The majority of fires are human induced either through accidental ignition or are intentionally set. Appropriate fire regimes in the Lowland Fynbos Mosaic requires careful planning due to ecotonal Renosterveld patches in the Atlantis Sand Fynbos, and transition areas from fynbos into strandveld along the coast. Renosterveld patches are less than 5 ha in size, while strandveld is slow-growing requiring a longer fire return interval than fynbos.
- **Unregulated utilisation of natural resources (Medium):** Harvesting and utilisation of natural resources without authorisation undermines appropriate resource management. This threat is significant for the Coastal, Intertidal and Inshore System, and less so for other focal values. The threat applicable within the 500 m seaward boundary of Dassen Island where marine resources such as West Coast rock lobster, *Jasus lalandii*, are harvested commercially, while pelagic fisheries offshore pose a threat to threatened species such as African penguin, *Spheniscus dermesus*, that feed on pelagic fish. Unregulated utilisation can be attributed to regulatory division between relevant authorities, which presents an opportunity for improved collaboration and cooperation between authorities. Additionally, there is opportunity for improved environmental awareness and management authority understanding of resource utilisation trends.
- **Vandalism and weathering (Medium):** Tangible cultural and historic features are subject to natural weathering, although neglect and a lack of resources to restore or maintain features may be a contributing factor to deteriorating conditions.

Heritage features of Dassen Island are well preserved and maintained. Tangible features of Ganzekraal however are subject to severe vandalism that can probably be ascribed to the absence of on-site management for several years. A lack of awareness or education as to the value of heritage assets may also be a contributing factor.

Future threats likely to occur highlight the requirement for surveillance, contingency planning and close cooperation between relevant entities to ensure coordinated disaster management efforts when required.

- **Invasive alien fauna (Low):** Although this threat is rated low overall, it is considered a significant threat to the Sensitive Island Ecosystem due to the historical introduction of species such as the European rabbit, *Orycotolagus cuniculus*, house mouse, *Mus musculus* and domestic cats, *Felis catus,* (Apps 1983, Cooper *et al*. 1985). Cats were eradicated from the island in 2002. Some marine invasive species such as the Mediterranean mussel, *Mytilus galloprovincialis*, also pose a challenge to the species diversity of the marine system. These species require active surveillance to curb further invasion.
- **Utility failure (Very High):** Failure of utilities such as the Koeberg Nuclear Power Station, the Chevron pipeline or the recently approved gas line that will pass through Ganzekraal is a significant potential threat. In the absence of management, the effects are likely to be disastrous.
- **Oil pollution at sea (Very High):** This poses a significant threat to the Sensitive Island Ecosystem and the Coastal, Intertidal and Inshore System. Participation by protected area management in regional oil spill contingency planning and implementation is crucial.

Climate change can have significant environmental, social, cultural and economic consequences for natural and social systems. Although the effects of climate change are speculative, it is likely to have major impacts such as an increase in the frequency of extreme weather events (for example droughts, floods and storm surges), habitat shifting and alteration, a hotter and drier climate and a rise in sea level. The focal values of the Complex link to the landscape being a priority climate change adaptation and mitigation corridor within the Western Cape.

Table 2.4. Rating of key threats to the Dassen Coastal Complex

Threats	Associated Values	Summary Threat rating
Invasive alien flora	Lowland Fynbos Mosaic; Natural Wetlands, Atlantis Aquifer, Coastal intertidal and inshore systems	High
Over abstraction of groundwater	Lowland Fynbos Mosaic; Natural Wetlands, Atlantis Aquifer	High
Land and water pollution	Lowland Fynbos Mosaic; Natural Wetlands, Atlantis Aquifer, Coastal intertidal and inshore systems	High
Inappropriate fire regime	Lowland Fynbos Mosaic; Natural Wetlands, Coastal intertidal and inshore systems	Medium
Unregulated utilisation of natural resources	Lowland Fynbos Mosaic; Coastal intertidal and inshore systems; Sensitive Island Ecosystem	Medium
Vandalism and Weathering	Cultural and Historic Heritage	Medium
Invasive alien fauna	Lowland Fynbos Mosaic; Natural Wetlands, Coastal intertidal and inshore systems; Sensitive Island Ecosystem	Low
(Potential) Utility failure (pipeline & nuclear power)	Lowland Fynbos Mosaic; Natural Wetlands; Atlantis Aquifer; Coastal intertidal and inshore systems; Cultural and Historic Heritage	Very High
(Potential) Oil pollution at sea	Coastal intertidal and inshore systems; Sensitive Island Ecosystem	Very High

2.6 Goals, Strategies and Objectives

Clear and measurable outcome-based goals, strategies and objectives are fundamental for the assessment of protected area management effectiveness and to the whole process of management itself. Goals are underpinned by strategies, objectives and indicators.

Based upon the information derived from the viability and threats assessment, a desired future condition was established for focal values by setting measurable, time-bound goals directly linked to the values and their key attributes.

Dassen Coastal Complex Goals:

To maintain the healthy ecological infrastructure that supports life on earth and climate change resilience, management needs to achieve the following:

1. By 2029, the Lowland Fynbos Mosaic of the Complex has an ecologically healthy age structure[1], at least 6 500 ha([2]) and the colonised frontal dune system is comprised of 99% indigenous species cover, and all essential linkages[3] remain intact.

   [1] Veld age Sand fynbos and pockets of ecotonal Renosterveld areas 8-10 yrs, Strandveld >20 yrs

   [2] Desired rating is based on 75% of the Complex

   [3] Critical Biodiversity Areas (CBA), Ecological Support Areas (ESA) and Other Ecological Support Areas (OESA) in the 25 000 ha intact ecosystems of the DCCP

2. By 2029, Natural Wetlands are in an ecologically healthy state[1], and surface flows specifically, are returned to an acceptable natural state.

   [1] Vegetated buffers of at least 50 m, hydro-period and water quality within an acceptable range, and 99% indigenous species composition

3. By 2029 the primary and secondary aquifer protection zones are clear of invasive plants, and all new built infrastructure does not compromise[1] the groundwater resource.

   [1] Infrastructure that may restrict recharge or pollute the groundwater resource in any way

4. By 2029 key reproductive macroinvertebrate populations[1] are sustainable and there is an appropriate adult-to-juvenile ratio[2] of African oystercatchers within the coastal and intertidal zones.

   [1] Key *Patella* sp.

   [2] As described by Hockey *et al*. 2005

5. The Sensitive Island Ecosystem continues to sustain viable populations of threatened seabirds[1] and the extent of characteristic ecosystems[2] remains stable.

   [1] African penguin, bank cormorant, crowned cormorant, Cape cormorant, great white pelican

   [2] Cape Kelp Forest

Achieving human well-being, derived from healthy responsibly-managed ecological infrastructure and heritage, requires that:

6. By 2029 heritage resources of cultural significance or other special value are sustainably enhanced, valued[1] and are benefiting[2] visitors and local inhabitants.

   [1] Documented, interpreted, understood, and maintained

   [2] Culturally and / or economically

7. By 2029 access to environmentally responsible built infrastructure[1], intact ecosystems[2] and abundant wildlife[2] adds economic value to ecotourism products and socio-economic development opportunities.

   [1] Location and design aligned to sensitivity and zonation and contributing to sense of place

   [2] Healthy natural focal values

8. By 2029 natural resources are managed equitably for legitimate access and in such a way that they will be available for current and future generations.

The social and economic context of the protected area complex, including favourable and adverse socio-economic impacts of management should be understood and adequately reflected in goals and objectives. To this end, an analysis of the conservation situation was undertaken, exploring the indirect threats or factors contributing to the direct threats of most significant concern that is, invasive alien species; over-abstraction of ground water; inappropriate fire regime; the unregulated utilisation of natural resources, and land and water pollution. The purpose of a situation analysis is to understand the relationships between the biological environment and the social, economic, political, and institutional systems and drivers that affect the focal values of the Complex. This process facilitated the selection and prioritisation of conservation strategies through identification of most promising intervention points that will assist in achieving the goals and objectives of the Complex.

Recommended strategies and objectives for the Complex are listed in Table 2.5. The Standard Implementation Framework (Section 5.1) provides detail.

Table 2.5. Recommended Strategies and Objectives for the Dassen Coastal Complex

Threat(s) abated	Strategy Type	Strategy	Objectives
Invasive alien flora; over abstraction of water; inappropriate fire regime; unregulated utilisation of natural resources; inadequate access for socio-economic opportunities; regulatory divisions of relevant entities; oil pollution; utility failure	Enabling Conditions	**Strategy 1:** Enhance governance of the Complex to improve transparency, facilitate collaborative planning and address regulatory divisions in natural resource management	**Objective 1.1:** By 2025 and beyond functioning governance structures facilitate participatory integrated planning and management with relevant stakeholders to enhance management effectiveness
			Objective 1.2: By 2019 and beyond annual plans of operation integrate relevant initiatives planned by relevant management authorities for the relevant financial year
Climate change	Focal Value Restoration / Stress Reduction	**Strategy 2:** Facilitate protected area consolidation and implement conservation beyond boundaries so that the Complex goals are considered in land and water use planning and marine resource management	**Objective 2.1:** By 2020 inadequacies in Nature Reserve design are improved by the consolidation of reserves through the transfer of state land to the relevant conservation management authority, and the declaration of relevant properties
			Objective 2.2: By 2029, within the Zone of Influence, priority sites / seascapes necessary for climate change adaptation and resilience are conserved through stewardship or other effective means
Invasive alien flora; inappropriate fire regime	Focal Value Restoration / Stress Reduction	**Strategy 3:** CapeNature, in collaboration with relevant management authorities, develop and implement long-term invasive alien species management to abate the negative impact that invasive alien vegetation has on fire regime, natural and cultural historic values and water availability	**Objective 3.1:** By 2023 and beyond eco-sensitive areas are comprised of 99% indigenous species
			Objective 3.2: By 2029 the Dassen Coastal Complex is comprised of 99% indigenous species
Inappropriate fire regime; Invasive alien flora	Focal Value Restoration / Stress Reduction	**Strategy 4:** CapeNature, in collaboration with relevant management authorities develop and implement integrated fire management to	**Objective 4.1:** By 2029 fire return intervals are longer than the minimum and shorter than the upper recommended limits and all prescribed fire treatments are in summer and autumn season

Threat(s) abated	Strategy Type	Strategy	Objectives
		restore the fire regime within the Complex and Zone of Influence	**Objective 4.2:** By 2025 there is a reduction in fires that are accidentally set by means other than road accidents
Utility failure; Oil pollution at sea	Threat Reduction	**Strategy 5:** Develop and implement integrated Disaster Management and Contingency Plans in the event of utility failure on land and oil spill at sea	**Objective 5.1:** By 2021 disaster management and contingency planning enables early detection and coordinated rapid response
Inappropriate development; uncontrolled recreation activities; inadequate operational and tourism infrastructure; compromised visitor and staff safety	Enabling Conditions	**Strategy 6:** Develop and implement a Concept Development Plan that guides infrastructure development and utilisation to complement focal values and human wellbeing benefit	**Objective 6.1:** By 2023 and beyond operational and tourism infrastructure is environmentally responsible and mitigates visitor impacts
			Objective 6.2: By 2023 interesting natural features / cultural / historical points of interest guide the development of appropriate infrastructure
			Objective 6.3: By 2025 and beyond all off-road vehicle activity and recreational use is managed and limited to designated areas
Invasive alien flora; Unregulated utilisation of natural resources; reduced resource availability due over exploitation; break down in trophic links; lack of knowledge related to extent of utilisation	Threat Reduction	**Strategy 7:** Develop and implement a natural resource utilisation framework to improve resource management and regulation of resource use	**Objective 7.1:** By 2020 and beyond there is adequate knowledge and understanding of natural resources and associated management requirements to responsibly manage resources
			Objective 7.2: By 2029 key natural resources persist according to the findings of the resource availability assessment
Vandalism; overgrazing; inappropriate fire regime; Invasive alien flora; uncontrolled recreation activities; unregulated utilisation of natural resources; poaching of flora; land and water pollution	Behavioural Change	**Strategy 8:** Facilitate skills development to enable marketability of Expanded Public Works Programme (EPWP) participants and Small, Medium and Macro Enterprises (SMME's)	**Objective 8.1:** By 2019 and beyond a training and development framework improves standards of work and marketability of EPWP participants
			Objective 8.2: By 2019 and beyond SMMEs are established and marketable

Threat(s) abated	Strategy Type	Strategy	Objectives
Inappropriate fire regime, vandalism; uncontrolled recreation activities; unregulated utilisation of natural resources; poaching of flora and fauna; pollution	Enabling Conditions	**Strategy 9:** Develop and implement integrated environmental awareness and education programmes aimed at neighbours, resource users, school groups and visitors, to nurture protected area support and respect and care for natural and cultural historic values	**Objective 9.1:** By 2020 sound fire management information is disseminated to target audiences
			Objective 9.2: By 2025 the level of understanding of visitors / communities / neighbours of protected area values has increased from that of 2019
			Objective 9.3: By 2025 the level of beneficiaries taking ownership (initiate and facilitate) of participatory initiatives increases by 5%
			Objective 9.4: By 2029 the tangible and intangible cultural historic heritage of the Dassen Coastal Complex is preserved and promoted
			Objective 9.5: By 2029 more than 80% of resource users and visitors comply with relevant legislation and there are zero incidents of non-compliance
Weathering; vandalism; inappropriate development; utility failure	Focal Value Restoration / Stress Reduction	**Strategy 10:** Develop a Plan for the Management of Cultural and Historic Resources	**Objective 10.1:** By end 2020 a formal baseline survey for the Complex is completed by an accredited Heritage practitioner
			Objective 10.1: By 2029 the tangible and intangible cultural historic heritage of the Dassen Coastal Complex is preserved and promoted
Unregulated utilisation of natural resources; poaching of fauna and flora; uncontrolled recreation activities; compromised visitor and staff safety; vandalism; reduced resource availability due to over exploitation; inappropriate fire regime	Threat Reduction	**Strategy 11:** Develop and implement an integrated compliance plan in collaboration with partners and law enforcement entities	**Objective 11.1:** By 2020 and beyond all compliance and law enforcement entities agree on roles and responsibilities
			Objective 11.2: By 2021 and beyond all enforcement staff identified in the compliance plan have been appointed and trained
			Objective 11.3: By 2025 and beyond all off-road vehicle and other recreational activities are managed & limited to designated areas
			Objective 11.4: By 2025 more than 80% of resource users and visitors comply to relevant legislation and there are zero incidents of non-compliance
			Objective 11.5: By 2025 there is a reduction in the amount of pollution affecting reserves, and a reduction in nutrient loads of run-off from surrounding land use into sensitive ecosystems

Threat(s) abated	Strategy Type	Strategy	Objectives
Overgrazing; inappropriate fire regime	Threat Reduction	**Strategy 12:** Implement wildlife management principles as a mechanism for veld management and restoration	**Objective 12.1:** By 2019 and five years thereafter veld condition mapping guides veld management and restoration
			Objective 12.2: By 2025 viable populations of appropriate game species persist in the coastal portion of the Dassen Coastal Complex
			Objective 12.3: By 2029 key palatable indigenous plant species persist and species composition and numbers reflect the findings of the habitat assessment & stocking potential assessment
This strategy does not address a specific threat, rather the need for data and analysis to support adaptive management; to measure the status of key attributes and / or strategy effectiveness	Enabling Conditions	**Strategy 13:** Develop and implement an ecological programme of work to enable focal value status monitoring and research in collaboration with entities with complementary knowledge mandates.	**Objective 13.1:** By 2020 and beyond an ecological programme of work directs monitoring and research needs

3. PROTECTED AREA COMPLEX OVERVIEW AND BACKGROUND

3.1 Legal Status and Designation

Dassen Island Nature Reserve was established as a Provincial Nature Reserve in terms of Section 6 the Nature Conservation Ordinance (Ordinance 19 of 1974), on 9 March 1988 and proclaimed in the Provincial Gazette of 18 March 1988 by Proclamation No. 23/1988.

The boundaries of the Dassen Island Nature Reserve were extended 500 m seawards from the high-water mark, as amended in terms of Section 6(1)(b) of the Nature Conservation Ordinance (Ordinance 19 of 1974), read with Sections 2 and 5(1) of the Sea-shore Act (Act No. 21 of 1935), on 14 January 1999.

The area around Dassen Island, bounded by the latitudes 33º24.420'S and 33º26.289'S and longitudes 18º04.161'E and 18º06.317'E, is subject to fisheries closure in terms of Section 20 of the Marine Living Resources Act (Act No. 18 of 1998). Regulation 20(4) added by Government Notice 375 of 4 May 2001 states that no person shall use any drift, set or staked-net for fishing within the closed area.

Seal Ledges Nature Reserve was established as a Provincial Nature Reserve in terms of Section 6 the Nature Conservation Ordinance (Ordinance 19 of 1974), on 9 March 1988 and proclaimed in the Provincial Gazette of 18 March 1988 by Proclamation No. 23/1988.

Riverlands Nature Reserve was established as a Provincial Nature Reserve in terms of Section 6 the Nature Conservation Ordinance (Ordinance 19 of 1974), on 12 April 1994 and proclaimed in the Provincial Gazette of May 1994 by Proclamation No. 37/1994. The WWF-SA owned property known as Pella, which is managed as part of the Riverlands Nature Reserve, is in the process of being declared according to Section 23 of the National Environmental Management: Protected Areas Act (Act 57 of 2003) as part of the existing Riverlands Provincial Nature Reserve, at the time of writing.

The Ganzekraal Conservation Area is in the process of being declared according to Section 23 of the National Environmental Management: Protected Areas Act (Act 57 of 2003) as the ‘Ganze Craal Nature Reserve’, at the time of writing.

The privately owned farm Bokbaai is in the process of being declared according to Section 23 of the National Environmental Management: Protected Areas Act (Act 57 of 2003) as the ‘Bokbaai Nature Reserve’, at the time of writing.

Bokbaai was declared a Provincial Heritage Site (National Monument) according to Section 10(1) of the National Monuments Act (Act No. 28 of 1969) on 19 November 1971 in the Provincial Gazette 3309, No. 2071 and is reflected on the South African Heritage Resources Information System (SAHRIS) reference number 9/2/060/0022.

Management Agreements:

The following management agreements facilitate protected area management between CapeNature and other conservation management authorities:

- CapeNature has an open-ended Memorandum of Understanding (MOU) with DEA: Oceans and Coast (DEA:O&C) specifically related to the management of Dassen Island as a seabird breeding site.
- CapeNature has a Protected Area Management Agreement with Mapula Trust for the integrated management of Bokbaai and the Ganzekraal Conservation Area.
- CapeNature and the CCT have a signed MOU towards a partnership aimed at integrating conservation at the provincial and local levels within the jurisdiction of the CCT.

3.2 Location Extent and Highest Point

The Complex covers a total of approximately 9 969.5 ha.

Dassen Island (33°25' S, 18°05' E), is approximately 55 km northwest of Cape Town and 33 km southwest of Saldanha Bay. It is situated 11 km offshore of the town of Yzerfontein on the West Coast. Dassen Island is approximately 212.2 ha in size, and is about 3.2 km long and 1.6 km wide. The island is flat and low-lying, and the highest point is only at 19 m.a.s.l. The reserve boundary extends 500 m seawards and thus includes a marine environment of approximately 525 ha.

Seal Ledges Nature Reserve (30°38' S, 18°24' E) is approximately 31.2 km north of Cape Town and 830 m offshore from the Koeberg Nature Reserve in an area that forms part of the restricted access area of the Koeberg Nuclear Power Station. The island is small, flat and low lying with a total area of 0.35 ha. The reserve boundary extends 500 m seawards and includes a marine environment of approximately 100.5 ha.

The Ganzekraal Conservation Area (33º30´ S, 18º21´ E) is approximately 61 km north of Cape Town on the R27 West Coast road. The closest town is Mamre, situated 13 km to the east of the conservation area while the town of Atlantis is situated 19 km to the southeast. The Ganzekraal Conservation Area covers approximately 6 236.2 ha and Bokbaai is 1 181.1 ha in size. Altitude ranges from 0 - 160.9 m.a.s.l. The conservation area is bordered in the north by the coastal community of Grotto Bay and associated Private Nature Reserve, and by agricultural fields inland. In the east, the Groote Post / Pampoenvlei game farm and the informal Empolweni small-scale farmers' area borders the reserve. Areas of intact indigenous vegetation under the management of state or private entities border the property in the south and southeast. The Atlantic Ocean meets the conservation area on the West Coast.

Riverlands Nature Reserve (33º29´ S, 18º37´ E), comprising Riverlands and Pella, is situated approximately 75 km north of Cape Town, and approximately 10 km southwest of Malmesbury, the closest town. Riverlands proper is approximately 1 115 ha in size while Pella measures 600 ha. Altitude ranges from 92-177 m.a.s.l.

Riverlands is bordered by the Burgerspost Private Nature Reserve and game farm on the northern and western boundaries, while intensive agriculture and small livestock farms border the remainder of the reserve. The Riverlands and Pella properties are joined at a narrow bottleneck at the corners of the two properties and are thus largely separated by a triangular portion of vacant land comprised of indigenous vegetation and under the management of the HDA, a portion of which is earmarked for conservation. The villages of Chatsworth, Riverlands and Pella are situated 3 km south of the reserve. Refer to Appendix 2, Map 1.

Land parcels of the Dassen Coastal Complex are listed in Table 3.1.

Table 3.1. Land parcels constituting the Dassen Coastal Complex

Reserve component	Farm name and number	Title deed number	Diagram number	Noting sheet number	Conservation status
Dassen Island Nature Reserve	Farm 581	-	900/2015	BH-3C 3687	Provincial Nature Reserve
Seal Ledges Nature Reserve	N/A	N/A	N/A	N/A	Provincial Nature Reserve
Riverlands Nature Reserve	Michiel Heyns Kraal 755	T73809/1990	6989/93	BH – 4CC 3701 BH – 6AA 3711	Provincial Nature Reserve
Riverlands Nature Reserve (Pella)	Burgers Post 754 Portion 2	T16093/2001	6039/61	BH – 4CC 3701 BH – 6AA 3711	Inclusion into Provincial Nature Reserve in progress
Ganzekraal Conservation Area	Modder River 721 Portion 1	T60474/1984	10194/70	BD-3D 3688	Protected area status in progress
Ganzekraal Conservation Area	Farm 731	T22402/1985	42/1791	BH-3D 3688 & BH-5B 3707	Protected area status in progress
Ganzekraal Conservation Area	Ganzekraal 732	T22403/1985	243/1814	BH-3D 3688 & BH-5B 3707	Protected area status in progress
Ganzekraal Conservation Area	Cruywagenskraal 977 Remaining Extent	T44078/1985	480/1839	BH-5B 3707	Protected area status in progress
Ganzekraal Conservation Area	Cruywagenskraal 977 Portion 1	T44080/1985	7124/52	BH-5B 3707	Protected area status in progress
Ganzekraal Conservation Area	Farm 978 Portion 2	T16336/1973	887/1918	BH-5B 3707	Protected area status in progress
Ganzekraal Conservation Area	Farm 978 Portion 3	T44079/1985	886/1918	BH-5B 3707	Protected area status in progress
Ganzekraal Conservation Area	Farm 979	T8612/1977	4527/1895	BH-5B 3707	Protected area status in progress

Reserve component	Farm name and number	Title deed number	Diagram number	Noting sheet number	Conservation status
Ganzekraal Conservation Area	Buffels Rivier 980	T34712/1975	196/1832	BH-5B 3707	Protected area status in progress
Bokbaai	Bokkerivier 733	T24425/2015	113/1827	BH-5B 3707	Protected area status in progress

3.3 Administrative Context

In terms of the Municipal Systems Act (Act No.32 of 2000), local municipalities in South Africa are required to use integrated development planning to plan future development in their mandated management areas. The municipal Integrated Development Plan (IDP) is a 5-year strategic plan in which the municipal strategic and budget priorities for development are set.

An IDP is intended to be the principal strategic instrument that informs planning and development within a municipality with the aim of integrating and coordinating the work of local and other spheres of government, including how the environment will be managed and protected. Among the key components of an IDP are disaster management plans and a Spatial Development Framework (SDF). SDFs are essentially the spatial reflection of a municipal IDP. Local municipalities are responsible for producing and coordinating IDPs and SDFs, in consultation with stakeholders who can influence or be influenced by development and other changes in the area. All government departments working in an area are encouraged to refer to the IDP to ensure integration and alignment of work. As such IDPs and SDFs are tools for integrating social, economic and environmental issues and development within a municipality.

Since biodiversity is a fundamental component of sustainable development, SDFs and IDPs offer an opportunity to ensure that biodiversity priorities are incorporated into planning processes. In turn, the identification of biodiversity-related projects for the IDP can support local economic development and poverty alleviation.

Dassen Island and Riverlands both lie within the West Coast District Municipality (WCDM) and Swartland Municipality. The Ganzekraal Conservation Area spans two municipal areas, in particular the Swartland and City of Cape Town Metropolitan Council jurisdictions. The boundary between the three municipalities bisects Ganzekraal. Seal Ledges lies within the City of Cape Town Metropolitan Council.

The CCT SDF and associated Regional Spatial Implementation Framework propose concentrating and consolidating urban growth within the regional centres of Malmesbury and Atlantis, retaining the character and functionality of surrounding rural settlements, and protecting their natural hinterlands. This SDF also requires proactive management of urban growth pressures in this sub-region as a collaborative initiative between the CCT and Swartland Municipalities.

The CCT SDF has incorporated statutory conservation areas (along with critical biodiversity areas, conservation priority zones, critical, irreplaceable and restorable biodiversity sites, public conservation areas and private conservation areas) in its Core 1 category, *i.e.* conservation worthy / dependent areas. The Swartland Municipality IDP recognises the Complex as an opportunity in its demarcated Groen River / Diep River Corridor (Riverlands), Coastal Conservation Area (Ganzekraal) and Coastal Corridor (Dassen Island), highlighting opportunities for enhanced integration of the Complex into the IDP revision process.

The alignment of objectives and / or spatial priorities of the WCDM (2017), Swartland Municipality (2017) and the City of Cape Town (2017) IDPs and the strategies of the Dassen Coastal Complex is illustrated in Table 3.2.

Table 3.2. Alignment of objectives of the West Coast District Municipality, Swartland Municipality and City of Cape Town Metropolitan Council Integrated Development Plans with that of the strategies of the Dassen Coastal Complex

West Coast District Municipality	**Swartland Municipality**	**City of Cape Town Metropolitan Council**	**Dassen Coastal Complex and Zone of Influence**
OBJECTIVE			**STRATEGY**
Ensure the environmental integrity of the district is improved.	Objective 5: Protect ecological and agricultural integrity [Biophysical or Natural Environment]	Spatial priority 2: Manage urban growth, and create a balance between urban development and environmental protection	**Strategy 1:** Enhance governance of the Complex to improve transparency, facilitate collaborative planning and address regulatory divisions in natural resource management **Strategy 2:** Facilitate protected area consolidation and implement conservation beyond boundaries so that the Complex goals are considered in land and water use planning and marine resource management **Strategy 3:** CapeNature, in collaboration with relevant management authorities, develop and implement long-term invasive alien species management to abate the negative impact that invasive alien vegetation has on fire regime, natural and cultural historic values and water availability **Strategy 4:** CapeNature, in collaboration with relevant management authorities develop and implement integrated fire management to restore the fire regime within the Complex and Zone of Influence **Strategy 5:** Develop and implement integrated Disaster Management and

West Coast District Municipality	Swartland Municipality	City of Cape Town Metropolitan Council	Dassen Coastal Complex and Zone of Influence
OBJECTIVE			**STRATEGY**
			Contingency Plans in the event of utility failure on land and oil spill at sea **Strategy 11:** Develop and implement an integrated compliance plan in collaboration with partners and law enforcement entities **Strategy 12:** Implement wildlife management principles as a mechanism for veld management and restoration
Pursue economic growth and the facilitation of job opportunities.	Objective 1: Grow economic prosperity and facilitate economic sector growth (including mining, agriculture, tourism, commercial and industry [Economic Environment] Objective 2: Proximate convenient and equal access [Economic Environment]	Spatial priority 3: Plan for employment, and improve accessibility as well as access to economic opportunities	**Strategy 6:** Develop and implement a Concept Development Plan that guides infrastructure development and utilisation to complement focal values and human wellbeing benefit **Strategy 7:** Develop and implement a natural resource utilisation framework to improve resource management and regulation of resource use **Strategy 8:** Facilitate skills development to enable marketability of Expanded Public Works Programme (EPWP) participants and Small, Medium and Macro Enterprises (SMME's)
Promote the social wellbeing of residents, communities and targeted social groups in the district.	Objective 3: Sustain material, physical and social well-being [Social Environment] Objective 4: Protect and grow place identity and cultural integrity [Built Environment]	Spatial priority 1: Build an inclusive, integrated, vibrant city	**Strategy 9:** Develop and implement integrated environmental awareness and education programmes aimed at neighbours, resource users, school groups and visitors, to nurture protected area support and respect and care for natural and cultural historic values **Strategy 10:** Develop a Plan for the Management of Cultural and Historic Resources

The Swartland Municipality and City of Cape Town Metropolitan Council IDPs and SDFs are updated every five years and must indicate the desired patterns of land-use for the municipality and provide strategic guidance regarding the location and form of development, as well as conservation, within the municipality. An improved integration of the Complex into municipal planning frameworks presents an opportunity for protected area mainstreaming and incorporation of appropriate buffering mechanisms

around protected areas. The latest IDPs at the time of writing are in effect from July 2017 to June 2022.

3.4 Internal Rules

In terms of Section 52 of NEM:PAA, as amended, the management authority of a nature reserve may, in accordance with prescribed Norms and Standards, make rules for the proper administration of the area.

Rules made must be (1) consistent with the Act and the management plan for the area; (2) bind all persons in the area, including visitors; and (3) may, as a condition for entry, provide for the imposition of fines for breaching of rules.

The internal rules for the proper administration of the Complex are drafted in terms of Section 52 of the NEM:PAA and Regulations for the Proper Administration of Nature Reserves, Government Notice 99 of 2012.

In addition to the NEM:PAA, the Nature Conservation Ordinance (Ordinance 19 of 1974) and Provincial Notice 955 of 1975, as well as Regulations published under Government Notice 1111 in terms of the Marine Living Resources Act (Act No. 18 of 1998), have been consulted to set the internal rules for the Complex.

3.5 History of the Dassen Coastal Complex

The history of the management of the Complex reflects a shift in management intent, from one of resource extraction to one of conservation.

Dassen Island has been managed by a succession of government organisations since the 1860s, overcoming a history of resource extraction to embracing a future of resource conservation. Seabird populations were protected by legislation, and access to colonies controlled by a permit system and the presence of a headman from as early as 1844, although for the purposes of guano production rather than for seabird conservation. Seabird colonies are currently protected by the Sea Birds and Seals Protection Act (Act No. 46 of 1973). The island is managed by CapeNature, while the Lighthouse Services division of the National Ports Authority (Transnet) has servitude rights around the lighthouse and associated buildings.

The natural resources of Dassen Island have been extensively utilised in the past. Early European seafarers landed on the island in the early 1600s and noted the abundance of wildlife such as rock hyrax, *Procavia capensis,* and seals. Penguins served as food (fat and eggs), and fuel to supply the boilers of ships. Commercial egg harvesting was extensive in the early 1900s, with close to 600 000 eggs being collected in 1919 alone. To facilitate egg collection, a penguin exclusion wall was built around the outer perimeter of the island in the early 1940s. The commercial harvesting of eggs at Dassen Island was terminated in 1967. The penguin population has to date not recovered to pre-harvest levels (DEA 2013).

The guano-scraping industry was initiated in the early 1840s. Guano was harvested for use as an agricultural fertilizer and mostly obtained from Cape cormorants,

*Phalacrocorax capensi*s. Phosphatic sand was also removed from Dassen Island to replace nesting material at gannet colonies on other islands, where guano had been removed (Ross & Randall 1990). From 1898 guano scraping was conducted at Dassen Island by the Guano Islands division of the South African Government's Department of Industries (Siegfried & Crawford 1978). The scraping of guano on the island for commercial purposes was discontinued in 1974.

Riverlands Nature Reserve has also undergone a history of utilisation prior to one of conservation. In the early 1900s the farm, Michiel Heyns Kraal, was purchased by Dr Ottaway for the establishment of a town. Plots of land, in the order of 422, were registered against the names of 152 owners. Plans for the future town covered almost half of the original extent of Riverlands, now known as Michiel Heyns Kraal. However, plans to develop the town were not realised and the property was subsequently sold to Mr Frank van Reenen. The Riverlands section was later passed on to the South African Railway Service (hereafter the Railway Service) upon the passing of Mr van Reenen. A railway line passing over the western portion of the property was constructed between 1903 and 1926 as there was believed to be a good source of water from nearby Kalbaskraal. Several plots of land were subsequently sold to the Railway Service (CapeNature 2002; Department of Land Affairs 2002).

In 1953 the farm was leased from the Railway Service by the Dutch Reformed Mission Church of Malmesbury. During this time, the property was already under strict control to conserve nature, but to also allow controlled farming. Lease agreement conditions placed restrictions on ploughing and tree planting, and farming practices required written permission from the Railway Service. All destructive weeds had to be removed and no intentional burning of natural vegetation was allowed. Agricultural farming practices included the cultivation of crops such as grapes, potatoes, sweet potatoes, watermelon and livestock, although success was poor due to the nutrient poor soils (CapeNature 2002).

Riverlands was known for its unique vegetation, rich species diversity and concentration of threatened species. A portion of land was transferred from the Railway Service, now called Transnet, to the then Western Cape Provincial Administration. In 1985, the Western Cape Provincial Administration's Department of Nature Conservation set aside 1 297 ha of land for the establishment of a nature reserve (Department of Land Affairs 2002; CapeNature 2005). Riverlands was declared a Provincial Nature Reserve in April 1994. At the same time, the Pella section was leased as a research site by the Council for Scientific and Industrial Research (CSIR) to record red data species of the unique lowland sand fynbos. WWF-SA purchased Pella in 2001, and it has since been managed as a nature reserve by CapeNature as part of Riverlands Nature Reserve.

During December 2014, the Department of Transport and Public Works acquired 7 260 ha of Atlantis State Land, previously vested with the Department of Human Settlements. Due to the sensitivity of the Atlantis aquifer, this land was earmarked for conservation. CapeNature was appointed to manage the land as a protected area in highly-threatened and poorly-conserved lowland and coastal habitats. The land forms

part of a priority climate change adaptation and mitigation corridor (Pence 2009) due to the large, connected areas of natural vegetation still occurring in the area, the coastal to inland link and the high levels of biodiversity and endemism. This land is currently in the process of declaration as a Nature Reserve.

3.6 Cultural Historic Heritage

The National Heritage Resources Act (Act No. 25 of 1999) protects heritage resources as defined as part of the National Estate, according to Section 3 of the Act. These are heritage resources of South Africa, which are of cultural significance or other special value for the present community and for future generations, and fall within the sphere of operations of heritage resources authorities. Resources include paleontological resources, prehistoric/historic material, human remains, structures older than 60 years, ruins older than 100 years, and landscapes of cultural significance.

This area of the West Coast has a rich history and culture dating back many centuries, with evidence of pre-colonial habitation. The Koina, more specifically the West-Cochoqua tribe, were probably some of the first inhabitants of this region. After 1652 several Dutch East India Company (DEIC) posts developed in the area over the years including Ganze Craal in 1709. The farms Cruywagenskraal and Bokkerivier, amongst others, were also set aside for the exclusive use by the DEIC as grazing grounds for their cattle. Ganze Craal was privatised and sold in 1791. The then government retained Bokkerivier where lime was burnt and used in several buildings in the Cape, until the burning of lime at Bokkerivier ceased during 1826. During 1827, the government started leasing Bokkerivier and all other farms still in their possession to the public for a period of 17 years. Farms were privatised after 1844 (Sleigh 1993; Sleigh 2018). Many historical buildings, burial grounds and graves still exist in the area today, and several shell middens can be found along the coastline.

At least three noteworthy shipwrecks namely Scollevaar (1668), Reigersdaal (1747) and the British Peer (1896), occurred along the Ganzekraal coastline. Following the stranding of Reijgersdaal on 25 October 1774, 33 bodies washed ashore near the Bokbaai homestead and were buried near the mouth of the Bocke River (Bokke River) (Turner 1988). During November 1991, the bodies of two crew members from the British Peer were unearthed during construction work at the Ganzekraal resort and became known as the ‘Ganzekraal Skeletons’. One of them was identified as the ship’s steward, Mr George James Whyte. The bodies were re-interred on the adjacent Bokbaai farm. According to articles written in the Cape Times in 1896 and 1897, 14 bodies were recovered and buried on a ridge approximately 55 m from the shore (Wilson & van Rijssen 1994).

There is a long history of human activity on Dassen Island with the Dutch seafarer Joris van Spilburgen being the first to record and land on the island in 1601. Jan van Riebeeck of the DEIC ordered the first settlement of Dassen Island in 1654 to prevent intruders from gaining access to the island (Green 1946). The island was used to provide ships with the products of penguins and other marine life. This long history of human involvement left behind numerous structures and artefacts including the guano

scrapers' quarters, a penguin exclusion wall, an old limekiln, an ammunition depot (that was later converted to a water tank) and the lighthouse (1893).

Dassen Island is located in an area that experiences significant shipping activity, both recreational and commercial. Over the years many vessels have been wrecked in the vicinity of the island, mostly as a result of poor visibility due to thick fog (Figure 3.1). The island has many offshore reefs and pinnacles, as well as dense kelp beds, all of which can be hazardous to shipping. Some of these wrecks are still visible. The wrecks on the island are important from both a historical and an ecological perspective. They provide nesting habitat for seabirds, particularly crowned and Cape cormorants, and act as artificial reefs for marine organisms.

Figure 3.1 The Namaqua, a commercial West Coast rock lobster vessel, which ran aground at Dassen Island on 23 January 1993 (Photo: Johan Visagie)

3.7 Bio-physical Context

3.7.1 Climate and Weather

A key feature of the Complex landscape is the Dassenberg Climate Corridor (from Riverlands to the coast) (Pence 2009) (Figure 3.2).

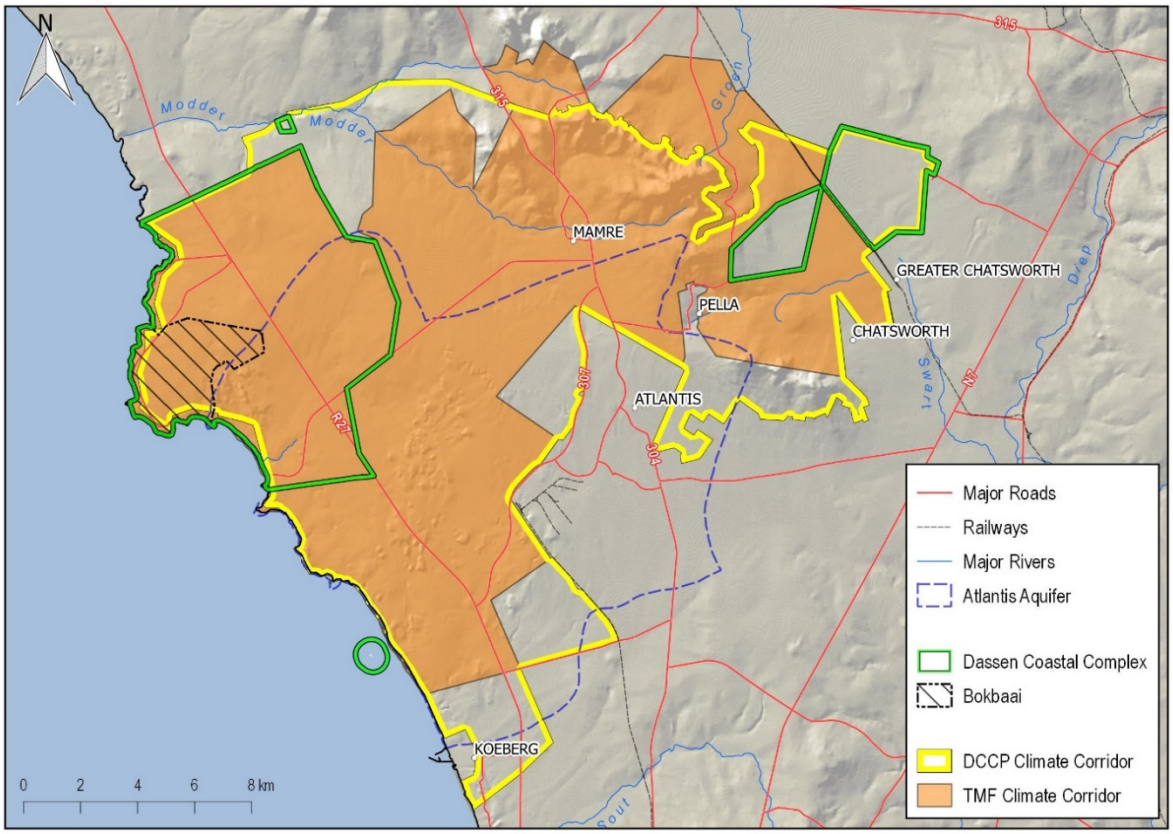

Figure 3.2 The location and extent of the WWF-SA TMF Climate Change Corridor in relation to the Dassenberg Coastal Catchment Partnership geographic domain

Climate change will place additional stress on fynbos ecosystems and species as the Western Cape is predicted to become hotter and drier, with more intense storms and floods, more frequent fires and more droughts (Pence 2009). Since human lifestyles are inextricably linked to the natural world, defending the resilience of ecosystems and the services they provide is essential to withstanding future climatic changes (Pence 2009). The Complex was rated highest of all the Climate Adaptation Corridors in terms of predicted 'severity of change' and therefore ranked as the most urgent to protect (Pence 2009).

Corridor selection, placement and design was based on the following key climate attributes and premises (Pence 2009):

- The ocean has a moderating effect on temperatures;
- Temperatures will increase less on south-facing slopes than north-facing;

- Fragmentation, invasive aliens and deleterious fire regimes significantly compound the problem (of climate change) both locally and regionally (and thus contiguous, well-managed protected areas provide the best opportunity to mitigate against these compounding threats);
- Species should be able to retreat to higher, cooler altitudes or other climate refugia;
- Intact linkages are important across broadly similar soil types to allow for shifting plant ranges (extensive and continuous acid sands in this case);
- Upland-lowland links are important at all scales from individual sites to regional gradients. In the Complex, the altitude range is from sea level to about 300 m.
- High water yield catchments and intact wetlands will play an increasingly important role, *e.g.* the Atlantis aquifer is a National Strategic (groundwater) Water Source Area; and
- Fine-scale centres of endemism are places that were likely resistant to past climate changes and may well be again. The Complex not only has the highest concentration of threatened plant species of any of the Climate Adaptation Corridors, but also supports one of the few remaining intact local centres of endemism in the greater CCT and is a likely climate refuge.

The Complex experiences a temperate, Mediterranean-type climate, with warm, dry summers and cool, relatively wet winters. The Atlantic Ocean and cold Benguela current have a moderating effect on temperatures. The warmest mean monthly temperatures are usually between January and March, and the coolest temperatures in July.

Northerly and north-northwesterly winds predominate in winter, bringing rain. In summer southerly and southwesterly winds dominate. The incidence of calms is greatest during spring and autumn months (September to November and March to May). On the mainland, dry, desiccating easterly berg winds can occur at any time of the year.

Rainfall generally results from cold fronts moving in from the South Atlantic Ocean. Most of the rain occurs between May and September, normally peaking in July, although there is some inter-annual variation. Mean annual rainfall for Dassen Island over a ten-year timeframe is approximately 330 mm (CapeNature 2012). On the mainland, the mean annual rainfall over the past ten years was approximately of 400-600 mm per annum across the Complex (See Figure 3.3 a). June, July and August are considered the wettest over a consecutive three-month period, with the rainfall peaking in June and averaging 72 mm (CapeNature 2002).

Mean annual temperatures range from 16 to18˚C across the Complex (See Figure 3.3 b). The highest maximum temperature is in February, with an average of 28.8˚C. The mean minimum temperature is in July at night, with an average of 6.3˚C.

Frost and fog mainly occur in the winter months from May to July.

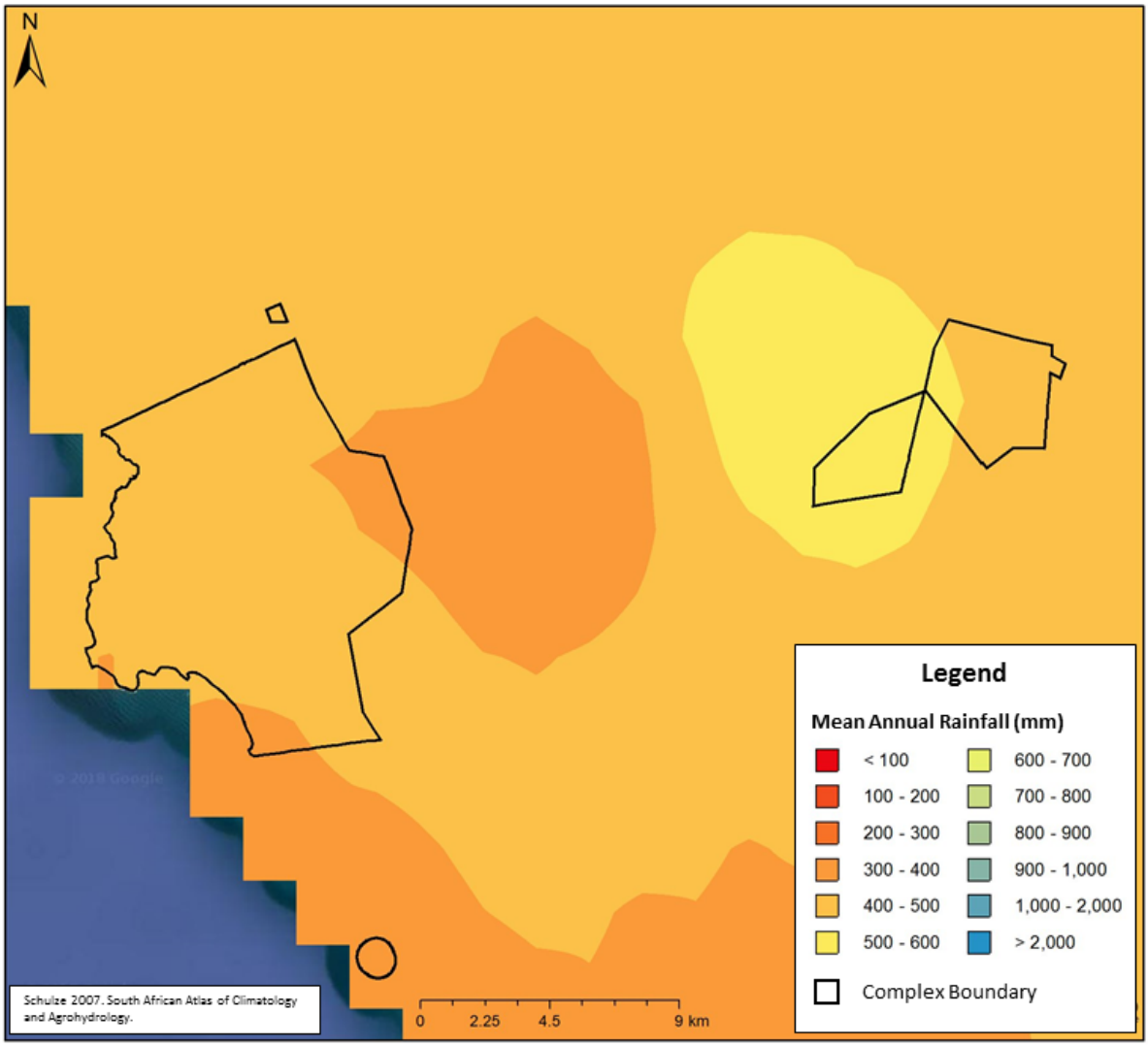

Figure 3.3a Mean annual rainfall for Riverlands Nature Reserve and Ganzekraal Conservation Area

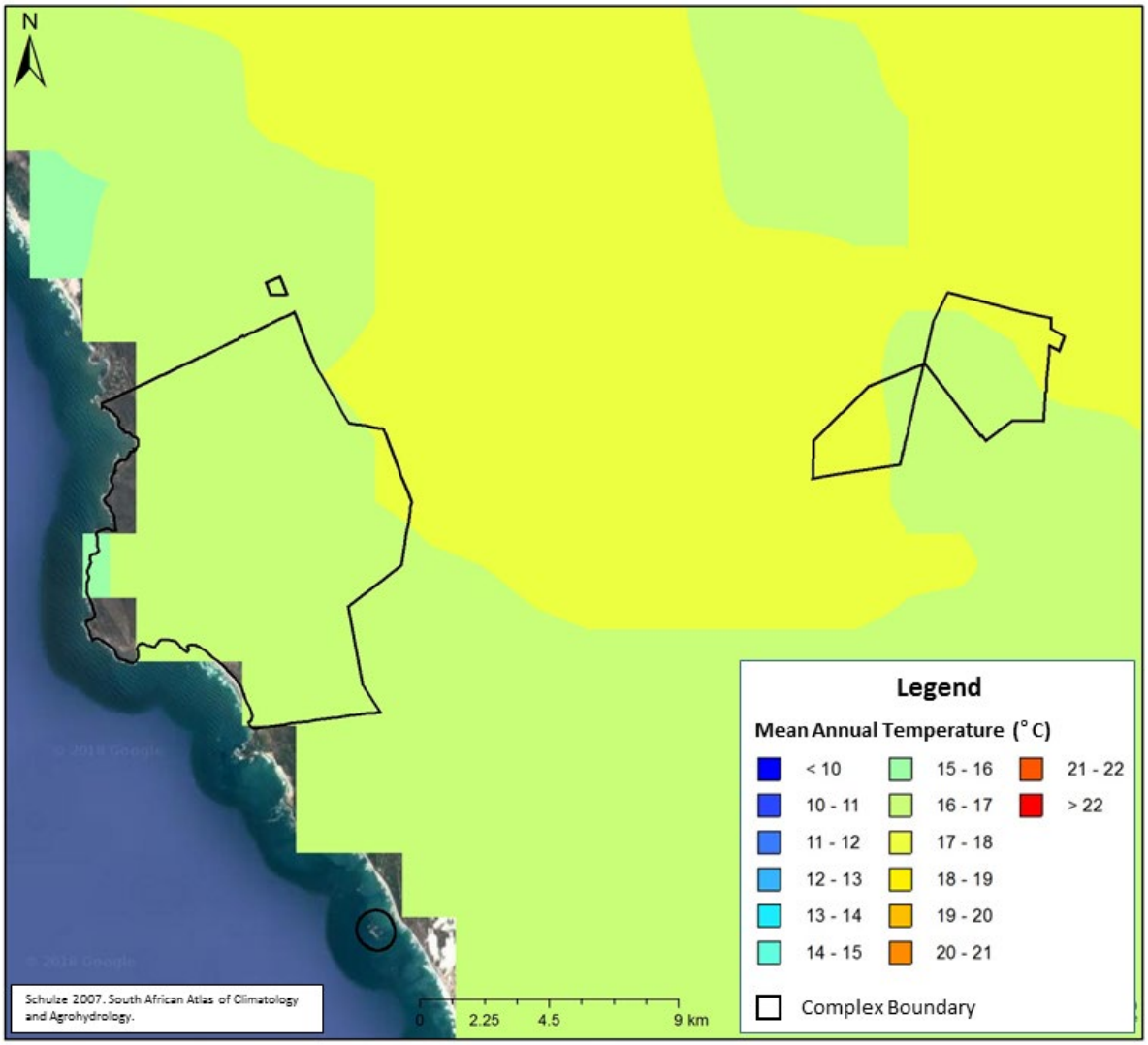

Figure 3.3b Mean annual temperatures for Riverlands Nature Reserve and Ganzekraal Conservation Area

3.7.2 Geology and Edaphic factors

Dassen Island and Seal Ledges form part of a chain of granite domes, known as the Cape Granites, running northwest-southeast along the Western Cape and Namibia. The geology comprises predominantly fine-grained tourmaline-granite with a few areas of biotite granite.

Seal Ledges is comprised of exposed rock (CapeNature 2012). The granites found in the interior of Dassen Island have weathered into flat exfoliated masses, some of which form temporary pans in winter. The granites that occur along the coast, to just above the high-water mark, consist of large, rounded boulders. A small outcrop of ferricrete occurs approximately 180 m south of House Bay Central and parts of the island are covered primarily with coarse, shell-derived sediments, with small areas covered by more recent limestone sediments (McLachlan 1949).

The topography of the mainland is relatively flat and low-lying. Riverlands and Ganzekraal are divided by the granite outcrops of Dassenberg and Mamre, which

range between 210 m to 410 m.a.s.l (van der Merwe 1983 as cited by Jovanovic *et al.* 2017). See Appendix 2, Map 2.

The coastal platform overlain by the Complex cuts across hard quartzose as well as softer rocks and is stepped from an elevation of approximately 400 m in the foothills of the mountains down to the coast (Deacon *et al.* 1992). The smoothly undulating plain is underlain by Malmesbury formation phyllites. Along the West Coast a strip of drift sands of considerable depth covers an old coastal plain with elevations of less than 50 m. Drift sands locally overlay more clayey fluvial deposits or residually weathered materials. The soils along the coast can therefore vary from very calcareous sandy material on limestone (Mispah form) to deep sandy calcareous to neutral sand (Fernwood form). Inland catenae include acidic, sandy soils of the Clovelly, Constantia, Lamotte and Fernwood forms. Locally, duplex soils (Kroonstad, Estcourt forms) are encountered where underlying clay is within 1.2 m of the surface (Lambrechts 1979).

The deep sandy soils of the Riverlands Nature Reserve are of aeolian and marine origin, coarse in texture, generally acidic and well-leached. The Reserve is situated upon Cenozoic deposits with Cape granite outcrops occurring in the surroundings (Jovanovic *et al*. 2012). The soils in the reserve are considered macroscopically homogenous and uniformly deep (Stander 2011).

Ganzekraal lies on a coastal plain with the Darling Hills and Dassenberg Hills in the north-west and west respectively. The bedrock of the site is occupied by a plateau-like feature of approximately 150 m to 160 m above sea level. The area is overlain by light grey/pale sands of the Springfontein Formation. The Springfontein Formation is an informal category that includes predominantly non-calcareous, windblown sand sheets and dunes, covering parts of the landscape since the middle Quaternary (approximately 800 000 years ago). These deposits may locally include muddy sands (of marine/lagoon origin) and peaty sands (formed in marshy/wetland environments) (Fick 2012). Refer to Appendix 2, Map 3.

3.8 Biodiversity Context: Ecosystems

3.8.1 Freshwater Ecosystems

The Complex lies within the Berg River catchment, which is part of the Berg-Olifants Water Management Area (WMA). Two distinct drainage regions are present, separated by the Mamre and Darling hills. The Ganzekraal section of the Complex is located within the Bokbaai catchment while the Riverlands section is located within the Diep River catchment bordering the Berg River system. Freshwater ecosystems are comprised of seasonal rivers and small streams, and depression and seep wetlands. There are no freshwater ecosystems present on Seal Ledges. A small seasonal rainwater dependent pan is present on Dassen Island.

From Riverlands a collection of non-perennial streams, flowing west-southwest, forms part of the northern upper catchment of the Swart River, a tributary of the Diep River. The Groen River tributary of the Diep River originates on Riverlands. These streams also form part of the extensive wetland system present on the Riverlands Nature Reserve. Some wetlands are associated with clay and ferricrete. The Ganzekraal Conservation Area represents a network of seasonal rivers and smaller streams that flow in a south-westerly direction towards the coast, where coastal seeps are frequent. Depressions and seeps are associated with deep unconsolidated sand, and localised areas of ferricrete. Coastal seeps are frequent along the coast, more visible in areas where bedrock is extruded.

Several surface water systems are likely dependent on groundwater and/or aquifer water sources and probably serve as important recharge for the Atlantis aquifer (CapeNature 2018). The Atlantis aquifer is the primary source of potable water to the towns of Atlantis, Mamre and Pella via the Atlantis Water Supply Scheme. As such, the Complex is significant for the maintenance of water security in the area. Refer to Appendix 2, Map 4 for an illustration of freshwater ecosystems.

Generally, intact riparian and wetland buffer zones prevail with a degree of intrusion by alien invasive plant species and overgrazing in seeps. The freshwater ecosystems and their buffer areas, contained within the protected areas, also provide important refuge areas for the species (floral and faunal species) that utilise these ecosystems. They also serve as important corridors for the movement of species.

Pressures on the hydrological functioning of the aquatic systems in these catchments include increasing water demands by the agricultural and urban sectors in the area. In addition to current groundwater use and artificial recharge practices in the Atlantis area, drought conditions (2015 and beyond) have resulted in wellfield exploration for future options to increase utilisation of ground water.

For the majority of freshwater ecosystems, important factors related to catchment management include the clearing and maintenance after clearing of invasive alien plants within the property boundaries of the Complex and priority areas within the protected area zone of influence. For freshwater ecosystem health, this is particularly important within riparian zones and wetlands.

Beyond the boundaries of the Complex, other factors stemming from land use patterns may impact on freshwater ecosystems. Land use activities surrounding protected areas are generally crop cultivation (specifically at Riverlands), livestock farming, game farming, and human settlement associated with subsistence farming, towns and villages. With these land use activities, the pollution of surface water and groundwater resources threatens freshwater ecosystems in the absence of management and engagement with stakeholders.

Another general and significant pressure on freshwater ecosystems and water provision are the impacts associated with climate change. Mitigating for the effects of climate change is challenging and adaptive management is critical. This should be informed by thorough monitoring, including the collection of rainfall and ambient temperature data. Rainfall data in particular are important, as this can inform the establishment of a link between surface water (hydrological), groundwater and aquifers (geohydrological) and rainfall conditions. This in turn will provide insight into the possible impacts imposed by water abstraction (surface or ground) on surface or groundwater flows (see for example Rose & Conrad 2006).

3.8.1.1 Groundwater/Aquifers

Groundwater systems associated with the Complex include unconsolidated sand aquifers underlain by Malmesbury Group sediments (Riverlands Nature Reserve), elements of the Cape Granite Suite, and the coastal deposits at Ganzekraal (Jovanovic *et al.* 2012; Jovanovic *et al*. 2017).

Riverlands Nature Reserve is situated on deep, well-leached, generally acidic and coarse sandy soils of marine and aeolian origin. The Riverlands catchment is considered fairly homogenous in terms of relief, soils form and depth (Stander 2011). The majority of the Ganzekraal Conservation Area is situated on the unconsolidated sediments that comprise part of the Atlantis aquifer, a primary coastal aquifer system and a focal value of the Complex.

The Atlantis aquifer is unconfined and comprised of unconsolidated sediments of Tertiary to Quaternary age overlying the Malmesbury Group bedrock that acts as an aquitard and elements of the Cape Granite Suite, covering an area of approximately 130 km². The average sand depth of the aquifer is 25 m, reaching a thickness of up to 60 m. The maximum elevation in the northeast is approximately 160 m, from which the thin aquifer slopes steeply in a south-westerly direction towards the sea in the west (Jovanovic *et al*. 2017). Groundwater discharges along the coast and in some coastal areas, the aquifer dips below sea level (Bugan *et al*. 2016).

The Atlantis aquifer supplies variable to high quality water for the towns of Atlantis, Mamre and Pella. The CCT has planned for a sustained yield of 12 million litres a day for the Atlantis aquifer. There are high volume extraction wellfields at Silwerstroom, situated within the Ganzekraal Conservation Area, and at Witzands, just south of Ganzekraal. A conceptual model of the site developed by the CSIR indicates that there were no signs of over abstraction by the year 1999, however, model predictions show that under high levels of abstraction draw down is possible at localised areas of

the Witzand Wellfield (Jovanovic *et al*. 2017). Increased groundwater abstraction associated with the current drought and future water demands could have detrimental effects on the terrestrial (*e.g.* Lowland Fynbos Mosaic) and freshwater ecosystems that are also dependent on this groundwater source (see Colvin *et al*. 2003).

Groundwater resources are naturally recharged by rainfall. The Atlantis aquifer is, however, augmented by artificial recharge via a water reticulation system with infiltration ponds (artificial wetlands) designed to catch and filter treated water to infiltrate into the aquifer. Artificial recharge forms part of the Atlantis Water Supply Scheme. The amount of groundwater recharge is dependent on initial soil water content, rainfall amounts and distribution, and evapotranspiration (Jovanovic *et al*. 2012). The Complex contributes to the recharge area for the Atlantis aquifer and thus contributes to the supply of high quality water to the aquifer and the downstream users. The presence of invasive alien flora poses a threat to not only the natural wetlands and watercourses, but also to the groundwater levels within the Complex areas and to the recharge rates of the Atlantis aquifer. Pollution is also a key threat, specifically point source pollution.

Over-abstraction of groundwater could result in the increased intrusion of salt water from the coast (high threat rating). According to the Department of Water Affairs and Forestry (DWAF 2000), now known as the Department of Water and Sanitation, groundwater quality in this area already has variable levels of salt content as measured by electrical conductivity. Salt content values are mapped to range from a slightly salty to notably salty taste south to north in the area of Silwerstroom and Ganzekraal, together with some variation towards Riverlands and Pella, where salt content is lower.

Adaptive management is essential to ensure the delivery of quality potable water and sustainable utilisation of groundwater resources (Seward *et al.* 2006). Management decisions should be guided and supported by monitoring data from strategically selected boreholes and associated wetlands nearby, and at various distances from abstraction points as control.

3.8.1.2 Rivers

The river ecosystems of the Complex comprise predominantly natural seasonal rivers (non-perennial; *e.g.* the Bokke River at Bokbaai) and smaller streams. There are no perennial rivers originating on Riverlands Nature Reserve. Here, a collection of non-perennial streams form part of the extensive wetland system that is present on the Reserve. It is likely that at least some of these seasonal streams would be dependent on groundwater levels.

Only one perennial river occurs within the Complex, namely the Silwerstroom River in the Ganzekraal Conservation Area. It is considered to be in a good condition and classified as mostly natural with few modifications (Nel *et al*. 2011). The Silwerstroom River originates amongst the dunes of Ganzekraal and drains in a south-westerly and then north-westerly direction towards the coast and into the ocean at Silwerstroomstrand as a micro estuary. The seasonal Modder River does not originate

within the Ganzekraal Conservation Area, but enters the ocean just north of Ganzekraal. Several other non-perennial streams originate within Ganzekraal, and all drain towards the ocean. Most of the Ganzekraal Conservation Area falls within a National Freshwater Ecosystem Priority Area (NFEPA) (Nel *et al*. 2011a, 2011b) catchment, which includes the lower section of the Modder River.

3.8.1.3 Other freshwater aquatic systems (wetlands, springs, pans)

Wetlands in the Complex are mostly depressions, seepage areas and springs.

Mapped wetlands fall into the southwest Sand Fynbos wetland vegetation grouping. The majority of wetland types are considered to be Critically Endangered and poorly protected (Gouws *et al*. 2012; Nel & Driver 2012). Southwest Sand Fynbos depression wetlands are, however, considered Vulnerable and poorly protected (see Ollis *et al*. 2013 for wetland type descriptions). Due to the surrounding land uses and their position in the lowland landscape, the condition of wetlands in the Complex vary from good to degraded. Related hydrological impacts include inflow of impaired water quality and quantity from adjacent agricultural practices (*e.g.* Riverlands), overgrazing and trampling of wetland soils (*e.g.* Ganzekraal) and the encroachment of invasive alien vegetation, especially Port Jackson willow, *Acacia saligna*.

Wetlands are one of the most highly threatened freshwater ecosystems globally, especially those located in the lowland areas (Gouws *et al.* 2012; Gouws & Gordon 2017). Despite threat levels, wetlands remain the least studied and monitored freshwater ecosystem in South Africa. A greater understanding of the health of wetlands and other freshwater ecosystems in the Complex is thus necessary. It will make a substantial contribution to the National wetland inventory and to site level strategic adaptive management, since the Complex is located entirely within highly threatened lowland ecosystems, within a climate change corridor underpinned by the concept of 'catchment to coast'.

In light of the above the natural wetland ecosystems of the Complex are identified as a focal value. Ecological attributes associated with this value include the overall condition of wetlands (wetland health), intact wetland buffer zones, indigenous plant species composition, water quality and hydro period of selected wetlands. Refer to Section 4.2.2 for more information.

A baseline wetland assessment and further biomonitoring of selected wetland ecosystems is required for the Complex. A simplified version of the Wet-Health (McFarlane *et al*. 2008) assessment method is implemented in protected areas and assessments include aspects concerning the condition (see Table 3.3 for condition/category explanation) and extent of each selected wetland ecosystem, taking into account factors such as water source, basic soil characteristics and dominant plant community. With the additional very high threats imposed by the presence of invasive alien flora and other physical impacts, the vegetation structure of the buffer areas of wetland systems should be maintained as close to natural as possible, to at least 32 m and preferably more than 100 m.

Table 3.3. The combined Impact Scores and Present Ecological State categories used to describe the health/integrity of wetlands (Adapted from McFarlane *et al*. 2008)

Present Ecological State	Impact score	Description
A	0 – 0.9	Unmodified, natural.
B	1 – 1.9	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.
C	2 – 3.9	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.
D	4 – 5.9	Largely modified. A large change in ecosystem processes and loss of natural habitats and biota has occurred.
E	6 – 7.9	The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognisable.
F	8 – 10	Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.

3.8.2 Vegetation

The Core Cape Subregion (previously termed the Cape Floristic Kingdom) has a flora that differs sharply from the immediate surrounds (Manning & Goldblatt 2012). The immediate surrounds fall within the Extra Cape Subregion which includes the Tanqua, Western Mountain Karoo, Knersvlakte, Namaqualand Hardeveld, Namaqualand Sandveld, the Kamiesberg Mountains, Gariep and Southern Namib (Snijman 2013).

The Core Cape Subregion is one of the world's smallest but richest floral kingdoms, encompassing a land area of approximately 90 760 km² (less than 4% of the southern African subcontinent). An estimated 9 383 species of vascular plants (ferns and other spore-bearing vascular plants, gymnosperms, and flowering plants) are known to occur here, of which just over 68% are endemic. The majority of these species are flowering plants. The Core Cape Flora of the Greater Cape Floristic Region is characterised by six endemic or near-endemic families and by the conspicuous presence of Asteraceae and Fabaceae (two largest families), and the Iridaceae, Aizoaceae, Ericaceae, Proteaceae, and Restionaceae (Manning & Goldblatt 2012).

South Africa recognises that different ecosystems have different species compositions and to effectively conserve all biodiversity, the country has set different targets for each ecosystem. The biodiversity target is the minimum proportion of each ecosystem type that needs to be kept in a natural or near-natural state over the long term to maintain viable representative samples of all ecosystem types and the majority of species associated with those ecosystems. The biodiversity target is calculated based

on species richness, using species–area relationships, and varies between 16% and 36% of the original extent of each ecosystem type (Desmet & Cowling 2004).

Threat status is provided for each ecosystem according to three assessments (CapeNature 2016):

- The National Biodiversity Assessment (NBA) of 2011;
- CapeNature's 2014 assessment of criterion A1 (habitat loss);
- The highest status achieved in either the national assessment or CapeNature's 2016 assessment of criterion A1 (habitat loss). This latter category is considered the best available status for the Western Cape Province.

Lowland fynbos is restricted to the plains lying between the coast and the foothills of the mountains, throughout the Western Cape (Helme *et al*. 2016). The vegetation of the Complex represents a lowland fynbos mosaic predominantly comprised of Sand Fynbos, Renosterveld, Strandveld, and Cape Seashore vegetation (see Table 3.3). The Complex contributes to regional biodiversity targets.

Riverlands is dominated by variable Atlantis Sand Fynbos with Renosterveld influences while Ganzekraal comprises Atlantis Sand Fynbos, Swartland Shale Fynbos, Strandveld and Cape Seashore vegetation. Riverlands is quite exceptional in the CFR and has the greatest concentration of threatened plant species of any CapeNature reserve – over 100 Red List species (R. Koopman & N. Helme pers. comm.). The sensitive island ecosystem of Dassen Island comprises disturbed Cape Seashore Vegetation. Much of the Renosterveld, predominantly at Ganzekraal, is disturbed due to historic farming practices, however it is still ecologically important as its deep sandy clay ecotonal areas harbour unique species - refer to Appendix 2, Map 5. Critical threats, discussed in Section 2.5 and 4.3, include alien invasive flora and an inappropriate fire regime. Refer to Appendix 2, Map 6 and Map 7.

Table 3.4. Vegetation Types of the Dassen Coastal Complex

Vegetation Type	WC Provincial Protection Target (ha)	% of WC target under CapeNature management	Ha Under CapeNature management	Endangered Ecosystem Threat Status
Atlantis Sand Fynbos	20649.36	24.8	5133.16	CR (D1)[1]
Cape Flats Dune Strandveld	9360.65	6.3	589.54	EN
Cape Seashore Vegetation	192.03	5.1	9.85	LT
Langebaan Dune Strandveld	7579.71	1.1	83.98	LT
Swartland Granite Renosterveld	24803.22	0.03	6.68	CR (A1[2] & D1)
Swartland Silcrete Renosterveld	2632.39	0.63	16.69	CR
Swartland Shale Renosterveld	128758.11	0.08	97.19	CR (A1 & D1)

[1] CR (D1): Threatened plant species associations – ≥ 80 threatened Red Data List plant species
[2] CR (A1): Irreversible loss of natural habitat – remaining natural habitat ≤ biodiversity target

Atlantis Sand Fynbos Critically Endangered (D1)

The Complex includes 24.8% of the provincial biodiversity target which comprises 19.3% of the remaining extent of this vegetation type.

Atlantis Sand Fynbos is characterised by moderately undulating to flat sandy plains with a dense, moderately tall, ericoid shrubland dotted with emergent, tall sclerophyllous shrubs and an open, short restioid stratum. Restioid and proteoid fynbos are dominant, with asteraceous fynbos and patches of ericaceous fynbos in seepages (Rebelo *et al.* 2006).

Atlantis Sand Fynbos contains high numbers of threatened and endemic species. New species and distributions are often recorded. There are significant variations in the vegetation communities, with clay and gravel-based seasonal wetlands (with some saline patches) being an outstanding feature of Riverlands Nature Reserve. Many of the endemics are restricted to these patches and the areas immediately adjacent to them. The edges of the wetlands are often well-delineated by Proteaceae,

Leucadendron corymbosum and *Leucadendron cinereum* being key markers in clay and sandy wetland areas, respectively. The depth of sand overlaying the various clays (whether shale, ferricrete, granitic or silcrete in origin) is influential in determining composition of the vegetation communities, resulting in high species turnover.

The majority of Atlantis Sand Fynbos in the area occurs on deep white sands of the Complex, as represented by Ganzekraal, which are ideal for groundwater recharge. Atlantis Sand Fynbos transitions into Strandveld near the coast, evidenced by fewer Proteaceae, Ericaceae and other typical fynbos species.

Sand Fynbos is characterised by species that are fire-dependent, *e.g*. Proteaceae. Some species, such as short-lived *Diastella proteoides* and re-seeding *Serruria*, are useful indicators of veld senescence.

Given that aquifer health is a strong focus of the Complex, and that continued abstraction of groundwater will occur on land within and adjacent to the protected areas, two easily identifiable perennial species that can be used as early warning systems in the Ganzekraal Conservation Area are *Serruria decipiens* and *Diastella proteoides.*

Swartland Shale Renosterveld Critically Endangered

The Complex includes 0.07% of the provincial biodiversity target which comprises 0.3% of the remaining extent of this vegetation type.

Swartland Shale Renosterveld is characterised by moderately undulating plains and valleys supporting low to moderately tall leptophyllous shrubland of varying canopy cover, as well as low, open shrubland dominated by renosterbos, *Elytroppapus rhinocerotis*. Heuweltjies are a very prominent local feature of the environment. Stunted trees and thicket are often associated with the heuweltjies. Disturbed areas are dominated by *Athanasia trifurcata* and *Otholobium hirtum*. Patches of *Cynodon dactylon* 'grazing lawns' also occur in abundance (Rebelo *et al.* 2006).

This vegetation type has the highest concentration of threatened species of any South African vegetation type (SANBI 2018). Approximately 70% of the Swartland Shale Renosterveld present in the Complex is degraded due to historic farming practice. The areas north and east of the Ganzekraal homestead that were previously ploughed have been colonised by annuals, largely daisies. These areas should be restored.

Some level of (strictly managed) grazing might also be required, as it is likely that this vegetation held relatively high numbers of game in pre-colonial times.

Swartland Granite Renosterveld Critically Endangered

The Complex includes 0.02% of the provincial biodiversity target which comprises 0.06% of the remaining extent of this vegetation type.

Swartland Granite Renosterveld is characterised by moderate foot slopes and undulating plains supporting a mosaic of grasslands/herblands and medium dense, microphyllous shrublands dominated by renosterbos. Groups of small trees and tall

shrubs are associated with heuweltjies and rocky outcrops. The boundary with Boland Granite Fynbos is diffuse and patchy (Rebelo *et al.* 2006). Higher slopes in the Complex have strong granite fynbos elements but these fall outside of the Complex management zone.

Swartland Silcrete Renosterveld Critically Endangered

The Complex includes 0.6% of the provincial biodiversity target which comprises 2.54% of the remaining extent of this vegetation type.

Swartland Silcrete Renosterveld is characterised by moderately undulating lowlands, often on elevated areas. An open, low, cupressoid- and small-leaved, low to moderately tall shrubland with many succulents is dominated by renosterbos (Rebelo *et al.* 2006).

Cape Flats Dune Strandveld Endangered

The Complex includes 6.2% of the provincial biodiversity target which comprises 3.9% of the remaining extent of this vegetation type.

Cape Flats Dune Strandveld is characterised by flat to slightly undulating (dune fields) landscape covered by tall, evergreen, hard-leaved shrubland with abundant grasses and annual herbs in shrubland gaps (Rebelo *et al.* 2006).

Langebaan Dune Strandveld Least Threatened

The Complex includes 1.1% of the provincial biodiversity target which comprises 0.31% of the remaining extent of this vegetation type.

Langebaan Dune Strandveld is characterised by flat to slightly undulating old coastal dune systems and stabilised inland duneveld supporting closed, evergreen, up to 2 m tall, sclerophyllous shrubland with prominent annual herbaceous flora occurring in gaps (and forming spectacular displays, especially after good rain in late winter) (Rebelo *et al.* 2006).

Cape Flats Dune Strandveld and Langebaan Dune Strandveld have an interesting relationship with the adjacent Atlantis Sand Fynbos. Unlike the Renosterveld / fynbos ecotones in the greater DCCP area, which tend to be quite well defined, fynbos and strandveld have a broad, almost imperceptible grading into each other. In several areas, some fynbos elements (such as *Leucospermum*) reach almost all the way to the coast. From a fire management perspective, this could mean that these areas are adapted to sporadic fire but not at the same frequency as the adjacent fynbos. The areas of the Complex which have been fenced for game range from Atlantis Sand Fynbos into this broad ecotone and Strandveld proper. It would be useful to establish grazing exclosure and repeat photography programmes to monitor the effect of grazing on this ecotonal system.

Cape Seashore Vegetation Least Threatened

The Complex includes 5.1% of the provincial biodiversity target which comprises 1.3% of the remaining extent of this vegetation type.

Cape Seashore vegetation is characterised by beaches, coastal dunes, dune slacks and coastal cliffs of open grassy, herbaceous and to some extent also dwarf shrubby (sometimes succulent) vegetation often dominated by a single pioneer species. Various plant communities reflect the age of the substrate and natural disturbance regime (moving dunes), distance from the upper tidal mark and the exposure of dune slopes (leeward vs seaward) (Rebelo *et al.* 2006). Cape Seashore Vegetation comprises Dassen Island and small pockets along the Ganzekraal coastline (Mucina *et al*. 2006).

The vegetated environment of Dassen Island is driven by the effects of the large seabird colonies, directly in the form of trampling, and indirectly due to the high levels of nutrients in the guano. Relentless wind and frequent sea storms also influence the vegetation. Consequently, the flora that has developed on the island has had to be tolerant of the above factors. The vegetation of the island is highly ephemeral, with dramatic seasonal changes in the distribution of vegetation communities. Species include succulent shrubs such as *Tetragonia fruticosa* and *Tetragonia decumbens,* herbs such as *Senecio elegans* and *Senecio glutinarius* and geophytic herbs such as *Trachyandra divaricata.*

3.8.3 Marine and Coastal Systems

The West Coast of South Africa is influenced by the cold, upwelling Benguela current. Nutrient-rich upwelled waters fertilise floating phytoplankton. Both phytoplankton and seaweeds are far more productive on the West Coast than on the South and East coasts, and fuel more productive food-chains, supporting the lucrative fisheries that are concentrated on the West coast. Although productivity is high on the West coast, there are far fewer species than the East coast. The large populations of plankton support large, offshore stocks of pelagic fish such as pilchard, *Sardinops sagax*, and anchovy *Engraulis capensis*, which are in turn preyed upon by marine predators such as seabirds and fish such as snoek, *Thyrsites atun*.

Coastlines of the Complex are characterised by exposed to sometimes exposed rocky shores, interspersed with pockets of sandy shores subjected to high-energy wave action. Offshore rocky outcrops are also a feature. Sandy shores are wave-dominated and extensive beaches such as Silwerstroomstrand at Ganzekraal can be classified as dissipative. The sandy beach at Silwerstroomstrand is one of 28 beaches in the Western Cape that has been awarded Blue Flag status, an international accreditation awarded to beaches that display excellence through meeting criteria covering four categories: environmental education and information, water quality, environmental management, and safety and services (WESSA 2018). The sandy beach at House Bay on the northern side of Dassen Island is protected, experiencing wave action only during strong winter storms. Remaining beaches of the Complex can be considered intermediate, with steeper shorter gradients, and are comprised of shell or pebbles or boulders. Seal Ledges is comprised solely of exposed rocky substrate.

The aquatic marine flora of the Complex is largely dominated by kelp forest and consists of three main species, namely sea bamboo, *Ecklonia maxima*, split fan kelp,

Laminaria pallida, and spined kelp, *Ecklonia radiata*. Species closely associated with the kelp forest are the West Coast rock lobster, *Jasus lalandii,* and abalone, *Haliotis midae*. Both species face extinction risk from over exploitation and diminished recruitment (Cockcroft *et al*. 2008). The nearshore environment around Dassen Island affords these species a level of protection, although poaching is a major pressure in the coastal waters of the Complex.

Intertidal communities supported by the Complex are typical of the West Coast, representing the five characteristic zones. These include:

- The Littorina: highest and most barren zone on the shore, inhabited only by the small, air breathing Littorina snails and the very hardy seaweed, *Porphyra* spp.
- The Upper Balanoid: few algae present in this zone, except for the bright green sea lettuce *Ulva* spp; small barnacles are more visible.
- The Lower Balanoid: supports thick beds of algae, particularly *Gigartina* species.
- The Cochlear: relatively barren, except for dense populations of the limpet, *Patella cochlear.*
- The Infratidal: lowest region on the shore; also the richest in plant and animal life.

The marine and coastal components of the Complex lie within the Southern Benguela Ecoregion, of which several habitat types, predominantly coastal habitat types, are threatened (Sink *et al*. 2012). For this management plan, marine ecosystems are defined according to Ecosystem Type as per the NBA (SANBI 2018 in prep.) and Threat Status as per the NBA of 2011 (Driver *et al*. 2012).

The Ganzekraal Conservation Area comprises threatened marine ecosystems such as the Endangered Cape Exposed Rocky Shore, Critically Endangered Cape Sheltered Rocky Shore and Vulnerable Cape Mixed Shore. Beaches comprise Southern Benguela Dissipative Sandy Shore, classified as Least Threatened and Cape Frontal Dunes, also Least Threatened (SANBI 2018 in prep.).

Dassen Island comprises the Endangered Cape Island Shore, and Cape Kelp Forest ecosystems. Seal Ledges is classified as Cape Kelp Forest (SANBI 2018 in prep.). Islands and their associated subtidal habitats are recognised as distinct habitat types due to the dominance by land-breeding marine predators and associated unique features, including those related to nutrient input (*e.g.* from guano) and predation pressure (*e.g.* trophic interactions between seabirds, seals and sharks; Williams *et al*. 2000). Intertidal and subtidal biota around islands thus differ from shores of nearby mainland areas (Bosman & Hockey 1986; Williams *et al*. 2000).

Islands are classified as ‘major’ or ‘minor’ depending on the size of the island and the permanence and density of seabird colonies. Species habitat interactions create an associated ‘zone of island influence’ that result from the biotic interactions from nutrient inputs and trophic responses from seabirds (marine predators). Dassen Island is classified a ‘major’ island, based on its size and conservation importance as a permanent and densely populated seabird colony (special importance is given to the

colonies of African penguin and bank cormorant). It is therefore buffered by a 20 km 'zone of island influence'. Seal Ledges is classified a 'minor' island due to its small size and low numbers of breeding seabirds, and is thus buffered by a 10 km 'zone of island influence (Sink *et al*. 2012).

The marine environment off Dassen Island and Seal Ledges and extending towards the mainland is comprised of the Cape Sandy Inner Shelf, classified as Least Threatened. The Cape Sandy Inner Shelf meets the marine and coastal habitat of Ganzekraal. The latter is comprised of Cape Kelp Forest, Cape Exposed Rocky Shore, Cape Mixed Shore, Southern Benguela Dissipative Sandy Shore, and Cape Frontal Dune (SANBI 2018 in prep.).

Dassen Island contributes to the protection of four habitat types, including the Cape Sandy Inner Shelf and the Endangered habitat types Cape Rocky Mid Shelf Mosaic, and Cape Island Shore, and the Cape Kelp Forest. Dassen Island also contributes to the protection of threatened species, providing breeding habitat for Cape and bank cormorants and African penguins, and offshore foraging for Cape gannets (Majiedt *et al*. 2013).

Several marine predator species that breed in the Complex (*e.g*. African penguin, great white pelican and the four marine cormorant species) have trans-national distributions and move between the Benguela Current Commission (BCC) countries (BCC 2008). As top predators, these species play an important role in the marine food web (Kirkman 2007). Recent changes in the distributions of some seabird species in the Benguela system are thought to reflect changes in prey distribution induced by climate change and fisheries activities (Crawford et al. 2015). Changes in numbers, distribution or other characteristics of top marine predators are frequently symptomatic of changes occurring at lower trophic levels. An ecosystem approach towards fisheries management is of great value, and is increasingly being adopted in the Benguela region (Roux & Shannon 2004, Shannon & Moloney 2004). Integral to this approach is the consideration of detrimental interactions between fisheries and non-target species (including top predators), and the prevention or mitigation of such interactions where possible (Kirkman 2007).

Fishing is the greatest threat to marine biodiversity due to over-exploitation, bycatch (*e.g.* of seabirds through longlining) and habitat damage (*e.g.* through demersal trawling). Poaching is widespread and threatens resource sustainability and livelihoods of legitimate fishers (Sink *et al.* 2012).

In the Complex, inappropriate coastal development, uncontrolled recreation activities, illegal use off-road vehicles, pollution, and climate change threaten beaches, dunes, other coastal habitats and their underlying processes, disrupting critical ecosystem services. Ecosystem services include protection from large waves associated with extreme weather events, provision of a reserve supply of sand in the dunes to maintain beaches, water filtration and nutrient cycling, provision of critical nursery areas for important fish species and opportunities for tourism and recreation (Sink *et al*. 2012).

The management of marine and coastal environments is complex due to the regulatory division of several entities responsible for the management of marine and coastal systems. Responsible management of natural resources and marine and coastal ecosystems requires collaboration and cooperation between entities. Poaching is considered one of the greatest pressures on the marine resources associated with the mainland. The possibility of an oil spill is perceived as a significant threat posed by shipping and the petroleum industry to marine and coastal systems. The probability of this occurring is generally considered to be low, although the environmental consequences of oil spills are severe (Sink *et al*. 2012), as illustrated by the Treasure Oil spill of 2000. Coordinated rapid response is necessary.

A focus area for the marine component of the Complex is to develop mechanisms to promote and encourage responsible and sustainable utilisation of marine resources within the 500 m marine zone surrounding Dassen Island and along the Ganzekraal coastline. These mechanisms require high-level engagement with entities such as DEA and DAFF. Formal conservation status, especially for the Dassen Island 'zone of island influence', should be pursued to ensure protection of this Endangered ecosystem and the associated pelagic fish and resident predators. The African penguin Biodiversity Management Plan for Species (BMP-s) proposes the delineation of Special Management Areas around existing, new and re-stablished penguin colonies and at feeding grounds (DEA 2018 in prep.).

The establishment of long-term site-level monitoring across broad ecosystem groups aligned to national processes is necessary to calibrate the assessment of national ecosystem condition. This will require collaboration with relevant entities and data can inform responses to emerging impacts at the regional scale. There is a need for improved coordination and collaboration in the collation and management of marine biodiversity data, and also data sharing to catalyse application and data security (Sink *et al.* 2012). Opportunities exist for stakeholders to contribute to the assessment and conservation of marine biodiversity. Collaborative mainstreaming initiatives, participatory research and citizen science initiatives can help to improve public participation.

3.9 Biodiversity Context: Taxa

3.9.1 Amphibians

Nine amphibian species have been recorded in the Complex. There have been several 'Bioblitz' surveys conducted in the area during recent years and the list of species for this Complex is probably largely complete. However, the identification of a small caco, thought to be the Klipheuwel caco, *Cacosternum aggestum*, should be verified (see Channing *et al.* 2013). No species are threatened.

The Cape caco, *Caocsternum capense,* is listed as Near Threatened (IUCN 2018). The Complex is on the periphery of this frog's relatively extensive distribution range and provides it with limited suitable habitat: only two localities were confirmed in 1976 and 1980, both near Mamre. Its current status in the Complex is unknown and there

have been no systematic surveys of this species since the early 2000s. Although the Cape caco has adapted to surviving in cultivated lands and pastures, its long-term survival in such regularly disturbed habitat is not ensured. The Near Threatened Cape rain frog, *Breviceps gibbosus*, has been recorded close to the Complex in the Dassenberg area, and should be included in future baseline surveys.

The conservation of amphibians in the Complex is reliant on ensuring the persistence of wetland breeding habitat and sufficient surrounding foraging and sheltering habitat. This will require responsible abstraction of surface and near-surface ground water, and management of large mammal stocking densities.

The conservation of amphibians will also require the effective control of invasive alien woody plant species and an appropriate fire-return interval. These management actions should be sufficiently measured and monitored under the vegetation and fire indicators to ensure persistence of the amphibian diversity in the Complex.

At this stage, only baseline data collection for continued presence of amphibians is indicated.

3.9.2 Reptiles

The Complex has a relatively rich reptile fauna with 38 reptile species recorded to date. 'Bioblitz' surveys during recent years have contributed to the species list, but it is possible that several more reptile species occur in the area, and standard surveillance surveys could eventually bring these to light. Possible additions include two Near Threatened (IUCN Red List) species recorded about 15 km to the north of the Complex in the coastal zone: the large-scaled girdled lizard, *Cordylus macropholis,* and Kasner's dwarf burrowing skink, *Scelotes kasneri*.

Three of the recorded species are endemic and listed as globally Threatened on the IUCN Red List (Bates *et al*. 2014) and two species are listed as Near Threatened, namely Gronovi's Dwarf Burrowing Skink, *Scelotes gronovii,* and the Tableview Dwarf Burrowing Skink, *Scelotes montispectus*.

Reptile species listed as Vulnerable and Critically Endangered are listed in Table 3.5.

Table 3.5. Reptile species of conservation concern that occur on the Dassen Coastal Complex

Species	Common Name	IUCN Category (2016)
Bitis armata	Southern adder	Vulnerable
Psammophis leightoni	Cape sand snake	Vulnerable
Psammobates geometricus	Geometric tortoise	Critically Endangered

The Cape sand snake, *Psammophis leightoni,* is currently listed as Vulnerable although there are still some unresolved taxonomic questions for this species. There is a single record from the Complex of the southern adder, *Bitis armata*, also listed as Vulnerable. Further records of the southern adder from targeted surveillance surveys

would aid understanding the habitat requirements of this species and help to determine whether the Complex is providing significant protection to this species.

The geometric tortoise, *Psammobates geometricus,* was recorded in the Riverlands and Koeberg Nature Reserves during the early 1990s. However, the Complex only has marginal habitat for this species and records are based on relatively few individuals. A combination of restricted habitat, invasive alien vegetation and too frequent fires may have led to the extinction of the Riverlands population. Although two adults of the Koeberg population were observed during the mid-2000s, the current status of this population is unknown. The occurrence of geometric tortoise populations elsewhere in the Complex is unlikely.

The hawksbill sea turtle, *Eretmochelys imbricata,* has been recorded along the coast of the Complex. This species is listed as Near Threatened in South Africa, and Critically Endangered globally. Protection of this species relies on responsible fishing practice since turtles can be trapped by fishing nets and lines, and drown. Reducing plastic waste reaching the ocean will reduce the threat of ingestion and entanglement. Keeping the shore clean and free of litter should be a standard management objective, and should be facilitated by rigorous waste management and regular beach clean-ups (an opportunity for citizen engagement for a worthwhile cause).

Dassen Island contains by far, the densest population of angulate tortoises, *Chersina angulata*, throughout its distribution range.

The conservation of terrestrial reptiles in the Complex is reliant on ensuring the effective control of invasive alien woody plant species, maintaining appropriate fire-return intervals and preventing too much (>25%) of the reserve burning in any one fire event. These management actions should be sufficiently measured and monitored under the vegetation and fire indicators to ensure persistence of the reptile diversity in the Complex.

3.9.3 Fish

Fish species recorded in waters around Dassen Island and at Ganzekraal along with their IUCN (2018) status are listed in Table 3.6. Species predominantly caught off Dassen Island include snoek, *Thyrsites atum*, yellowtail, *Seriola lalandi,* galjoen, *Dichistius capensis* and Hottentot, *Pachymetopon blochii*. Fish species caught mainly from the coast of Ganzekraal include kob (kabeljou), *Argyrosomus japonicas*, white steenbras, *Lithognathus lithognathus*, white stumpnose, *Lithognathus lithognathus*, guitar fish (various species), galjoen and Hottentot. Threats are related to unregulated utilisation and indiscriminate fishing practices, which result in by-catch and entanglement or drowning of marine predators.

Table 3.6. Fish species recorded in waters around Dassen Island Nature Reserve and at the Ganzekraal Conservation Area

Species	Common Name	IUCN Status (2018)
Galeorhinus galeus	Soupfin shark	Vulnerable
Galeichthys feliceps	White sea catfish	Not Listed
Alopias vulpinus	Thresher shark	Vulnerable
Poroderma patherinum	Leopard catshark	Not listed
Poroderma africanum	Pyjama catshark	Near Threatened
Eptatretus hexatrema	Six-gill hagfish	Least Concern
Sardinops sagax	Sardine	Not listed
Engraulis encrasicolus	Cape anchovy	Not listed
Chrysoblephus laticeps	Red Roman	Near Threatened
Thyrsites atum	Snoek	Not listed
Seriola lalandi	Giant Yellowtail	Not assessed
Argyrosomus japonicus	Kob	Not assessed
Mugil cephalus	Flat head mullet	Least Concern
Clinus agills	Agile klipfish	Not listed
Clinus cottoides	Bluntnose klipfish	Least Concern
Clinus superciliosus	Super klipfish	Least Concern
Clinus venustris	Speckled klipfish	Least Concern
Muraenoclinus dorsalis	Nosestripe klipfish	Least Concern
Pavoclinus graminis	Grass klipfish	Least Concern
Lithognathus lithognathus	White steenbras	Endangered
Rhabdosargus globiceps	White stumpnose	Vulnerable
Pachymetopon blochii	Hottentot	Least Concern
Dichistius capensis	Galjoen	Not assessed

The Diep River has two native freshwater fish species, the Cape galaxias, *Galaxias zebratus,* and the Cape kurper, *Sandelia capensis*. There is evidence for the presence of *G. zebratus* within the Silwerstroom River. Both these species are endemic to the Cape Fold Ecoregion (CFE), which is one of the six aquatic ecoregions of Southern Africa (Skelton 2001; Abell *et al.* 2008). Historically, both species were believed to be a single species with a wide natural distribution range and some morphological variation. Molecular-based studies have, however, illustrated the presence of genetically unique lineages within both these species. Waters and Cambray (1997) initiated the first molecular study on a freshwater fish of the CFE and presented evidence for unique lineages within *G. zebratus.* This has been supported by Van Niekerk (2004) and Wishart *et al.* (2006).

Similarly, the study of Roos (2004) illustrated that *S. capensis* appears to be a species complex with a number of lineages present in the CFE. Subsequent research by

Chakona *et al.* (2013) presented evidence for the existence of nine deeply divergent lineages within *G. zebratus* and provided distribution data for several of these lineages. These authors also identified two deeply divergent lineages in *Sandelia capensis* along with seven minor lineages within the CFE. As a result of these and other ongoing studies, both *G. zebratus* and *S. capensis* are undergoing major taxonomic revision and are listed as Data Deficient in terms of their conservation status (Tweddle *et al.* 2009).

While the status of some of these individual lineages has been assessed, the future survival of several is uncertain. This is largely due to the small geographic ranges of lineages and, in the case of *S. capensis*, restriction to lower reaches of mountain tributaries and associated increasing exposure to multiple anthropogenic pressures.

There are no fish distribution records for the Groen River tributary of the Diep River on Riverlands Nature Reserve. Distribution records exist outside Riverlands for both *S. capensis* and *G. zebratus* species within the main Diep River, downstream of Malmesbury. The Diep River is of conservation importance as it is home to a unique lineage of *S. capensis* (Roos 2004) and because three sub-quaternary catchments within the Diep River system have been listed as fish sanctuaries in the NFEPA project (Nel *et al.* 2011a).

A single distribution record exists for *G. zebratus* in the Silwerstroom River in the Ganzekraal Conservation Area.

The primary threats to *S. capensis* and *G. zebratus* are alien invasive fish and habitat destruction. Vectors for initial non-indigenous fish introductions into South Africa include recreational angling, aquaculture, and biological control. Additional pathways of introduction include the ornamental trade, inter-basin transfers and conservation translocations (Ellender & Weyl 2014). Non-indigenous fish species affect indigenous fishes through predation, habitat alteration, competition for resources, the introduction of diseases and the disruption of ecological processes (De Moor & Bruton 1988).

Land use activities such as wheat, orchard and vineyard cultivation and livestock farming (RHP 2003) within the catchment also pose a threat to indigenous fish through abstraction of water. Water quality is affected through agrichemicals and other point source and diffuse pollution sources.

In terms of threat mitigation and management interventions, very little can be done within Riverlands Nature Reserve as the freshwater fish occur downstream of the reserve boundary. With regard to supporting ongoing taxonomic research, DNA samples and voucher material should be collected from all *G. zebratus* populations within and associated with the Complex to determine the taxonomic status of these populations.

3.9.4 Mammalian Fauna

Based on historical and current accounts, there are 73 terrestrial and 25 marine mammal species, including 10 locally extinct and four introduced species, in the Complex (Birss 2017). Of the extant species, at the regional level, two are IUCN Red

Listed as Vulnerable and six as Near Threatened. See Table 3.7 for the list of Threatened, endemic and Conservation Dependent mammal species for the Complex.

Table 3.7. Threatened, Endemic and Conservation Dependent Mammal species and ecotypical game species that occur on the Dassen Coastal Complex

Species	Common Name	Regional IUCN Category (2016)	Level of Endemism
Mystromys albicaudatus	White-tailed mouse	Vulnerable	
Miniopterus schreibersii	Schreiber's long-fingered bat	Near Threatened	
Poecilogale albinucha	African striped weasel	Near Threatened	
Aonyx capensis	African clawless otter	Near Threatened	
Parahyaena brunnea	Brown hyaena	Near Threatened	
Acomys subspinosus	Cape spiny mouse	Least Concern	WCP[1] endemic
Bathyergus suillus	Cape dune molerat	Least Concern	WCP[1] endemic
Gerbilliscus afra	Cape gerbil	Least Concern	WCP[1] endemic
Raphicerus campestris	Steenbok	Least Concern	
Raphicerus melanotis	Cape grysbok	Least Concern; Conservation Dependent	WCP[1] near-endemic
Sylvicapra grimmia grimmia	Common duiker	Least Concern	
Pelea capreolus	Grey rhebok	Near Threatened	
Balaenoptera edeni	Bryde's whale	Vulnerable	
Megaptera novaeangliae	Humpback whale	Near Threatened	

[1] Western Cape Province

The white-tailed mouse, *Mystromys albicaudatus,* has a widespread but patchy and fragmented distribution across South Africa. Persistence of populations within the Complex requires confirmation through *ad hoc* surveys. The species appears to have a preference for microhabitats and transitory habitats post fire. The white-tailed mouse is considered rare. Further field surveys are needed to estimate population sizes and trends of these species more accurately (Avenant *et al*. 2016).

The Cape clawless otter, *Aonyx capensis,* occurs in all major drainage systems and is affected by riparian habitat transformation, pollution and disturbance (Okes *et al*. 2016). Density estimates are required from across the species' range to calculate overall population size in order to monitor the long-term effects of riparian habitat degradation.

Numbers of the African striped weasel, *Poecilogale albinucha,* are reported to have declined in the rest of South Africa but appear to have increased in the Western Cape Province. The current area of occupancy, densities and home range sizes should be determined (Child *et al*. 2016).

Generally, threats to mammals within the Complex are considered to be low. Poaching of mammals could have a localised negative impact on certain mammal species. Of specific concern is the illegal hunting of small antelope using methods such as snares and dogs.

The 2016 Regional IUCN Red Listing process highlighted a lack of good quality data for monitoring the trends of several species, particularly small mammals (Child *et al*. 2016). CapeNature has identified small mammal priorities for which representative distribution data are inadequate to assess the conservation status (Birss 2017). Of the priority small mammals, the Cape spiny mouse, *Acomys subspinosus*, the Cape dune molerat, *Bathyergus suillus*, the Cape gerbil, *Gerbilliscus afra,* and the Cape molerat, *Georychus capensis,* occur in the Complex. The collection of field data for these species will require different approaches and are to be guided by ethical and responsible methods, particularly since these species are difficult to collect via trapping. The collection of owl pellets from *Tyto* species is contributing to the development of a Rodent Cranio-dental Key, however some focussed small mammal field surveys are still recommended for the Cape spiny mouse and the white-tailed mouse in the Complex.

Riverlands Nature Reserve and Ganzekraal Conservation Area maintain registers aimed at monitoring population trends for game and domestic species. Population trend data are not yet available, however the registers adequately reflect the presence and persistence of most listed species. Refer to Table 3.8 for reserves indicating presence and total population estimates of domestic and game species.

Small antelope species, such as Cape grysbok, *Raphicerus melanotis*, steenbok, *Raphicerus campestris,* and common duiker, *Sylvicapra grimmia grimmia,* occur naturally in the landscape and generally exhibit unimpeded dispersal. These species are important indicators of the overall ecological state of the Complex. Their persistence is indicative of resilience against urban edge effects, however, the they may be affected by poaching. Presence and persistence of these species are inferred through monitoring, spatial distribution data and natality observations.

In the absence of conducting precision counts, spatial population density indications are determined through focussed seasonal observations to maintain population trend data (Table 3.8). The current estimates inform a baseline against which future data will be compared to establish whether the population is stable, declining or increasing. This potentially provides an indicator for monitoring the state of terrestrial habitat condition in the Complex. Where these small antelope species survive and breed, it can be inferred that there are sufficient resources (mate availability, forage, shelter and territory size) and that the ecosystem is sufficiently large, continuous and balanced.

Cape grysbok, a near endemic to the Cape Floristic Region, is primarily associated with the Fynbos Biome and primarily regarded as a browser (Palmer *et al*. 2016a). The register data indicate that Cape grysbok has only been observed on Ganzekraal, and there is no evidence of persistence of the species there.

Grey rhebok, *Pelea capreolus,* a South African endemic species, has declined nationally and is listed as Near Threatened. Grey rhebok are generally associated with the rocky hills of mountain fynbos, are predominantly browsers, feeding on ground hugging forbs, and are independent of the availability of open water sources. (Taylor *et al*. 2016). Grey rhebok has also only been observed at the Riverlands Nature Reserve.

Steenbok, observed throughout the Complex, are well adapted to a range of habitat types but tend to favour heavily grazed regions with high concentrations of forbs. They are important for seed dispersal. Steenbok are susceptible to predation by domestic dogs and snaring which can result in local declines (Palmer *et al*. 2016b).

Table 3.8. Game and domestic species recorded for the Dassen Coastal Complex

Reserve Parcel	Cattle	Donkey	Horse	Goat	Ostrich	Cape grysbok	Common duiker	Grey rhebok	Steenbok
Ganzekraal	x	x	x	x	x	x	x	x	x
Riverlands	x		x				x		x
Estimated Total	686	16	434	59	111	1	25	1	36

The European rabbit, *Oryctolagus cuniculus*, which was introduced to Dassen Island, is regarded as being one of the world's five worst alien invasive species. Feral populations of rabbits have a devastating impact on any natural environment in that they compete with indigenous wildlife, damage vegetation and degrade the land (Birss 2017). The impact of rabbits on Dassen Island requires investigation. However, rabbits die off during the summer months when water is scarce and are preyed upon by kelp gull, *Larus dominicanus vetula* and great white pelican, *Pelecanus onocrolatus,* potentially relieving predation pressure on African penguin or other threatened seabirds (J. Visagie pers. comm.).

Cattle, horses, donkeys, goats, dogs, cats and the house mouse are present in the Complex. Wildlife management and associated influences between neighbouring game and livestock farming practices and the Complex, are discussed in Section 4.9 Zone of Influence: Protected Area Mainstreaming and Integration.

3.9.5 Avifauna

The Complex represents a variety of bird communities across local climate gradients from the marine and coastal habitats of offshore Dassen Island and Ganzekraal to the inland koppies of the Dassenberg Hills and Riverlands in the east. To date, 232 bird species have been recorded in the Complex. Several species, mostly sea and / or coastal birds, have low reporting rates. These birds are either pelagic, forced closer

to the shore during stormy weather, or vagrants that arrive along the coast of South Africa.

Although wetlands are seasonal and not ideal water bird habitat, a number of water bird species have been recorded in the Complex, several with very high reporting rates. It is probable that these birds are using wetlands in the surrounding areas. Despite fynbos vegetation covering a significant portion of the complex, only two of the fynbos endemic species, orange-breasted sunbird, *Anthobaphes violacea,* and Cape sugarbird, *Promerops cafer,* have been recorded. The other five fynbos endemics prefer more mountainous terrain (Hockey *et al*. 2005), which is not a feature of the Complex.

Table 3.9 presents a list of threatened species (regional and/or global listings) that have been recorded within the Complex. Species marked with an asterisk (*) are either vagrants to South Africa and therefore also to the Complex (*e.g.* red knot, *Calidris canutus,* and bar-tailed godwit, *Limosa lapponica*), or occur in habitats adjacent to the protected areas such as deep sea habitat (black-browed albatross, *Thalassarche melanophris,* and sooty shearwater, *Puffinus griseus*), wetlands (maccoa duck, *Oxyura maccoa,* and lesser flamingo, *Phoenicopterus minor)* and cultivated areas (blue crane, *Anthropoides paradiseus*). A number of threatened species (*e.g.* secretary bird, *Sagittarius serpentarius,* and peregrine falcon, *Falco peregrinus*) occur at low densities as evidenced by low reporting rates (South African Bird Atlas Project SABAP2, http://sabap2.adu.org.za/).

In terms of the threatened terrestrial species, the Complex is important for black harrier, *Circus maurus,* and southern black korhaan, *Afrotis afra*. The average reporting rate for the black harrier within the complex as determined by the SABAP2 is in the order of 12%. Taylor (2015) assigned reporting rates of 5% or more as high-density areas for this species. The average reporting rate for the Southern black korhaan is just under 12%. Hofmeyer and Taylor (2015) indicate that the Complex sits within an area where this species occurs at relatively high densities. Both the Southern black korhaan (Cohen *et al.* 2003) and the black harrier (Curtis *et al*. 2004) show a strong preference for naturally vegetated areas and their population declines are attributed mostly to land transformation (Taylor 2015; Hofmeyer & Taylor 2015).

In the Fynbos Biome the southern black korhaan shows a preference for Renosterveld and strandveld (Allan 1997). In the Western Cape the black harrier occurs mostly in the fynbos, especially strandveld and mountain fynbos (Curtis *et al*. 2004). The Complex and surrounding intact landscape is therefore of considerable importance for these two species.

There are a number of threatened seabird species occurring within the Complex namely the African penguin, *Spheniscus demersus*, bank cormorant, *Phalacrocorax neglectus*, crowned cormorant, *Phalacrocorax coronatus*, Cape cormorant, *Phalacrocorax capensis,* and Leach's storm petrel, *Oceanodroma leucorhoa.* The great white pelican, *Pelecanus onocrolatus*, is also threatened. While some of these species utilise the coast of the Ganzekraal Conservation Area, it is on Dassen Island

where these species occur in substantial numbers and breed. Birds dominate the vertebrate fauna of Dassen Island, both in terms of diversity and numbers. Dassen Island provides safe roosting and breeding sites for 10 of the 15 seabird species endemic to Southern Africa. There are also are a number of waders and shorebirds that utilise the coastline of the island, while a suite of terrestrial birds can be found in the interior. Some of these are resident and breed on the island, while the rest are merely visitors.

Historically, Dassen Island was the most important breeding site for African penguins and it is estimated that there was a maximum of 1 500 000 penguins inhabiting the island in the 1930s. The current population is in the vicinity of 2000 breeding pairs (unpublished data, Western Cape Nature Conservation Board). A number of threats have contributed to this decline including historical egg collection, habitat alteration due to commercial exploitation of guano, and predation by feral cats (CapeNature 2012). Current threats include oil spills at sea, while a reduction in the pelagic fish stocks on which African penguin feed is a contributing factor. A BMP-s for the African penguin, first compiled in 2013, guides management of the species.

Dassen Island is one of only two localities in South Africa where the great white pelican breeds. The current breeding population on the island is in the vicinity of 300 breeding pairs (unpublished data, Western Cape Nature Conservation Board). Crawford *et. al*. (2012) indicated that the population used to be approximately 500 breeding pairs, about 20% of the South African breeding population. Great white pelican cause appreciable disturbance to other avifauna on Dassen Island, notably preying on the chicks of kelp gulls, Cape cormorants, crowned cormorants, and African penguins. They may also have disturbed bank cormorant, Hartlaub's gull, *Larus hartlaubi* and swift tern, *Sterna bergii bergii* colonies on the island (J. Visagie personal observation).

There are three species of threatened cormorants breeding on Dassen Island: Cape, crowned and bank cormorants. The crowned cormorant, feeding mainly on bottom-dwelling fish in the infratidal and intertidal zones, is the only species that has shown an increase in population over the last 25 years. The latest estimate is 390 breeding pairs, representing 13.5% of the global population (unpublished data, Western Cape Nature Conservation Board). Both the bank, and to a greater extent, the Cape cormorant have declined over the last 25 years (unpublished data, Western Cape Nature Conservation Board). The most recent estimate of Cape cormorant population is 184 breeding pairs (unpublished data, Western Cape Nature Conservation Board). The species is subject to inter-annual fluctuations in the number of breeding birds due to their nomadic nature, which is related to the abundance of their main food source, Cape anchovy, *Engraulis capensis* (Crawford & Dyer 1995). The latest population estimate for bank cormorant is 70 breeding pairs, somewhat lower than the estimated 200 pairs recorded in the 1980s but higher than the 35 breeding pairs in 2010 (unpublished data, Western Cape Nature Conservation Board). It is possible that this species is showing a recovery, although continued monitoring is required to verify the trend. Bank cormorant prey on a wide variety of bottom and reef-dwelling organisms occurring in inshore kelp beds, such as clinids, crustaceans (including West Coast rock lobster) and cephalopods (octopus and cuttlefish) (Cooper 1985; DAFF 2016).

The Leach's storm petrel has a large global population size (more than 10 million breeding pairs), although the current South African population is a mere 5 breeding pairs; much lower than the 20 breeding pairs recorded in 1998 (unpublished data, Western Cape Nature Conservation Board). Dassen Island is the only known breeding locality for these birds in the Southern Hemisphere after breeding ceased at Dyer Island in 2005 (Taylor *et. al*. 2015).

Other endemic species of note include the swift tern, Hartlaub's gull and kelp gull, *Larus dominicanus vetula.* Swift tern display substantial inter-annual fluctuations of the number of birds breeding in the southwestern Cape in general and on Dassen Island in particular. This might be related to fluctuations in the abundance of Cape anchovy, the most important prey item of swift terns in the region (Crawford & Dyer 1995). Site-specific population fluctuations are also because the species moves between breeding sites from one year to the next (Crawford *et al*. 1994). Hartlaub's gulls, relatively nomadic, frequently breed in mixed colonies with swift terns. One of the chief factors affecting the reproductive success of Hartlaub's gull is predation, especially by mammals (on the mainland) and great white pelicans. The kelp gull is the most widespread and abundant species of gull in the Southern Hemisphere. The largest breeding population occurs at Dassen Island (Crawford *et al*. 1994). It has recently been observed that the breeding success of kelp gulls at Dassen Island is significantly reduced by predation of young chicks by great white pelicans. The African oystercatcher is a breeding endemic to the coast of southern Africa. Oystercatchers are sensitive to anthropogenic disturbances such as off-road vehicles and uncontrolled dogs on beaches, especially during the breeding season. The African oystercatcher population on Dassen Island (and other protected sites) displays a higher breeding productivity when compared with mainland sites (CapeNature 2012).

Oil and plastic pollution are common threats to marine birds, while utility failure will have serious consequences for marine and terrestrial birds alike. Disaster contingency plans and swift coordinated disaster response are thus essential.

Threats such as invasive vegetation, inappropriate fire regimes, overgrazing, uncontrolled recreational activities and inappropriate development are likely to have an adverse impact on birds through habitat alteration or destruction. Measures implemented to mitigate and reverse threats will benefit not only the threatened species, but all birds in the Complex.

Table 3.9. Avifauna species of conservation concern that occur within the Dassen Coastal Complex. Species marked with an asterisk (*) are either vagrants to South Africa and therefore also to the Complex or occur in habitats adjacent to the protected areas.

Species	Common name	South African Conservation Status	IUCN Status
Oceanodroma leucorhoa	Leach's storm petrel	Critically Endangered	Least Concern
Spheniscus demersus	African penguin	Endangered	Endangered
Phalacrocorax neglectus	Bank cormorant	Endangered	Endangered
Phalacrocorax capensis	Cape cormorant	Endangered	Endangered
Circus maurus	Black harrier	Endangered	Vulnerable
Polemaetus bellicosus	Martial eagle*	Endangered	Vulnerable
Thalassarche melanophris	Black-browed albatross*	Endangered	Near Threatened
Circus ranivorus	African marsh-harrier*	Endangered	Least Concern
Sterna vittata	Antarctic tern*	Endangered	Least Concern
Morus capensis	Cape gannet*	Vulnerable	Vulnerable
Sagittarius serpentarius	Secretary bird*	Vulnerable	Vulnerable
Afrotis afra	Southern black korhaan	Vulnerable	Vulnerable
Procellaria aequinoctialis	White-chinned petrel*	Vulnerable	Vulnerable
Sterna caspia	Caspian tern*	Vulnerable	Least Concern
Pelecanus onocrotalus	Great white pelican	Vulnerable	Least Concern
Falco biarmicus	Lanner falcon*	Vulnerable	Least Concern
Anthropoides paradiseus	Blue crane*	Near Threatened	Vulnerable
Delichon urbicum	Common house-martin*	Near Threatened	Near Threatened
Phalacrocorax coronatus	Crowned cormorant	Near Threatened	Near Threatened
Phoenicopterus minor	Lesser flamingo*	Near Threatened	Near Threatened
Oxyura maccoa	Maccoa duck*	Near Threatened	Near Threatened
Puffinus griseus	Sooty shearwater*	Near Threatened	Near Threatened
Phoenicopterus ruber	Greater flamingo*	Near Threatened	Least Concern
Pterodroma macroptera	Great-winged petrel*	Near Threatened	Least Concern
Falco peregrinus	Peregrine falcon*	Near Threatened	Least Concern
Macronectes giganteus	Southern giant-petrel*	Near Threatened	Least Concern
Limosa lapponica	Bar-tailed godwit*	Least Concern	Near Threatened
Calidris canutus	Red knot*	Least Concern	Near Threatened
Haematopus moquini	African oystercatcher	Least Concern	Near Threatened

3.9.6 Terrestrial Invertebrates

Invertebrates are a vital component of terrestrial ecosystems and constitute more than 80% of all animal diversity, yet they are grossly under-represented in studies of African diversity. Site biodiversity estimates that do not consider invertebrates not only omit the greatest components of what they are attempting to measure, but also ignore groups that are very significant contributors to terrestrial ecosystem processes.

Invertebrates are important for a number of ecosystem processes (McGeoch 2002; Samways *et al.* 2010; Samways *et al.* 2012), such as primary production, nutrient recycling, predation, herbivory and competition. Many Cape plant species are dependent on specialised invertebrate pollination guilds. Myrmecochory (seed dispersal by ants) is an important ecological process in the Fynbos Biome (Le Maitre & Midgley 1992). In South Africa, myrmecochorous plants are mainly restricted to the Fynbos Biome and approximately 20% of the strictly fynbos plant species are dependent on myrmecochory for their survival (Johnson 1992). A total of 29 families and 78 genera of fynbos plants has been identified as containing species that are ant-dispersed (see Table 1 in Bond & Slingsby 1983).

The butterflies of South Africa were recently assessed according to the latest IUCN criteria as part of the South African Butterfly Conservation Assessment project (Mecenero *et al.* 2013). There are 38 species of butterflies that are endemic to the Western Cape. Species of conservation concern that are likely to occur in the Complex are listed in Table 3.10. All are threatened by habitat destruction due to developments, and habitat degradation due to invasive alien plants and too frequent fires (Mecenero *et al.* 2013).

Table 3.10. Terrestrial Invertebrate species of conservation concern that occur on the Dassen Coastal Complex

Species	Common Name	IUCN Category (2014)	Red List Criteria
Stygionympha dicksoni	Dickson's hillside brown	Critically Endangered / Possibly Extinct	B2ab(i,ii,iii,iv,v)
Chrysoritis dicksoni	Dickson's strandveld copper	Critically Endangered	B1ab(ii,iii,v)
Trimenia wallengrenii wallengrenii	Wallengren's Silver-spotted Copper	Critically Endangered	B1ab(i,ii,iii,iv,v)

The three species that might occur in the area are classified as Critically Endangered. Dickson's hillside brown, *Stygionympha dicksoni,* is further classified as Possibly Extinct and used to occur on the low hills south of Darling and near Malmesbury. This species is restricted to Swartland Granite Renosterveld and Hopefield Sand Fynbos, but due to its habitat being lost to agriculture and ongoing habitat degradation, has not been recorded since 1985 (Mecenero *et al.* 2013). Another Critically Endangered butterfly species, the Dickson's strandveld copper, *Chrysoritis dicksoni*, is known from a single subpopulation north of Witsand. This species used to occur from Melkbosstrand to the Mamre area in Atlantis Sand Fynbos (Mecenero *et al.* 2013).

Wallengren's Silver-spotted Copper, *Trimenia wallengrenii wallengrenii,* occurs near summits on western slopes of low hills of Swartland Granite Fynbos at altitudes of 350 to 450 m. The last two subpopulations are between Darling and Mamre on privately-owned farms. Urgent monitoring of these species and research into their ecological requirements are needed. An extensive research programme has been launched by the Lepidopterists' Society of Africa to address these issues. Habitat management plans are essential if extinction of these species is to be avoided.

Another ecologically important invertebrate group is the Arachnida. The South African National Survey of Arachnida (SANSA) was initiated in 1997 (Dippenaar-Schoeman *et al*. 2015) and is an umbrella project that is implemented at a national level in collaboration with researchers and institutions countrywide. The aim is to document and unify information on arachnids in South Africa. SANSA is providing essential information needed to address issues concerning the conservation and sustainable use of the arachnid fauna (Dippenaar-Schoeman *et al*. 2013; Dippenaar-Schoeman *et al.* 2015). Presently 71 spider families, 471 genera and 2 240 species are known from South Africa, representing approximately 4.8% of the world fauna. A total of 966 species represented by 365 genera and 68 families have been recorded in the Western Cape (Dippenaar-Schoeman *et al.* 2015) of which 361 species are endemic to the Western Cape (37.4%), with 119 species only known from their type locality. Unfortunately there is not a spider species list available for the Complex, but given the information generated by SANSA, it is likely that there might be endemic spider species in the Complex.

There are no comprehensive invertebrate species lists available for the Complex. Such lists are essential as inventories of what occurs in the Complex, especially in terms of Red List and endemic species, and as baseline information for long-term monitoring. Some protection might be provided to certain arthropod groups in protected areas given the fact that there are correlations between insect species richness and biomes in the Western Cape (*e.g.* Procheş & Cowling 2006, 2007; Procheş *et al.* 2009). Therefore, the argument can be made that prioritisation and protection of an area for its floral diversity might provide some protection for its insect diversity (Samways *et al.* 2012).

Any invertebrate species lists of the Complex will be updated through *ad hoc* baseline data collection. An investigation of the Coleoptera (beetles) living in the nests of African penguins on Dassen Island has produced some interesting results. These include the discovery of a new species of Histeridae, *Atribalus wolfaardti*, and the discovery of the unknown larva of *Hypocaccus brasiliensis* (Gomy & Perreau 2001). Additional information on the insects of the Greater Cape Floristic Region can be obtained from Iziko Museums of South Africa (www.iziko.org.za).

3.10 Socio-economic Context

CapeNature endeavours to build and sustain support among communities for natural resource management, cultural heritage and environmental awareness and education through promoting biodiversity management.

Protected area management planning is limited in the absence of due consideration for the influence of the protected area on its neighbours, *i.e.* communities and / or private landowners, and the influence of neighbours on the protected area. As such, planning and management of the Complex must consider the role of neighbours in the formulation and implementation of the management plan.

The majority of protected areas are located in rural areas, predominantly characterised by inadequacies in infrastructure and basic services, and low levels of education and high unemployment rates. CapeNature is often viewed as a catalyst for development. It is therefore expected by stakeholders that, as CapeNature discharges its mandate, it takes into account these realities and engages in people-centred outcomes and structured programmes, contributing towards sustainable development and poverty alleviation in these communities.

CapeNature's People and Conservation Programme (hereafter referred to as the Programme) is responsible for leading engagement with communities for the benefit of all concerned. The purpose of the Programme is to enable people to meaningfully participate, support and engage with biodiversity management and the natural and cultural historic heritage conservation effort and activities undertaken by CapeNature. The Programme facilitates engagement on social, economic and environmental aspects through targeted, structured facilitations and capacity building interventions within local communities by promoting biodiversity management as a socio-economic development and positive change catalyst.

The 2015 – 2020 People and Conservation Strategic Plan speaks to four focus areas that are aligned and linked to relevant organisational, Provincial and National imperatives. See Figure 3.4.

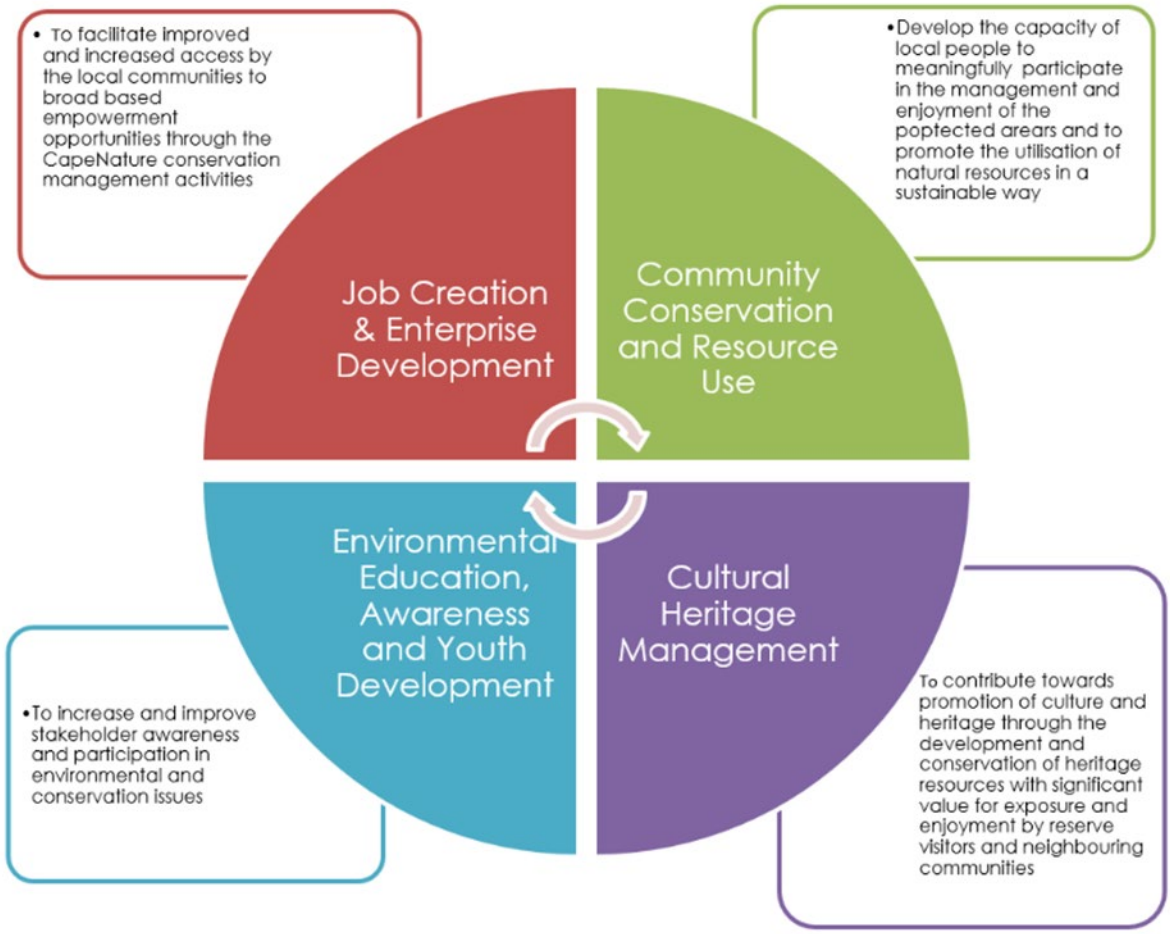

Figure 3.4 The 2015-20 People and Conservation Strategic Plan illustrating the four focus areas.

3.10.1 Job Creation and Enterprise Development

Over the years CapeNature has spearheaded community beneficiation projects through internal integrated management programmes and implementation of the Expanded Public Works Programme (EPWP) and small, medium and macro enterprise (SMME) development programmes to stimulate local economic development opportunities. These efforts contribute directly and indirectly towards poverty alleviation of communities adjacent to protected areas.

The implementation of National job creation programmes such as the EPWP (which enables the appointment of Full Time Equivalents) and the Natural Resource Management Programme (*e.g.* alien vegetation management and wetland restoration), has led to employment opportunities and small business development in areas adjacent to protected areas, serving as one of the key economic drivers in these areas.

3.10.1.1 Expanded Public Works Programme

CapeNature has the opportunity to improve the lives of people in the Western Cape, especially in rural landscapes, by providing job opportunities. Job opportunities are created through eco-tourism operations and conservation management actions.

CapeNature facilitates job creation, social development and functional training interventions across the province through EPWP projects implemented in protected areas with a focus on vulnerable groups *i.e.* youth, woman and people with disabilities.

EPWP-classified projects are governed by the National Department of Public Works Projects List and recorded in the EPWP Reporting System annually whilst job opportunities created via these projects are reported in the National Department of Public Works database and reporting system monthly. Job creation in CapeNature thus emanates from the EPWP and from small business opportunities created for local entrepreneurs. Implementation of a Responsible, Accountable, Consulted and Informed (RACI) Chart and associated standard operating guidelines outlines process flow and guides regional roll out of job creation programmes.

To promote and enhance protected area management and public access, a project funded through the Environmental Protection and Infrastructure Programme is approved for implementation during the period 2018-19 to 2023. This includes the upgrade of infrastructure, which will facilitate and enable improved access and management effectiveness.

3.10.1.2 Enterprise Development – Small, Medium and Macro Enterprises

CapeNature provides business opportunities aligned to approved annual operational plans and budgets that are complementary to organisational and protected area objectives, goals and targets. A focussed Enterprise Development Programme and localised support is key to growing SMMEs. CapeNature continues to partner with business support institutions such as the Small Enterprise Development Agency, South African Revenue Service, Department of Labour, banks and relevant Provincial and National departments in providing capacity building and incubation opportunities to identified and appointed SMMEs.

Understanding the value of engaging with SMMEs in their development agendas, CapeNature has institutionalised Regional Contractor Development Forums as a platform for focussed business development discussions, networking opportunities, engagement opportunities with business support institutions and sharing of success stories.

Local economic development is stimulated through the facilitation of SMME opportunities within protected area eco-tourism services and conservation management actions such as integrated catchment management.

SMME recruitment and selection is guided by standard operating guidelines. SMME opportunities in the Complex are aimed at supporting emerging contractors, small

businesses and wood harvesters' co-operatives. Contractors are guided by a terms of reference while SMME Forums are used as platforms to engage regularly.

3.10.1.3 Capacity building

CapeNature ensures that accredited and functional training for different categories of workers, and knowledge and skills development adds value to worker employability in the mainstream economy. This is achieved through projects aimed at youth development such as the Youth Environmental Service (YES) Programme. RACI Charts are used to clarify roles and to integrate implementation of YES and other capacity building initiatives. Regional and corporate training plans and community service plans further guide the process.

Furthermore, as part of the social development framework, a Women Empowerment Plan implemented by CapeNature includes focused interventions to address societal challenges (e.g. finance, education, health) that are at the centre of women emancipation struggles. The plan provides a wide range of activities aimed at advancing women in the workplace and in society.

3.10.2 Cultural Heritage Management

Cultural heritage management contributes to the promotion of culture and heritage through the conservation of, and access to, significant heritage resources for the benefit of visitors and communities.

Cultural heritage programmes within the Complex are implemented through a Landscape Education Programme. This is an environmental education method focussing on conceptual heritage aspects with primary school learners. The management and condition of focal heritage values are indicators of management effectiveness, measured through the METT-SA.

3.10.3 Community Conservation and Resource Utilisation

In South Africa, it is entrenched practice to involve communities in the management of protected areas. This practice provides opportunity to engage and agree on a shared Vision, making communities equal partners in the engagement process, rather than just beneficiaries. Transparency is a fundamental value to overcome the distrust and tendency to resolve conflict through confrontation that was fostered by the oppressive, inhuman practices and social fabric destruction associated with the Apartheid era. The approach to participatory protected area management requires a sound foundational architecture complemented by enabling mechanisms (discussed below) aligned to conservation action objectives and achievable deliverables. The promotion of cooperative governance and establishment of partnerships with role players who see an opportunity to contribute to conservation objectives is critical.

3.10.3.1 Protected Area Advisory Committees and forums

Participatory protected area management is enabled through Protected Area Advisory Committees (PAAC) that are institutionalised structures within CapeNature, as referred to in Section 1.6.

In conflict situations, agreed mechanisms for dispute and conflict resolution exist to guide the different organisations affected. Conflict resolution requires swift activation to address and resolve issues and restore relations. Mechanisms for conflict resolution are implemented through PAACs and facilitated by the People and Conservation Programme and Natural Resource User Groups (NRUG) approved Code of Conduct. A key function of the PAAC is to hold the management to account for the effective and transparent management of the Complex, for the benefit of society.

The functionality of the PAAC is reported and measured through regional People and Conservation reporting structures and general regional management reports (related to stakeholder engagement). It serves as an indicator for management effectiveness, measured through the METT-SA.

For the Complex, PAACs exist for Dassen Island and Riverlands Nature Reserves. The establishment of the Ganzekraal Conservation Area PAAC is in progress. At the Complex level, mechanisms for enhanced integration of participatory management for the protected areas are identified as a key strategy to improve participatory planning, transparency and cooperative governance across the Complex.

Additional platforms for engagement, as discussed in Section 1.6, include Intergovernmental Steering Committee meetings held under the umbrella of the Comprehensive Rural Development Programme. These meetings are scheduled quarterly for the municipal Wards including Atlantis, Pella and Mamre, and Chatsworth, Riverlands, Abottsdale and Kalbaskraal. Various government departments as well as community-based organisations report here on projects implemented in the different communities.

3.10.3.2 Natural Resources User Groups

CapeNature maintains relationships with Natural Resource User Groups (NRUGs) at the local and regional scale for meaningful participative discussions and capacity building interventions. Capacity building interventions relate to the Nature Conservation Ordinance (Ordinance 19 of 1974) and other legislated mechanisms aimed at issues such as resource regulation, fire awareness, access to demarcated sites for traditional or spiritual purposes, sustainable harvesting and other bioprospecting initiatives, wise water use, climate change, waste management and recycling.

Regional and Corporate People and Parks Action Plans drive and guide the implementation of the NRUG component within the Complex and surrounding landscape. Provincial People and Parks Steering Committee meetings are also utilised as platforms to facilitate implementation. Furthermore, People and Parks related matters are dealt with in quarterly local area meetings while regionally elected

members address matters that cannot be addressed at locally. Capacity building interventions are presented to members at regional meetings and discussion points may relate to bioprospecting, public participation processes and relevant legislation pertaining to the regulation and management of natural resources.

Resource utilisation in the Complex is facilitated by assisting NRUGs to be compliant in terms of regulatory requirements in collaboration with the Small Enterprise Development Agency who support NRUGs in the registration of co-operatives and offer the relevant training to develop their businesses (*e.g.* tourism services, invasive alien clearing, infrastructure maintenance, confectionaries). Furthermore, capacity-building interventions are aimed at helping beneficiaries understand the roles of the various actors responsible for resource management, the legislative prerequisites for harvesting, and the mechanisms to ensure that harvesting methods promote persistence of the resource.

3.10.4 Environmental Education, Awareness and Youth Development

CapeNature provides an enabling environment for environmental education, awareness and youth development primarily aligned to school curriculums (where relevant), environmental calendar days and species conservation. The aim of this focus area is to increase and improve stakeholder awareness, expand knowledge and participation in environmental and conservation issues.

Primary themes for the Complex relate to fire, species conservation, cultural and historic heritage, healthy living, and water and waste. These link to the broader theme of climate change.

Both outreach and site-specific programmes are conducted as formalised programmes aligned to school curriculums. Other mechanisms for education and awareness projects include exhibitions, volunteer-based learning opportunities (such as beach clean-ups), holiday programmes, educational talks and overnight camps. Longer term, more sustainable projects, such as the Junior Rangers Programme, are also implemented, and students can enrol as Honorary Nature Conservation Officers (HNCOs) to perform volunteer duties when they exit the programme. The Junior Rangers Programme is presented annually at Primary school level and the focus is on water saving, landscape education, citizen science, marine awareness, careers in conservation and leadership coaching.

Fire awareness interventions are undertaken in predetermined hot spot areas adjacent to the Complex. Annual festivals or events such as the annual flower festival in the towns of Mamre and nearby Darling present opportunities to engage with various groups about the Complex. Bioblitz events create opportunities for citizen science and for communities to identify possible bioprospecting projects adjacent to the Complex.

Site-specific implementation plans for each protected area in the Complex are captured in the regional People and Conservation Work Plan, aligned to CapeNature's Annual Performance Plan and the People and Conservation Strategic Plan.

3.11 Organisational Context

The Complex is one of 32 protected areas managed by CapeNature within the Western Cape and it is one of six protected areas which fall within the organisation's West Region. The closest CapeNature Regional Office to the Complex is in Porterville and all regional administrative matters which affect the Complex are dealt with through this office.

3.11.1 Finance and Asset Management

In line with the legal requirement, the strategies identified for implementation within the Complex, to achieve the desired state, have been costed below.

The Complex will adhere to the guiding principles listed below:

- Responsibly manage the allocation of budget, revenue raising activities and expenditure;
- Ensure solid financial management supporting the achievement of the objectives of this plan; and
- Compliance with the Public Finance Management Act (Act No. 1 of 1999) as well as CapeNature's financial policies and procedures.

Using a zero-based budgeting approach, a funding estimate was derived based upon the activities in this management plan. When estimating the costing, the following items were considered:

- Those costs and associated resources which could be allocated to specific activities and which were of a recurring nature;
- Those costs and associated resources which could be allocated to specific activities but which were of a once-off nature;
- Unallocated fixed costs (water, electricity, phones, bank fees, *etc*.);
- Maintenance of infrastructure; and
- Provision for replacement of minor assets, (furniture, electronic equipment, vehicles, *etc*.).

3.11.1.1 Income

CapeNature's budget is funded by the Medium Term Expenditure Framework (MTEF) allocation, other government grants and generated from own revenue sources derived from commercial activities. Any surplus revenue generated is used to fund shortfalls in management costs across the organisation.

CapeNature has overhead costs relating to support services such as human resources, marketing and eco-tourism, finance, biodiversity support, conservation services, people and conservation, legal services, *etc*. which is not allocated to individual protected area complexes and must also be funded through grant funding or own revenue generated.

This PAMP is a 10-year plan, and thus straddles multiple MTEF periods that impact on actual budget allocation and projection.

Total income projected for 2019/20 is budgeted at R 4 516 213, increasing at an estimated annual rate of 10% from previous years. A summary is presented in Table 3.11.

Table 3.11. A summary of the total projected income for the Dassen Coastal Complex

Allocation	2017/18 R'000	2018/19 (current year) R'000	2019/20 (projection) R'000
Total Income	R 4 127 451	R 4 832 584	R 4 516 213
MTEF Allocation	R 2 569 755	R 2 806 554	R 3 219 852
Own Funding	R 0	R 202 563	R 0
External Funding	R 1 557 696	R 1 823 468	R 1 296 361

The Complex is also financially supported by the Global Environmental Facility (GEF 5) project in the DCCP, titled '*Improving Management Effectiveness of the Protected Areas Network'.* The project aims to strategically demonstrate protected areas expansion, sustainable financing of the protected areas network, synergy between land reform and the protected areas network, and improving management effectiveness of conservation areas within the DCCP landscape.

3.11.1.2 Expenditure

3.11.1.2.1 Recurring Costs

The annual directly allocated cost (includes staff, transport and travel, stores and equipment) is estimated at R 4 516 213 for 2019-20. These ongoing costs are split according to strategies as illustrated in Figure 3.5.

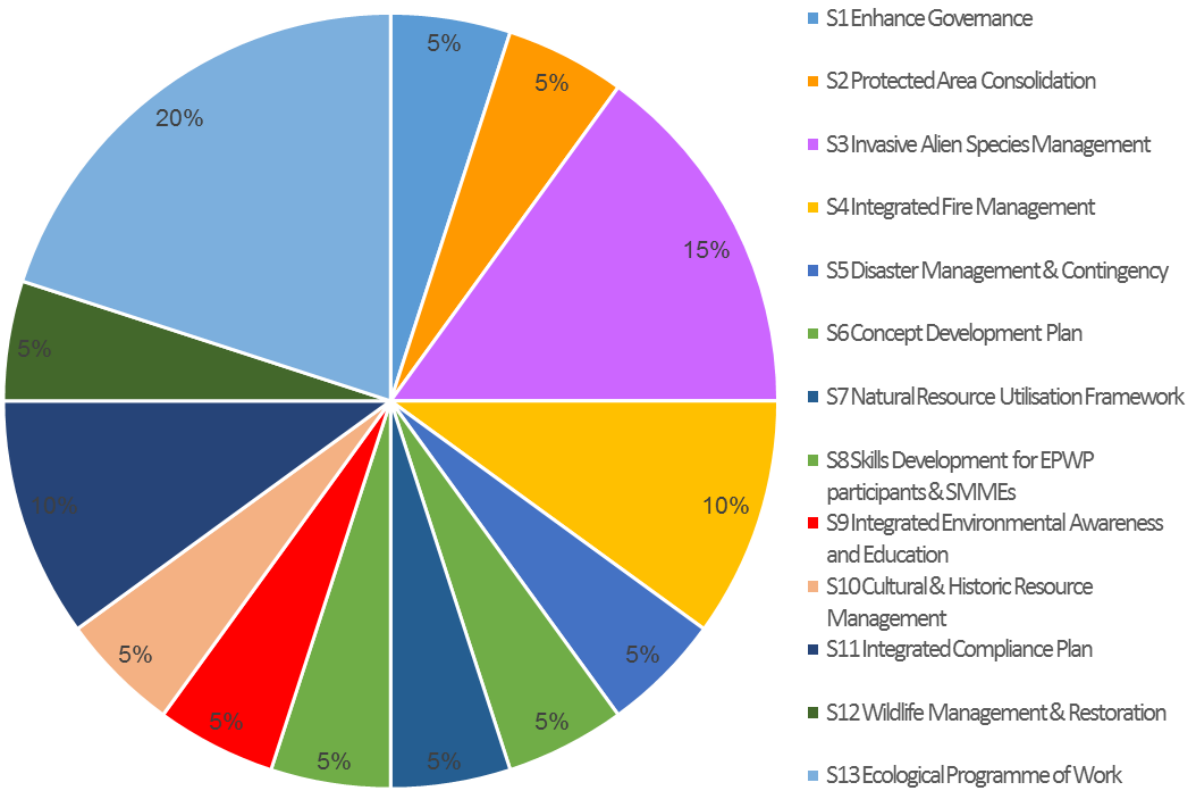

Figure 3.5 The estimated proportion of annual operational costs for the Dassen Coastal Complex for year 2019-20 aligned with the identified and prioritised strategies.

3.11.1.2.2 Once off Costs

In addition to the recurring costs there might be once-off replacement costs of assets, *e.g.* tractor, firefighting equipment, field equipment, *etc*. that are aligned with the life span of the relevant assets being replaced.

3.11.1.2.3 Maintenance

The provincial Department of Transport and Public Works is responsible for and carries out maintenance on buildings in CapeNature managed protected areas as captured in the User Asset Management Plans (U-AMP), governed by the Government Immovable Asset Management Act (Act No.19 of 2007).

An annual earmarked allocation is provided for the development of new, and upgrades and maintenance of tourism infrastructure. Tourism projects are prioritised across all CapeNature facilities and maintenance is scheduled accordingly.

3.11.1.3 Summary

It is estimated that the Complex will require an annual operating budget of R 4 516 213 for 2019/20, increasing at a projected annual rate of 10%.

3.11.1.4 Implications

Unsuccessful securing of external funding and replacement of crucial capital equipment could lead to potential shortfall and will have a negative impact on strategies throughout.

3.11.2 Operational Staff

The Complex has three main operational centres, namely Dassen Island, Ganzekraal and Riverlands. The Complex employs five permanent staff between the protected areas. In addition to the permanent staff, Ganzekraal and Riverlands employ contract staff, referred to as Full Time Equivalent (FTE) staff and funded by the EPWP. In total, there are 20 FTE employees between the protected areas. In addition, there are four GEF 5 DCCP project funded contract positions. A DCCP Coordinator supports the coordination and implementation of the GEF 5 project, supported by a Finance and Administration Officer, while two Field Rangers are employed to support operationalisation of the Ganzekraal Conservation Area. The Administration Officer supports the Ganzekraal Conservation Area in addition to GEF 5 DCCP project administrative support.

Protected area management lies within the Conservation Management Directorate of CapeNature. Conservation Managers report to the Protected Areas Manager of the Western Region, based at Kluitjieskraal just outside the town of Wolseley. Protected Areas are supported at the regional scale by the Regional Manager of the Western Region, based in Vanrhynsdorp.

Dassen Island and Ganzekraal Conservation Area are managed by a Conservation Manager based at the office in Mamre and responsible for both on-shore and off-shore sections of the Complex. Three Field Rangers report to the Conservation Manager. One field ranger is based on Dassen Island, and two field rangers dedicated to the Ganzekraal Conservation Area are based at the office in Mamre. Ganzekraal Conservation Area employs 14 FTEs. Staff rotate between Dassen Island and Ganzekraal.

Riverlands Nature Reserve is managed by a Conservation Manager responsible for both Riverlands and Pella. Two Field Rangers report to the Conservation Manager. Riverlands employs seven FTEs and all staff at based at the reserve office at Riverlands Nature Reserve. The staffing structure for the Complex is depicted in Figure 3.6.

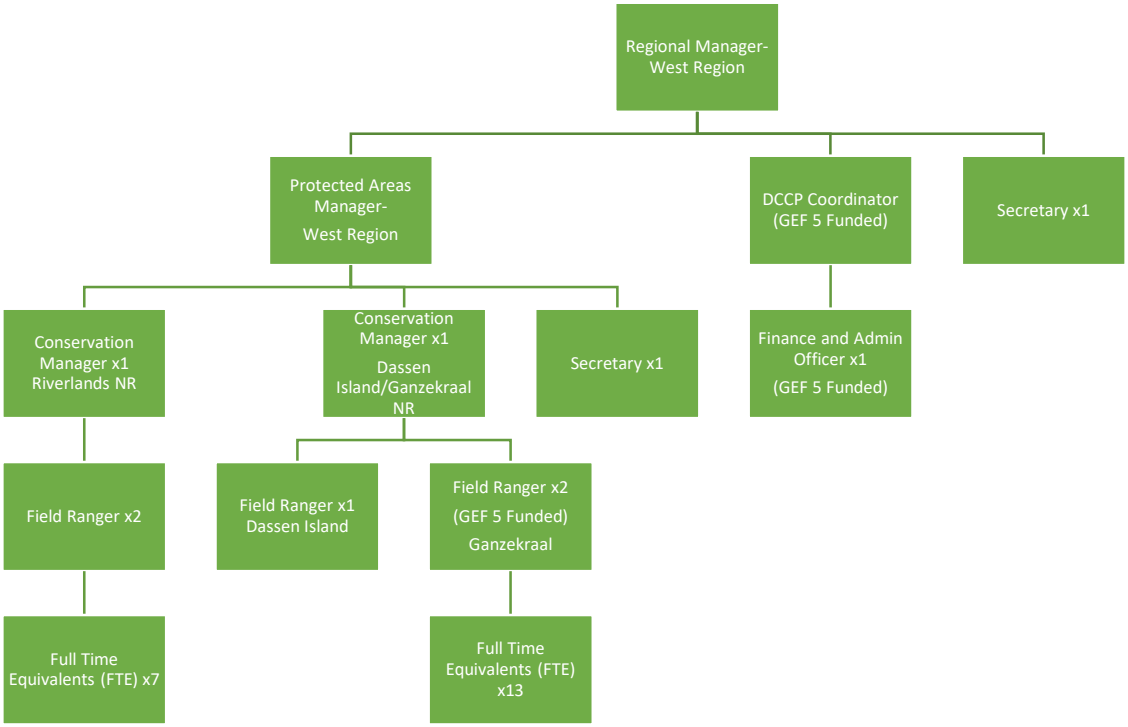

Figure 3.6 Approved organogram for the Dassen Coastal Complex

3.12 Environmental Management

In terms of the Norms and Standards for the Management of Protected Areas in South Africa (Government Notice 382 of 31 March 2016) Section 11(g) and (h):

(g) All development projects that require environmental scoping are assessed through and are authorized at the relevant level. The indicators for this are that (1) there are records of decisions and authorisations in place and that (2) there is a process to monitor and effect compliance with conditions of the records of decisions.

(h) Commercial tourism, where applicable, is compatible with and contributes to, the protected area objectives. Indicators include (1) cooperation between Protected Area Management and Tourism operators to enhance visitor experiences, maintain Protected Area conservation values and resolve conflicts; (2) the commercial tour operators are subject to the Protected Area management authority; (3) Permits, licenses and concessions are granted in terms of management plan objectives; (4) Tourism standards are developed for nature based tourism.

All new developments are subject to the rules and regulations set in terms of the relevant legislation, including the National Environmental Management Act (Act No. 107 of 1998) as amended in terms of the Environmental Impact Assessment Regulations (2014). All development shall be in line with the ethos, values and conservation principles of the Management Authority and compliment or enhance the biodiversity estate and visitor experience.

The management authority shall investigate strategic business opportunities as well as reserve-specific tourism needs and opportunities, evaluate sustainability options and ensure that tourism facilities and products are ecologically and economically responsible and viable.

The Management Authority shall determine the carrying capacity, both cumulative and for individual activities and events to ensure that natural and cultural values are not negatively impacted.

The Management Authority shall investigate business opportunities with external partners to facilitate responsible eco-tourism and adventure events and activities within the Complex.

The Management Authority shall suitably capacitate staff or appoint external partners to monitor business ventures, events and activities within the Complex.

Activities (including filming, photography, events and functions) are allowed on the authority of a Special Use Permit or are allowed in terms of a MOU with the Management Authority. Such activities are only allowed in pre-approved locations within the Complex and under strict conditions. Environmental Management Plans are required where (1) the activity is considered large scale; (2) crosses sensitive environments; (3) has the potential to impact the environment negatively; or (4) has the potential to impact CapeNature or surrounding communities negatively.

Environmental Management Plans will also be required for the following:

- All development activities, whether new construction or upgrade of existing facilities.
- All tourism or adventure activities permitted within the Complex.
- Where MOUs are in place and external organisations or companies bring visitors, especially youth groups.

The use of qualified and experienced Environmental Control Officers (ECO) is essential to ensure a high level of monitoring and compliance management for all activities (including development, construction, events, filming, photography and functions).

The issuing of contracts for alien clearing, integrated catchment management or other environmental projects may also be subject to Environmental Management Plans (EMP). Contractors will be required to undergo induction training, sign the EMP and work site conditions.

3.13 Infrastructure Management

The infrastructure of Riverlands Nature Reserve comprises a boundary fence and network of firebreaks on the boundaries of the reserve that serve a dual purpose of management jeep tracks. The nature reserve office and staff accommodation are situated in the northeastern corner of Riverlands (Appendix 2, Map 8 a).

Ganzekraal Conservation Area infrastructure comprises boundary fences and a network of firebreaks and jeep tracks. Wellfields and associated operational infrastructure managed by the CCT Water and Sanitation Department are present at Silwerstroomstrand, as are two resorts that are managed by the local authorities. The Ganzekraal Conservation Area has no operational or tourism infrastructure such as offices, visitor facilities or formal trails as at 2018. Refer to Appendix 2, Map 8 b. Other existing infrastructure comprises historic buildings, as described in Section 3.6. Once restored, these can serve the dual purpose of heritage conservation and operational or tourism infrastructure upon restoration (refer to Section 4.7).

The Complex boundaries are demarcated by signage at strategic points, and fencing.

The infrastructure of Dassen Island is utilised for operations and staff accommodation, and comprises two infrastructure nodes linked by a jeep track. The CapeNature infrastructure node is situated in the north, while the National Ports Authority infrastructure node that is associated with the lighthouse is situated in the south. Much of the operational infrastructure on Dassen Island is of historic significance. See Appendix 2, Map 8 c.

The concept development plan, associated zonation scheme and strategic framework guide proposed development over the planning period. See Section 4. Focus areas include infrastructure evaluation, environmental scoping and land use advice to define environmentally responsible development options. This includes feasibility studies and costings for proposed restoration and / or replication of heritage structures that can serve the dual purpose of heritage conservation and awareness and operational and tourism management.

3.13.1 Roads / Jeep Tracks

The roads network of the Complex comprises jeep tracks that are utilised for management purposes and for access to demarcated nature access areas. Jeep tracks are accessible by four-wheel drive vehicles only, due to deep sands.

A single jeep track exists on Dassen Island between the CapeNature and National Ports Authority infrastructure nodes.

3.13.2 Hiking Trails

An informal hiking trail extends along the coast of the Ganzekraal Conservation Area from Grotto Bay in the north to Silwerstroomstrand in the south. The trail is utilised for recreation, citizen science and access to marine resources. The Concept Development Plan, associated zonation scheme and strategic plan identify options for additional trails to facilitate nature access.

3.13.3 Buildings

Buildings of the Complex are designed and utilised for operations and staff accommodation, and serviced by the Provincial Department of Transport and Public Works. The Concept Development Plan, associated zonation scheme and strategic framework identify existing development footprints and focus areas for management.

3.13.4 Fences

The boundaries of Riverlands and Ganzekraal are fenced. Fences comprise game fencing where boundaries are shared with game farms, and standard six-strand livestock fencing elsewhere. The purposes of fences are predominantly to prevent neighbouring game from escaping, to prevent livestock from entering conservation areas, and to demarcate boundaries.

3.13.5 High Sites

There are no high sites within the Complex. There is a registered high site on the Dassenberg Hills, west of the Riverlands Nature Reserve. The site is utilised by CapeNature for radio communications in the area. Access is via neighbouring private properties, Burgers Post and Nuwe Post.

3.13.6 Signage

Signage is located at all major entrance points to the Riverlands Nature Reserve and Ganzekraal Conservation Area. Signage for Dassen Island is located at the Yzerfontein Harbour and on the Dassen Island jetty. The primary purpose of signage is to demarcate protected areas, stipulate conditions for access and provide contact details for the management authority.

The strategic framework identifies the need for additional informational and interpretive signage at strategic points and nature access areas.

3.13.7 Utilities

Water Supply

The primary water supply to the Complex are groundwater via boreholes, and harvested rainwater.

Dassen Island is solely dependent on rainwater harvesting. During the summer months when water supply runs low, the water supply is supplemented by water from the mainland that is transported to Dassen Island by boat from the Yzerfontein harbour. Riverlands Nature Reserve utilises groundwater via three boreholes for potable water throughout the year, augmented by harvested rainwater. The Ganzekraal Resort and Silwerstroomstrand Resort situated inside the Ganzekraal Conservation Area and managed by local authorities, rely solely on groundwater throughout the year. Protected area management is not responsible for the management of resorts, although there are servitude and management implications for the Ganzekraal Conservation Area.

Water saving measures include rainwater harvesting and utilisation of grey water where possible. Groundwater utilisation should be accompanied by monitoring in collaboration with the relevant entities such as WCDM and CCT.

The Atlantis Water Supply Scheme supplies water to the towns of Atlantis, Mamre and Pella from the Atlantis aquifer through a network of wellfields situated in the most productive zones of the Atlantis aquifer at Witzands and Silwerstroomstrand. The Silwerstroomstrand Wellfield and associated bulk water supply infrastructure are situated at Silwerstroomstrand within the Ganzekraal Conservation Area. Infrastructure comprises a network of boreholes and associated roads network, as well as a surface water extraction point on the Silwerstroom River. Infrastructure here comprises the CCT Water and Sanitation bulk water supply pump stations and offices, and is managed by the CCT. Refer to Section 4.6 Access.

Electricity Supply

Eskom supplies electricity to the Riverlands Nature Reserve office, and to resorts and utilities that are managed by other entities within the Ganzekraal Conservation Area. Although protected area management is not responsible for the management of these resorts and utilities specifically, there are servitude and management implications for the Ganzekraal Conservation Area. Refer to Section 4.6 Access.

Dassen Island is solely dependent on electricity supply by generator and solar power.

All new infrastructure developments or upgrades make provision for utilisation of renewable energy, where possible.

Energy - Fuel and Gas

A SAFRON fuel pipeline runs parallel to the R27 from Saldanha Bay in the north to the Milnerton Refinery in Cape Town. The pipeline runs underground through the Ganzekraal Conservation Area, east of the R27. Management of the pipeline includes

the maintenance of a firebreak and road to facilitate easy access to the pipe for routine checks and maintenance. Refer to Section 4.6 Access.

Waste Management

There are no waste disposal sites within the Complex. Waste from Riverlands and Dassen Island is disposed of at the registered waste landfill site of Swartland Municipality. Waste from Ganzekraal is disposed of at both the Swartland and CCT sites due to the location of the property.

Sewerage systems comprise septic tanks and soakaways. Any new infrastructure development or infrastructure upgrades provide the opportunity to improve and upgrade sewerage systems.

4. THE PLANNING CONTEXT

4.1 Establishing Natural and Cultural Values

This approach entailed the selection of focal values that represent the overall biodiversity and cultural historic heritage of the Complex. Values that are in good condition or healthy, provide the ecosystem services that support human welfare. Human well-being targets, or aspects of human welfare that are within the scope of protected area management, were also selected based on the condition of healthy natural and cultural historic values.

Facilitated stakeholder workshops identified values systematically at the coarse level through the identification of ecological systems, followed by a fine-filter review of ecological communities and species. Selected values were then screened for species or features that have special or unique conservation requirements or management. The same approach was followed for cultural historic heritage.

The assemblage of values identified captures all parts of ecosystems and the critical processes that sustain them, as well as cultural and historic heritage, and the attributes that maintain it. The following standard criteria (CMP 2013) guided the final selection of values:

- Co-occurrence in the landscape (*i.e.* are they captured by other values);
- Requiring similar ecological processes;
- Having similar viability; and
- Having similar threats.

4.2 Viability Analysis

Viability analysis identified the key characteristics or attributes that define healthy focal values, established indicators to measure key attributes of values, assess the current status of the value, and establish the desired state where possible. Viability analysis informed the establishment of measurable goals.

Key ecological attributes of natural values were assessed in terms of size (*i.e.* population size / patch size), condition (*i.e.* reproduction or species composition), and landscape context (ecological processes and connectivity) by selecting indicators of attribute health. Attributes and indicators relating to cultural historic values and human well-being were measured in terms of condition (presence and condition of assets, knowledge, mechanisms, access).

Once current condition was articulated, and indicators informed setting thresholds for condition to aid determining viability. For each value, indicators provide the basis for ratings of status: POOR, FAIR, GOOD, or VERY GOOD, using the best available information. See Table 4.1 for viability rating definitions. Indicator ratings are usually quantitative although can be qualitative when relationships between an indicator and the viability of a value are poorly understood or information is lacking (CMP 2013).

Table 4.1. Descriptions of viability ratings used in the Open Standards

Very Good *Optimal integrity*	The factor is functioning at a desirable status and requires little human intervention.
Good *Minimum integrity*	The factor is functioning within its acceptable range of variation; it may require some human intervention.
Fair *Vulnerable*	The factor lies outside its acceptable range of variation and requires human intervention. If unchecked, the value will be vulnerable to serious degradation.
Poor *Imminent Loss*	Allowing the factor to remain in this condition for an extended period will make restoration or preventing extirpation practically impossible.
Not Rated	There is insufficient information to determine a trend.

Based upon information derived from the viability assessment, a desired future condition was established for key attributes by setting measurable, time-bound Goals directly linked to values and their key attributes.

The following focal values and key attributes were identified:

4.2.1 Lowland Fynbos Mosaic

Value Description

A focal value of the Complex is the representation of a mosaic of lowland fynbos vegetation comprising the following vegetation types, some of which are threatened or poorly conserved: Atlantis Sand Fynbos, Swartland Shale Renosterveld, Swartland Silcrete Renosterveld, Swartland Granite Renosterveld, Cape Flats Dune Strandveld and Langebaan Dune Strandveld.

The robustness of the focal value was tested by applying filtering criteria such as species management requirements, rarity, unique ecological process requirements, specific dependency on ecological processes, and/or the utilisation of multiple systems by a species. As such, species are nested within the focal value since they co-occur on the landscape and require similar ecological processes, are of similar viability or condition and face similar threats. Plant species assemblages (over 300 threatened species) and fauna species assemblages (indigenous small antelope species, predators, pollinators) are included.

Key Ecological Attributes

- Indigenous species composition
  Vegetation types are characterised by high levels of species richness, rarity and endemism. The concentration of rare and endemic species is high in the Complex, especially at Riverlands which displays variation in edaphic factors, and in transitional areas and the fynbos-renosterveld ecotone. Strandveld endemics occur particularly on specialised substrates (such as mineral-rich

deposits) and many of the endemics are range-restricted. High bird (frugivores and nectarivores in particular) and animal densities are important for maintaining pollination and seed dispersal (Helme & Rebelo 2016). Sand fynbos is characterised by the presence of dense populations of tall restios, ericoid shrubs and many proteas, interspersed with patches of annual plant species. Renosterveld, largely ecotonal in the Complex, shows high species richness and endemism with a particularly high number and diversity of geophytes.

The health of the Lowland Fynbos Mosaic can be informed by the type, age and ecological condition of indigenous plant cover, species richness, and the presence of key guilds of species (*e.g.* re-seeders; or woody, perennial shrubs, and winter annuals). The abundance and distribution of populations of threatened and other species of conservation concern are also essential to monitor, while an absence or a low density of invasive alien species must be maintained.

The presence of indigenous fauna such as caracal, aardvark, mongoose, genets, porcupines, small antelope, Cape spiny mouse and white tailed mouse, and the presence and number of birds and other pollinators, are also key indicators of ecosystem health.

- Fire regime

  The Complex represents a mosaic of veld age classes, varying from three years to more than 20 year-old veld. Fynbos vegetation types have adapted to survive fires and require periodic dry season fires for optimal recruitment and long-term survival of the full species complement (Van der Merwe 1966). Fire management practices aimed at biodiversity conservation within protected areas are often in conflict with hazard reduction requirements (Kraaij *et al*. 2011) and, where such conflict of interest exists, it is important to know the ecological thresholds within which fire may be managed. Well-managed fynbos is not considered a significant threat to adjacent infrastructure. Burning in summer is feasible and more appropriate when applied pro-actively under appropriate weather conditions, before the veld becomes old, moribund and of high biomass. Old, moribund veld with high biomass could burn accidentally under severe weather conditions that make controlling the fire unmanageable.

  Adaptive management is based on formulating thresholds of potential concern (Biggs & Rogers 2003) describing acceptable variations in the four elements (frequency, season, intensity, size) of fire regime, with regular monitoring to assess 'whether the fire regimes that arise from various forms of management remain within the specified ranges' (van Wilgen *et al*. 2011).

  Indicators illustrated in Table 4.2 are based on studies conducted in Pella, for post-fire regeneration in a sand fynbos community (Musil & De Witt 1990). In the sand fynbos, species richness increases in the first three years after a fire and attains maximum values in five-year-old vegetation (Hoffman *et al.*1987). There is relatively very little information available on the proportion of seeders

to sprouters in the sand fynbos. Fire frequency must allow for sufficient seed-set in slow-maturing species such as the Proteaceae. The appropriate seasonal fire regime must be retained with fires occurring in summer to early autumn (December to March) (Helme *et al*. 2016). Accidental fire in veld that is older than the threshold of eight to 10 years in the dry season should be allowed to burn.

Fire is not considered a key driver of the Strandveld as fuel loads are too low to carry significant fire. However, Strandveld is vulnerable to an altered natural fire regime in terms of inappropriate frequency especially in areas where invasive alien vegetation is present (Helme & Rebelo 2016). Fire frequency should be kept to a minimum due to the slow recovery rate of Strandveld.

- Extent and Connectivity
  The Complex lies within a large tract of intact lowland fynbos linking marine and coastal habitats to the inland koppies of the Dassenberg Hills across local climate gradients. This intact natural landscape is important for ecological resilience and natural adaptation in the face of climate change. The maintenance of habitat or environmental gradients is necessary to maintain species turnover and variations in species richness, often found at the edge of fynbos communities and areas of edaphic variation. Intact vegetation types and associated wetlands and seeps are important for retaining distinctive plant communities while the intact Strandveld ecosystem serves as an important corridor facilitating the movement of fauna (birds and mammals) along the coastal strip. The Lowland Fynbos Mosaic beyond the Complex boundaries is vulnerable to pressures such as agricultural expansion, coastal ribbon development, invasion by alien invasive plant species, inappropriate burning and unregulated flora harvesting. Local scale habitat loss can lead to loss of species, including pollinators.

The viability assessment for Lowland Fynbos Mosaic is provided in Table 4.2. Text in bold outlines the Current Status, text in italics outlines the Desired State. TBD represents ‘to be determined’ in instances where there is not enough information to quantify the state.

Table 4.2. Lowland Fynbos Mosaic Viability Assessment

KEAs and Indicators for the Lowland Fynbos Mosaic (Condition: Good)						
KEA Category	**Key Attribute**	**Indicator**	**POOR**	**FAIR**	**GOOD**	**VERY GOOD**
Landscape Context	Fire Regime	Fire return interval Dune Strandveld	-	< 20 yrs	***> 20 yrs***	TBD
	Fire Regime	Fire return interval Fynbos & Renosterveld	> 25 yrs	15 – 20 yrs	***8-10 yrs***	TBD
Condition	Indigenous species composition	Persistence of key species in the area of the Dassen Coastal Complex with 99 % indigenous species cover.	< 6 500 ha	**6 500 ha**	> 6 500 ha => 8 000 ha	*> 8 000 ha = > 1 km boundary buffer*
Landscape Context	Extent and connectivity	% Essential Linkages present in 2018 still intact (% remaining; % conserved)	-	-	**100 %**	*> 100 %*
	Extent and connectivity	Ability to walk from Riverlands via Kanonkop or Riverlands to coast without crossing more than two roads and leaving natural veld.	No	No	**Yes**	*Yes*
	Extent and connectivity	Narrowest Corridor	< 600	< 600 m	**equal to or > 600 m**	*1 500 m*

Critical management activities necessary to maintain the lowland fynbos ecosystem include the strategic management of invasive alien vegetation, over-abstraction of groundwater, inappropriate fire regimes and land and water pollution. Disaster management and contingency planning are necessary to avoid or mitigate the potentially devastating effects of utility failure. Other key interventions relate to ensuring legal land protections are in place where appropriate, and that protected areas are consolidated and augmented through stewardship or other effective means. Furthermore, enabling interventions such as cooperative governance, managed access and the responsible and sensitive development of infrastructure and associated operations are necessary to ensure the long-term conservation of the Lowland Fynbos Mosaic.

4.2.2 Natural Wetlands

Value Description

The focal value comprises natural wetlands, including perennial and non-perennial streams, depressions, seepage areas and springs. Wetland ecosystems are vulnerable to irreversible transformation outside of protected areas, especially in lowland areas. The Complex is one of the few remaining options to protect these ecosystems, which secure important biodiversity and ecosystem services. The area also contributes to groundwater recharge and may represent several groundwater dependent ecosystems. The extent of groundwater dependent ecosystems needs to be quantified. Large-scale ecosystem drivers include climate, catchment geomorphology and geology (Snaddon *et al*. 2016).

Key Ecological Attributes

- Vegetated buffer zone
  The maintenance of a vegetated buffer zone is important for connectivity between inland aquatic systems and surrounding/adjacent terrestrial ecosystems. Intact drainage patterns support indigenous vegetation structure and composition, enabling ecological processes longitudinally and laterally. Aquatic ecosystems within the Complex are intact, with the exception of the Silwerstroom River where there is bulk water supply infrastructure for large-scale abstraction as part of the Atlantis Water Supply Scheme.

- Hydro period (*i.e.* the timing and duration of saturation or inundation)
  Seasonal wetlands and seeps retain distinctive plant communities and water-dependent vegetation communities vulnerable to changes in hydrological pattern. Fine scale variation in plant communities and presence of rare or threatened species are affected by variation in soil type and water availability. Water availability is influenced by land use activities outside of the Complex, such as groundwater abstraction, and large-scale irrigation works which alter drainage patterns and run-off into seasonal wetlands in Riverlands Nature Reserve. Anthropogenically influenced water source patterns (groundwater abstraction or surface water run-off) result in altered timing and duration of saturation or inundation of wetlands, which can result in significant changes to aquatic biodiversity and can promote invasion by weedy or invasive species. The surface flow of the Silwerstroom River, a FEPA (Nel *et al.* 2011a; Nel *et al*. 2011b) and micro-estuary, is maintained although there is an established abstraction point for bulk potable water supply.

- Water quality
  Water quality is a key driver of aquatic ecosystem functioning. Species are adapted to an optimal range of chemical conditions and are therefore vulnerable to changes in water quality. An assessment of water quality for selected wetlands is necessary to establish a baseline for the Complex. Wetlands dominated by bulrush, *Typha capensis,* are usually degraded as a

result of eutrophication (Snaddon *et al.* 2016). The extent of *Typha capensis* serves as a macro-indicator for selected wetlands in the absence of an established baseline for water quality.

- Indigenous species composition
  Intact vegetation types and associated wetlands and seeps are important for retaining distinctive plant communities in the Sand Fynbos. Drainage of water is an important driver of vegetation structure and composition in strandveld ecosystems, with dune slack wetlands contributing significantly to overall diversity of the strandveld ecosystem. Aquatic biota, sensitive to changes in water quality and quantity, are good indicators of wetland ecosystem health. A wetland assessment is necessary to inform the establishment of a baseline against which to measure wetland ecosystem condition over time. The absence or a low density of invasive alien species must be maintained.

The viability assessment for Natural Wetlands is provided in Table 4.3. Text in bold outlines the Current Status, text in italics outlines the Desired State.

Table 4.3. Natural Wetlands Viability Assessment

KEAs and Indicators for Natural Wetlands (Condition: Good)						
Category	**Key Attribute**	**Indicator**	**POOR**	**FAIR**	**GOOD**	**VERY GOOD**
Landscape Context	Vegetated natural buffer zone	Adequate cover in square metres	<32 m	32-50 m	**50-100 m**	*>100 m*
Condition	Water quality	Biochemical composition	*Not Rated:* There is insufficient baseline information to establish the condition.			
		Extent of Typha	Dense & extensive stand	**Present**	*Emerging*	Absent
Condition	Hydro period	Surface water flow (Silwerstroom River)	Regular breaks in flow (>1 in 10 years)	Occasional breaks in flow (<=1 in 10 years)	**Perennial flow**	*Perennial flow*
		Extent of standing water	Permanent standing water / no water in the wrong season	-	Not too much or too little at the wrong time	-
	Indigenous Species Composition	Persistence of key species within the percentage	*Not Rated:* There is insufficient baseline information to establish the condition.			

KEAs and Indicators for Natural Wetlands (Condition: Good)						
Category	**Key Attribute**	**Indicator**	**POOR**	**FAIR**	**GOOD**	**VERY GOOD**
		delineated wetland with 99 % indigenous species cover				

A simplified version of the Wet-Health (McFarlane *et al*. 2008) assessment method is implemented in CapeNature protected areas. A desktop assessment followed by ground-truthing is necessary to establish a baseline and select key wetlands for long-term monitoring. Sites selected for long-term should represent a variety of wetland types, incorporating groundwater/aquifer-dependent ecosystems and wetlands vulnerable to anthropogenic pressures such as groundwater abstraction and inappropriate development. Wetlands that are likely impacted by threats originating from outside the boundaries of the Complex, such as altered surface flows, nutrient enrichment and over-abstraction, will also be included for long-term monitoring.

Critical management activities necessary to maintain freshwater ecosystems are the same as those for the Lowland Fynbos Mosaic, with an emphasis on cooperative governance and closer collaboration in the management of groundwater resources and adjacent land management practices.

4.2.3 Atlantis Aquifer

Value Description

The Atlantis aquifer, via the Atlantis Water Supply Scheme, is an important natural source of potable water for the City of Cape Town. The focal value comprises the Atlantis aquifer and the surface water reticulation system with associated artificial wetlands designed to augment recharge of the aquifer. The reticulation system of artificial wetlands is designed to collect storm water runoff and treated water from wastewater treatment works. This water artificially recharges the aquifer (Bugan, 2016; Jovanovic *et al.* 2017).

The Atlantis aquifer is divided into buffer and protection zones according to surface and basement topography and the likely travel time for pollutants. Protection zones inform planning and control within the CCT of the threats, hazards and consequence of groundwater pollution to the bulk water supply to Atlantis, in particular the abstraction of potable groundwater used as the primary source of water in the Atlantis Water Supply Scheme. The controls required are set out for each zone. The aquifer is assumed to be controlled by dividing compartments that are basin structures of aeolian and marine sands and that result in heterogeneous aquifer properties and preferential flow paths. Monitoring data are required to determine water levels and drawdown due to groundwater abstraction.

Nested within the focal value are the natural vegetated surface landscape, dune systems, wellfields, and artificial recharge areas within the geographic scope of the delineated aquifer. Key attributes of this focal value are water quantity, water quality and the natural surface environment. The natural land surface comprises unvegetated dune fields, Atlantis Sand Fynbos, Cape Flats Dune Strandveld and Langebaan Dune Strandveld.

The Nature Conservancy, in cooperation with the CCT, improve the management of the Atlantis aquifer and Atlantis Water Supply Scheme under the auspices of the Greater City of Cape Town Water Fund. The fund aims to improve ecological infrastructure of the aquifer protection zone, enhance recharge and strengthen the CCT's existing initiatives to protect the aquifer against pollution.

Key Ecological Attributes

- Annual yield / abstraction
- Groundwater level
- Intact natural environment
- Water balance
- Water quality

Viability Assessment

Table 4.4 describes the indicators and condition the Atlantis Aquifer. There is insufficient information to determine the overall condition of the focal value. This is partly because the aquifer and its management extend well beyond the bounds of the Complex, although well within the Complex Zone of Influence. The attributes identified are, however, key to the functioning of the Atlantis Aquifer. The associated data gathered is essential for decision support and adaptive management by relevant entities. Through the Greater City of Cape Town Water Fund, studies aim to improve the current state of knowledge of the aquifer, and water loss due to invasive alien plants and replacement vegetation following clearing operations.

The viability assessment for the Atlantis aquifer is provided in Table 4.4. Text in bold outlines the Current Status, text in italics outlines the Desired State. TBD represents 'to be determined' in instances where there is not enough information to quantify the state. The condition rating of the Atlantis aquifer is based on the Key Attribute 'Intact Natural Recharge Area', an attribute under the direct influence of management within the Complex. Other key attributes are noted as significant to rate overall condition of the Atlantis aquifer, which is necessary during implementation of the management plan and requiring a collaborative effort with civil society and the private sector.

Table 4.4. Atlantis Aquifer Viability Assessment

KEAs and Indicators for Atlantis Aquifer (Condition: Poor)						
Category	**Key Attribute**	**Indicator**	**POOR**	**FAIR**	**GOOD**	**VERY GOOD**
Landscape Context	Annual yield / abstraction*	Volume from Witzands Wellfield & Silwerstroom Wellfield	-	**Unintentionally declining**	*Adequate*	TBD
	Groundwater level*	Groundwater level	Level continuously below minimum of desired range	**Declining trend beyond desired range**	*Stable in desired range*	Stable in desired range over long term
	Intact Natural Recharge Area	% non-invasive plant species cover in buffer zones	**0.01 – 5 %**	6 - 98 %	*99 %*	100 %
		% non-invasive plant species cover in protection zones 1 & 2	**0.01 – 5 %**	6 - 98 %	*99 %*	100 %
	Water balance*	Total recharge	TBD	Insufficient	Sufficient	TBD
	Water quality*	Degree of salinity	Too high	**Occasionally too high**	*Consistent low salinity*	TBD
		Dissolved organic carbon (DOC) load	*Not Rated:* There is insufficient baseline information to establish the condition.			
		Presence / absence of nutrients	*Not Rated:* There is insufficient baseline information to establish the condition.			
		Safe artificial recharge at all points	Not safe	**Improving trend**	*Safe (above TPCs)*	Super safe

*Key attributes noted as significant to rate and monitor the viability of the Atlantis aquifer as a whole and requiring collaboration with the relevant mandated entities.

The management of the Atlantis aquifer requires an integrated collaborative effort between entities such as the Department of Water and Sanitation, CCT Water and Sanitation, CapeNature, West Coast Biosphere Reserve, water users and tertiary institutions.

The management of the Ganzekraal Conservation Area makes provision for the strategic management of invasive alien vegetation, inappropriate fire regimes and land and water pollution within the geographic scope of the Complex. Close collaboration with relevant management authorities is essential for an integrated approach to the management of these critical threats. An integrated monitoring and knowledge management approach is necessary to enable adaptive management for the sustainable utilisation of groundwater resources (*e.g.* Seward *et al.* 2006). Management decisions should be guided and supported by monitoring data for strategically selected boreholes and associated wetlands nearby, and at various distances from abstraction points as control. This may be achieved through the establishment of governance structures for the Complex and associated working groups.

Monitoring of production boreholes should include the measurement of abstraction rates and the implementation of a predetermined low water level threshold that, when reached, triggers intervention to reduce or yield abstraction. It is recommended that CCT Water and Sanitation implement groundwater monitoring with data sharing and regular engagement between entities.

4.2.4 Coastal Intertidal and Inshore System

Value Description

The Coastal, Intertidal and Inshore System is a focal natural value of the Complex. The system comprises a linear coastal zone extending 500 m inshore of the coastline to 10 m depth and incorporates the progression of coastal and marine ecosystems from land to sea, *i.e.* natural dune systems to the outer seaward edge of the Cape Kelp Forest ecosystem as delineated by the NBA Marine and Coastal component (SANBI 2018 in prep.). This follows the key divisions in the national marine and coastal habitat classification (Sink *et al*. 2012). Coastal types include rocky coast substrate, mixed coast substrate and sandy coast substrate, while inshore types comprise rocky substrates and unconsolidated substrates.

Nested targets include the Cape Kelp Forest and associated species assemblages with an emphasis on abalone and West Coast rock lobster; rocky shores and mixed shores and associated macroinvertebrate communities; sandy beaches, pebble beaches and boulder beaches; and Cape frontal dunes, up to 500 m inland. Associated seabirds and shorebirds are also nested values.

Key Ecological Attributes

The following key ecological characteristics driving ecosystem function, pattern and structure include:

- Natural dune system colonised by pioneer beach vegetation (Cape seashore vegetation) and strandveld:
  Pioneer beach vegetation and strandveld that occur on primary and frontal dunes are critical for maintaining ecological processes and biogeographical gradients, longitudinally and in relation to drainage systems. The extent of alien

invasive plants serves as an indicator to measure the health of the natural dune system. An absence or low density of invasive alien plants should be maintained. The colonised dune system, particularly by strandveld, overlaps with the Lowland Fynbos Mosaic, where indigenous species composition is a measure of condition. As such, condition assessment of strandveld is addressed under the Lowland Fynbos Mosaic.

- Breeding success of priority shorebirds:
  The breeding success of the African oystercatcher was selected as an indicator due to the species' sensitivity to disturbance and prey fluctuations, which can provide insights into the health of the intertidal macroinvertebrate community. Breeding success is measured as the number of fledglings per breeding pair per year (flg / breeding pair / yr), where a breeding success rate of 0.35 fledglings/breeding pair/year is required to maintain a stable population (Hockey *et al*. 2005).

- Rocky shore macroinvertebrate species composition and abundance:
  Species composition and abundance of intertidal rocky shore macroinvertebrate communities are critical features of marine and coastal ecosystem food-chains, ecological processes and ecosystem functioning. Exposed rocky shores are subject to acute harvesting of limpets, especially *Patella cochlear* and *P. granularis*, and their population sizes could be correlated with poaching events. Mediterranean mussel and potentially other marine invasive species are emerging threats. An upward trend in the abundance of mature limpet *Patella* sp., more specifically the persistence of mature *Patella* sp., is considered an adequate indicator of ecosystem health. It is also useful for early detection and rapid response to the emergence and spread of marine invasive species. The indicator also serves as a proxy for the effectiveness of law enforcement efforts. A baseline field survey is required and offshore Dassen Island is an ideal reference site, although a baseline is necessary for Dassen Island too.

- Species composition of the inshore system:
  Abalone and West Coast rock lobster are heavily poached along the coast. Population sizes and trends serve as indicators of the health of the Cape Kelp Forest ecosystem, and also as a proxy for the effectiveness of law enforcement efforts. Baseline conditions need to be determined and desirable benchmarks established against which to measure condition over time. See Table 4.5.

Abovementioned attributes can provide a picture of the overall condition of the Coastal, Intertidal and Inshore System. Condition can be evaluated in terms of representation and persistence, illustrating progress towards the desired state (Goals).

The viability assessment for the Coastal, Intertidal and Inshore System is provided in Table 4.5. Text in bold outlines the Current Status, text in italics outlines the Desired

State. TBD represents 'to be determined' in instances where there is not enough information to quantify the state.

Table 4.5. Coastal, Intertidal and Inshore System Viability Assessment

KEAs and Indicators for Coastal, Intertidal and Inshore System (Condition: Fair)						
Category	**Key Attribute**	**Indicator**	**POOR**	**FAIR**	**GOOD**	**VERY GOOD**
Condition	Colonised natural dune system	Extent of invasive alien flora	**Dense infestation (50-100%)**	Scattered (5-50%)	*Low infestation (0-5%)*	Not present
	Breeding success of priority shorebirds	Breeding success of African oystercatcher	0.27 flg/brpr/yr	**0.35 flg/brpr/yr**	*0.45 flg/brpr/yr*	0.56 flg/brpr/yr
	Rocky shore macro-invertebrate species composition and abundance	Persistence of mature *P. cochlear* and *P. granularis* limpet sp.	Mature limpet species are not present	**Mature limpet are present but not sustainable**	*Sustainable mature population for breeding*	TBD
	Species composition of inshore system	Persistence of abalone population	*Not Rated:* Data not available.			
	Species composition of inshore system	Persistence of West Coast rock lobster population				

Condition assessments can also serve as proxy for the effectiveness of legal land protections and management of the Ganzekraal Conservation Area, supported by sensitivity analysis and associated zonation schemes, cooperative governance and stakeholder engagement, environmental awareness and education, and law enforcement and compliance monitoring.

4.2.5 Sensitive Island Ecosystem

Value Description

The Sensitive Island Ecosystem comprises Dassen Island and its offshore waters within the 'zone of island influence' described by Sink *et al*. (2012). It comprises the Cape Island Shore, Cape Kelp Forest, and Cape Sandy Inner Shelf ecosystems.

The Cape Island Shore includes Dassen Island in its entirety, up to the outside edge of the surf zone. It includes the associated species assemblages, with priority given to threatened sea- and shorebirds, rocky shore macroinvertebrate species, abalone and West Coast rock lobster. The priority species of the Cape Kelp Forest, the extent of

which was mapped during 2018 also include bank cormorant, West Coast rock lobster and abalone. Priority species of the Cape Sandy Inner Shelf include pelagic fish such as sardine and anchovy, an important food source for seabirds such as the African penguin and Cape cormorant and a target of fisheries in the area.

Key Ecological Attributes

The key ecological characteristics driving ecosystem function, pattern and structure include:

- Cape Island Shore species composition:
  Indicators of Cape Island Shore species composition include the 1) abundance of threatened marine predators such as African penguin, Cape, crowned and bank cormorants, and great white pelican; 2) breeding success of African penguin and bank cormorant; 3) rocky shore invertebrate diversity; 4) persistence of abalone population; and 5) persistence of West Coast rock lobster population.

  Marine seabird predators are considered good indicators of the health of marine ecosystems, and their breeding success and condition provide insights into food availability and sustainability of fisheries. Bank cormorants, endemic to southern Africa, seldom range further than 10 km offshore and their distribution coincides with Cape kelp forest. Bank cormorants prey on various fish, crustaceans and cephalopods, but mainly prey on West Coast rock lobster in kelp forests. Breeding success thus serves as proxy for the condition of the Cape Island Shore and Cape Kelp Forest. Crowned cormorants also utilise this area, feeding primarily on bottom-dwelling fish in the infratidal and intertidal regions. African penguins feed primarily on anchovy and sardine. African penguin breeding success is thus proxy for the condition of the offshore Cape Sandy Inner Shelf ecosystem and associated pelagic species assemblages. Rocky shore invertebrate diversity, abalone and West Coast rock lobster population size are selected indicators of the health of Cape Island Shore, the Cape Kelp Forest, and extent of emerging marine invasive species. Relative abundance and breeding success of the above-mentioned avifauna is based on a monitoring programme established in 1991 and is rated as 'Fair' (unpublished data, Western Cape Nature Conservation Board).

- Cape Kelp Forest size and extent:
  The extent of Cape Kelp Forest was mapped for the first time during 2018 for the NBA (SANBI 2018 in prep), serving as a baseline going forward.

- Cape Kelp Forest species composition:
  Cape Kelp Forest will be altered by imbalances in trophic levels due to an overabundance or reduction of macro-invertebrate predator and prey species as a result of changing distributions or over-exploitation. The persistence of keystone species for kelp forest is identified as a required indicator, although this still needs to be defined for the Sensitive Island Ecosystem.

- Cape Sandy Inner Shelf pelagic species abundance:
  The large populations of plankton support large, offshore stocks of pelagic fish such as sardine and anchovy, which are in turn preyed upon by marine predators, including numerous seabirds and fish such as snoek. Data can be derived from pelagic fish seismic surveys while fishing pressure or African penguin condition could serve as a proxy of pelagic fish abundance when considered in relation to other indicators at scale. Protection and understanding of the offshore pelagic stock is of vital importance to the survival of many marine predator species on Dassen Island such as the African penguin and Cape cormorant. Inter-annual fluctuations in the number of swift tern breeding at Dassen Island are related to the abundance of anchovy (Crawford & Dyer 1995).

Above-mentioned attributes can be related to habitats, species or ecological processes, the health of which is related to the overall condition of the Sensitive Island Ecosystem. Condition can be evaluated in terms of representation and persistence, illustrating progress towards the desired state (Goals).

The viability assessment for the Sensitive Island Ecosystem is provided in Table 4.6. Text in bold outlines the Current Status, text in italics outlines the Desired State.

Table 4.6. Sensitive Island Ecosystem Viability Assessment

KEAs and Indicators for Sensitive Island Ecosystem (*Not Rated*: There is insufficient information to determine the condition)						
Category	**Key Attribute**	**Indicator**	**POOR**	**FAIR**	**GOOD**	**VERY GOOD**
Condition	Cape Island Shore species composition	Abundance of threatened marine predators (avifauna)	All 5 species abundance rates range from 'Poor' to 'Fair'	**At least 2 spp. abundance rates are 'Fair' & 'Good'**	*All 5 spp. abundance rates are 'Fair' to 'Good', with a minimum of 2 spp. rated as 'Fair'*	All 5 spp. abundance rates range from 'Good' to 'Very Good'
		Breeding success of African penguin	0.37 flg/brpr/yr	0.5 flg/brpr/yr	0.67 flg/brpr/yr	1.0 flg/brpr/yr
		Breeding success of bank cormorant	0.12 flg/brpr/yr	0.64 flg/brpr/yr	0.97 flg/brpr/yr	1.5 flg/brpr/yr
		Rocky shore invertebrate diversity	*Not Rated:* There is insufficient baseline information to establish the condition.			

KEAs and Indicators for Sensitive Island Ecosystem (*Not Rated*: There is insufficient information to determine the condition)						
Category	**Key Attribute**	**Indicator**	**POOR**	**FAIR**	**GOOD**	**VERY GOOD**
		Persistence of abalone population	*Not rated:* Data not available.			
		Persistence of West Coast rock lobster population				
Size	Cape Kelp Forest size and extent	Extent of Cape kelp forest	*Not Rated:* New ecosystem type mapped for South Africa. Status in prep (SANBI 2018 in prep.).			
Condition	Cape Kelp Forest species composition	Persistence of keystone kelp forest species	*Not Rated:* There is insufficient baseline information to establish the condition.			
	Cape Sandy Inner Shelf pelagic species abundance	Abundance of anchovy and sardine	*Not Rated:* Data not available.			

Dassen Island is relatively free of human disturbance. Illegal landings by the public are not a frequent occurrence and immediately addressed when this does occur. Predation rate of eggs and chicks by kelp gull and great white pelican are considered within ecologically acceptable ranges. Dassen Island is not a Cape fur seal, *Arctocephalus pusillus,* colony, and seals, when observed, are actively chased off the island to prevent colonisation due to the vulnerability of resident seabirds to predation and disturbance.

Dassen Island and associated habitats are an ideal reference for measurement of ecosystem response to climate change and other human induced pressures over time. Illegal and indiscriminate fishing practice is a threat, and rock lobster fishing takes place within the 500 m seaward boundary of Dassen Island. The shortage of fish stocks which is currently driving the decline of a number of threatened seabirds is outside the ambit of reserve management and needs to be addressed at a national level by DAFF and DEA:O&C. Monitoring and surveys related to seabirds and macro invertebrates in the intertidal zone according to set protocols are, however, the responsibility of reserve management and the data emanating from these activities will contribute to the establishment of national strategies and policies.

Threatened sea- and shorebird presence and abundance, and breeding success of key species, are well-monitored and long term datasets exist. Baseline conditions need to be determined for rocky shore invertebrate diversity, abalone and West Coast rock lobster, and desirable benchmarks established against which to measure

condition over time, in collaboration with DAFF and DEA:O&C. An appropriate keystone species must be determined for the Cape Kelp Forest. Established monitoring programmes for pelagic fish abundance surveys and ecosystem assessment need to inform site level monitoring programmes and data collection, and promote collaboration. A closer collaboration with DEA:O&C and alignment of monitoring techniques of sea- and shorebirds are necessary, while engagement with entities such as SANBI and tertiary institutions can facilitate ecosystem condition monitoring and assessment. Dassen Island also serves as a reference site for the Coastal, Intertidal and Inshore System.

4.2.6 Cultural and Historic Heritage

The focal value is described in terms of tangible heritage features, and 'living heritage' which comprises the intangible aspects of inherited culture, for example cultural tradition, oral history, knowledge systems relating to, for example, the environment and plant use; traditional access to environmental resources, *etc.* as defined by the National Heritage Act (Act No. 25 of 1999).

Value Description

The focal value comprises the tangible cultural historic heritage including historical buildings, shipwrecks, graves and burial grounds. The National Heritage Resources Act (Act No. 25 of 1999) protects heritage resources as defined under the National Estate. These resources include among others paleontological resources, prehistoric / historic material, human remains, structures older than 60 years, ruins older than 100 years, and landscapes of cultural significance. Shipwrecks, governed by the Merchant Shipping Act (Act No. 57 of 1951) and the National Monuments Act (Act No. 28 of 1969) as amended, burial grounds and paleontological resources are not included in this viability assessment (*i.e.* condition was not assessed). These resources require a survey by a credible heritage practitioner and intact, undisturbed ecosystems provide protection for these resources. The National Monuments Act (Act No. 28 of 1969) places an emphasis on wrecks older than 50 years with the objective of controlling indiscriminate and destructive salvage operations.

Nested values include intangible heritage such as historic, traditional and religious activities and knowledge.

Key attributes

- Physical condition of heritage buildings
  Structures on Dassen Island that serve a dual purpose of heritage protection and operations are on a maintenance schedule, while the heritage structures present in Ganzekraal are vulnerable to vandalism, and weathering due to neglect. The percentage of buildings in good condition serve as an indicator to measure the condition of tangible heritage.

- Protection status of heritage structures

The outcomes of heritage assessment and significance ascribed is a measure of the degree of value that a feature holds for society. This indicator serves as proxy for the value placed on features by society. The indicator relates to Museum Status or other 'formal' protection under the Monuments or Heritage Acts.

- Conceptual meaning
  Conceptual meaning relates to the level of information documented and made available, including but not limited to means of interpretation such as interpretive information or material, signage and the language of information made available. This follows the rationale that through access to information, increasing awareness and education, the erosion of cultural values over generations can be mitigated.

The viability assessments for Cultural and Historic Heritage is provided in Table 4.7. Text in bold outlines the Current Status, text in italics outlines the Desired State.

Table 4.7. Cultural and Historic Heritage Viability Assessment

KEAs and Indicators for Cultural and Historic Heritage (Condition: Good)						
Category	**Key Attribute**	**Indicator**	**POOR**	**FAIR**	**GOOD**	**VERY GOOD**
Condition	Physical Condition of Heritage Buildings	% Buildings in good condition	< 25 %	**24 - 49 %**	*50 – 75 %*	> 75 %
	Protection Status of Heritage Buildings	% Buildings with formal protection status	< 25 %	**24 - 49 %**	*50 – 75 %*	> 75 %
	Conceptual Meaning	Level of cultural historic information made available	Not documented. Not known.	History is not easily accessible apart from in memory or archival records.	**History is documented & available, elderly people know history.**	*Most people know the history and directly benefit from it.*

The condition of the historical buildings in the Complex vary from very good to poor. The historical buildings and infrastructure on Dassen Island are in a good condition and are listed on the South African Heritage Resource Inventory (SAHRIS), while a large proportion of the infrastructure within Ganzekraal are in a state of neglect or subject to vandalism. The farm Bokkerivier (Bokbaai) is a declared Provincial Heritage Site (National Monument). Formal protection status for heritage assets currently not listed should be pursued based on the outcomes of a formal Heritage survey.

General history of the area has been fairly well documented from *circa* 1400s, but is not always readily accessible in formats suitable for the general public and interested

parties. Colonial history is well-documented and available in many formats across all platforms. Although a wealth of local, detailed, historical knowledge exist, most of it is not documented and available to the general public.

4.3 Threat Assessment

The viability assessment was followed by a threats assessment to identify and define the activities that may directly affect or degrade a value, or prevent it from achieving the established desired state (*i.e.* the Goal).

Direct threats were identified and articulated per focal value. Threats were rated according to the scope and severity of impact, and reversibility of the effect of the threat. A threat rating was generated according to extent (the scope) and magnitude of the threat (a combination of threat severity and irreversibility). Threats were filtered using criteria such as similarity, similarity in the direct causal factor impacting on / degrading focal values, and similarity of potential mitigation strategies (CMP 2013).

To prioritise threats, threat ratings were amalgamated across natural and cultural historic values, and those having the highest overall rank formed the subset of critical threats, *i.e*. those that require focussed conservation effort. These are summarised in Section 2.1.4.

Remaining lower ranking, but significant threats were also screened for consideration where necessary. Prioritised threats were evaluated by analysing the conservation situation to better understand the casual factors, actors, and to identify opportunities and strategic intervention points. A conceptual model was developed to illustrate the conservation situation and guided the formulation of strategies. The situation analysis illustrates that listed threats may be attributed to the fact that the Complex is new, *i.e*. in a state of development. The Ganzekraal Conservation Area specifically, where threats tend to be more severe, was historically vacant and remotely managed.

The most critical threats to the focal values of the Complex as briefly discussed in Section 2.5, are:

- Invasive alien flora (H);
- Over-abstraction of groundwater (H);
- Land and water pollution (H);
- Inappropriate fire regime (M);
- Unregulated utilisation of natural resources (M);
- Vandalism and weathering (M);
- Invasive alien fauna (L);
- Utility failure (VH);
- Oil pollution at sea (VH);
- Climate change.

This section discusses invasive alien flora and fauna, over-abstraction of groundwater and inappropriate fire regime in the context of the conservation situation in more detail than Section 2.5. Significant lower rated threats requiring surveillance and/or early

intervention to prevent degradation or loss of values (based on irreversibility), are also discussed. These include:

- Poaching of terrestrial fauna and flora (L) and marine resources (M);
- Overgrazing by livestock (M);
- Uncontrolled recreation activities (M):
- Inappropriate development (M);
- Land invasion (L);
- Invasive alien fauna (L).

4.3.1 Invasive alien flora (H)

Invasive alien flora, rated as high, is a critical threat to the focal values of the Complex, excluding the Sensitive Island Ecosystem of Dassen Island. The goal for the Complex is to have at least 6 500 ha comprising 99% indigenous species cover, including that the primary and secondary aquifer protection zones and natural dune system are clear of invasive alien plants by 2029.

Alien invasive flora pose a low threat to the Sensitive Island Ecosystem as it is currently not pervasive in its spread. Two alien invasive species are actively eradicated through mechanical means. These are seasonal species associated with nutrient poor soils and include khaki weed, *Tagetes minuta,* and *Agave* species. Several manitoka trees, *Myoporum serratum*, are limited to demarcated staff housing areas in demarcated management zones. Several other species are considered exotic weeds, and the island is transformed during and after the breeding seasons when all standing plant material is used by resident birds for construction of nests. See Table 4.8.

Table 4.8. Checklist of terrestrial invasive plants recorded at Dassen Island Nature Reserve

Common name	Scientific name
Canary grass	*Polypogon monspeliensis*
Blue grass	*Poa annua*
Wild barley	*Hordeum murinum*
Poison bulb	*Homeria miniata*
Stinging nettle	*Urtica urens*
Devil's thorn	*Tribulus terrestris*
Wheat bush	*Chenopodium murale*
Brakbossie	*Atriplex semibaccata*
Chickweed	*Stellaria media*
Heron's bill	*Erodium moschatum*

Common name	Scientific name
Small mallow	*Malva parviflora*
Blue pimpernel	*Lysimachia monelli*
Fumitory	*Fumaria muralis*
Wild tobacco	*Nicotiana glauca*
Manitoka	*Myoporum tenuifolium*
Sow thistle	*Sonchus oleraceus*
Tumbleweed	*Salsola kali*
Annual beard-grass	*Polypogon monspeliensis*

Invasive alien flora pose a critical threat to the Lowland Fynbos Mosaic, Natural Wetlands, Atlantis Aquifer, and Coastal Intertidal and Inshore System of the Complex. Priority alien plant species include Port Jackson willow, *Acacia saligna*, rooikrans, *Acacia cyclops,* black wattle *Acacia mearnsii,* and various *Eucalyptus* and *Pinus* species. In natural wetlands that are subject to high nutrient loads from surrounding or historic land use practices, indigenous species such as *Typha capensis* and *Phragmites australis* tend to form monospecific stands inhibiting free flow of water and outcompeting other indigenous species. Kikuyu grass, *Pennisetum clandestinum,* is invasive in areas bordering vegetable farms with irrigated crops, specifically at the Riverlands Nature Reserve. Monocultures comprising largely of couch grass, *Cynodon dactylon,* dominate localised areas in Ganzekraal Conservation Area and Riverlands Nature Reserve that were historically ploughed or intensively grazed by livestock. Invasive alien plant density in 2017 is illustrated in Appendix 2, Map 6.

Factors that have likely contributed to the current state of invasion include historic land use activities and differing clearing objectives by land managers at the time, unnatural and too frequent fire and limited resources for effective compliance monitoring. Lowland fynbos is vulnerable to habitat fragmentation and edge effects, and prone to subsequent invasion by invasive alien plants, especially in the absence of buffering mechanisms. On protected area boundaries where there is no buffer, ecosystems appear sensitive to nutrient rich run-off from adjacent cultivated land. In these areas, indigenous species become invasive while alien, weedy species such as Patterson's curse, *Echium plantaginuem*, blue lupine, *Lupinus angustifolius,* European yellow lupine, *Lupinus luteus,* khaki weed and Kikuyu grass encroach. See Table 4.9.

Table 4.9. Invasive alien plant (IAP) species present within the Ganzekraal Conservation Area and Riverlands Nature Reserve

IAP species name	Common name	NEM:BA Category	Distribution
Acacia cyclops	Rooikrans	1b[1]	Widespread
Acacia mearnsii	Black Wattle	2[2]	Localised areas in Riverlands & west of the R27 in Ganzekraal
Acacia saligna	Port Jackson Willow	1b	Widespread
Bouteloua dactyloides	Buffalo grass	2	Roads and road reserves
Eucalyptus camaldulensis	Red River Gum	1b	Localised areas in Riverlands & east of the R27 in Ganzekraal
Eucalyptus lehmannii	Spider gum	2	Localised Ganzekraal
Grevillea striata	Beef Silky Oak	2	Localised Riverlands
Leptospermum laevigatum	Australian Myrtle	1b	Localised Riverlands
Pinus pinaster	Cluster Pine	1b	Localised Riverlands
Pinus pinea	Stone pine	2	Localised Ganzekraal
Populus canescens	Poplar	2	Localised Riverlands & Ganzekraal
Echium plantaginuem	Patterson's curse	1b	Seasonal widespread Riverlands & Ganzekraal
Lupinus angustifolius	Blue lupin	-	Seasonal Ganzekraal in historically farmed areas
Lupinus luteus	European yellow lupine	-	Seasonal Riverlands in historically farmed areas
Cirsium vulgare	Spear thistle	1b	Seasonal along roads and road reserves
Brassica napus	Canola	2	Seasonal localised Riverlands
Ricinus communis	Castor-oil plant	2	Localized Ganzekraal
Dittrichia graveolens	Cape khaki weed	-	Seasonal along roads and road reserves, becoming more prevalent along drainage lines in Riverlands; localised Dassen Island

[1] Includes most widespread and troublesome species and requires control and landowners must comply with species management programmes where these are developed.

[2] Includes commercial plantation species that require permits for cultivation and requiring control outside of areas demarcated for cultivation.

Invasive alien plant species densities within the Complex are variable. For the Ganzekraal Conservation Area, dominant invasive alien plant species are Port Jackson willow and rooikrans. Other species observed include castor oil, *Ricinus communis*, and blue lupine in areas previously under agriculture, while historic homesteads are characterised by spider gum, *Eucalyptus lehmannii*, pomegranate, *Punica granatum, Bougainvillea* sp., wild tobacco, *Nicotiana glauca* and various species of pine. Port Jackson willow dominates the landscape east of the R27 highway, varying in densities from scattered to dense, while densities are classified as occasional in areas west of the R27, and rare along the coast. West of the R27 freeway rooikrans dominates, and densities are classified as scattered. Both Port Jackson willow and rooikrans occur in higher densities east of the Ganzekraal resort nearing the R27. East of the R27 freeway, invasive alien plant densities appear to be highest along property borders and near highways such as the R27 and Silverstroom Road. Biological control agents such as the gall forming rust fungus, *Uromycladium tepperianum,* appear to have been present in the area for several years. In localised areas, the effectiveness of the rust fungus appears comprised by too frequent fires.

The dominant invasive alien plant species in the Riverlands Nature Reserve is Port Jackson willow. Edges of the reserve bordering vacant and remotely-managed and/or disturbed land are dominated by *Eucalyptus camaldulensis* and *Pinus pinaster.* Other invasive alien plants that occur at lesser densities are rooikrans, black wattle, Australian myrtle, *Leptospermum laevigatum, Pinus pinea* and grey poplar, *Populus canescens*. These species occur in localised patches and are restricted to disturbed areas. Since Riverlands Nature Reserve is almost entirely surrounded by agricultural land use, the site is vulnerable to invasion by weedy exotic species such as Patterson's curse, spear thistle, *Cirsium vulgare*, Canola, *Brassica napus,* European yellow lupine and khaki weed.

Invasive alien plant species management and operational planning are guided by a prioritisation process informed by clearing history, alien plant species density and NEM:BA category, fire history and mapping of ecologically sensitive areas. Ecologically sensitive areas for the Complex include watercourses, the Atlantis aquifer protection zones, foredunes and the Riverlands wetland system. Furthermore, veld condition mapping is an additional informant to guide operations. Accessibility is also a consideration, although not a critical factor for the Complex.

Alien vegetation management applies an integrated approach, which includes the use of biological control agents and fire. A challenge in the Complex is the appropriate management of fuel loads that are generated by clearing operations. Currently, stack burning is implemented in demarcated areas such as along roads or firebreaks. Invasive alien vegetation management in the greater DCCP landscape is actively implemented by several partner organisations such as the CCT Environmental Management Department, Greater City of Cape Town Water Fund, Cape West Coast Biosphere Reserve and private landowners. This creates an ideal opportunity for integrated management of alien invasive species towards the maintenance of critical biodiversity and ecological support areas within the climate change corridor.

4.3.2 Over abstraction of groundwater (H)

This is a threat to the Lowland Fynbos Mosaic, Natural Wetlands and the Atlantis Aquifer. Proactive approaches to ensuring future water security in a growing Cape Town Metropole in the face of climate change (Bugan *et al*. 2016), is necessary to cope with unpredictable long-term rainfall patterns and droughts. The effects of over abstraction related to drawdown are not well-understood, while the extent of groundwater dependent ecosystems requires field verification. Additionally, salt-water intrusion into the aquifer is a risk. A situation of over-abstraction of groundwater may be attributed to current demand coupled with socio-economic development and a growing demand for water that may exceed the supply. Wastage is a factor to consider, potentially a result of aging infrastructure and general lack of awareness by resource users. Knowledge gaps may exist in terms of current abstraction rates as the number of registered extraction points may not adequately reflect all abstraction points. With the recent drought conditions experienced in Cape Town (2015-2017) and increased pressure of groundwater resources to augment supply, groundwater monitoring design and implementation are likely to require collaboration between resource management entities and frequent review.

The Greater City of Cape Town Water Fund, established during 2016 and a partnership between the CCT and The Nature Conservancy, aims to facilitate synergies between relevant entities and invest in ecological infrastructure to ensure water security. This entails improving ecological infrastructure on the aquifer protection zone, enhancing aquifer recharge and strengthening the CCT's existing initiatives to protect the aquifer against pollution. This includes awareness raising for resource users to understand the importance of water and the Atlantis aquifer. Studies are focusing on improving understanding of the Atlantis aquifer's water balance and evapotranspiration rates.

4.3.3 Inappropriate fire regime (M)

Fire management is restricted to the Ganzekraal Conservation Area and the Riverlands Nature Reserve. The intensity of fire in sand fynbos is associated with the season, with summer fires being more intense than winter fires. Fynbos fires are fast moving and therefore relatively intense. Fires are more severe where there is woody alien vegetation with a higher biomass than fynbos. Thus invasive alien flora may increase intensities by 10-fold or more, altering the fire regime (Richardson & van Wilgen 1986). These fires can damage soil, soil stored seeds and depress recruitment response (Holmes 2008).

In the Complex, fire frequencies are considered short for the vegetation types affected. Average veld age ranges from four years at Riverlands to five years at Ganzekraal in localised areas close to roads networks, the coast and areas utilised for wood harvesting. Due to the recent involvement of CapeNature at Ganzekraal, fire history prior to 2015 is unknown. Several fynbos species are fire-dependent, and in places the fynbos mosaic displays signs of senescence in localised patches of sand fynbos as evidenced by the sugarbush, *Protea repens.*

The predominant ignition sources are unnatural accidental fires due to road accidents, operation of wood and honey harvesters, careless disposal of cigarette butts and burning of waste. There have also been incidents of arson (unpublished data, Western Cape Nature Conservation Board). The majority of fire hotspots are in close proximity to human settlement and along roads. This highlights the value of a coordinated approach to fire awareness, education and management by entities such as CapeNature, CCT, the Fire Protection Associations and private landowners.

Fire management, readiness and coordinated response are also necessary. The sand fynbos is interspersed with Renosterveld patches thus planning for fire should aim to ensure an integrated approach, with season and frequency suited to the sand fynbos, taking care that slower growing strandveld is not burned outside of desired thresholds.

The CapeNature Veldfire Management Policy (2017) places emphasis on ecological management and the critical relationship between ecological findings and factors governed by legislation and the socio-economic environment. The National Veld and Forest Fire Act (Act No.101 of 1998) requires that CapeNature be prepared for the occurrence and management of fires that occur on or adjacent to CapeNature-managed land. CapeNature is a member of both the Greater Cederberg and the Cape Peninsula Fire Protection Associations. Bulldozing the veld as a mechanism to suppress unplanned fire is not a supported firefighting technique.

4.3.4 Poaching of terrestrial fauna and flora (L) and marine resources (M)

Illegal harvesting of fauna and flora is considered a low, although significant threat to the Lowland Fynbos Mosaic and Natural Wetlands. The collection of plants is widespread, although illegal harvesting of threatened species is localised. Small antelope are illegally hunted by means of snares and dogs. If poaching results in the loss of keystone species, this will affect the structure and species composition of focal values.

Wild flowers and *Carpobrotus* spp. are harvested without the necessary authorisation in the Ganzekraal Conservation Area, for medicinal use and for confectionaries such as jam. Families in the area collect wild flowers for private use or for functions. Due to previous lack of active land management in the area, members of the public may not yet be aware of regulatory requirements for the collection of flora.

The poaching of marine resources, primarily abalone and West Coast rock lobster, is pervasive in the Coastal, Intertidal and Inshore System of the Complex, and to a lesser extent, in the Sensitive Island Ecosystem.

Regulatory divisions and the differing priorities of the relevant law enforcement and compliance entities place differing emphasis on compliance monitoring of certain areas and transport networks. A closer collaboration between CapeNature and relevant law enforcement entities coupled with environmental awareness and compliance monitoring can help alleviate the pressure on ecosystems.

4.3.5 Overgrazing by livestock (M)

This current threat is localised and limited to the Lowland Fynbos Mosaic and Natural Wetlands. The threat is more severe in the Ganzekraal Conservation Area and an emerging threat in the Riverlands Nature Reserve. Although localised in Ganzekraal, overgrazing and associated trampling are severe where it does occur, especially at natural springs that flow during the dry season. Overgrazing is caused by cattle, horses, goats and donkeys that are either released in the conservation area or roam into the area from neighbouring human settlements (unpublished data, Western Cape Nature Conservation Board). Some of the cattle owners live in or around Cape Town and are not residents of neighbouring communities.

Overgrazing by livestock is considered incompatible with strategies aimed at tourism development, selective restoration and the re-introduction of historically occurring game species. The threat is considered reversible under conditions where the veld is rested for at least two years (Cadman 2016) followed by the introduction of appropriate game species in appropriate numbers. Large game should not be introduced in areas requiring restoration until the veld has been restored, unless selected areas are fenced off while being restored. Game numbers will require active management to prevent over-grazing and trampling, especially in areas supporting threatened plant species.

Situations of livestock roaming within, and onto, the Complex will be addressed through the Reserve Management Committee with the assistance of other spheres of Government and the relevant local municipal authority as per the National Animal Pounds Bill of 2013. According to this Bill, it is the responsibility of the relevant municipalities to compile impoundment bylaws. Feral animals, notably pigs and donkeys, will be removed from the Complex once confirmed that animals are *res nullis* (*i.e.* not belonging to anybody).

This management plan makes provision for the introduction of historically occurring game species into Ganzekraal Conservation Area. This should be guided by a detailed Game Management Plan outlining the stocking potential, contingencies for removal of excess game numbers, monitoring guidelines and custodianship of game species. To prevent overgrazing within the Complex exacerbated by game that may escape from neighbouring farms, game farms bordering the Complex are enclosed to standards stipulated in CapeNature's Fencing Policy (2015). Owners of these game farms ensure that fences are regularly patrolled and inspected and CapeNature personnel conduct regular patrols on the reserve side of fences and report escapees to the owner. Game farm owners are provided a reasonable timeframe to remove the escaped animals if in possession of a valid Certificate of Adequate Enclosure (CoAE). Game species escaping from properties without a valid CoAE are regarded *res nullis* and are dealt with accordingly.

4.3.6 Uncontrolled recreation activities (M)

This is rated a medium threat to the Coastal, Intertidal and Inshore System, Lowland Fynbos Mosaic and Natural Wetlands. Activities include the indiscriminate use of dirt

motorcycles, quad bikes, four-wheel drive vehicles and horses in conservation areas, and walking / running with uncontrolled dogs in coastal areas. At times, these activities are related to events in the vicinity that draw large numbers of people. Associated stresses to focal values include disturbance to sensitive species, wildlife mortalities, *e.g.* oystercatcher chicks, soil compaction and disruption of topsoil, erosion, trampling of vegetation, introduction of alien or invasive species, disruption of dune systems and fragmentation due to the development of networks of informal trails / roads.

The threat is localised, although if it continues to grow at the current rate it will become severe and costly to address.

4.3.7 Inappropriate development (M)

Inappropriate development within the Complex could pose a threat to focal values. Due to the presence of threatened and sensitive ecosystems (threatened vegetation types, Atlantis aquifer, wetlands, and coast) and heritage assets, future development options should be sensitive to the environment in terms of location, footprint, style and utilities such as sewerage systems, waste management systems, water and power supply. Currently, all planned infrastructure development is restricted to existing footprints in keeping with protected area zonation and sensitivity analysis, and aimed at visitor management and implementation of day-to-day operations.

4.3.8 Land invasion (L)

The threat of land invasion is rated as low across focal values (excluding the Sensitive Island Ecosystem, where it does not apply), although considered severe and irreversible should it occur. Currently approximately 2000-2500 ha of land is illegally inhabited adjacent to the Ganzekraal Conservation Area. Riverlands Nature Reserve harbours a family dwelling, governed by a historic agreement between CapeNature and the tenant. The footprint of the dwelling requires clear demarcation to prevent further expansion into the nature reserve.

In terms of scope and rate of invasion, the threat is currently considered low, however, severity is high as well as irreversibility should it occur. As such, the threat is considered significant, requiring constant surveillance and early detection and rapid response.

4.3.9 Invasive alien fauna (L)

The threat of invasive alien fauna is rated low for Lowland Fynbos Mosaic, Natural Wetlands, and the Coastal, Intertidal and Inshore System. Nevertheless, continuous surveillance is needed to ensure rapid response if there is an increase in unwanted species.

This is especially true for Dassen Island. The European rabbit was introduced for food in about 1665 (Cooper & Brooke 1982) and is still present. At Dassen Island, however, the rabbit population is kept in check during the hot summer months when water and

food are limited. Rabbits are also preyed on by kelp gull and great white pelican, relieving predation pressure on other avifauna. The degree of impact on the habitat by rabbits is not quantified, and requires further investigation. The impact of rabbits on island ecology can be devastating if rabbit populations are allowed to grow unchecked, as evidenced at Robben Island during the early 2000s.

House mice were probably introduced to Dassen Island in the 19th Century (Cooper *et al*. 1985), and are still present. Mice have not been observed in seabird colonies and are currently restricted to management infrastructure zones. Mice are actively controlled in these areas. The impact of mice on the island's ecology can be potentially severe, as illustrated at Marion Island. Studies have shown that predation by mice causes a collapse in invertebrate biomass which leads to prey switching by mice to other invertebrates and towards birds (Parkes 2016).

The extent of marine invasive species such as the Mediterranean mussel may pose a risk to the species diversity of the marine system. The Mediterranean mussel is an aggressive invader. It is the most dominant invertebrate on primary rock surfaces along the West Coast outcompeting indigenous mussel and limpet species, resulting in a broadening in the width of intertidal mussel beds and altering intertidal communities (Sink *et al*. 2012). The European shore-crab, *Carcinus maenas*, also occurs on the West Coast although restricted to Table Bay and Hout Bay Harbour in Cape Town (Sink *et al*. 2012). Although not recorded in the Complex, invasion could be severe for indigenous biota that are vulnerable to predation.

These species require active surveillance to understand the extent of invasion and to find mechanisms to curb invasion.

Feral pig and fallow deer have been observed in low numbers in the DCCP landscape and surrounds and will be removed if observed in the Complex. Other feral animals such as donkeys, cats and dogs, will be removed from the Complex once confirmed to be *res nullis*.

4.4 Sensitivity Analysis

Sensitivity mapping of the Complex's biodiversity, heritage and physical environment is the primary informant for spatial planning and decision-making in protected areas. The Sensitivity Analysis is intended to:

- Highlight areas containing sensitive biodiversity and heritage features;
- Inform all planned and *ad hoc* infrastructure development *e.g.* location of management and tourism buildings and precincts, roads, trails, firebreaks;
- Inform holistic reserve planning and designation of utilisation areas, type of use, access points and type of access by means of a Reserve Zonation Scheme; and
- Support conservation management decisions and prioritisation of management actions.

Sensitivity mapping allows for direct comparison of sites both within and between reserves to support CapeNature's planning at local and regional scales. The process elevates:

- Sites with the highest regional conservation value;
- Areas where human access or disturbance will have a negative impact on biodiversity or heritage, and specific environmental protection is required;
- Areas where physical disturbance or infrastructure development will cause higher environmental impacts, and/or higher construction and ongoing maintenance costs; as well as
- Areas where there is significant environmental risk to infrastructure.

The method ensures that the location, nature and required mitigation for access, activities, and infrastructure development within protected areas can be guided by the best possible landscape-level biodiversity informants.

The process uses both expert-derived information and scientific data and the decisions are defensible and based on a transparent process.

Biodiversity, heritage and physical features are rated on a standard scale of 1 to 5, where 1 represents no or minimal sensitivity and 5 indicates maximum sensitivity (see Figure 4.1). Additional features such as visual sensitivity, fire risk and transport costs can also be included. Higher scores represent areas that should be avoided for conventional access and infrastructure, or where specific mitigation would be required in order to address identified environmental sensitivity. A score of 5 typically represents areas where mitigation for conventional access or infrastructure development would be extensive, costly or impractical enough to be avoided at all costs, or features so sensitive that they represent a 'no go' area. For biodiversity features highest scores represent high priority sites where conservation management cannot be compromised.

Sensitivity maps cannot replace all site-scale investigation, but allow for rapidly reviewing known environmental risks, and guiding holistic planning to minimise overall negative environmental impact.

A decision tree / hierarchical approach is used for the sensitivity analysis. This method is based on the premise that if a portion of the landscape is demarcated as highly sensitive in one of the categories considered in the analysis then, regardless of the sensitivity in other categories, that portion will be considered to be highly sensitive in the overall scoring. The decision tree approach thus allocates the highest allocated sensitivity in any of the input categories as the ultimate sensitivity class for that particular portion. The benefit of using this approach is that a landscape unit which is scored as highly sensitive for one feature category but has low sensitivity in all other feature categories will retain the high sensitivity scoring. Furthermore, as new and improved data become available, there is the possibility of adding these data to the sensitivity layer without having to re-analyse it from the beginning.

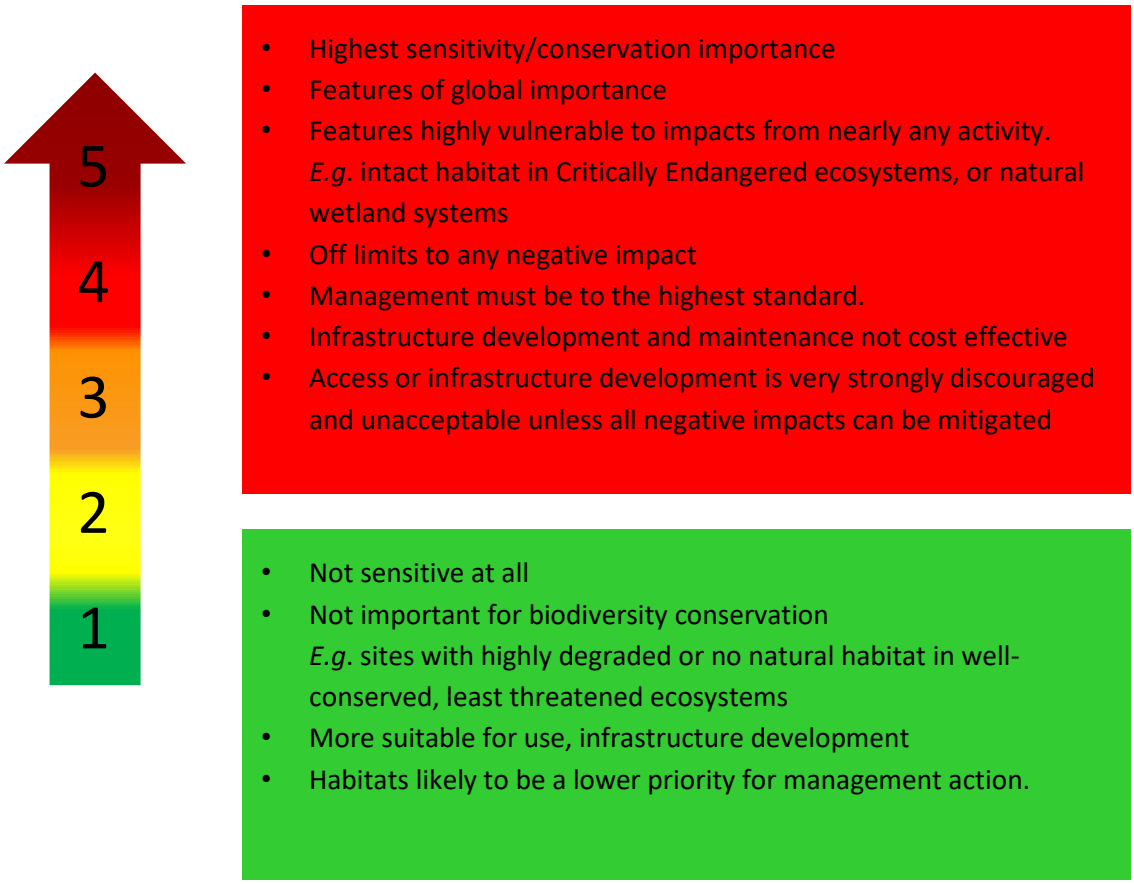

Figure 4.1 CapeNature Method for Sensitivity Scoring and Synthesis

The sensitivity of the Complex is illustrated in Appendix 2, Map 9. Physical and biodiversity features were included in the analysis as per Table 4.10 below.

Table 4.10. Physical, biodiversity and heritage sensitivities included in the sensitivity analysis of the Dassen Coastal Complex

Category		Dataset	Criteria	Sensitivity score	
Physical	Slope (degrees)	Slope calculated from 20m resolution digital elevation model	Off-limits for infrastructure development due to extreme risk of erosion and instability, or extreme engineering mitigation and associated construction costs required.	Highest sensitivity > 30°	5
			Strongly avoid infrastructure development – cut and fill or other difficult and expensive construction method required. Appropriate engineering mitigation essential to prevent erosion and slope instability. Highest initial and on-going cost due to slope stabilization and erosion management required.	High sensitivity 20°-30°	4
			Avoid road, trail and firebreak construction if possible. Severe erosion will develop on exposed and unprotected substrates. Pave roads and tracks, and ensure adequate drainage and erosion management is implemented. May provide good views.	Moderate sensitivity 10°-20°	3
			Low topographic sensitivity, likely still suitable for built infrastructure. Use of gentle slopes may provide improved views or allow access to higher areas.	Low sensitivity 5°-10°	2
			Preferred areas for any built infrastructure, lowest risk of erosion or instability, lowest construction and on-going maintenance costs.	Lowest sensitivity 0°-5°	1
	Soil erodibility / Geology	None included	No special features identified for inclusion.	Highest sensitivity	5
Biodiversity	Rivers	1: 50 000 NGI Rivers	Within 200m of perennial river.	Highest sensitivity	5
			Within 100m of non-perennial river.	High sensitivity	4
	Wetlands / Riparian / Pans	Riparian watercourses, NLC, as extracted for the BSP (GeoTerraImage) Pan mapped for Dassen Island (Hayward 2003)	Riparian areas and watercourses extracted from the NLC and used in the Biodiversity Spatial Plan (BSP) 2017. Included the pan mapped during the spring 2003 vegetation survey done for Dassen Island.	Highest sensitivity	5
	Vegetation status / Ecosystems threat status	Ecosystem Threat Status based on Cape's 2014 or 2016 assessments per veg type	Critically Endangered – Swartland Silcrete Renosterveld, Swartland Granite Renosterveld, Swartland Shale Renosterveld, Atlantis Sand Fynbos.	Highest sensitivity	5
			Endangered – Cape Flats Dune Strandveld.	High sensitivity	4
			Least Threatened – Cape Seashore Vegetation, Langebaan Dune Strandveld.	Lowest sensitivity	1

Category		Dataset	Criteria	Sensitivity score	
		(Rebelo *et al.* 2006)			
	Rare and endangered plant species	Kelp forest offshore (digitized from SPOT5 images), Rare and endangered plant spp extracted from CN Biodiversity DB, All threatened Species (SANBI 2015)	All plant species rated as Critically Endangered, Critically Rare, Endangered, Vulnerable, Near Threatened or Rare. Point localities buffered by 5m. Kelp forest offshore, visible on SPOT5 images.	Highest sensitivity	5
	Rare and endangered animal species	High priority areas for birds (CapeNature 2013)	Birds on Dassen Island with the highest conservation priority. The breeding- and study sites identified for bank cormorant, Leach's storm petrel and African penguin.	Highest sensitivity	5
			Other sensitive bird breeding areas.	High sensitivity	4
Heritage	Archaeological & cultural sites	Mapped heritage site footprints	All known heritage sites. Includes the location of all structures and shipwrecks known to be older than 60 years (pre 1968). Point localities of heritage sites are buffered by 100m.	Highest sensitivity	5

Results of Sensitivity Analysis

Sensitivity scores for the Complex are provided in Table 4.11 and illustrated in Map 9.

Key drivers of sensitivity are threatened ecosystems, threatened species, freshwater ecosystems and cultural historic heritage features.

Riverlands obtained the highest sensitivity score due to the presence of threatened vegetation types, resulting in a 100% ecosystem threat status per vegetation type, predominantly Critically Endangered Atlantis Sand Fynbos. Parts of Ganzekraal also obtained a high sensitivity score (88% ecosystem threat status) due to the presence of Critically Endangered Atlantis Sand Fynbos and Swartland Shale Renosterveld, and endangered Cape Flats Dune Strandveld. Sensitivities for both Riverlands Nature Reserve and Ganzekraal Conservation Area are also elevated due to a network of wetlands, streams and seeps.

The sensitivity of Dassen Island is rated as High to Very High due to the presence of resident threatened and endemic breeding sea birds. The vegetated interior of Dassen Island is classified as Cape Seashore Vegetation (least threatened) which is less sensitive and dominated by *Tetragonia* and *Trachyandra* spp. However, African penguins breed throughout the island and make use of both these species as breeding habitat. *Tetragonia* sp. nests are the third most important nesting habitat on Dassen Island and up to 33% of the island's African penguin population make use of this habitat (unpublished data, DEA:O&C).

The proportionately high number of cultural historic features at Dassen Island and Ganzekraal Conservation Area contribute to the overall sensitivity of the Complex.

Table 4.11. Summary of sensitivity scores for the Dassen Coastal Complex

Sensitivity score	Area (ha)	Area (% of total)
1	570.8	5.7
2	45.4	0.5
3	13.1	0.1
4	617.0	6.2
5	8 470.6	85.0

At the time of writing, marine ecosystem statuses, for example the Cape Island Shore, were not available for publishing and thus not incorporated into sensitivity analysis. A 20 m contour was available for inclusion into sensitivity analysis for slope classes. This may be considered too coarse for lowland and coastal ecosystems, and associated dune systems. As such, intermittent revision of the management plan will revisit sensitivity analyses to better incorporate marine and coastal ecosystems and associated features such as dunes.

4.5 Zonation

Protected area zonation provides a standard framework of formal guidelines for conservation, access and use for particular areas and is underpinned by the sensitivity analysis. Zonation goes beyond natural resource protection and must also provide for:

- Appropriate visitor experience;
- Access and appropriate access management;
- Environmental education; and
- Commercial activities, in keeping with the protected area objectives and sensitivity analyses.

Ideally, zonation scheme development should be conducted at the same time as infrastructure development planning. Good planning must aim to reduce cumulative environmental impacts and the long-term operating costs of all activities. Zonation and infrastructure development planning must be guided by:

- Sensitivity analysis;
- Existing infrastructure and use;
- Potential future infrastructure and access requirements; and
- Careful evaluation of overall impact, construction costs and operating costs vs likely benefits; for alternatives for every component.

Zonation requires input from all appropriate internal CapeNature stakeholders, and is a key component of the management plan which is evaluated during the Public Participation Process.

CapeNature's zonation categories (See Table 4.12) were developed by an internal workshop process completed in September 2010. Existing protected area zoning schemes worldwide were examined to develop a simple and powerful scheme that provides for the required range of visitor experience, access and conservation management. Particular effort was made to maintain consistency with the best developed South African zonation schemes, in particular those of SANParks and Ezemvelo KZN Wildlife (EKZNW). CapeNature's zonation categories have fewer tourism-access categories, but provide more detailed and explicit guidelines with regard to zone objectives and characteristics. Furthermore, CapeNature's zonation includes new zones specifically required in the context of highly sensitive biodiversity sites and zoning of privately owned Contract Nature Reserves.

Table 4.12. Guide to CapeNature Conservation Management Zones

Zonation Category	Explanation
Wilderness / Wilderness (declared)	Areas with pristine landscape, sensitive areas or threatened ecosystems. Very limited access.
Primitive	Areas providing natural landscape, solitude and limited access. Normally a buffer area to wilderness zones.
Nature Access	Providing easy access to natural landscape. Includes areas with roads and trails, and access to popular viewing sites and other sites of interest.
Development – Low intensity	Area with existing degraded footprint. Providing primarily self-catering accommodation and camping, environmental education facilities.
Development – High intensity	Area extensively degraded. Providing low and/or higher density accommodation, and maybe some conveniences such as shops and restaurants.
Development – Management	Location of infrastructure and facilities for reserve administration and management.
Development - Production	Commercial or subsistence farming (applicable to privately owned and managed nature reserves).
Development – Private Areas	Private dwellings and surrounds (only applicable to privately owned and managed nature reserve).
Species / Habitat / Cultural Protection	Areas for protection of species or habitats of special conservation concern.
Cultural Species / Habitat Visual Natural Resource Access	Special management overlays for areas requiring specific management interventions within the Species / Habitat / Cultural Protection Zone.

The zonation scheme for the Complex is informed by the sensitivity analysis and strives to meet conservation goals whilst providing opportunities for nature-based tourism and socio-economic development. The Complex is considered highly sensitive overall due to the threatened status of ecosystems such as Atlantis sand fynbos and Renosterveld, cultural historic heritage and species of conservation concern. Zonation thus aims to strike a balance between conservation of threatened ecosystems and species, and facilitate opportunities for socio-economic development.

Some of the key factors considered are:

- Conservation of threatened ecosystems and species;
- Water conservation and protection of the Atlantis aquifer;
- Preservation of cultural heritage;
- Socio–economic development opportunities;
- Access to the wildflower route and to wild spaces for recreation;
- Scenic beauty and sense of place;
- Development footprints; and
- Degraded areas.

A systematic four-tiered approach was applied to establish zones responsibly within the Complex (Table 4.13).

Table 4.13. Four tiers used to assign zonation categories within the sensitive Dassen Coastal Complex

Tier 1	Tier 2	Tier 3	Tier 4
Landscape overview	Screening for terrestrial degraded areas, for example monocultures of *Cynodon dactylon*	Screening for historic development footprints within these areas	Selection of historic features that can serve a dual purpose for operational infrastructure
			Selection of historic features that can serve dual purpose for tourism infrastructure
		Screening for areas with restoration potential	Selection of areas for selective restoration aimed at visitor enhancement
			Selection of areas for ecosystem restoration
	Fine scale screening for areas of cultural or biodiversity significance	Screening for access opportunities & type	Selection of existing roads / trails / features
Existing operational / tourism infrastructure overview	Resorts	Assessment of number & type of accommodation units & other facilities	Determination of buffer requirement
	Utilities	Assessment of type of utility and service delivered	Determination of buffer requirement
	Servitudes / roads	Assessment of user & type of service delivered	Determination of buffer requirement

A summary of the final zonation scheme is depicted in Table 4.14 and illustrated in Appendix 2, Map 10.

Table 4.14. Summary of CapeNature zonation categories applicable to the Dassen Coastal Complex

Zonation Category	Explanation
Primitive	A significant proportion of the Complex is zoned as 'primitive', thus enabling limited access to a natural landscape and providing opportunities for solitude. The primitive zone is buffered by 'nature access' zones.
Nature Access	A coastal strip 100 m wide is demarcated as 'Nature Access' and the historic Ganzekraal Homestead farm is also demarcated as such. This zone promotes easy access to the natural landscape for the enjoyment and benefit of visitors and includes popular viewing sites, and sites of interest. Public roads with unrestricted access are zoned 'Nature Access' and are buffered by 25 m on either side and areas demarcated as 'Development – High' are buffered by 100 m. Here, the 'Nature Access' zone serves as a buffer to the primitive zone.
Development – Low intensity	The Bokbaai homestead and associated development footprint is zoned 'Development – Low Intensity' to make provision for environmental awareness and education facilities and activities. Three historic homesteads are also zoned as such to make provision for low-key tourism and rustic overnight facilities.
Development – High intensity	Areas zoned as 'Development – High Intensity' includes the Ganzekraal Homestead footprint, the Ganzekraal Resort and the Silwerstroomstrand Resort. Ganzekraal and Silwerstroomstrand Resorts offer overnight facilities in the form of camping and chalets, and conference facilities. Silwerstroomstrand Resort makes additional provision for day visitors. These areas are buffered by a 100 m wide 'Nature Access' zone.
Development – Management	Infrastructure nodes utilised for operational management of the Complex are zoned as 'Development – Management'. This includes the Riverlands Nature Reserve office and Dassen Island infrastructure nodes. The Transnet infrastructure node on Dassen Island is also zoned as such, including the jeep track linking the CapeNature infrastructure node and the Transnet infrastructure node. The CCT Bulk Water Supply infrastructure node, which includes an associated roads network, well-field and pump stations that are situated within the Ganzekraal Conservation Area, are also zoned 'Development – Management'.
Species / Habitat / Cultural Protection	The land mass of Dassen Island and Seal Ledges are zoned Species / Habitat Protection zone due to sensitive species that inhabit and breed throughout the islands.
Cultural Species / Habitat Visual Natural Resource Access	A 'Special Management Overlay' was assigned to cultural historic heritage sites that are also zoned for development purposes. These features are buildings and associated infrastructure that will / currently serves a dual purpose of heritage conservation and utilisation as operational / tourism infrastructure or sites of interest. The 'Special Management Overlay' facilitates appropriate heritage feature restoration, preservation, utilisation and management of these features over time.

4.6 Access

Seal Ledges Nature Reserve, due to its location, natural structure and small size, is not accessible. Access to Dassen Island via the jetty in House Bay is purely for the management of utilities (Transnet), conservation management, and approved filming and research. A helicopter landing pad is located at the Transnet infrastructure node and is utilised for Transnet management purposes and emergencies only. Access to the Riverlands Nature Reserve is via the main entrance at the office. Access to the western side of the Ganzekraal Conservation Area is via the Ganzekraal Resort Road. Demarcated coastal access points are at Jacob's Bay, just south of Grotto Bay, Leêrbaai, situated south of the Ganzekraal Resort, and at Bokbaai. Access to the eastern portion of Ganzekraal is via the homestead, on the eastern side of the R27 highway and opposite the Ganzekraal Resort turn off from the R27 highway.

Public access points to the Complex are listed in Table 4.15 and demarcated coastal access points are listed in Table 4.16, and illustrated in Appendix 2, Map 11.

Table 4.15. Managed public access points to the Dassen Coastal Complex

Locality	Name	Type of Access	Activity
Dassen Island Nature Reserve	Dassen Island Jetty	Managed access; access by boat from Yzerfontein harbour.	Landing area; research, filming and monitoring
Ganzekraal Conservation Area west: R27	Main Entrance (to Coast)	Managed access; Vehicular	Low key recreation (birding, hiking, interpretation); Resort accommodation; events; citizen science
Ganzekraal Conservation Area east: R27	Main Entrance (to East)	Managed access; Vehicular	Low key recreation (birding, hiking, accommodation; interpretation); citizen science
Riverlands Nature Reserve	Main Entrance	Managed access; Vehicular	Research and monitoring; citizen science

Table 4.16. Demarcated coastal access points within the Dassen Coastal Complex

Locality	Name	Type of Access	Activity
Ganzekraal Conservation Area: Jacob's Bay	Die Skaapwas, Jacob's Bay	Vehicular; Pedestrian (from designated parking area)	Low key recreation (birding, hiking, swimming, diving, fishing, interpretation); citizen science; marine resource utilisation
Ganzekraal Conservation Area: Leêrbaai	Leêrbaai	Pedestrian (from designated parking area)	Low key recreation (birding, hiking, swimming, diving, fishing, interpretation); citizen science; marine resource utilisation
Ganzekraal Conservation Area: Bokbaai	Bokbaai	Pedestrian (from designated parking area)	Low key recreation (birding, hiking, swimming, diving, fishing, interpretation); citizen science; marine resource utilisation

Both the Ganzekraal and Silwerstroomstrand Resorts are situated within the Ganzekraal Conservation Area. Public coastal access is thus also managed via the Ganzekraal Resort by the West Coast District Municipality (WCDM), while the CCT Recreation and Parks Department, manages coastal access at Silwerstroomstrand.

Several servitude agreements exist for the Complex (Table 4.17 and Map 11).

Table 4.17. Servitudes and management agreements applicable to the Dassen Coastal Complex

Date of Agreement	Type of Agreement	Partner	Duration of Agreement (years)	Area Affected	Conditions of use
10/04/2001	Servitude	Transnet	Perpetuity	Dassen Island Transnet Complex	Essential services and infrastructure
26/04/1984	Servitude	Chevron pipeline	Perpetuity	Ganzekraal Conservation Area, east (Farm 731)	Fuel oil delivery from Saldanha to Milnerton
26/04/1984	Servitude	Chevron pipeline	Perpetuity	Ganzekraal Conservation Area, east (Farm 732)	Fuel oil delivery from Saldanha to Milnerton
26/04/1984	Servitude	Chevron pipeline	Perpetuity	Ganzekraal Conservation Area, east (Farm 977)	Fuel oil delivery from Saldanha to Milnerton
26/04/1984	Servitude	Chevron pipeline	Perpetuity	Ganzekraal Conservation Area, east (Farm 977/1)	Fuel oil delivery from Saldanha to Milnerton
26/04/1984	Servitude	Chevron pipeline	Perpetuity	Ganzekraal Conservation Area, east (Farm 980)	Fuel oil delivery from Saldanha to Milnerton
22/02/1994	Servitude	Borehole and pipeline	Perpetuity	Ganzekraal Conservation Area, east (Farm 732)	Water provision for Ganzekraal Resort
01/11/2016	Management	GCFPA	3 Years (31/10/2018)	The Complex (excl. Dassen Island)	Fire management
01/11/2017	Management	CPFPA	3 Years (31/10/2019)	The Complex (excl. Dassen Island)	Fire management

There are currently no agreements between CapeNature and (1) the CCT Bulk Water Branch for management of the Silverstroom Wellfield and Silwerstroom River water abstraction point, (2) CCT Recreation and Parks Department for management of the Silwerstroomstrand Resort, or (3) WCDM for the management of the Ganzekraal Resort. These agreements, and development of the associated Maintenance Management Plans, will be negotiated.

An approved proposed Sunbird Energy (Ibubhezi) gas pipeline will stretch from Kabeljoubank on the coast and follow the Ganzekraal firebreaks east of the R27 to the Ankerlig Power Station located just east of the Witzands Nature Reserve. This will also require a Memorandum of Agreement between CapeNature, Eskom and Sunbird Energy together with the compilation of Maintenance Management Plans and registration of a servitude.

4.7 Concept Development Plan

Tourism products and related infrastructure developments at CapeNature are considered as investments and are intended to:

- Harness and enhance the income generation potential of protected areas with a view to achieving long term business sustainability; and
- The provision of safe, informative and purpose-built access to protected areas for all users, visitors and stakeholders.

Project selection

Organisationally potential tourism product developments are selected based on internal consultation and approval where factors such as appropriateness, environmental approval, financial feasibility and the apparent return on investment are considered. Where external approvals for developments are required, these are sought from the relevant authorities prior to the commencement of any development activities (see Figure 4.2). In general terms, identified potential tourism investments are likely to receive more favourable consideration where benefits are relatively obvious; the approval process will likely be unchallenged and where these can be concluded within one fiscal year.

CapeNature may elect to operate tourism products and services internally or via other mechanisms described in the Public Finance Management Act (Act No.1 of 1999) such as concessions or public private partnerships.

Figure 4.2 Concept Development Framework

Methodology

Tourism products and infrastructure within CapeNature protected areas are designed to be sensitive to their locations and are intended as prime examples of responsible and sustainable commercial developments. These include: off-grid bulk water and energy services; passive design efficiencies; enhanced resource utilisation and resource-saving features. Tourism developments should comply with prevailing zonation schemes and sensitivity analysis unless approval to the contrary has successfully been sought.

Wherever possible, tourism products, developments and services are intended to provide training and employment opportunities to communities within and surrounding the protected area.

Development options for operations and nature-based tourism are focussed on the Ganzekraal Conservation Area for the timeframe of the management plan. Management of the site was transferred to CapeNature in 2015. This presents an opportunity to address adverse pressures from historic land use practices, and to facilitate positive synergies between community, biodiversity conservation, water conservation, tourism, and socio-economic development. This can be achieved by the responsible and environmentally sensitive development of infrastructure and associated operations.

Short-term objectives include initiating and implementing necessary processes such as infrastructure evaluation and demarcation, mapping points of interest, identification of appropriate development options, conducting environmental scoping and obtaining authorisation, followed by utilising existing footprints. Developments associated with day visitors such as managed access points, demarcated visitor use areas and existing jeep tracks and trails for nature access with informational signage are envisioned.

Long-term objectives are aimed at evaluating the feasibility of restoring the Ganzekraal Homestead as a historic asset to serve a dual purpose of heritage conservation and Complex management. This management and heritage centre will facilitate effective conservation and visitor management, also providing the necessary infrastructure to support opportunities for socio-economic development through tourism-derived livelihoods. An environmental awareness and education centre is also envisioned.

4.8 Protected Area Expansion

The expansion of protected areas in South Africa is guided by the National Protected Area Expansion Strategy (NPAES) (SANBI & DEAT 2008). This strategy provides a broad national framework for protected area expansion in South Africa by identifying areas necessary for achieving National biodiversity targets and areas that should be conserved as formal protected areas or through other effective means. The NPEAS introduces a suite of mechanisms that can be applied to achieve this.

In response to the NPAES that calls on provinces to develop implementation plans in support of the national strategy; including support for provincial conservation efforts and priorities, CapeNature has produced a Western Cape Protected Area Expansion Strategy (WCPAES) and Implementation Plan 2015-2020 (CapeNature 2015). This CapeNature strategy addresses the formal declaration of priority natural terrestrial, freshwater and estuarine habitats in the Western Cape Province as protected areas to secure biodiversity and ecosystem services for future generations. Although aligned to the concepts and goals of the national strategy, the provincial strategy is informed by immediately available resources and therefore highlights some different spatial priorities.

Protected area expansion is thus implemented as per the Western Cape Protected Areas Expansion Strategy: 2015-2020 (WCPAES). Priority areas identified by means of systematic conservation planning and stakeholder engagement include sites that contain critical biodiversity areas, ecological support areas and that are important for climate change adaptation. Mechanisms for protected area expansion include the promotion of stewardship options on private land in collaboration with landowners, regularising existing private nature reserves, and the consolidation of state land as formal protected areas managed by conservation authorities such as the CCT and CapeNature (see Appendix 2, Map 12). The WCPEAS has not highlighted priority marine zones for expansion, and planning for protected area expansion into the marine environment is guided by the NPAES.

The GEF 5 project in the DCCP, '*Improving Management Effectiveness of the Protected Areas Network*', aims to strategically demonstrate protected areas expansion. Protected areas establishment and expansion within the DCCP incorporates various processes. These include the transfer and vesting of state land with CapeNature (Ganzekraal Conservation Area), gazetting of private land as protected areas, such as Bokbaai and Koeberg, the consolidation of properties linked to the Klein Dassenberg Nature Reserve, and the subdivision and transfer of state land by the Housing Development Agency (Riverlands Servcon triangle). Other mechanisms include ongoing stewardship support to the Mamre Communal Property Association, Bokbaai and Koeberg Nature Reserve.

Expansion opportunities for Dassen Island Nature Reserve are aligned to the 20 km 'zone of island influence' as specified in the 2011 NBA (Sink *et al.* 2012).

Expansion opportunities are also informed by the experimental island closure process initiated in January 2008 by the DEA at Dassen Island and at Robben Island (Table Bay, Cape Town). The rotational Island Closure Programme has also been implemented in Nelson Mandela Bay, Port Elizabeth, for St. Croix and Bird Islands.

The Island Closure Programme is informed by the foraging behaviour of African penguin (foraging distances of <20 km from islands during breeding) and distribution of sardine and anchovy as a food source for the penguins. The programme entails the rotational closing of demarcated areas around Dassen and Robben Islands to pelagic fisheries for periods of one to three years (DAFF 2016). This relates to an action in the BMP-s for African penguin to investigate and monitor the potential impact of fishing on the biology of African penguins (DEA 2013).

Options for expansion of the marine boundary within the 20 km 'zone of island influence' requires further investigation to verify the extent of priority ecosystems, assess the Complex's contribution to national ecosystem protection levels and to determine if there are associated special management requirements for threatened seabirds. This is necessary to guide protection mechanisms and special management zones that can be implemented.

Formal protection of this area aims to contribute to the conservation of the threatened Cape Island Shore ecosystem and associated ecological interactions, communities and species assemblages. This should include ecosystems utilised by pelagic fish in the waters surrounding Dassen Island, thereby contributing to the conservation of pelagic fish within the foraging range of the African penguin and other marine predators.

Apart from the benefits to the seabird species breeding on Dassen Island, the opportunity exists to substantially benefit local subsistence and recreational fishing communities who rely on the natural movements of the pelagic fish and their associated marine predators such as snoek.

4.9 Zone of Influence: Protected Area Integration and Mainstreaming

Purpose

The Norms and Standards attached to the NEM:PAA require that a Zone of Influence (ZOI) must be identified for a protected area, that a programme is encouraged to develop and maintain good relations with neighbours, that there is a formal programme of regular interaction between protected area management and neighbours, that protected area staff regularly collaborate with partners, local communities and other organisations, and that neighbouring communities have relevant input into decisions relating to the protected area management (Government Notice 382 of 31 March 2016). The ZOI is intended to integrate strategies in the land- and seascape that enable protected area expansion and the maintenance of existing core areas and expansion nodes. Its development should proactively encourage compatible resource use, land and water use in collaboration with mandated authorities and relevant stakeholders. The ZOI should thus facilitate integration and mainstreaming of conservation and sustainability in the surrounding land- and seascape.

Various land uses exist in the local landscape surrounding the Complex. Provision for these is made through municipal zoning schemes and development plans. These land uses vary from agriculture to residential and may influence the integrity of the protected area network and landscape, and the 'sense of place' in the absence of good neighbour relations and cooperative governance. The ocean supports commercial, subsistence and recreational fisheries, and engagement and collaboration between stakeholders are needed to ensure sustainable resource utilisation. Cooperative governance is especially important because of regulatory divisions in the management of marine resources.

Thus, the ZOI provides a spatial scope of proactive engagement for any activities, developments, tourism and economic activity in the area that may require collaboration between CapeNature and its neighbours and stakeholders for management input and / or action.

The ZOI takes into account the focal values of the Complex, significant threats and contributing factors, and in particular resource utilisation and land and water use

planning, in the context of building and maintaining climate change adaptation and resilience towards the achievement of the desired state, *i.e.* Complex goals.

Context

The regional context is covered in Section 3, focal values and key ecological attributes are listed in Section 2.4 and Section 4.2, and relevant threats in Section 2.5 and Section 4.3. Further context is provided by the extent of the greater DCCP planning domain and the Western Cape Protected Area Expansion Strategy and Conservation Action Plan. The latter is informed by the Western Cape Biodiversity Spatial Plan and the NBA.

Dassen Island, Ganzekraal and Riverlands form part of the core conservation areas of the Cape West Coast Biosphere Reserve that was designated by UNESCO in November 2000 in accordance with the Man and the Biosphere Programme.

Inputs and results

A 10 km buffer was set around the terrestrial protected areas and generally determined the maximum extent of the ZOI. The 20 km 'zone of island influence' was used for the marine environment. This buffer is not absolute and where justified, can be expanded or shrunk to accommodate influences.

The Complex is influenced by current land use and activities linked to residential development, agriculture, recreation, nature appreciation and resource utilisation. It is recognised that, given current socio-economic conditions (very high local levels of unemployment and poverty), that a number of pressure points exist. This may result in adverse impacts on both site-level and landscape-level ecosystems, including the protected area network. These pressure points act as drivers of socio-ecological change. The aim of management is to implement a proactive approach towards facilitating protected area mainstreaming, integration and engendering stakeholder support.

Pressure points, or key drivers, that guide the delineation of the ZOI are listed in Table 4.18. Assigned ratings are derived from the threats assessment, and used as an informant to depict the level of associated influence spatially, as a management tool. Proactive informants, such as areas of, or earmarked for, compatible land use are also considered as key drivers of the ZOI.

Table 4.18. Drivers and criteria used for delineating the Zone of Influence of the Dassen Coastal Complex

Driver	Rating	Criteria	Zone area (ha)	% of zone
New agriculture	Low (1)	Agriculture potential - Moderate potential arable land within remnants	28 426.00	12
Pollution of groundwater system	High (3)	Pollution caused by high-density animal farming. Digitised based on reserve input	68	0
	High (3)	Agricultural based water pollution - annual crops, horticulture, pivots	22 816.60	9.7
	High (3)	Pollution runoff into reserve via river system. buffered by 32m	49.9	0
Fire hazards (high fire frequency)	Medium (2)	Fire hazards (high fire frequency) - areas identified as hotspots	4 631.80	2
Over abstraction of water (surface and groundwater)	High (3)	Surface- and Groundwater Abstraction Point - 100m buffer	73.7	0
	High (3)	Atlantis aquifer - Highly productive areas (Fractured and intergranular)	2 233.90	0.9
	Medium (2)	Atlantis aquifer - Moderate productive areas (Intergranular)	13 109.70	5.6
Unregulated resource use	Very high (4)	Illegal resource use - Flora poaching threat, livestock grazing and fauna poaching threat, including marine resources	26 666.70	11.3
Uncontrolled recreation activities	Medium (2)	Uncontrolled access from recreational activities	2 033.30	0.9
Illegal land invasions	Low (1)	Areas from which illegal land invasions occur - 1500 m buffer	3 604.60	1.5
Mining	Medium (2)	Mining application - Phosphates prospecting 2013	935.6	0.4
Invasive alien plants (IAP)	High (3)	Plantations and stands of invasive alien plants	7 936.70	3.4
Renewable energy	Medium (2)	Renewable energy installations - phase 1 and 2 planned for both wind and solar	23 773.40	10.1
Illegal access along routes	Low (1)	Illegal access along routes/corridors - buffer major roads, railway lines and powerlines by 100m	2 343.90	1
Game farming	Low (1)	Game farms adjacent to protected area - Extracted from WCGDDB, Nov 2015	5 039.90	2.1
Stewardship sites	Low (1)	Stewardship Sites - Signed and designated	5 703.10	2.4

Driver	Rating	Criteria	Zone area (ha)	% of zone
Areas identified in PAES (CAP map)	Low (1)	Protected Area Expansion Strategy (PAES) - Conservation Action Plan (CAP) map, May 2015	12 696.70	5.4
Coastal areas and marine protected areas (MPAs)	Low (1)	Coastal areas and marine protected areas (MPAs) and managed fisheries closure zone.	152 906.70	64.8

Management effort within the ZOI should be applied through a filter of threats assessment results and relevant actors in relation to drivers of the ZOI and existing land and water use patterns. With increasing proximity of activities to the Complex, these drivers probably require increasing effort to maintain good neighbour relations and resource authority collaboration.

Drivers rated 'Medium' to 'Very High' are likely to require a high sustained level of effort from protected area management to develop and maintain relations with neighbours and relevant resource managers to harness opportunities, avoid or prevent adverse impacts and to minimise impacts. Lower rated drivers probably require surveillance and a lower although sustained effort.

'Medium' to 'Very High' drivers require a proactive approach probably heavily supplemented by reactive responses to changing circumstances. With reference to marine resources, examples include collaborating with DAFF, DEA: O&C and law enforcement entities to integrate resource management and compliance planning, while having to implement a reactive approach in the form of law enforcement action. Similarly, collaborating with Fire Protection Associations and engaging in fire awareness activities is a proactive effort whilst having to respond to accidental fire is reactive.

Lower rated drivers are considered more stable, addressed predominantly through proactive engagements, for example, providing extension support to a privately-owned protected area or negotiating fence-dropping and / or custodianship agreements with neighbouring landowners.

Key drivers of the ZOI are groundwater pollution, over abstraction of water, unregulated utilisation of resources and invasive alien plants.

Vigilance by protected area management is necessary to respond to incidents of damage-causing wildlife onto neighbouring farms or settlements; and escaped game, feral or domestic animals roaming into the reserve from neighbouring farms or settlements. Risks to biodiversity include hybridisation and overgrazing although game farming presents an opportunity as a compatible land use and buffer to the Complex. Reports of wildlife exiting the Complex and causing damage and livestock losses on neighbouring properties will require investigation. Mitigation management by neighbours must be applied to minimise and prevent losses before any lethal mechanisms or management will be considered. No confiscated, nuisance damage-causing or rehabilitated wildlife may be dropped off or released within the Complex, unconditionally. Damage-causing wildlife and release processes are overseen by

CapeNature Conservation Services, relying on collaboration between them, protected area managers, and neighbours.

The Marine Environment - Zone of Influence Limitations

The extent of the marine ZOI was determined by the extent of the managed fisheries closure zone around Dassen Island, as discussed in Section 4.8. This is an important zone for managing pelagic fish stocks and other marine resources critical for the survival of several threatened seabirds and for the maintenance of ecosystems. Although the ZOI illustrates a low protected area management influence in the surrounding natural marine environment, this is not an adequate representation of the requirement in terms of marine resource utilisation in the inshore waters of Dassen Island and Ganzekraal Conservation Area.

Offshore fisheries include commercial pelagic fisheries (pelagic fishing grid blocks 4921, 4931 and 4932). Snoek, yellowtail and hottentot have through the years become synonymous with Dassen Island amongst both recreational and commercial line fishers (J. Visagie, pers. comm.). The rocky reefs and Cape Kelp Forest of Dassen Island support the commercial West Coast rock lobster fishery. The Complex falls within demarcated fishing Area 7, Zone D. The 2013/2014 resource assessment showed an alarming decline in the status of West Coast rock lobster, and the area was subsequently closed to all lobster fishing with the exception of controlled offshore commercial fishing using traps (DAFF 2016) for a period of two years. Recreational, subsistence and small-scale commercial fisheries are practiced in the coastal waters of the Ganzekraal Conservation Area.

CapeNature is a representative on the various working groups for the African penguin as it pertains to habitat protection and pelagic fisheries. Collaboration is necessary with DAFF Research and Compliance in terms of the sustainability of the West Coast rock lobster fishery and implementation of discriminate fishing practices.

Intermittent review of the Zone of Influence is aimed at improved incorporation of ecosystems, monitoring sites and drivers such as marine resource management zones and associated quotas.

The spatial extent and levels of influence within the delineated Complex ZOI is depicted in Appendix 2, Map 13.

5. STRATEGIC IMPLEMENTATION FRAMEWORK

For the Complex, an analysis of the conservation situation was undertaken to enable a common understanding of the context of the Complex inclusive of the biological environment and the social, economic, cultural and institutional systems that influence values. The aim of the situation analysis was to understand drivers of direct threats and explore contributing factors to find opportunities and strategic points where intervention is possible and considered to have the most impact. This formed the basis for developing strategies and action plans for the Complex.

Strategies were rated, and those strategies anticipated to be the most effective and feasible were interrogated using Results Chains to test theories of change and establish objectives and intermediate results. Where relevant, strategies are aligned with existing complementary plans to address gaps, and promote and reinforce existing efforts.

Strategies are aimed at:

- Focal value restoration / stress reduction;
- Behavioural change / threat reduction; and
- Establishing of enabling conditions.

The Strategic Implementation Framework is provided Table 5.1 and strategies are detailed in Tables 5.2-5.14.

CapeNature will lead the implementation of the management plan, although achieving the vision requires coordinated effort. Stakeholder groups and organisations identified are key role players in delivery of the plan.

Table 5.1. Strategic Implementation Framework for the Dassen Coastal Complex

Focal Value	Goals	Strategies
Lowland Fynbos Mosaic	By 2029, the Lowland Fynbos Mosaic of the Complex has an ecologically healthy age structure[1], at least 6 500 ha([2]) and the colonised frontal dune system is comprised of 99% indigenous species cover, and all essential linkages[3] remain intact. [1] Veld age Sand Fynbos and pockets of ecotonal Renosterveld areas 8-10 yrs, Strandveld >20 yrs [2] Desired rating is based on 75 % of the Complex [3] Critical Biodiversity Areas (CBA), Ecological Support Areas (ESA) and Other Ecological Support Areas (OESA) in the 25 000 ha intact ecosystems of the DCCP	**S1,S2,S3,S4, S5,S6,S8,S9, S12,S13**
Natural Wetlands	By 2029, Natural Wetlands are in an ecologically healthy state[1], and surface flows specifically, are returned to an acceptable natural state. [1] Vegetated buffers of at least 50m, hydro period and water quality within an acceptable range, and 99% indigenous species composition	**S1,S2,S3,S4, S5,S6,S8,S9, S12,S13**
Atlantis Aquifer	By 2029 the primary and secondary aquifer protection zones are clear of invasive plants, and all new built infrastructure does not compromise[1] the groundwater resource. [1] Infrastructure that may restrict recharge or pollute the groundwater resource in any way.	**S1,S2,S3,S4, S5,S6,S8,S13**
Coastal, Intertidal and Inshore System	By 2029 key reproductive macroinvertebrate populations[1] are sustainable and the adult-to-juvenile ratio[2] of African oystercatchers are in a good condition within the coastal and intertidal zones of the Complex. [1] Key *Patella* sp. [2] As described by Hockey *et al*. 2005	**S1,S2,S5,S6, S8,S9;S13**
Sensitive Island Ecosystem	The Sensitive Island Ecosystem continues to sustain viable populations of priority seabirds[1] and the extent of characteristic ecosystems[2] remains stable. [1] African penguin, bank cormorant, crowned cormorant, Cape cormorant, great white pelican [2] Cape Kelp Forest	**S1,S2,S3,S13**
Cultural and Historic Heritage	By 2029 heritage resources of cultural significance or other special value are sustainably enhanced, valued[1] and are benefiting[2] visitors and local inhabitants. [1] Documented, interpreted, understood, and maintained [2] Culturally and / or economically	**S1,S4,S5,S6, S9,S10,S11, S13**

Core Service Area	Goals	Strategies
Personal agency, tourism & nature based economic opportunities	By 2029 access to environmentally responsible built infrastructure[1], intact ecosystems[2] and abundant wildlife[2] adds economic value to ecotourism products and socio-economic development opportunities. [1] Location and design aligned to sensitivity and zonation contributing to sense of place [2] Healthy natural focal values	**S1,S2,S3,S4, S5,S6,S7,S8, S11,S12,S13**

Core Service Area	Goals	Strategies
Responsible utilisation of natural resources	By 2029 natural resources are managed equitably for legitimate access and in such a way that they will be available for current and future generations.	**S1,S6,S7,S9, S11,S13**

Table 5.2. Enhance Governance of the Dassen Coastal Complex

STRATEGY 1:	Enhance governance of the Complex to improve transparency, facilitate collaborative planning and address regulatory divisions in natural resource management				
GOALS:	Refer to Table 5.1				
THREATS:	Unregulated utilisation of natural resources; over abstraction of water; inadequate access for socio-economic opportunities; regulatory divisions of relevant entities; inappropriate fire regime; invasive alien flora				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2025 and beyond functioning governance structures facilitate participatory integrated planning and management with relevant stakeholders to enhance management effectiveness	Establish a functioning Dassen Coastal Complex Protected Area Advisory Committee to improve transparency, facilitate collaborative planning and address regulatory divisions in natural resource management	Lead: Conservation Manager Enablers: Community Conservation Manager; People and Conservation Senior Manager; Protected Areas Manager	Year 1	DCC Protected Area Advisory Committee register of stakeholders and attendance records that reflect representative registered stakeholders Constitution and Terms of Reference Register & Schedule of platforms for engagement Relevant Agendas, meeting proceedings and Records of Decision	PAAC SOG; NEM:PAA Norms & Standards for the Management of Protected Areas in South Africa
	Draft a constitution for the Protected Area Advisory Committee in collaboration with committee members		Year 1 – Year 2		
	Establish and maintain Partnerships with entities such as CCT (Biodiversity; Parks & Recreation; Water &	Lead: Conservation Manager Enablers: Community Conservation Manager;	Year 1 – Year 2 and as per timeframe of agreement	MOA and MOUs that stipulate partner commitments	

STRATEGY 1:	Enhance governance of the Complex to improve transparency, facilitate collaborative planning and address regulatory divisions in natural resource management				
GOALS:	Refer to Table 5.1				
THREATS:	Unregulated utilisation of natural resources; over abstraction of water; inadequate access for socio-economic opportunities; regulatory divisions of relevant entities; inappropriate fire regime; invasive alien flora				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
	Sanitation); Greater City of Cape Town Water Fund; DEA:O&C; DAFF (LandCare; Research & Compliance) to improve transparency, facilitate collaborative planning and address regulatory divisions in natural resource management	People and Conservation Senior Manager; Protected Areas Manager; Coastal Programme Senior Manager; Protected Area Expansion & Stewardship Senior Manager; Legal Services Manager			
	Engage and collaborate with marine resource regulatory authorities for the sustainable management of marine resources	Lead: Conservation Manager Enablers: Senior Manager Coastal Programme; Regional Ecologist	Year 2 – Year 10	Register of response to requests received for input into marine resource management zones and quotas	
	Enhance servitude management through pursuing management agreements and maintenance management plans with the relevant entity	Lead: Conservation Manager Enablers: Protected Areas Manager	Year 1 – Year 3 and as per timeframe of agreement	MOA and MOUs outline conditions of servitude and utilities management Maintenance Management Plans	
By 2019 and beyond annual plans of operation integrate relevant initiatives	Define, create and maintain working groups related to natural resource management	Lead: Conservation Manager	Year 1 and annually thereafter	Terms of Reference for relevant working groups	Existing TORs and MOUs; People & Conservation Integrated Work Plan

STRATEGY 1:	Enhance governance of the Complex to improve transparency, facilitate collaborative planning and address regulatory divisions in natural resource management				
GOALS:	Refer to Table 5.1				
THREATS:	Unregulated utilisation of natural resources; over abstraction of water; inadequate access for socio-economic opportunities; regulatory divisions of relevant entities; inappropriate fire regime; invasive alien flora				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
planned by relevant management authorities for the relevant financial year	(marine and terrestrial, including game), groundwater resource management, integrated compliance, environmental awareness and education	Enablers: Community Conservation Manager; Regional Ecologist; Ecological Coordinator; Protected Areas Manager		Integrated APOs reflect key focus areas of work	

Table 5.3. Facilitate protected area consolidation and implement conservation beyond boundaries

STRATEGY 2:	Facilitate protected area consolidation and implement conservation beyond boundaries so that the Complex goals are considered in land and water use planning and marine resource management				
GOALS:	Refer to Table 5.1				
THREATS:	Climate change; inappropriate development				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2020 inadequacies in nature reserve design are improved by the consolidation of reserves through the transfer of state land to the relevant conservation management authority, and the declaration of relevant properties	Facilitate the transfer of state land vested with CapeNature	Lead: Legal Services Manager Enablers: Conservation Manager; Conservation Services Manager; GIS Technician; Regional Ecologist; Protected Area Expansion & Stewardship Senior Manager	Year 2	Map illustrating % Essential Linkages intact, against a baseline of 2018 PA Inspection Reports and Legal Submissions Registry (Provincial Department Transport & Public Works)	Western Cape Biodiversity Spatial Plan; WCPAES
	Secure transferred state land as formal (declared) protected areas	Lead: Legal Services Manager Enablers: Protected Area Expansion & Stewardship Senior Manager		Number of Ha's legally secured in terms of the NEM:PAA (against a baseline of 2018) Provincial Gazetting Notices (Intentions to Declare, Public Participation) DEA Protected Areas Register (notification for listing)	

STRATEGY 2:	Facilitate protected area consolidation and implement conservation beyond boundaries so that the Complex goals are considered in land and water use planning and marine resource management				
GOALS:	Refer to Table 5.1				
THREATS:	Climate change; inappropriate development				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2029, within the Zone of Influence, priority sites / seascapes necessary for climate change adaptation and resilience are conserved through stewardship or other effective means	Enhance knowledge, technical skills and information exchange to build capacity of landowners who manage stewardship sites	Lead: Conservation Services Manager Enablers: Conservation Manager; Community Conservation Manager; Scientific Services; Land-use Scientist	Year 1 and annually thereafter	Knowledge Exchange & Peer Learning Programme (inclusive of field trips, workshops, seminars) Stewardship Fact Sheets and Guidelines, and use thereof aligned to site-specific management plans Stewardship site management plans and audits. Register of stewardship site visits Stakeholder Database (annually updated)	WCPAES; Stakeholder Database; Stewardship Site Register
	Negotiate and facilitate stewardship on priority sites	Lead: Conservation Services Manager Enablers: Conservation Manager; Protected Area Expansion and Stewardship Senior	Year 1 – Year 10	Number of Ha's secured through signed stewardship agreements (against a baseline of 2018)	Western Cape Biodiversity Spatial Plan; WCPAES; CAP Map; Swartland Municipality SDF; WCDM SDF;

STRATEGY 2:	Facilitate protected area consolidation and implement conservation beyond boundaries so that the Complex goals are considered in land and water use planning and marine resource management				
GOALS:	Refer to Table 5.1				
THREATS:	Climate change; inappropriate development				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
		Manager; Land Use Scientists; Conservation Services Officers; GIS Technician		Map illustrating % Essential Linkages intact, against a baseline of 2018	CCT SDF; West Coast Buffer Zone CDF
	Within the Zone of Influence, provide land and water use decision support	Lead: Land Use Scientist Enablers: Conservation Services Manager; Conservation Planner; Conservation Manager; Ecological Coordinator	Year 1 – Year 10 (and as per requests received)	Database on land-use management inputs within the ZOI (including number of land-use proposals and/or EIAs received and commented on)	Western Cape Biodiversity Spatial Plan; WCPAES; CAP Map; Swartland Municipality IDP; WCDM IDP; CCT IDP
	Collaborate with CCT: Water & Sanitation for the monitoring of groundwater and data sharing	Lead: Regional Ecologist Enablers: Conservation Manager; Ecological Coordinator	Year 1 – Year 10	MOA and MOUs that stipulate partner commitments Groundwater Monitoring Protocol Groundwater monitoring database and reports	
	Integrate protected area management into municipal SDFs, IDPs and the CCT Biodiversity Network	Lead: Land Use Scientist Enablers: Conservation Manager; Conservation Planner; Ecological	Year 3 – Year 10 (noting 5-year municipal planning cycle)	PA reflected spatially in municipal SDFs (coupled with zoning scheme) and EMFs	Western Cape Biodiversity Spatial Plan; WCPAES; CAP Map; Swartland Municipality SDF, EMF & IDP;

STRATEGY 2:	Facilitate protected area consolidation and implement conservation beyond boundaries so that the Complex goals are considered in land and water use planning and marine resource management				
GOALS:	Refer to Table 5.1				
THREATS:	Climate change; inappropriate development				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
		Coordinator; Protected Areas Manager		PA management objectives (and projects) listed and aligned with municipal IDPs and Service Delivery & Budget Implementation Plans Register & Schedule of platforms for engagement	WCDM SDF, EMF & IDP; CCT SDF, EMF & IDP
	Develop understanding of the value and sensitivity of the Cape Island Shore and ensure findings inform expansion opportunities	Lead: Conservation Manager Enablers: Senior Manager Coastal Programme; Regional Ecologist; Ecological Coordinator; Protected Areas Manager	Year 1 - Year 4	Concept document that describes sensitive marine ecosystems and the need for formal conservation	Operation Phakisa (DEA)

Table 5.4. Invasive alien species management

STRATEGY 3:	CapeNature, in collaboration with relevant management authorities, develop and implement long-term invasive alien species management to abate the negative impact that invasive alien vegetation has on fire regime, natural and cultural historic values and water availability				
GOALS:	Refer to Table 5.1				
THREATS:	Inappropriate fire regime; alien & invasive flora				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2023 and beyond eco-sensitive areas are comprised of 99 % indigenous species By 2029 the Dassen Coastal Complex is comprised of 99 % indigenous species	Establish a baseline for veld condition, and review in five years to guide veld management and restoration over the long term	Lead: Regional Ecologist Enablers: Ecological Coordinator; Botanist; Conservation Manager	Year 1; Year 5	Veld condition map indicates % degraded area relative to the baseline of 2019 supports restoration planning	
	Develop and implement a long term invasive alien species management plan to integrate and complement relevant initiatives planned by partners and neighbours	Lead: Conservation Manager Enablers: Catchment Manager; Regional Ecologist; Ecological Coordinator; Protected Areas Manager	Year 1 – Year 2	Invasive Alien Species Management Plan	Invasive Alien Plant prioritisation database; NEM:BA; AIS regulations; IAP density map; Integrated Work Plan
	Draft and implement an Annual Plan of Operations in collaboration with relevant management authorities and funders		Year 1 and annually thereafter	APO aligned to long term invasive alien species management plan objectives	

STRATEGY 3:	CapeNature, in collaboration with relevant management authorities, develop and implement long-term invasive alien species management to abate the negative impact that invasive alien vegetation has on fire regime, natural and cultural historic values and water availability				
GOALS:	Refer to Table 5.1				
THREATS:	Inappropriate fire regime; alien & invasive flora				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
	Conduct IAP density mapping & maintain an invasive alien plants clearing prioritisation map to guide the compilation of Annual Plan of Operations	Lead: Conservation Manager Enablers: Catchment Manager; Ecological Coordinator; GIS Scientist	Year 1 and annually thereafter	IAP density map shows decreasing IAP density in eco sensitive areas by 2023 IAP density map shows decreasing IAP density in other areas by 2029 IAP density map shows % reduction in the extent of IAP on natural dune system (against a baseline of 2018) Persistence of key species in the area of the DCC with 99% indigenous species cover reported	

Table 5.5. Integrated Fire Management

STRATEGY 4:	CapeNature, in collaboration with relevant management authorities, develop and implement integrated fire management to restore the fire regime within the Complex and Zone of Influence				
GOALS:	Refer to Table 5.1				
THREATS:	Inappropriate fire regime; alien & invasive flora				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2029 fire return intervals are longer than the minimum and shorter than the upper recommended limits and all prescribed fire treatments are in summer and autumn season	Conduct an analyses of fire frequency, fire return interval, fire size and season for Dune Strandveld, Fynbos & Renosterveld	Lead: Regional Ecologist Enablers: Ecological Coordinator; Conservation Manager; Protected Areas Manager	Year 2 – Year 3	Integrated fire Management Plan outlining thresholds or progress towards thresholds for an appropriate fire regime	Fire Database; Veld fire management guidelines; Fire database; National Veld and Forest Fire Act; Veld fire Management Policy; Fire Management Guidelines
	Conduct post-fire monitoring to determine fire return intervals	Lead: Conservation Manager Enablers: Regional Ecologist; Ecological Coordinator; Conservation Manager	Year 1 and ongoing		
	Draft and implement an integrated long term fire management plan for the Complex to direct fire management towards supporting an ecologically resilient	Lead: Conservation Manager Enablers: Regional Ecologist; Ecological Coordinator; Catchment Manager; Protected Areas Manager	Year 2 – Year 3	Integrated fire Management Plan implemented Risk Assessment Firebreak Register	

STRATEGY 4:	CapeNature, in collaboration with relevant management authorities, develop and implement integrated fire management to restore the fire regime within the Complex and Zone of Influence				
GOALS:	Refer to Table 5.1				
THREATS:	Inappropriate fire regime; alien & invasive flora				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
	landscape in keeping with legal obligations			FPA membership MOA with WCDM and CCT	
By 2025 there is a reduction in fires that are accidentally set by means other than road accidents	Implement environmental awareness and education programmes	Lead: Community Conservation Manager Enablers: Conservation Manager; Catchment Manager; Protected Areas Manager	Year 1 and annually thereafter	Fire database depicting ignition source shows a decrease in accidentally set fires Environmental Awareness and Education Programme	

Table 5.6. Disaster Management and Contingency

STRATEGY 5:	Develop and implement integrated Disaster Management and Contingency in the event of utility failure on land and oil spill at sea				
GOALS:	Refer to Table 5.1				
THREATS:	Utility failure; oil pollution at sea				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2021 disaster management & contingency planning enables early detection and coordinated rapid response	Collaborate with relevant entity (*e.g.* Eskom; DEA:O&C; CCT) to develop Disaster management & contingency plans	Lead: Conservation Manager Enablers: Catchment Manager; Protected Areas Manager; Senior Manager Coastal Programme	Year 2 and as per timeframe of review	Risk Assessment & Contingency Plan makes provision for coordinated rapid response Seabird rescue plan incorporated into Regional Oil Spill Plan	Regional Oil Spill Contingency plan; MOU/agreements
	Capacitate staff to implement disaster management and contingency plans				
	Incorporate seabird rescue plan into Regional (coastal zone) Oil Spill Contingency Plan				

Table 5.7. Concept Development Plan

STRATEGY 6:	Develop and implement a Concept Development Plan that guides infrastructure development and utilisation to complement focal values and human wellbeing benefit				
GOALS:	Refer to Table 5.1				
THREATS:	Inappropriate development; uncontrolled recreation activities; inadequate operational & tourism infrastructure; compromised visitor and staff safety				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2023 and beyond operational and tourism infrastructure is environmentally responsible and mitigates visitor impacts	Implement infrastructure mapping and evaluate adequacy of existing infrastructure	Lead: Conservation Manager Enablers: Ecological Coordinator; Regional Ecologist; Community Conservation Manager; Programme Manager Tourism Management Services	Year 1 and every three years thereafter	Infrastructure map and evaluation report guides development options User Asset Management Plan	Infrastructure Registers; Infrastructure Evaluation; Sensitivity Analysis; Zonation Scheme; NEMA
	Conduct environmental scoping and obtain land use advice to inform proposed development	Lead: Conservation Manager Enablers: Regional Ecologist; Ecological Coordinator; Land Use Scientist; Protected Areas Manager	Year 1 - Year 3	Environmentally responsible operational and tourism infrastructure developed	
	Define environmentally responsible development options and ensure options are implemented in accordance with zonation schemes		Year 1 to Year 5		
By 2023 interesting natural features / cultural / historical points of interest	Identify and map features to guide the development of eco and cultural tourism	Lead: Conservation Manager	Year 1 - Year 3	Infrastructure development is aligned to feature map	

STRATEGY 6:	Develop and implement a Concept Development Plan that guides infrastructure development and utilisation to complement focal values and human wellbeing benefit				
GOALS:	Refer to Table 5.1				
THREATS:	Inappropriate development; uncontrolled recreation activities; inadequate operational & tourism infrastructure; compromised visitor and staff safety				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
guide the development of appropriate infrastructure	infrastructure development	Enablers: Programme Manager Tourism Management Services; Community Conservation Manager; Ecological Coordinator; Regional Ecologist		Outcomes of visitor perception survey	
	Incorporate the management of Heritage features that serve dual purposes for operations and tourism in the Heritage Management Plan		Year 5 - 10	Heritage Management Plan	
By 2025 and beyond all off-road vehicle activity and recreational use is managed and limited to designated areas	Implement access control and demarcate use areas through informational signage		Year 2 - Year 6 and ongoing	Manned gate houses established at demarcated points Infrastructure map illustrates no new informal roads / trails / congregation areas Signage indicates designated areas and their uses	

Table 5.8. Develop a Resource Utilisation Framework

STRATEGY 7:	Develop and implement a natural resource utilisation framework to improve resource management and regulation of resource use				
GOALS:	Refer to Table 5.1				
THREATS:	Invasive alien flora; unregulated utilisation of natural resources; reduced resource availability due over exploitation; break down in trophic links; lack of knowledge related to extent of utilisation				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2020 and beyond there is adequate knowledge and understanding of natural resources and associated management requirements to responsibly manage resources	Conduct a natural resource availability assessment for consumptive use in collaboration with experts (botanical and social)	Lead: Conservation Manager Enablers: Regional Ecologist; Botanist; Ecological Coordinator; Conservation Services Manager; Community Conservation Manager; People & Conservation Senior Manager	Year 2 and 5 years thereafter	Resource availability assessment provides decision support for establishing quotas	CapeNature Policy on consumptive utilisation (2007); Zone of Influence; Western Cape Biodiversity Spatial Plan
	Maintain an inventory of NRUGs and resources utilised for the Complex	Lead: Community Conservation Manager Enablers: Conservation Manager; Regional Ecologist; Botanist; Ecological Coordinator; Conservation Services Manager; People & Conservation Senior Manager	Year 2 and annually thereafter	NRUG database depicting NRUGs and inventory of resources utilised	
	Develop and implement a NRUG compliance guideline	Lead: Community Conservation Manager	Year 1	NRUG Resource Utilisation Guideline document for decision support & awareness	

STRATEGY 7:	Develop and implement a natural resource utilisation framework to improve resource management and regulation of resource use				
GOALS:	Refer to Table 5.1				
THREATS:	Invasive alien flora; unregulated utilisation of natural resources; reduced resource availability due over exploitation; break down in trophic links; lack of knowledge related to extent of utilisation				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
	Develop capacity for Natural Resource Utilisation & Management	Enablers: Conservation Services Manager; Conservation Manager; People & Conservation Senior Manager; Senior Manager Biodiversity Crime Unit	Year 1 – Year 2 and every 2 years thereafter	NRUG Resource Utilisation training interventions with relevant staff and NRUGs	
By 2029 key resources persist according to the findings of the resource availability assessment	Develop a zonation scheme based on the results of the resource availability assessment and DCC sensitivity analysis.	Lead: Conservation Manager Enablers: Regional Ecologist; Botanist; Ecological Coordinator; Conservation Manager; GIS Technician; People & Conservation Senior Manager	Year 2 and as per monitoring requirement	Persistence of key harvestable species, including marine resources reported	
	Establish quotas based on the results of the resource availability assessment				
	Monitor the effects of utilisation to provide decision support for the revision of quotas				

Table 5.9. Capacity Building and Skills Development towards personal agency, tourism and nature-based economic opportunities

STRATEGY 8:	Facilitate skills development to enable marketability of Expanded Public Works Programme (EPWP) participants and Small, Medium and Macro Enterprises (SMME's)				
GOALS:	Refer to Table 5.1				
THREATS:	Vandalism; overgrazing; inappropriate fire regime; alien & invasive flora; uncontrolled recreation activities; unregulated utilisation of natural resources; poaching of flora; land and water pollution				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2019 and beyond a training and development framework improves standards of work and marketability of EPWP participants	Conduct an annual skills audit to determine training needs of EPWP, including marine (*e.g.* WIO-COMPAS) Develop an annual programme of training aimed at developing specific skill sets for relevant tasks	Lead: Community Conservation Manager Enablers: SMME Manager; Training Manager; Conservation Manager; Human Resources Manager	Year 1 and annually thereafter	Number of EPWP participants transitioned into other opportunities (exit interview) Percentage of training plan completed	EPWP training and development framework; Exit interview process; Performance Management System
By 2019 and beyond SMME's are established and marketable	Develop a programme of themed workshops / training aimed at developing and supporting SMME's	Lead: Community Conservation Manager Enablers: SMME Manager; Conservation Manager; People & Conservation Senior Manager	Year 1 and annually thereafter	Number of established and supported SMMEs	

Table 5.10. Integrated Environmental Awareness and Education

STRATEGY 9:	Develop and implement integrated environmental awareness and education programmes aimed at neighbours, resource users, school groups and visitors, to nurture protected area support and respect and care for natural and cultural historic values				
GOALS:	Refer to Table 5.1				
THREATS:	Inappropriate fire regime, vandalism; uncontrolled recreation activities; unregulated utilisation of natural resources; poaching of flora and fauna; pollution				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2020 sound fire management information is disseminated to target audiences	Develop and implement a fire awareness programme in collaboration with the FPAs (& WoF)	Lead: Community Conservation Manager Enablers: Conservation Manager; Catchment Manager; Protected Areas Manager	Year 1 and annually thereafter	Fire Awareness Programme Number of Fire awareness interventions with identified audience	Environmental Interpretation and Awareness Programme; Zone of Influence; Integrated Work Plan
	Identify hotspot areas and collaborate with relevant partners to implement annual fire awareness campaigns	Lead: Conservation Manager Enablers: Community Conservation Manager; Protected Areas Manager; Conservation Manager; Catchment Manager		Sensitivity and hotspots maps guide focus areas and target audience (linked to ZOI) Fire database defining ignition source shows a decrease in accidentally set fire	Fire Database; Eco sensitive and hotspots maps

STRATEGY 9:	Develop and implement integrated environmental awareness and education programmes aimed at neighbours, resource users, school groups and visitors, to nurture protected area support and respect and care for natural and cultural historic values				
GOALS:	Refer to Table 5.1				
THREATS:	Inappropriate fire regime, vandalism; uncontrolled recreation activities; unregulated utilisation of natural resources; poaching of flora and fauna; pollution				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2029 the tangible and intangible cultural historic heritage of the Dassen Coastal Complex is preserved and promoted	Develop and implement a Cultural Historic awareness programme in collaboration with Heritage Western Cape	Lead: Community Conservation Manager Enablers: Conservation Manager; Catchment Manager; Conservation Services Manager	Year 1 and annually thereafter	Level of cultural historic information made available Evidence of traditional knowledge in environmental awareness and education programmes APO aligned to long term environmental awareness and education programme objectives	Environmental Interpretation and Awareness Programme
By 2025 the level of understanding of visitors / communities / neighbours of protected area values has increased from that of 2019	Conduct visitor & community perception surveys	Lead: Conservation Manager Enablers: Community Conservation Manager; Programme Manager Tourism Management Services	Year 1 and Year 5	Outcomes of visitor and community perception surveys	
	Participate in prioritised annual exhibitions	Lead: Community Conservation Manager	Year 1 and annually	Number of people engaged at exhibitions	

STRATEGY 9:	Develop and implement integrated environmental awareness and education programmes aimed at neighbours, resource users, school groups and visitors, to nurture protected area support and respect and care for natural and cultural historic values				
GOALS:	Refer to Table 5.1				
THREATS:	Inappropriate fire regime, vandalism; uncontrolled recreation activities; unregulated utilisation of natural resources; poaching of flora and fauna; pollution				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
	Facilitate People and Parks meetings	Enablers: Conservation Manager; People & Parks Officer; People & Conservation Senior Manager		Agenda, Meeting minutes and attendance register	National People & Parks Strategy; People and Conservation Strategy
By 2025 the level of beneficiaries taking ownership (initiate and facilitate) of participatory initiatives increases by 5 %	Community groups conduct environmental programmes at Path out of Poverty (POP) centres	Lead: Community Conservation Manager Enablers: Conservation Manager; People & Parks Officer; People & Conservation Senior Manager	Year 1 and annually thereafter	Number of environmental awareness initiatives conducted by community groups	People and Parks Strategy; Regional Community Conservation Work plan
	Develop a Volunteers Initiative for the Complex			Number of volunteers (incl. HNCOs) participating	
By 2029 more than 80 % of resource users and visitors comply with relevant legislation and	Develop a NRUG capacity building programme	Lead: Community Conservation Manager Enablers: Conservation Manager; Conservation	Year 1 and annually thereafter	NRUG Capacity Building Programme Number of environmental capacity building workshops	People and Parks Strategy and Annual Action Plan; Natural Resource Utilisation Policy;

STRATEGY 9:	Develop and implement integrated environmental awareness and education programmes aimed at neighbours, resource users, school groups and visitors, to nurture protected area support and respect and care for natural and cultural historic values				
GOALS:	Refer to Table 5.1				
THREATS:	Inappropriate fire regime, vandalism; uncontrolled recreation activities; unregulated utilisation of natural resources; poaching of flora and fauna; pollution				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
there are zero incidents of vandalism	Conduct environmental capacity building workshops with natural resource users to comply with relevant legislation	Services Manager; Botanist		with resource users, and attendance registers Compliance & Enforcement data analysis shows the number of compliance interventions decreases	Visitor register
	Establish interpretive and information signage	Lead: Conservation Manager Enablers: Community Conservation Manager; Botanist; Aquatic Scientist (relevant specialists)	Year 1 – Year 3	Compliance & Enforcement data analysis shows a reduction in repeat offenders	Infrastructure Register

Table 5.11. Cultural and Historic Heritage Resource Management

STRATEGY 10:	Develop a Plan for the Management of Cultural and Historic Resources				
GOALS:	Refer to Table 5.1				
THREATS:	Weathering; vandalism; inappropriate development; utility failure				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By end 2020 a formal baseline survey for the Complex is completed by an accredited Heritage practitioner	Conduct a detailed baseline heritage survey in collaboration with an accredited Heritage Practitioner (SAHRA, HWC)	Lead: Conservation Manager Enablers: Community Conservation Manager; Ecological Coordinator	Year 2	Baseline Heritage assessment to guide management actions and provide decision support	National Heritage Resources Act; National Monuments Act; South African Heritage Resource Inventory (SAHRIS)
By 2029 the tangible and intangible cultural historic heritage of the Dassen Coastal Complex is preserved and promoted	Maintain and update the Heritage Resource Inventory	Lead: Conservation Manager Enablers: Ecological Coordinator	Year 1 and annually thereafter	Level of cultural historic information available and valued	
	Develop and implement a plan for the management of cultural historic heritage resources	Lead: Conservation Manager Enablers: Community Conservation Manager; Protected Areas Manager; People and Conservation Senior Manager	Year 2 – 3	% structures in good condition Evidence of traditional knowledge in environmental awareness and education programmes	

Table 5.12. Integrated Compliance and Law Enforcement

STRATEGY 11:	Develop and implement an integrated compliance plan in collaboration with partners and law enforcement entities				
GOALS:	Refer to Table 5.1				
THREATS:	Unregulated utilisation of natural resources; poaching of fauna and flora; uncontrolled recreation activities; compromised visitor and staff safety; vandalism; reduced resource availability due over exploitation; inappropriate fire regime				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2020 & beyond all compliance and law enforcement entities agree on roles and responsibilities	Develop and implement a long term integrated compliance plan to integrate and complement relevant initiatives planned by law enforcement entities and neighbours	Lead: Conservation Manager Enablers: Conservation Services Manager; Community Conservation Manager; Senior Manager Biodiversity Crime Unit, Regional Ecologist; People & Conservation Senior Manager; Director: Conservation Management; Director: Biodiversity Support	Year 2 and annually thereafter	APO aligned to long term Integrated Compliance Plan (ICP) objectives	Relevant suite of environmental legislation and associated regulations, by laws and Policy
By 2025 and beyond all off-road vehicle and other recreational activities are managed & limited to designated areas			Year 6 – Year 10	Communication Plan aligned to long term ICP objectives Reduction in repeat offenders Number of compliance interventions	Compliance & Enforcement Database; Illegal Activities Database
By 2025 more than 80 % of resource users and visitors comply to relevant legislation and there are zero incidents of non-compliance	Draft and implement an Annual Plan of Operations in collaboration with relevant law enforcement entities		Year 6	Number of compliance interventions Reduction in repeat offenders % structures (incl. graves) in good condition	Compliance & Enforcement Database; Illegal Activities Database
By 2025 there is a reduction in the			Year 6	Amount of dumped material removed per	

STRATEGY 11:	Develop and implement an integrated compliance plan in collaboration with partners and law enforcement entities				
GOALS:	Refer to Table 5.1				
THREATS:	Unregulated utilisation of natural resources; poaching of fauna and flora; uncontrolled recreation activities; compromised visitor and staff safety; vandalism; reduced resource availability due over exploitation; inappropriate fire regime				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
amount of pollution affecting reserves, and a reduction in nutrient loads of run-off from surrounding land use into sensitive ecosystems				scheduled clean-up event Results of water quality monitoring indicates water quality is in an acceptable range Results of monitoring indicate the extent of standing water is in the natural range	
By 2021 & beyond all enforcement staff identified in the compliance plan have been appointed and trained	Implement a training programme to develop staff skill and ability	Lead: Conservation Manager Enablers: Conservation Services Manager; Senior Manager Biodiversity Crime Unit; Human Resources Manager	Year 2 and a refresher every 2 years thereafter	Compliance & law enforcement training programme Number of trained and capacitated staff	Training Register; Appointment letters & cards

Table 5.13. Implement Veld Management and Restoration

STRATEGY 12:	Implement wildlife management principles as a mechanism for veld management and restoration				
GOALS:	Refer to Table 5.1				
THREATS:	Overgrazing, inappropriate fire regime				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2019 and five years thereafter veld condition mapping guides veld management and restoration	Conduct a habitat assessment and assess stocking potential Implement recommended veld management and restoration actions	Lead: Regional Ecologist Enablers: Conservation Manager; Ecological Coordinator; Conservation Services Manager	Year 1; Year 5	Veld condition map and habitat assessment improve biodiversity knowledge & understanding to guide game management & veld restoration Stocking potential informs game management Veld condition map and habitat assessment indicate % degraded area is reduced relative to the baseline of 2019	Game Translocation and Utilisation Policy for the Western Cape Province; SOG: Checklist for Evaluating Game Management Plans; Fencing and Enclosure of Game and Predators in the Western Cape Province; SOG: Conducting Habitat Evaluations for Game Species as Prescribed by GTUP; SOG: Inspections for Certificate of Adequate Enclosure and Fencing; National Animal Pounds Bill; Western Cape Game Distribution Database; Game on Reserve Register
By 2025 viable populations of appropriate game species persist in the coastal portion of the Dassen Coastal Complex	Implement wildlife management principles as it pertains to *e.g.* game escapees, damage causing wildlife & domestic animals roaming into the Complex	Lead: Conservation Manager; Conservation Services Manager Enablers: Wildlife Programme Manager	Year 1 and ongoing	Fence inspection reports A decrease in the report of escaped / *res nullius* game Damage-Causing Wildlife Reports reflect a	

STRATEGY 12:	Implement wildlife management principles as a mechanism for veld management and restoration				
GOALS:	Refer to Table 5.1				
THREATS:	Overgrazing, inappropriate fire regime				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2029 key palatable indigenous plant species persist and species composition and numbers reflect the findings of the habitat assessment & stocking potential assessment				decrease in the number of DCA's reported Persistence of key palatable plant species Veld condition map and habitat assessment indicate % degraded area is reduced relative to the baseline of 2019	
	Develop and implement a livestock exit strategy in collaboration with the relevant management authority	Lead: Conservation Manager Enablers: Conservation Services Manager; Community Conservation Manager	Year 1 to Year 2	Game on reserves data analysis indicates livestock are not observed in the Complex Persistence of key palatable plant species reported Game condition assessment indicates condition of selected game species is good	
	Enter into a custodianship agreement with the relevant management authority for the	Lead: Conservation Manager	Year 3	Signed custodianship agreements	

STRATEGY 12:	Implement wildlife management principles as a mechanism for veld management and restoration				
GOALS:	Refer to Table 5.1				
THREATS:	Overgrazing, inappropriate fire regime				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
	introduction of appropriate game species	Enablers: Wildlife Programme Manager; Conservation Services Manager; Regional Ecologist; Ecological Coordinator		Game Management Plan aligned to results of stocking potential assessment Game condition assessment indicates condition of selected game species is good The Game on Reserves data analysis indicates population trends are appropriate	
	Compile and implement a Game Management Plan in collaboration with relevant management authority		Year 3 to Year 5		

Table 5.14. Knowledge Management and Ecological Programme of Work

STRATEGY 13:	Develop and implement an ecological programme of work to enable focal value status monitoring and research in collaboration with entities with complementary knowledge mandates.				
GOALS:	Refer to Table 5.1				
THREATS:	This strategy does not address a specific threat, rather the need for data and analyses to support adaptive management; to measure the status of key attributes and / or strategy effectiveness				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
By 2020 and beyond an ecological programme of work directs monitoring and research needs.	Develop and implement a protected area monitoring and evaluation programme aligned to focal values	Lead: Regional Ecologist Enablers: Ecological Coordinator; Conservation Manager; Community Conservation Manager; Conservation Services Manager; Scientific Manager; Conservation Planner; Catchment Manager; People & Conservation Senior Manager; Protected Area Expansion & Stewardship Senior Manager; Coastal Programme Senior Manager	Year 1 –Year 10	Ecological Programme of Work Ecological projects prioritised to measure selected focal value status / threat reduction measures Research needs are identified and prioritised Research Register DCC project file maintained in Miradi	Ecological Matrix per reserve; BMS; Dassen Coastal Complex Miradi project file

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7. APPENDIX 1 STAKEHOLDER ENGAGEMENT REPORT: DASSEN COASTAL COMPLEX

DASSEN COASTAL COMPLEX

Western Cape, South Africa

STAKEHOLDER ENGAGEMENT PROCESS REPORT

COMPILED BY FOOTPRINT ENVIRONMENTAL SERVICES

DATE: JANUARY 2019

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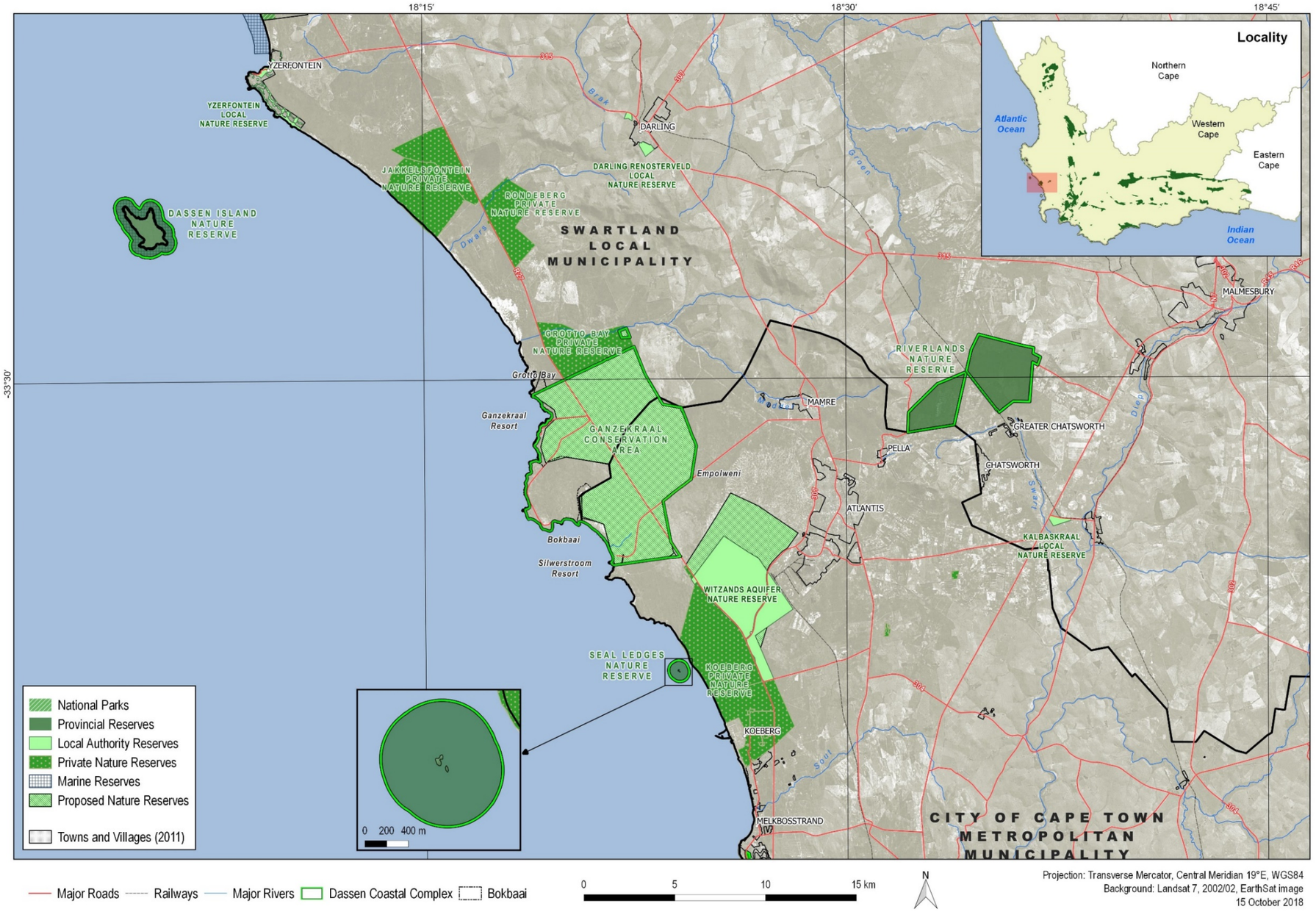
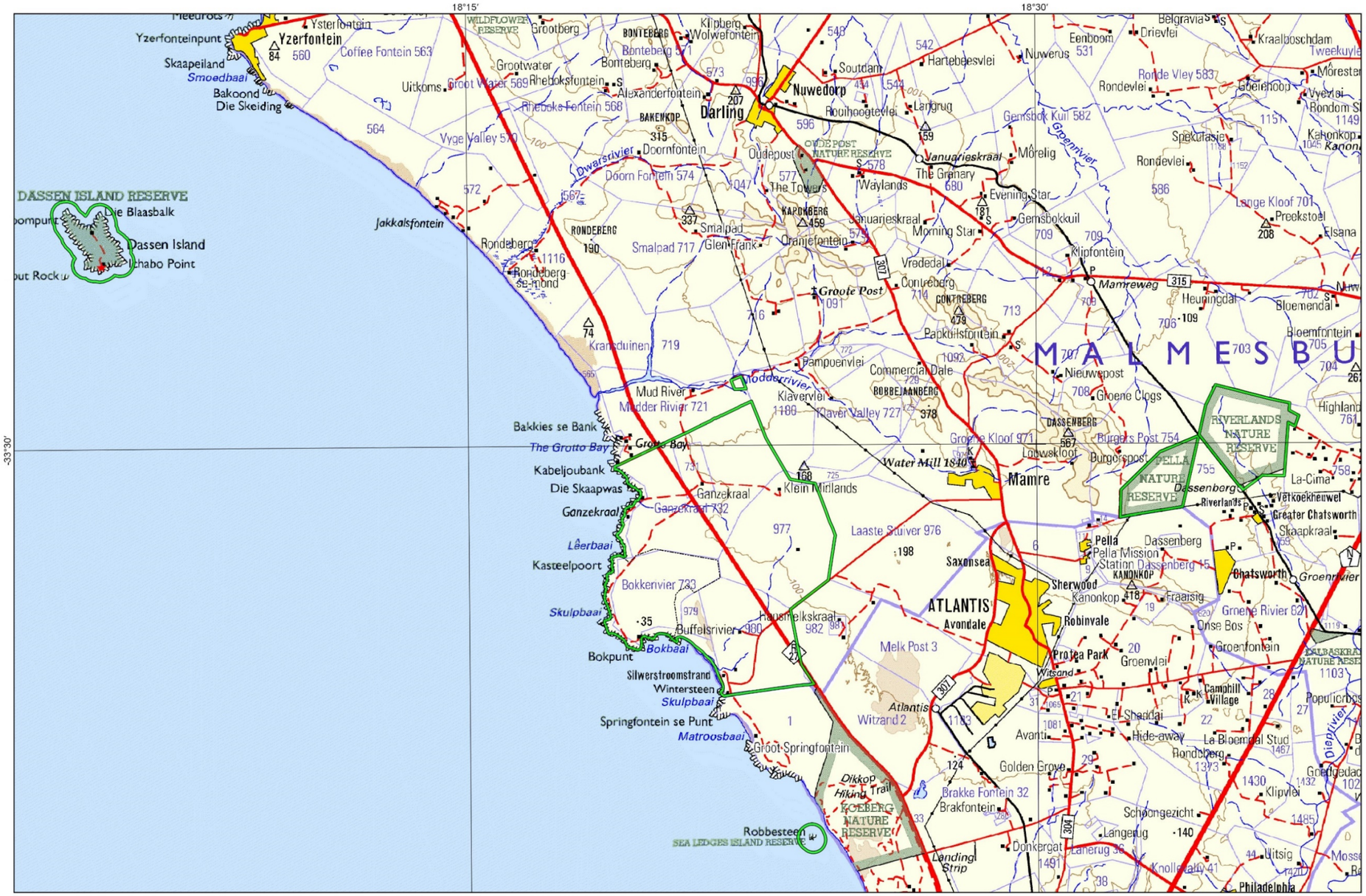
7. APPENDIX 2 MAPS OF THE DASSEN COASTAL COMPLEX

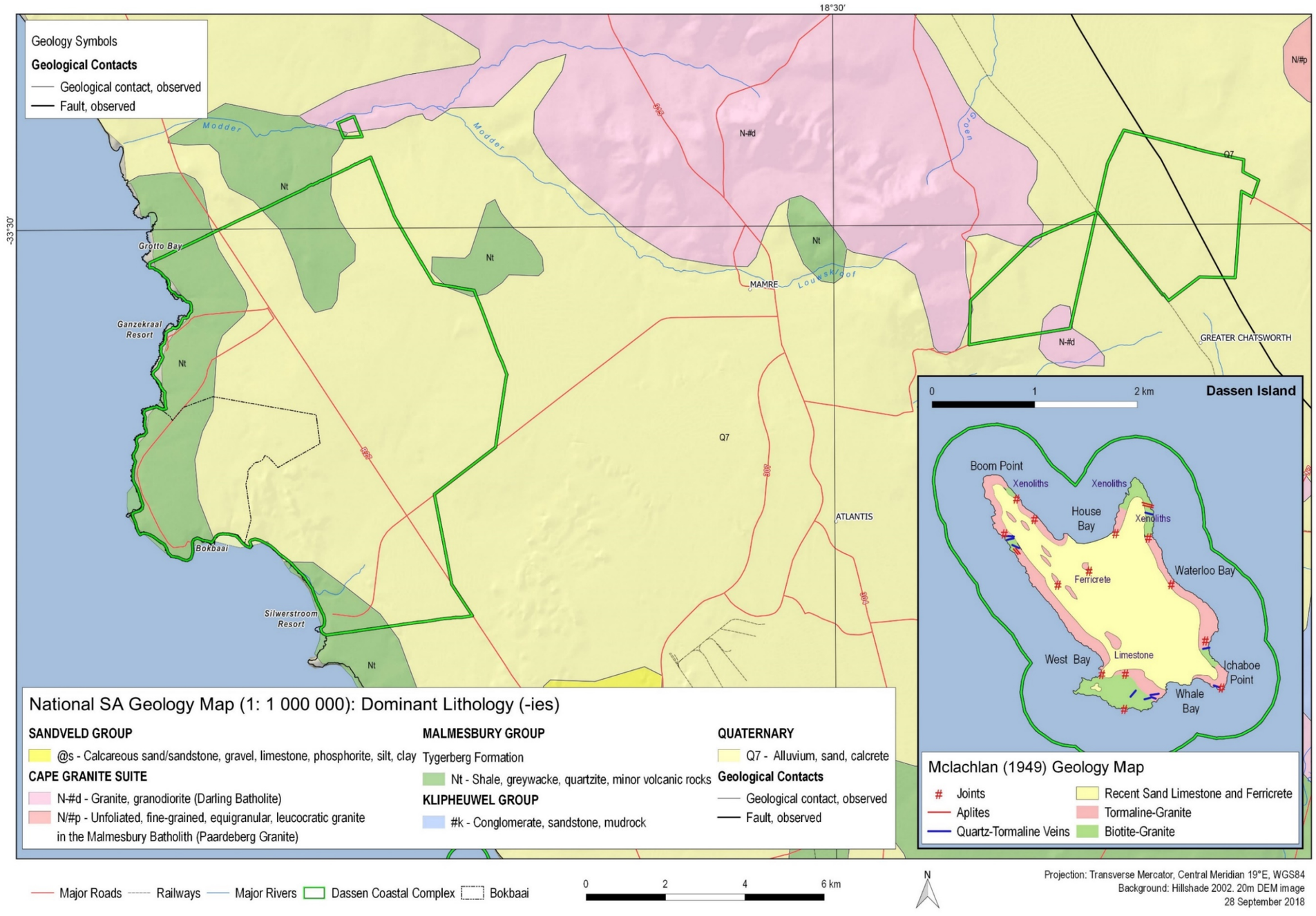
MAP 1 Location and extent of the Dassen Coastal Complex



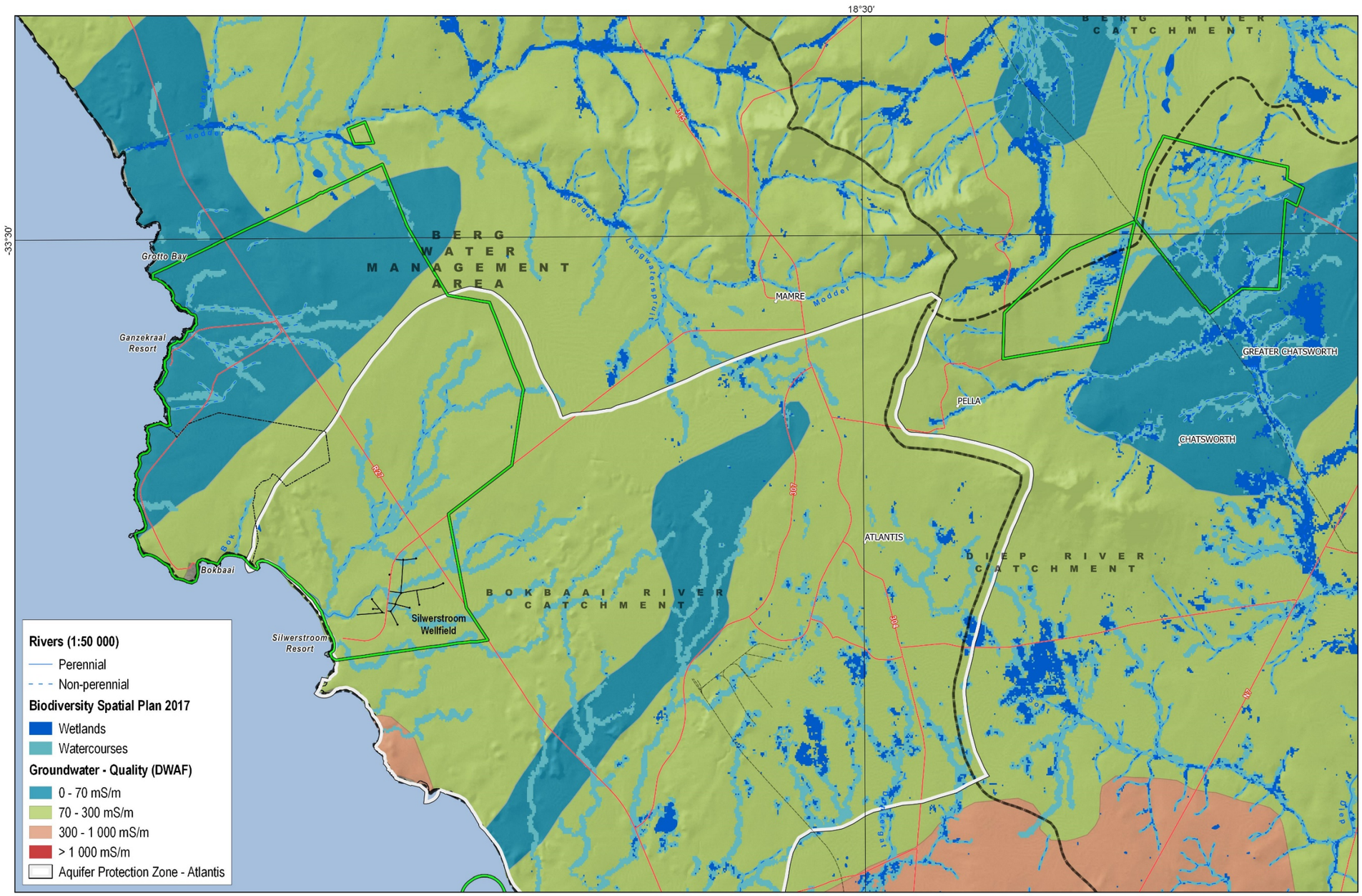
MAP 2 Topography of the Dassen Coastal Complex



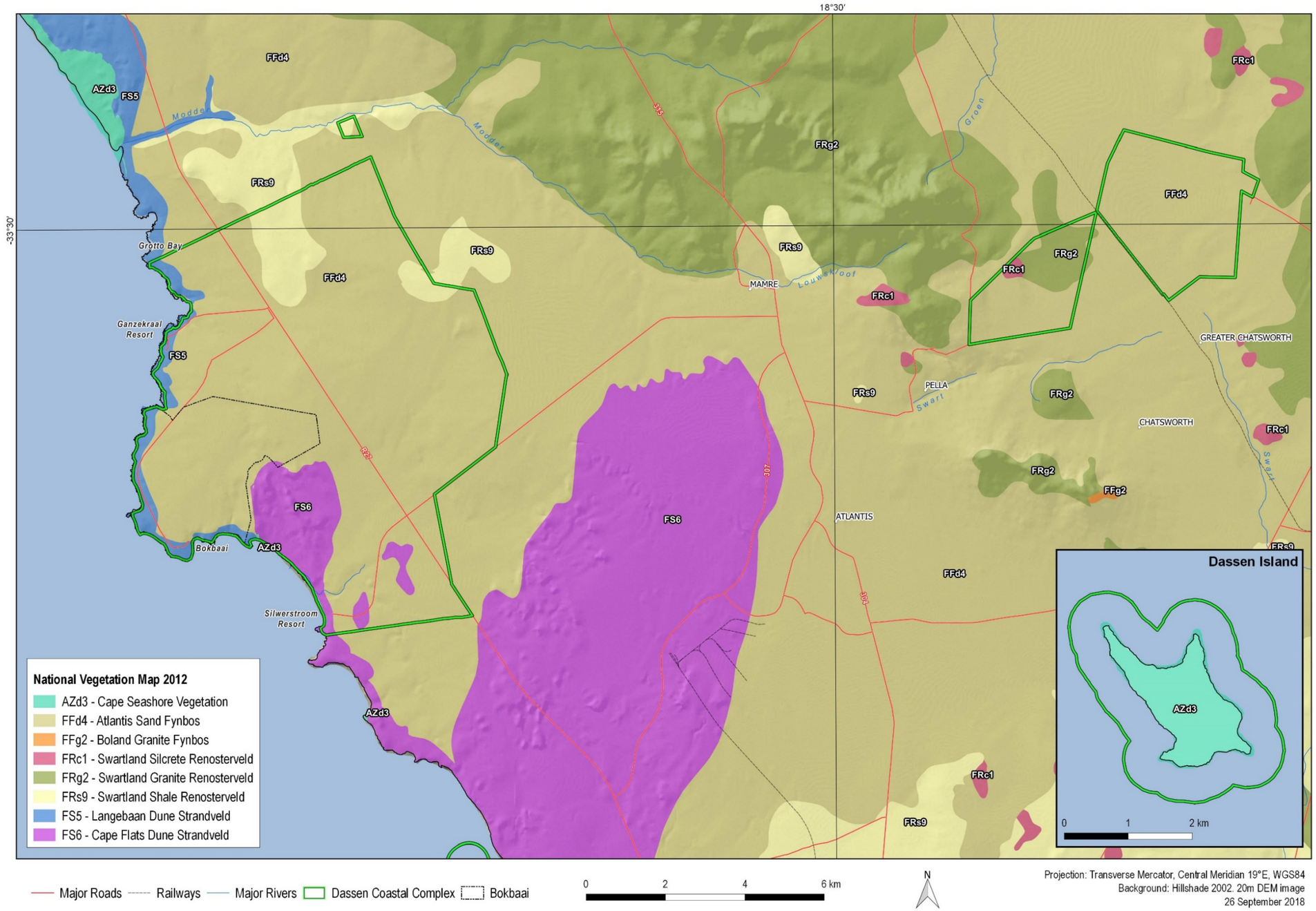
MAP 3 Geology of the Dassen Coastal Complex (Mclachlan 1949)



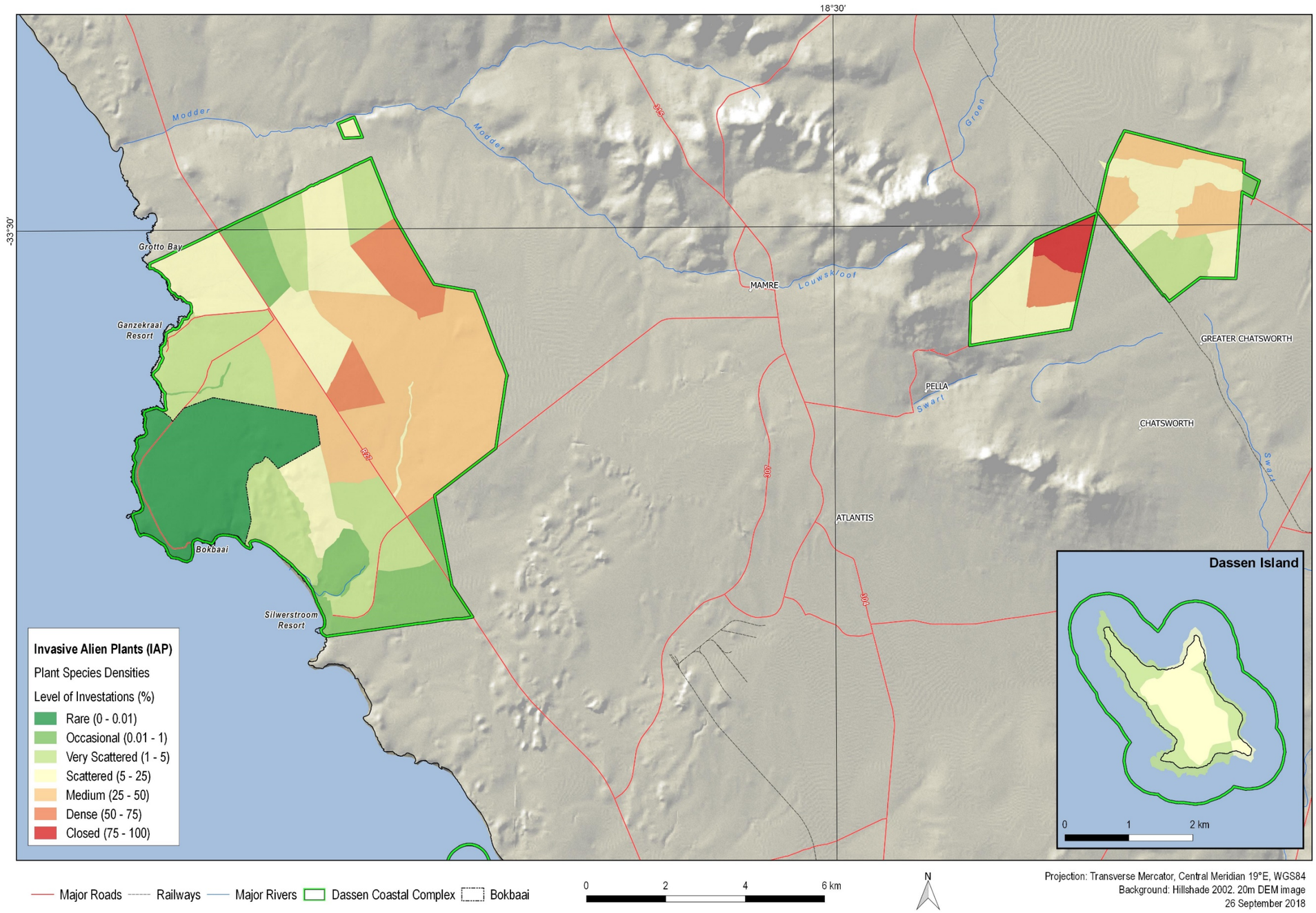
MAP 4 Aquatic systems of the Dassen Coastal Complex



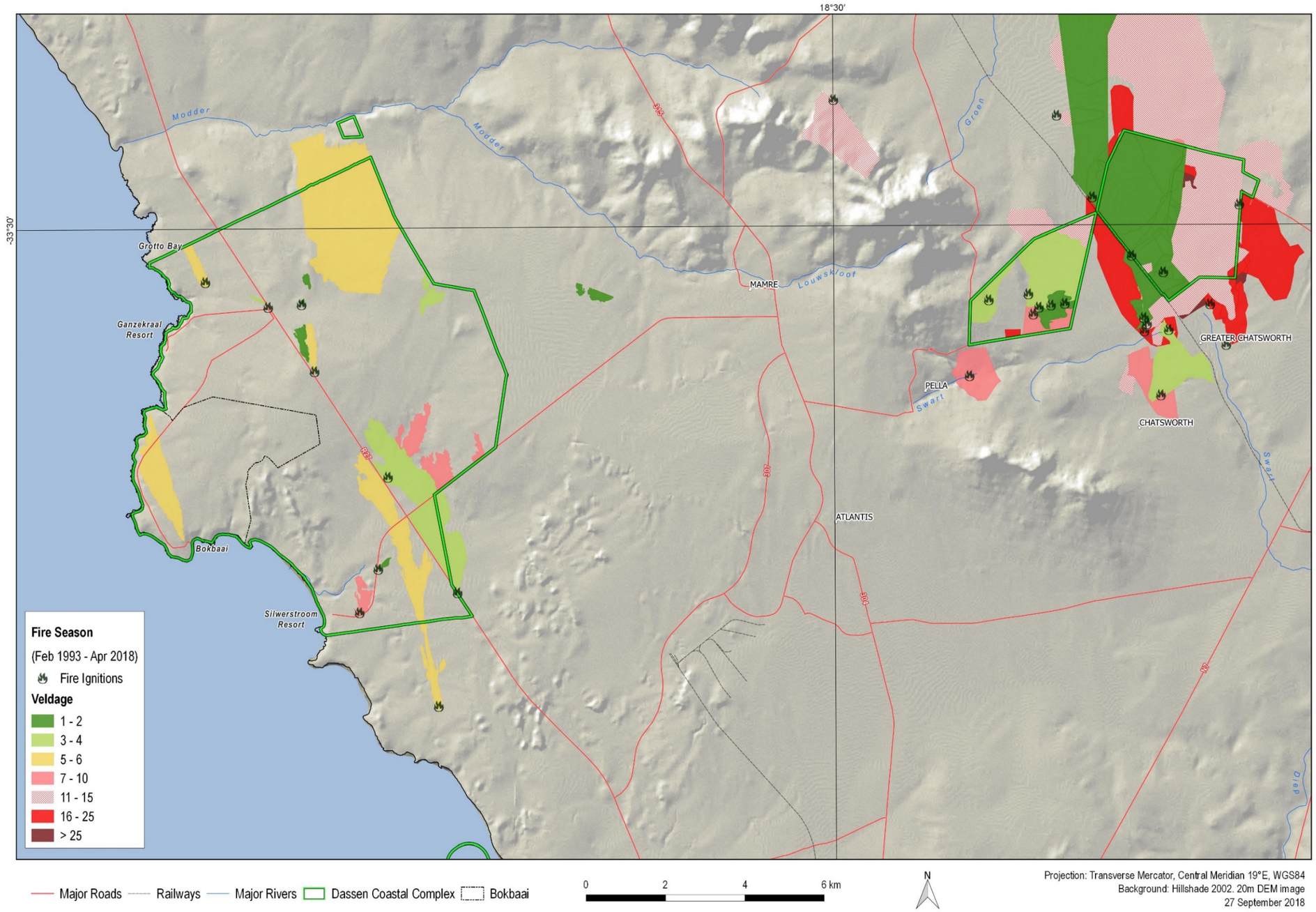
MAP 5 Vegetation of the Dassen Coastal Complex (Rebelo *et al.* 2006)



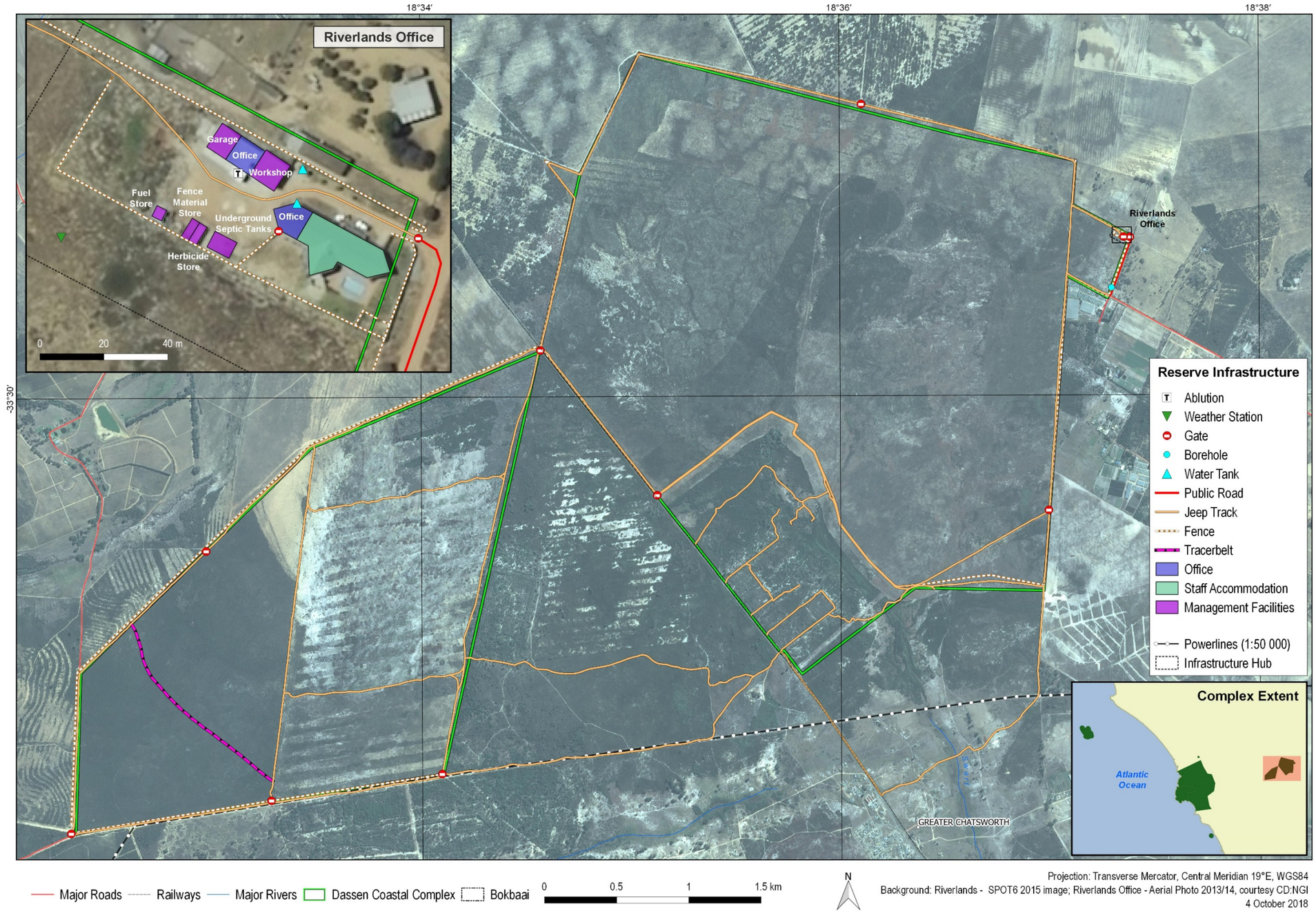
MAP 6 Invasive alien vegetation map and management compartments of the Dassen Coastal Complex



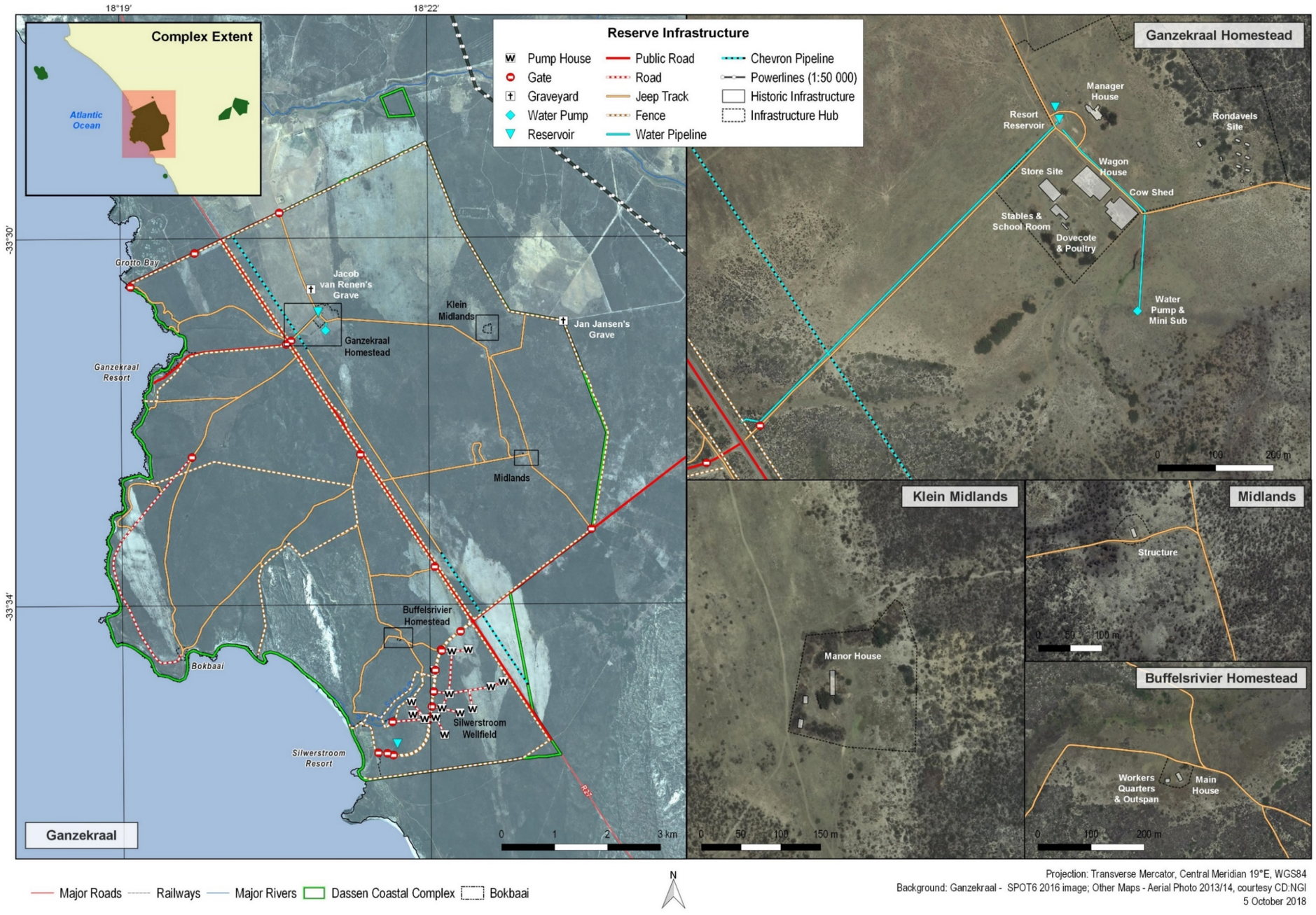
MAP 7 Veld Age map of the Dassen Coastal Complex



MAP 8a Infrastructure map of the Dassen Coastal Complex: Riverlands Nature Reserve

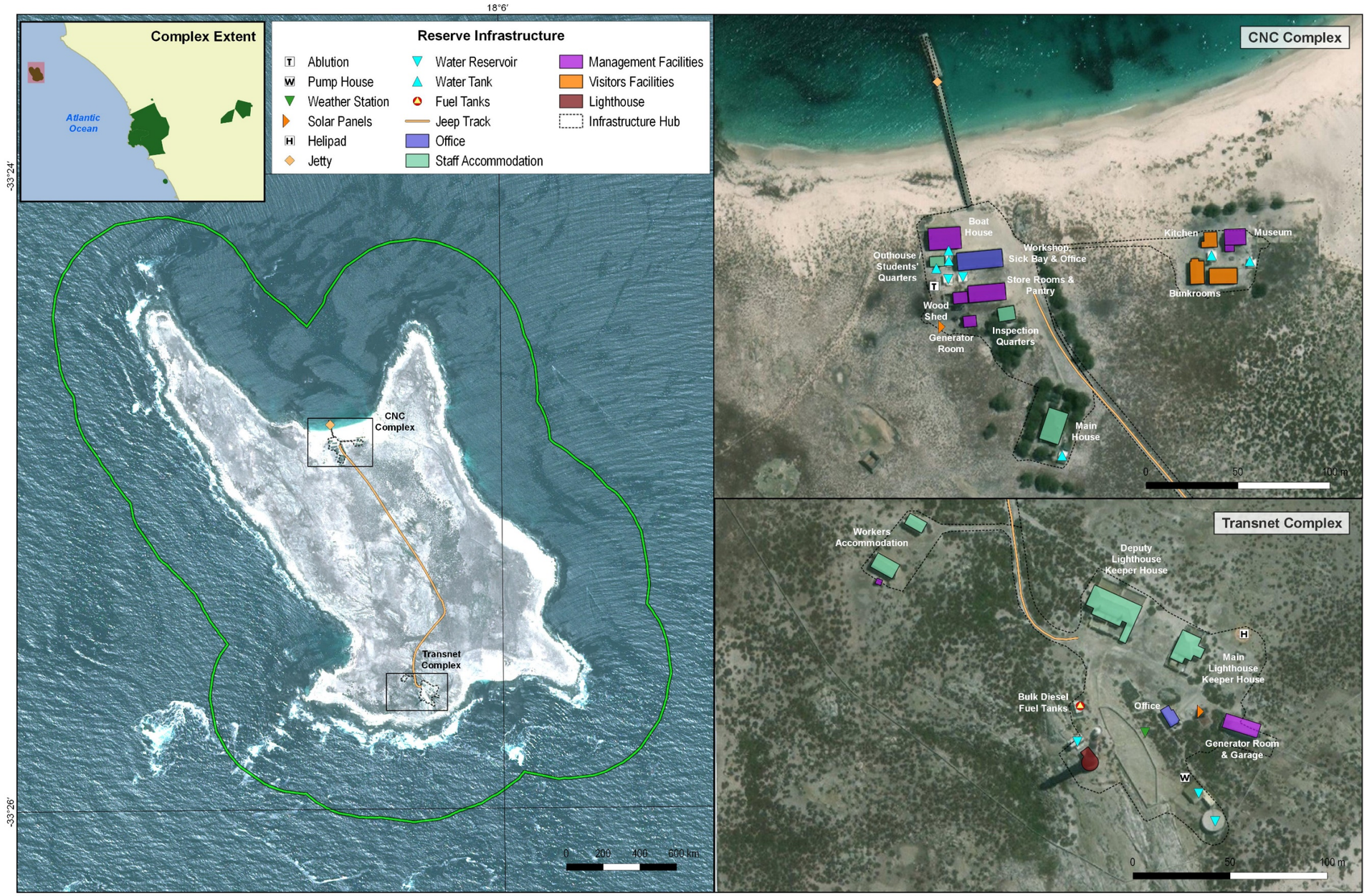


MAP 8b Infrastructure map of the Dassen Coastal Complex: Ganzekraal Conservation Area



Projection: Transverse Mercator, Central Meridian 19°E, WGS84
Background: Ganzekraal - SPOT6 2016 image; Other Maps - Aerial Photo 2013/14, courtesy CD:NGI
5 October 2018

MAP 8c Infrastructure map of the Dassen Coastal Complex: Dassen Island Nature Reserve

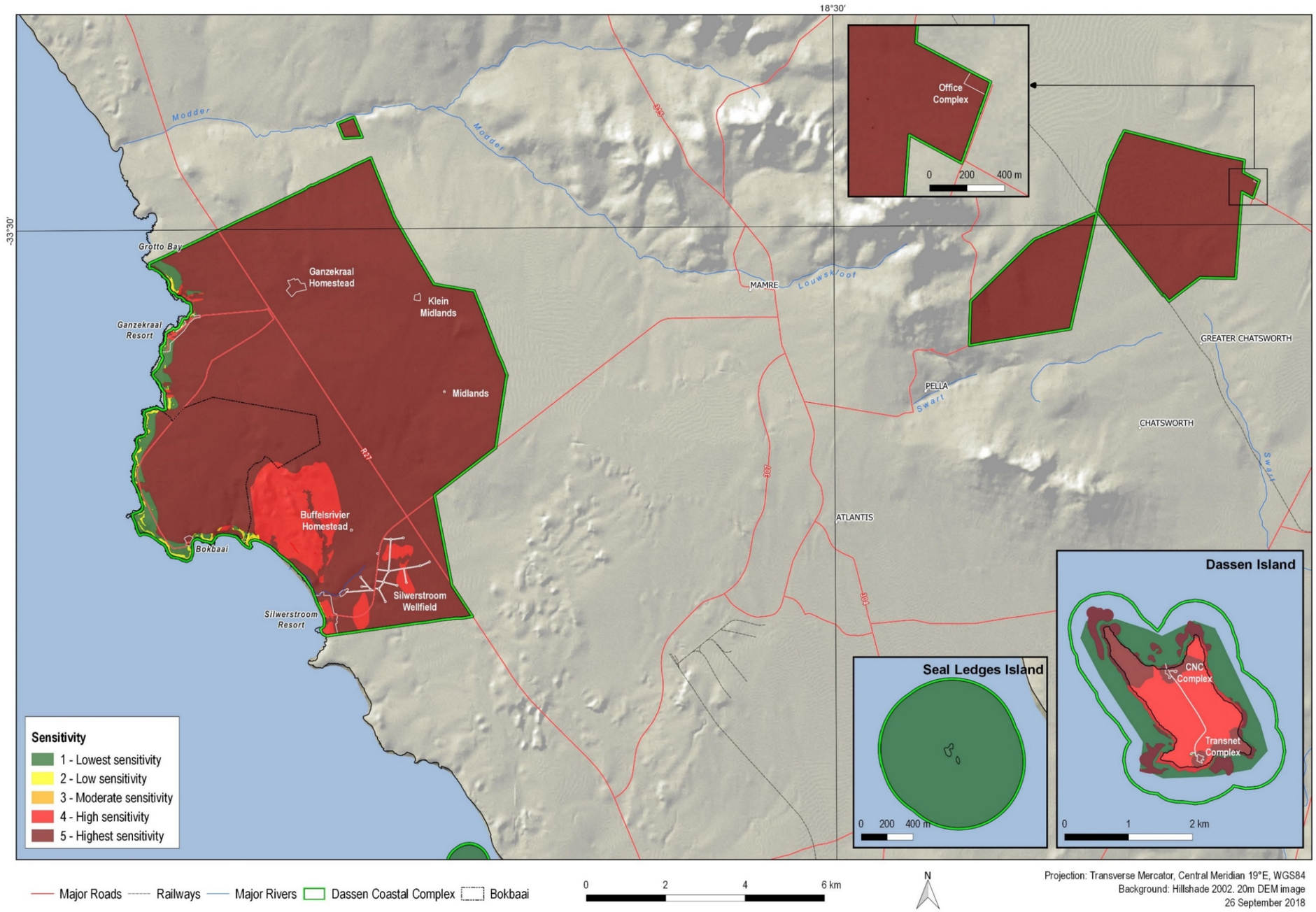


Major Roads Railways Major Rivers Dassen Coastal Complex Bokbaai

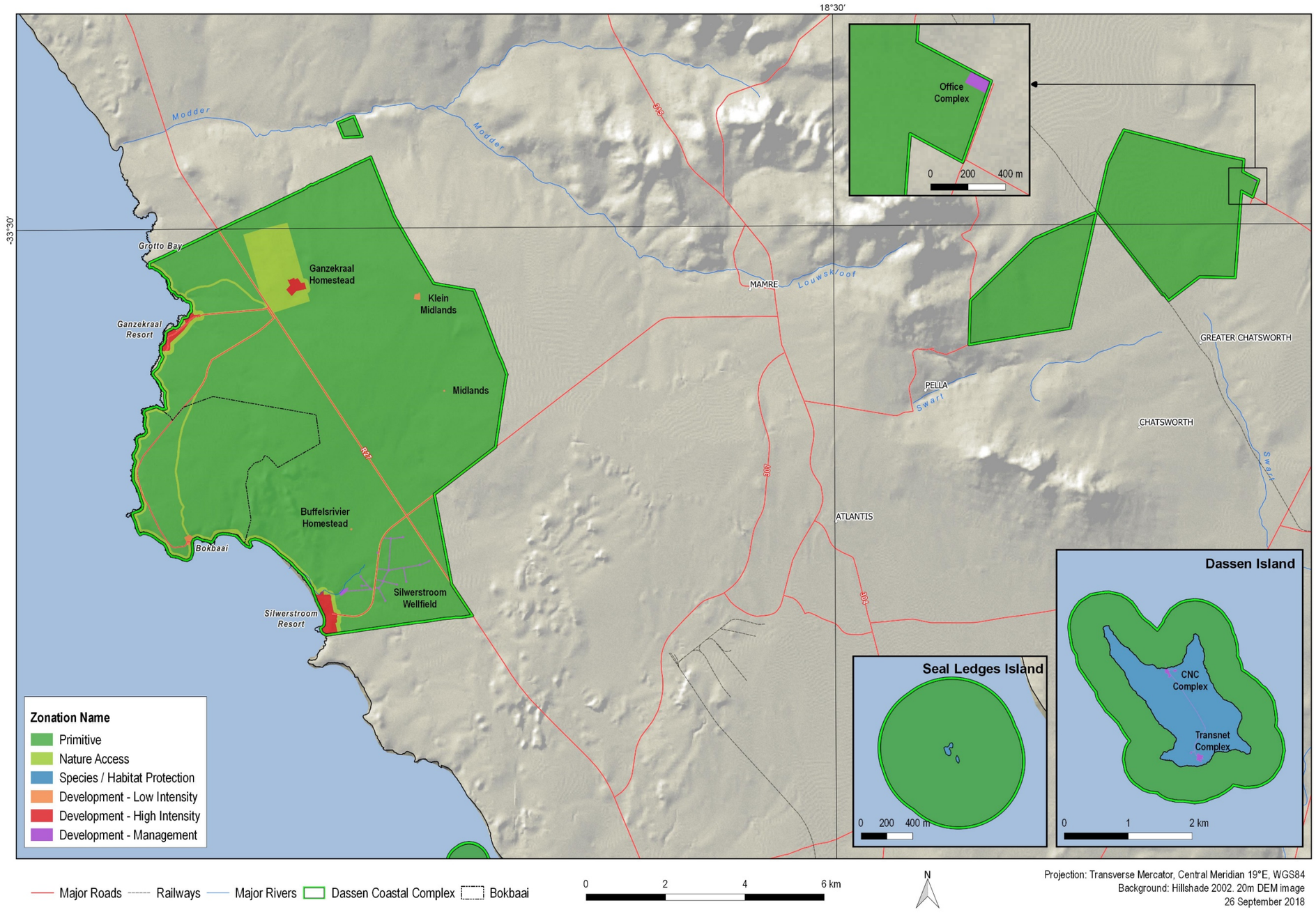
N

Projection: Transverse Mercator, Central Meridian 19°E, WGS84
Background: Dassen Island - SPOT6 2016 image; CNC & Transnet Complex - This Bing image is rectified. @ 2018 Microsoft Corporation @ 2018 DigitalGlobe @ CNES (2018) Distribution Airbus DS
10 October 2018

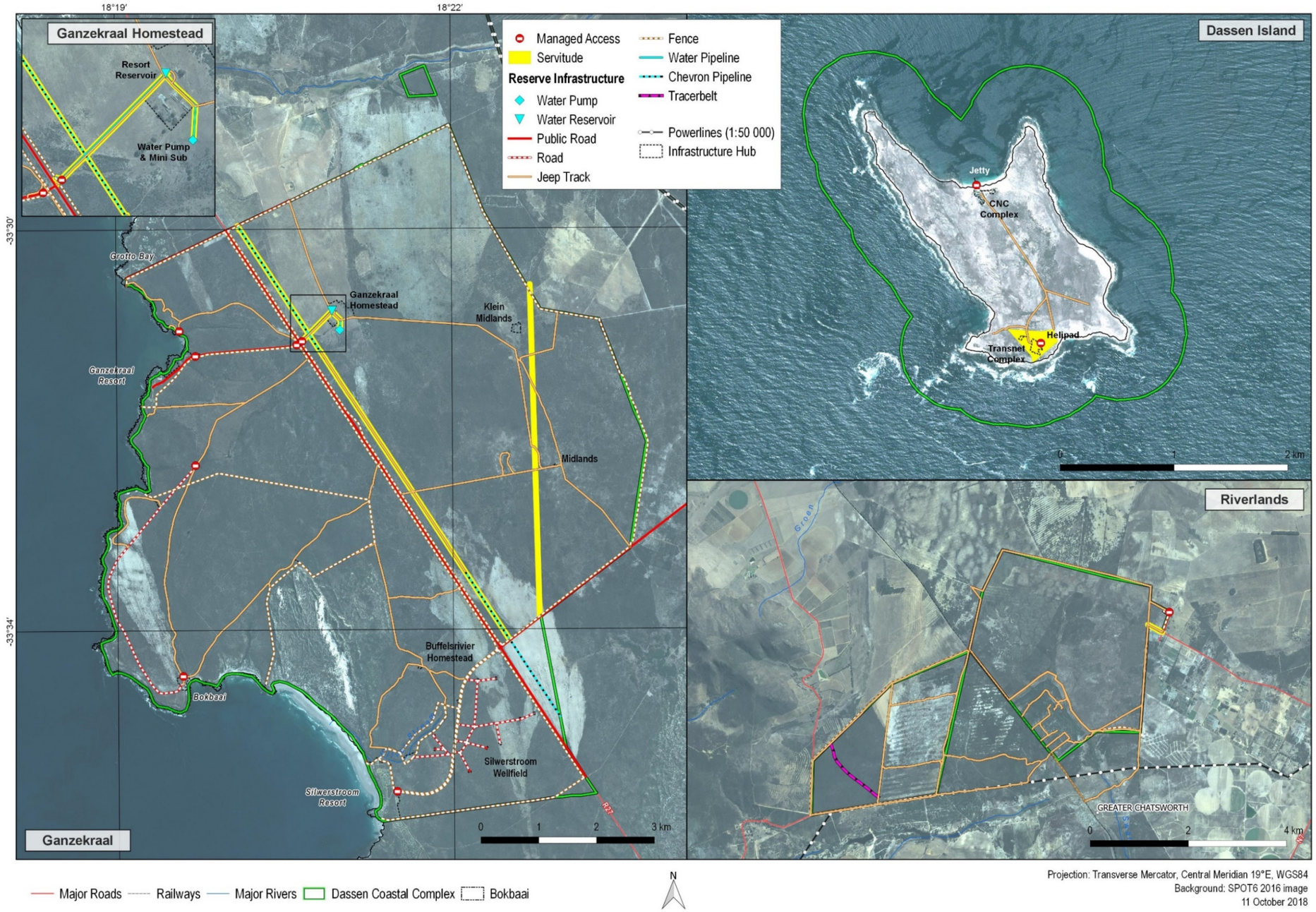
MAP 9 Sensitivity map of the Dassen Coastal Complex



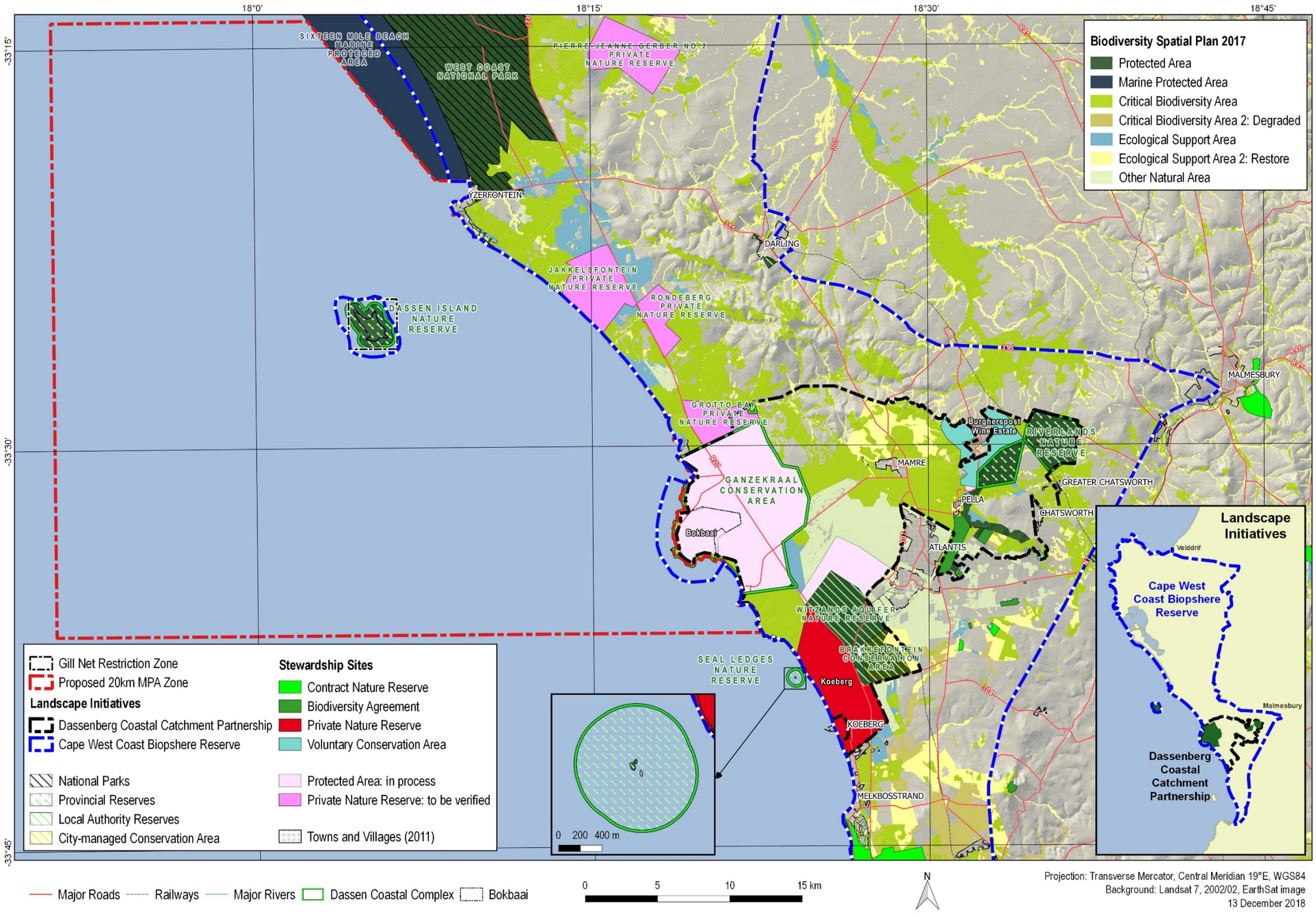
MAP 10 Zonation map of the Dassen Coastal Complex



MAP 11 Access to the Dassen Coastal Complex



MAP 12 Expansion of the Dassen Coastal Complex



Projection: Transverse Mercator, Central Meridian 19°E, WGS84
Background: Landsat 7, 2002/02, EarthSat image
13 December 2018

MAP 13 Dassenberg Coastal Complex Zone of Influence spatial extent and rating