



CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

POLICY

THE CAPE TOWN BIOREGIONAL PLAN (POLICY NUMBER 44854)

NOTED BY COUNCIL : 19 AUGUST 2015
C43/08/15

AS PART OF RESOLUTIONS TAKEN BY THE EXECUTIVE
MAYOR IN TERMS OF DELEGATED POWERS:
JULY 2015



CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

The Cape Town Bioregional Plan

Adopted as Council Policy¹ on 19 August 2015

C43/08/15: RESOLUTIONS TAKEN BY THE EXECUTIVE MAYOR IN TERMS OF

DELEGATED POWERS AND DECISIONS TAKEN TOGETHER WITH THE

MEMBERS OF THE MAYORAL COMMITTEE: JULY 2015

Prepared by the

City of Cape Town Municipality

Energy, Environmental & Spatial Planning Directorate

Environmental Resource Management Department

August 2015

Edited by:

Arne Purves

E arne.purves@capetown.gov.za

Patricia Holmes

E patricia.holmes@capetown.gov.za

¹ This plan has not been published in terms of NEM:BA (Act 10 of 2004), but adopted as Council policy.

Executive Summary

The Cape Town Bioregional Plan was adopted as City Policy in July 2015 (Annexure 3). It comprises a biodiversity profile for the bioregion, the Biodiversity Network and management guidelines. The Cape Town Biodiversity Network is a spatial plan that shows terrestrial and aquatic features that are critical for conserving biodiversity and maintaining ecosystem functioning. These are classified as Critical Biodiversity Areas (CBAs) and Critical Ecological Support Areas (CESAs) respectively. The Provincial Government of the Western Cape has incorporated the Biodiversity Network into the Western Cape Biodiversity Framework.

The bioregion encompasses the City of Cape Town metropolitan area of 2,460km². The Bioregional Plan adheres to the principles outlined in the National Environmental Management: Biodiversity Act (Act 10 of 2004) and comprises a biodiversity profile, the Biodiversity Network (a map of biodiversity priorities), with accompanying land-use planning and decision-making guidelines, and additional management measures. It indicates Critical Biodiversity Areas (CBAs) and Critical Ecological Support Areas (CESAs). The CBAs are required to meet national biodiversity targets for terrestrial and wetland ecosystems according to the National Spatial Biodiversity Assessment (Rouget et al. 2004). CBAs and CESAs are required to secure Cape Town's unique biodiversity into the future and ensure sustainable development.

The purpose of the Bioregional Plan is to inform and guide planning, environmental assessment and natural resource management by a wide range of sectors whose policies and decisions impact on biodiversity. It will provide a framework for all City line departments to align their environmental functions and responsibilities. The spatially explicit Biodiversity Network (CBA map) will facilitate forward planning that minimizes impacts on biodiversity. This will create a more integrated, cost-effective approach to environmental management and conservation in the bioregion. The intention of the Bioregional Plan is to provide critical information on biodiversity to guide forward planning and future development.

The Bioregional Plan is aligned with the National Spatial Biodiversity Assessment (Driver et al. 2005) and National Biodiversity Framework and serves as City Policy for biodiversity priority areas in Cape Town. The Bioregional Plan aims to ensure that the National Environmental Management Act (NEMA, Act 107 of 1998) principles are applied within Cape Town in an effective and equitable manner, in order to avoid loss and degradation of natural habitat in Critical Biodiversity Areas.

The Cape Town Biodiversity Network is a regularly updated, fine-scale systematic biodiversity plan. As natural habitat is being lost continuously to formal and informal developments, agriculture and mining, securing the Biodiversity Network is an urgent priority. Owing to Cape Town's exceptional biodiversity richness and uniqueness, as well as the intensive pressures on the land, minimum national biodiversity targets can no longer be achieved for eight out of 19 national vegetation types found in the bioregion.

The Biodiversity Network was integrated into the Cape Town Spatial Development Framework (CTSDF) which was then approved as the statutory spatial component of the Integrated Development Plan (IDP) in terms of the Municipal Systems Act (Act 32 of 2000). Both The CTSDF and IDP embody the principles of sustainable development. The eight district Spatial Development Plans (SDPs) and Environmental Management Frameworks (EMFs) were approved by Council as spatial policy in terms of Section 4(10) of the Land Use Planning Ordinance and by the Department of Environmental Affairs and Development Planning, with the concurrence of the national Minister, and

in terms of the 2010 EMF regulations, respectively. The District SDPs inform and respond to the CTSDF and are the tools used on a daily basis to guide statutory land use decision-making. The EMFs must be taken into account in any application for Environmental Authorization. The Bioregional Plan objectives and guidelines find expression through the CTSDF and the district SDPs and EMFs.

The mandated users of the Cape Town Bioregional Plan include the City, which must align the contents of the plan into future revisions of the IDP, CTSDF, EMFs and District SDPs.

Note that the Cape Town Bioregional Plan is not in itself a multi-sectoral planning and assessment tool and that the CTSDF is the statutory land use management and decision-making plan used in guiding statutory land use decision-making in the City.

In addition, any organ of state preparing an environmental implementation plan or environmental management plan should refer to the Bioregional Plan. Further mandated users include environmental decision-makers and the competent authorities prior to issuing environmental authorizations for: the ploughing of virgin land, prospecting and mining, and the granting of water licenses and water allocations.

The Bioregional Plan will be monitored and reviewed on a five-yearly basis. The plan will be reviewed against a number of set biodiversity targets and indicators. These will include the biodiversity targets and indicators as set in the City's State of Environment report.

Acknowledgements

The editors wish to thank all the contributors who assisted in the compilation of this Bioregional Plan, all the reviewers of the draft documents and the team behind the technical reports. The many contributions that have been made (starting in 2003) are too many to list, but it must be noted that this plan is the accumulation of the work of many people and organisations that are deeply committed to the protection and conservation of the City's biodiversity.

Table of Contents

EXECUTIVE SUMMARY	2
ACKNOWLEDGEMENTS	3
LIST OF TABLES	7
LIST OF MAPS	7
LIST OF ABBREVIATIONS	8
PART A 9	
1. INTRODUCTION	9
1.1 PURPOSE AND OBJECTIVES	9
1.2 LIMITATIONS AND CONSTRAINTS	11
1.3 INTERNATIONAL, NATIONAL AND LOCAL OBLIGATIONS	12
1.3.1 <i>International</i>	12
1.3.2 <i>National</i>	12
1.3.3 <i>Local</i>	13
1.4 LEGISLATION	14
1.4.1 <i>Legal Framework of the Bioregional Plan</i>	14
2 POLICY AND STRATEGIES	15
2.1 PROVINCIAL SPATIAL DEVELOPMENT FRAMEWORK (PSDF)	15
2.2 INTEGRATED DEVELOPMENT PLAN (IDP)	16
2.3 CAPE TOWN SPATIAL DEVELOPMENT FRAMEWORK	16
2.4 ENVIRONMENTAL MANAGEMENT FRAMEWORKS (EMFs) & DISTRICT SPATIAL DEVELOPMENT PLANS (DSDPs)	17
2.5 INTEGRATED METROPOLITAN ENVIRONMENTAL POLICY (IMEP)	18
2.6 OTHER RELEVANT CITY POLICIES AND STRATEGIES	18
3 USERS	19
3.1 MANDATED USERS	19
3.2 RECOMMENDED USERS	19
4 BOUNDARY OF THE BIOREGION	20
5 DEVELOPING THE CITY OF CAPE TOWN SYSTEMATIC BIODIVERSITY PLAN	23
5.1 TERRESTRIAL BIODIVERSITY NETWORK MAP	23
5.2 THE RIVERS AND WETLANDS MAP	24
6 INTEGRATION OF THE BIODIVERSITY NETWORK WITHIN THE CCT PLANNING TOOLS	25

PART B:26

7	BIODIVERSITY PROFILE	26
7.1	OVERVIEW OF BIODIVERSITY SIGNIFICANCE	26
7.2	TERRESTRIAL ECOSYSTEMS IN THE BIOREGION.....	26
7.2.1	Sand Fynbos	31
7.2.2	Alluvium Fynbos	31
7.2.3	Granite Fynbos.....	31
7.2.4	Sandstone Fynbos.....	32
7.2.5	Shale Fynbos	32
7.2.6	Cape Flats Dune Strandveld	32
7.2.7	Renosterveld	33
7.2.8	Southern Afrotemperate Forest	33
7.3	FRESH WATER FEATURES IN THE BIOREGION.....	34
7.3.1	Wetlands.....	34
7.3.2	Rivers	34
7.3.3	Groundwater.....	34
7.4	COASTAL ZONE FEATURES IN THE BIOREGION	37
7.4.1	The Coastline.....	37
7.4.2	Intertidal Habitats	37
7.4.3	Breeding Sites.....	37
7.4.4	Estuaries	38
7.4.5	Marine Protected Areas and Closed Areas.....	38
8	IMPORTANT ECOLOGICAL CORRIDORS AND FEATURES	40
9	ECOSYSTEM PROTECTION LEVEL WITHIN THE BIOREGION	41
10	MAJOR LAND USE AND RESOURCE USE PRESSURES IN THE BIOREGION	41
10.1	THREATS	41
10.2	AREAS OF POTENTIAL IMPACT	42
10.2.1	Procedure for dealing with areas of potential impact within the City of Cape Town	42
PART C 44		
11	CRITICAL BIODIVERSITY AREA MAPS	44
11.1	MAP 1: CITY OF CAPE TOWN BIOREGIONAL PLAN: CRITICAL BIODIVERSITY AREAS	45
11.2	MAP 2: CITY OF CAPE TOWN BIOREGIONAL PLAN: RIVERS AND WETLANDS	46
11.3	MAP 3: CITY OF CAPE TOWN BIOREGIONAL PLAN: COMPOSITE MAP	47
PART D 48		
GUIDELINES FOR LAND-USE PLANNING AND DECISION MAKING		48
12	PROTECTED AREAS (PAS)	48

12.1 NATIONAL PARKS, NATIONAL BOTANICAL GARDENS, PROVINCIAL NATURE RESERVES, LOCAL AUTHORITY NATURE RESERVES AND CONTRACTUAL NATURE RESERVES SIGNED IN PERPETUITY (PROTECTED AREA 1).	48
12.2 STATE-OWNED SITES WITH CONSERVATION MANAGEMENT	49
12.3 PRIVATE CONSERVATION AREAS	50
13 CRITICAL BIODIVERSITY AREAS (CBAS)	51
13.1 CBA 1(A-E)	51
13.2 CBA 2: RESTORABLE IRREPLACEABLE SITES	53
14 ECOLOGICAL SUPPORT AREAS	54
14.1 CRITICAL ECOLOGICAL SUPPORT AREAS.....	54
14.2 OTHER ECOLOGICAL SUPPORT AREAS.....	55
15 OTHER NATURAL VEGETATION.....	56
16 NO NATURAL HABITAT (TRANSFORMED).....	56
PART E 57	
ADDITIONAL MEASURES FOR EFFECTIVE MANAGEMENT OF BIODIVERSITY IN THE BIOREGION	
17 PROTECTED AREA EXPANSION	57
17.1 PUBLIC LAND	58
17.2 PRIVATE LAND	58
17.2.1 Stewardship Programme	58
18 BIODIVERSITY OFFSETS.....	59
19 PRIORITY AREAS FOR REHABILITATION AND RESTORATION	59
20 COASTAL PROTECTION ZONE AND COASTAL FLOOD RISK AREAS	60
21 INVASIVE SPECIES MANAGEMENT (ISM)	60
21.1 INVASIVE ALIEN PLANTS	60
21.2 INVASIVE ALIEN ANIMALS.....	61
22 PROTECTED AREA MANAGEMENT AND BIODIVERSITY MANAGEMENT PLANS	62
22.1 INTEGRATED RESERVE MANAGEMENT PLANS.....	62
22.1.1 Management Effectiveness Tracking Tool (METT) & Protected Area review	62
22.2 THREATENED ECOSYSTEM MANAGEMENT PLANS	62
22.3 THREATENED SPECIES MANAGEMENT PLANS.....	63
23 OPPORTUNITIES FOR SUSTAINABLE DEVELOPMENT AND LIVELIHOODS	63
23.1 TOURISM	64
23.2 EXPANDED PUBLIC WORKS PROGRAMMES.....	64

23.3 NATURAL RESOURCE HARVESTING	65
24 COMMUNICATION, EDUCATION AND PUBLIC AWARENESS (CEPA)	65
PART F 66	
MONITORING AND REVIEW	66
25 MONITORING	66
25.1 MONITORING INSTRUMENTS	66
25.2 MONITORING INDICATORS.....	67
26 REVISION OF THE BIOREGIONAL PLAN	67
PART G 68	
27 GIS FILES	68
28 REFERENCES	68
29 ANNEXURES:.....	71

List of Figures

Figure 1: Growth of urban areas, agriculture and the proclaimed conservation estate in the CCT, over the last century (Rebelo et al., 2011).....	9
Figure 2: The alignment of the Cape Town BioNet categories with the PSDF and MOSS categories...	16

List of Tables

Table 1: National vegetation types showing historic and remaining extent, biodiversity targets & ecosystem protection level.....	28
Table 2: Breakdown of Conserved Land in Cape Town	41
Table 3: Description of Categories in the CCT Biodiversity Network.....	43
Table 4: CCT Biodiversity Network primary data layers	68

List of Maps

Map 1: Coverage of the Bioregion	22
Map 2: Historical Distribution of Vegetation	27
Map 3: Vegetation Remnants	30
Map 4: Catchments, Rivers and Groundwater.....	37
Map 5: Marine Protected Areas and Estuaries	40

List of Abbreviations

BioNet	Biodiversity Network
CBA	Critical Biodiversity Area
CBD	Convention of Biological Diversity
CEPA	Communication, Education and Public Awareness
CESA	Critical Ecological Support Area
CFR	Cape Floristic Region
CFRAs	Coastal Flood Risk Areas
CCT	City of Cape Town Municipality
CPZ	Coastal Protection Zone
CREW	Custodians for Rare and Endangered Wildflowers
CTSDF	Cape Town Spatial Development Framework
CTZS	Cape Town Zoning Scheme
DEA&DP	Department of Environmental Affairs and Development Planning
DEAT	former Department of Environmental Affairs and Tourism
DSDP	District Spatial Development Plan
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EIP	Environmental Implementation Plan
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ERMD	City of Cape Town Environmental Resource Management Department
FCG	Freshwater Consulting Group
ISM	Invasive Species Management
IDP	Integrated Development Plan
IMEP	Integrated Metropolitan Environmental Policy
LBIP	City's Local Biodiversity Implementation Plan
LBSAP	Local Biodiversity Strategy and Action Plan
LUPO	Land-Use Planning Ordinance
MOSS	Metropolitan Open Space System
MSA	Municipal Systems Act
NBF	National Biodiversity Framework
NEMA	National Environmental Management Act
NSBA	National Spatial Biodiversity Assessment
PGWC	Provincial Government of the Western Cape
PSDF	Provincial Spatial Development Framework
SANBI	South African National Biodiversity Institute
TMNP	Table Mountain National Park

Part A

1. INTRODUCTION

1.1 Purpose and Objectives

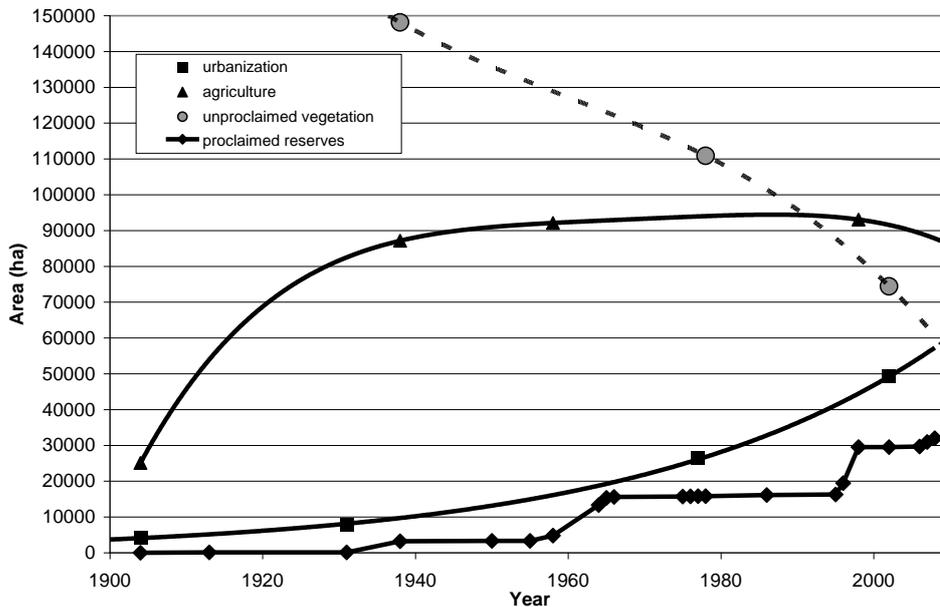
The Bioregional Plan for the City of Cape Town Municipality (CCT) includes the Biodiversity Network (BioNet: a map of biodiversity priorities) and accompanying land-use planning and decision-making guidelines, to inform land-use planning, environmental assessments and authorisations and natural resources management to a range of sectors whose policies and decisions impact on biodiversity. The National Environmental Management Act (NEMA; No 107 of 1998) requires that all organs of state take biodiversity considerations into account in their decision making.

The BioNet is a spatial plan that shows terrestrial and aquatic features that are critical for conserving biodiversity and maintaining ecosystem functioning. These are referred to as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs).

The boundary of the bioregion covered by this Bioregional Plan covers the entire extent of the City of Cape Town Municipality (CCT), in the Western Cape Province of South Africa. This is the first Bioregional Plan for the CCT and therefore does not replace any previous plans.

The Critical Biodiversity Areas (CBAs) are priority areas requiring managed conservation interventions to ensure their long term survival. At the current rate of habitat conversion occurring in the CCT up to 12 % of our remaining natural areas will be lost by the year 2020 as shown in Figure 1 (Rebelo et al., 2011).

Figure 1: Growth of urban areas, agriculture and protected areas (proclaimed conservation estate) in the CCT, and natural vegetation outside protected areas (unproclaimed) over the last century (Rebelo et al., 2011).



The BioNet is a fine-scale systematic biodiversity plan, and aims to be the most efficient and representative biodiversity network to meet our local and national biodiversity targets. The CCT bioregion is a very low option (i.e. very few remaining natural remnants to select from) biodiversity network and represents the bare minimum which is required to meet our biodiversity targets.

There is a high level of richness and uniqueness of the biodiversity currently represented in remaining natural areas of the CCT. This is indicated by the diversity of the vegetation types (19 National vegetation types of which six are endemic to the CCT), wetlands, rivers and intertidal ecosystems. This, together with the extent of the historical habitat transformation within a rapidly growing urban context, means that a high proportion of the remaining intact natural habitat remnants are required to meet biodiversity targets. These selected and prioritised natural remnants represent the last and only opportunity to conserve the minimum representative sample of natural habitat that can enable the conservation of the CCT's unique biodiversity and its persistence for future generations (Laros, 2007)

The Bioregional Plan will inform and guide planning and natural resource management by a wide range of sectors whose policies and decisions impact on biodiversity. It serves as the statutory reference for biodiversity priority areas in the CCT and is aligned with the National Spatial Biodiversity Assessment (Driver et al, 2005) and National Biodiversity Framework (NBF).

The Bioregional Plan aims to ensure that the National Environmental Management Act (NEMA) principles are applied within the CCT in an effective and equitable manner, in order to avoid loss and degradation of natural habitat in Critical Biodiversity Areas.

The BioNet indicates spatially, the location of Critical Biodiversity Areas (CBAs) and Critical Ecological Support Areas (CESAs) within the CCT. The CBAs and CESAs are required in order for the City to meet its required contribution to national biodiversity targets in terms of the NSBA and secure the CCT's biodiversity into the future. The Bioregional Plan makes provision for integrated management of wetlands, rivers, coastal areas and terrestrial vegetation remnants.

The Bioregional Plan will also help ensure that the CCT's ecosystems remain intact; continue to deliver high quality and sustained environmental goods and services to the municipality's residents; and to provide various opportunities to the local community such as recreation, tourism and environmental education and job creation. This is fundamental to the City's vision of sustainability. It will also guide environmental management for areas requiring restoration to a natural state. Securing CBAs and restoring degraded areas will increase (and secure long-term) the sustainability of these ecosystem goods and services, as well as mitigate the impact of climate change by improving biotic adaptation to climate change.

The Bioregional Plan will provide a framework for all City line departments and other organs of state to align their environmental functions and responsibilities. The spatially explicit BioNet CBA maps will allow for forward planning that avoids severe impacts on the remaining CBAs. This will create a more integrated, cost-effective approach to environmental management and conservation within the City and assist the City in realising its 2020 Vision for the environment (IMEP, 2003). It will also assist with the City's Environmental Agenda target of the securing 65% of the BioNet by 2019.

The intention of the BioNet is to reduce conflict between environmental and development planning by providing up-to-date information on biodiversity priorities that will guide forward planning and the future development in the CCT. This will also facilitate sustainable development and conservation of our natural assets.

1.2 Limitations and Constraints

The BioNet is based on a fine-scale systematic biodiversity plan. It is an accurate estimate of the remaining natural habitat² that is required to meet the City's biodiversity targets, which are aligned with, and derived from, the national biodiversity targets. The base layers used in the biodiversity planning process are the most up-to-date layers available at the time the systematic biodiversity plan is analysed; however, these layers are regularly updated and refined as new information becomes available.

Natural habitat in the BioNet is constantly being lost to formal and informal development, mining and to a lesser degree agriculture and invasive alien vegetation, with the result that securing the BioNet is an urgent priority in the City. This means that the BioNet is regularly under review and needs to inform responsible planning and development in the City.

In eight of the CCT's 19 recognised national vegetation types the minimum biodiversity targets are not achievable due to habitat loss. The importance of all remaining natural areas within the CCT bioregion should be considered within this context and it should always be borne in mind that the selected BioNet is the minimum estimated area required to meet national and local biodiversity targets. The remaining natural areas will need to make up for shortfalls (where still possible) in the event of loss of CBAs.

The information and maps provided in the Bioregional Plan do not replace the requirement for fine scale site assessment and detailed planning, referencing the "best available information" at the time of the assessment.

² Vegetation remnants are used as the surrogate for remaining natural habitat.

1.3 International, National and Local Obligations

1.3.1 International

South Africa is a signatory to a number of specific international agreements, such as the Biodiversity Convention and World Heritage Convention and it is incumbent on local authorities to give local effect to such conventions by adopting appropriate management strategies.

The 1992 Convention on Biological Diversity (CBD), is the core international agreement on biodiversity, and one of the main agreements of the 1992 Rio Summit and adopted by over 180 countries established the three fundamental objectives for biodiversity:

1. Conservation of biodiversity
2. Sustainable use of biological resources, and
3. Equitable sharing of biodiversity benefits.

The city contains one of the serial sites of the Cape Floristic Region Protected Areas World Heritage Site. Table Mountain National Park (TMNP), including Kirstenbosch National Botanical Garden, is one of the eight protected areas that make up the Cape Floristic Region World Heritage Site. TMNP is also one of only a few National Parks in the world that occurs within the boundaries of a single Municipality.

CCT is a member of Local Action for Biodiversity (LAB) which is a programme developed in conjunction with ICLEI (Local Governments for Sustainability) and partners. LAB focuses on exploring the best ways for local governments to engage in urban biodiversity conservation, enhancement, utilization and management. Cape Town signed the Durban Commitment in September 2008, and therefore acknowledges accountability and responsibility for the health and wellbeing of our communities through protecting, sustainably utilizing and managing biodiversity and recognizing its role as the foundation of our existence.

1.3.2 National

The National Environmental Management: Biodiversity Act (Act 10 of 2004) provides an overview for integrated biodiversity planning and monitoring of South Africa's biodiversity (chapter 3). This includes the drafting of Bioregional Plans and biodiversity management plans. The CCT Bioregional Plan³ has been adopted as CCT policy (Annexure 3).

The National Biodiversity Framework (NBF, 2008) provides a framework to co-ordinate and align the efforts of the many organisations and individuals involved in conserving and managing South Africa's biodiversity, in support of sustainable development. It focuses on the most urgent strategies and actions for securing CBAs. The heart of the NBF is a set of 33 Priority Actions, grouped into 5 Strategic Objectives, which provide an agreed set of priorities to guide the work of the biodiversity sector in South Africa for the next five years.

The NBF provides a framework for conservation and development. Too often in South Africa conservation and development are seen as opposing or irreconcilable goals. As our economy grows, we need to ensure that the way we achieve this growth allows for the continued functioning of ecosystems and the persistence of the natural resource base. This is possible, if care is taken over the location of development, the type of development, and the consumption of natural resources in the development process. **Sustainable development** depends on where and how development takes place.

The challenge we face in addressing these pressures on biodiversity is not to *either* conserve or develop, but rather *how to conserve and develop*. The issue is not whether development takes place but rather where and how it takes place. The biodiversity sector is developing increasingly effective tools to support and streamline environmental decision-making and ensure that development is appropriate. Key among these are bioregional plans in terms of the Biodiversity Act, which identify CBAs, including ecological corridors and important catchments, and give land-use planning and decision-making guidelines for these CBAs.

The CCT is a signatory of CAPE (Cape Action for People and the Environment) which is a bioregional programme supported by the Global Environmental Facility; the goal of which is:

"By the year 2020, the natural environment of the Cape Floristic Region will be effectively conserved and restored wherever appropriate, and will deliver significant benefits to the people of the region in a way that is embraced by local communities, endorsed by government and recognized internationally."

1.3.3 Local

The CCT Bioregional Plan is the primary environmental informant and source of environmental information, for incorporating biodiversity considerations into land-use planning and decision making, in order to avoid loss and degradation of remaining natural habitat in CBAs.

The City's environmental responsibility is mandated in terms of the legislation listed to protect the environment. In July 2015 the CCT Bioregional Plan was adopted as Council Policy (Annexure 3).

The 2011 BioNet analysis specifically incorporated biodiversity climate change adaptation features and measures (Pence 2011; refer Annexure 2).

In response to climate change, the City has adopted the Cape Town Energy and Climate Change Strategy. This strategy aims to reduce the impact of the city's emissions and resource use in contributing to accelerated climate change. The value of healthy ecosystems' delivery of goods and services (e.g. clean water) is recognised as being of critical importance in ensuring the long term survival of most plant and animals species (ourselves included) in response to rapid climatic changes.

1.4 Legislation

1.4.1 Legal Framework of the Bioregional Plan

The CCT Bioregional Plan has been adopted as City Policy (July 2015, Annexure 3). All City line departments whose functions impact on biodiversity must therefore align their activities with the Bioregional Plan.

The legislation that governs environmental management and implementation in South Africa is entrenched in the following pieces of legislation:

1.4.1.1 The Constitution of South Africa (Act 108 of 1996)

Section 24 of the Constitution states that all South Africans have the right to a healthy environment, which is protected for present and future generations from ecological degradation. The Constitution presents an overarching obligation to sustainable environmental management. Municipal planning is identified as a local government function in Part B of Schedule 4 of the Constitution. Local authorities should therefore provide services in a sustainable manner, provide a safe and healthy environment for all communities, promote social and economic development and ensure transparent governance.

1.4.1.2 National Environmental Management Act (Act 107 of 1998)

The National Environmental Management Act (NEMA) states that local government should develop strategies to protect natural and cultural resources (which constitute and sustain the metropolitan area) but at the same time proactively address poverty.

1.4.1.3 National Environmental Management: Biodiversity Act (Act 10 of 2004)

The Biodiversity Act seeks (among other things) to provide for the management and conservation of biological diversity within South Africa. To do this the Biodiversity Act introduces several new legislated planning tools to assist with the management and conservation of South Africa's biological diversity.

Section 48(2) of the Biodiversity Act provides that an organ of state that must prepare an Environmental Implementation Plan or Environmental Management Plan in terms of Chapter 3 of NEMA, and a municipality that must adopt an Integrated Development Plan in terms of the Municipal Systems Act must:

- a) Align its plan with (...) any applicable bioregional plan;
- b) Incorporate into that plan those provisions of (...) a bioregional plan that specifically apply to it; and
- c) Demonstrate in its plan how (...) any applicable bioregional plan may be implemented by that organ of state or municipality.

As CCT policy, the Cape Town Bioregional Plan will inform spatial planning processes and the Integrated Development Plan.

1.4.1.4 Municipal Systems Act (Act 32 of 2000)

The Municipal Systems Act (MSA) has certain implications and obligations for environmental management by local government, which must be accommodated and reflected in the institutional framework and policies of the local government authority.

1.4.1.5 Municipal Planning By-Law

The Municipal Planning By-Law refers to policies, such as the Cape Town Bioregional Plan, which should guide decision making in respect of applications made in terms of this By-Law.

1.4.1.6 Other Acts that relate to local authorities and biodiversity

(This list is not exhaustive)

- Integrated Coastal Management Act (No. 24 of 2008)
- Atmospheric Pollution Prevention Act (Act 45 of 1965)
- National Water Act (Act of 1998)
- Conservation of Agricultural Resources Act (Act 43 of 1983)
- Sea Birds and Seals Protection Act (Act 46 of 1973)
- Water Services Act (Act 108 of 1997)
- National Veld and Forest Fire Act (Act 101 of 1998)
- National Heritage Resources Act (Act 49 of 1999)
- World Heritage Resources Act (Act 49 of 1999)
- Nature Conservation Ordinance (Act 19 of 1974)
- Marine Living Resources Act (Act 18 of 1998)

2 Policy and Strategies

2.1 Provincial Spatial Development Framework (PSDF)

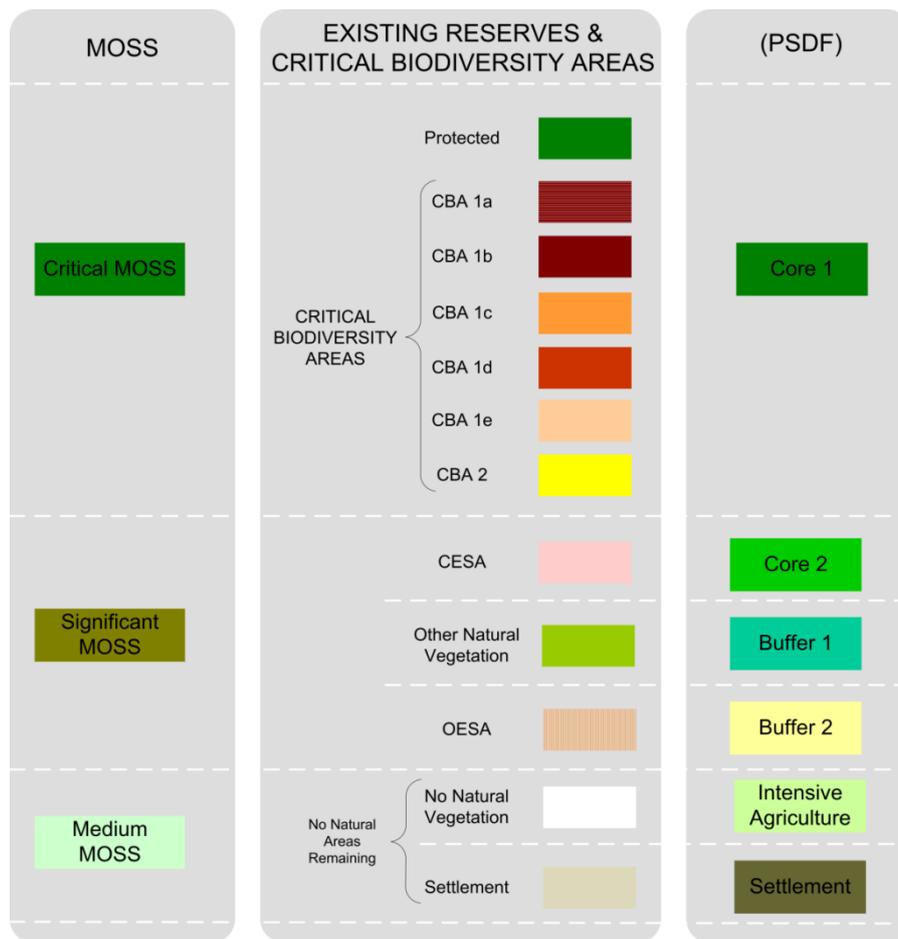
The PSDF is the spatial expression of the Provincial Growth and Development Strategy. The Broad Provincial Spatial Planning Categories as set out in the PSDF are required to be refined and delineated in greater detail at the district and local SDF level.

The PSDF requires that ground-truthing and site assessments are done to inform appropriate development decisions at the local level. The PSDF also supports bioregional planning as the methodology on which spatial planning should be based.

This Bioregional Plan follows the guidelines as set in the PSDF as it relates to Objective 8: Protect biodiversity and agricultural resources. **Core 1 areas as identified in the PSDF include Critically Endangered remnants of biodiversity.**

These core areas represent a national and/or provincial/regional resource in which the natural environment is able to provide a range of ecosystem services essential for sustainable life on earth and as such should be retained in their natural state.

Figure 2: The alignment of the Cape Town BioNet categories with the PSDF and MOSS categories.



2.2 Integrated Development Plan (IDP)

In terms of the Municipal Systems Act (Act 32 of 2000) municipalities are required to lead and manage a plan for development or IDP. This IDP includes the allocation of resources, not only to concentrate on the provision of fundamental municipal services, but in addition to the eradication of poverty, boost local economic development, create employment and promote the process of reconstruction and development. An integrated development plan therefore should be seen as a tool that would be used to eradicate the legacy of the past through restructuring the city, promoting social equality, creating wealth, fighting poverty and enabling inter and intra governmental co-operation.

2.3 Cape Town Spatial Development Framework

The overall intention of the Cape Town Spatial Development Framework (CTSDF) is to guide and manage urban growth, and to balance competing land-use demands, by putting in place a long-term, logical development path that will shape the spatial form and structure of Cape Town. The CTSDF is underpinned by well-defined spatial development principles (CTSDF, 2012).

The CTSDF was approved as a component plan of the IDP in terms of the Municipal Systems Act (No 32 of 2000) (MSA). Council approved the CTSDF in terms of the MSA on the 8th June 2012. The BioNet (CBA Map) was integrated into the CTSDF in its entirety as the primary critical biodiversity areas informant.

The CTSDF includes policy directly related to the protection and enhancement of biodiversity as follows:

Policy Statement 25:

'Increase efforts to protect and enhance biodiversity networks at all levels of government'

Policy Guideline 25.1:

'Carefully assess the impact of proposed development on critical biodiversity areas and endangered species and make decisions related to the city's Biodiversity Network based on the development guidelines in the relevant DSDPs, other relevant policies and the most up to date mapping of the city's Biodiversity Network'.

The CTSDF also contains urban and coastal edge lines which will inter alia support the preservation of biodiversity resources in the city.

2.4 Environmental Management Frameworks (EMFs) & District Spatial Development Plans (DSDPs)

The Bioregional Plan objectives and guidelines find expression as the key biodiversity informant of the CTSDF and the integrated district SDPs/EMFs – the latter legislated in terms of the 2010 EMF regulations. The District SDPs/EMFs inform and respond to the CTSDF and future City plans and programmes and are the tools used on a daily basis to guide statutory land use decision-making.

EMFs are intended to inform environmental assessment and management. The intention is that in the future, EMFs will help to streamline the environmental assessment process by geographically determining sensitive areas where certain activities require Environmental Authorisation (EA) and other less sensitive areas where authorisation is not required. EMFs are legally enforceable through section 5(2) of the EMF regulations which provides that the EMF must be taken into account in the consideration of applications for environmental authorisation in or affecting the geographical area to which the framework applies.

The City has integrated the EMFs (for all eight districts comprising the CCT) into their DSDPs in order to ensure the EMFs effectively inform, and respond to the future plans and programmes for the City. The EMFs therefore form an integrated component of the District SDP report.

The EMFs have been approved by DEA&DP with the concurrence of the national Minister of Environmental Affairs in terms of section 5 of GNR 547 (the 2010 EMF regulations). The SDP / EMFs were approved by Council as spatial policy in terms of s 4(10) of LUPO. The CTSDF is the spatial component of the City's IDP.

The Department of Environmental Affairs' (DEA) Draft EMF Guideline (Guideline 6, 2006) states that ... "EMFs should not conflict or be in competition with land use plans for an area but should rather be structured to also provide the necessary environmental inputs into such plans (including SDFs and IDPs)" (DEAT, 2006). It is recognised that EMFs assist the planning process to identify the opportunities and constraints and to provide guidance regarding the nature and scale of development which should occur in an area whilst retaining a sustainability focus.

2.5 Integrated Metropolitan Environmental Policy (IMEP)

IMEP: Year 2020 Vision:

There will be a high expectation from the people of the authorities in respect of environmental management, monitoring, auditing, as well as accountability. Environmental issues and impact studies will be dealt with in a structured and efficient way, and impact studies will have ensured a better aesthetic and ecologically balanced City of Cape Town.

- There will be a positive relationship between local government and civil society, collective responsibility for the environment, and an ethic of partnership building.
- The CCT population will be environmentally educated, aware and conscious. Equitable environmental education will have ensured that people care for and respect their environment.
- The **environmental quality will have improved** in terms of air, water, land and sea.
- The cultural heritage and the built environment will be enhanced, restored and protected, while diverse religions and cultures will enrich the social fabric of the CCT.
- Environmental poverty will no longer exist and all communities will live in an environment that is not detrimental to their health or well-being.
- Waste management will be efficient, and recycling efforts will be supported and sustained by the population.
- Wastewater treatment facilities will be efficient and comply with the legislative requirements.
- Public transport will be safe, clean, efficient and non-polluting. Commuters will be less reliant on private transport and there will be significant reductions in traffic congestion and air pollution. Public transport will provide all inhabitants of the CCT with safe, affordable and convenient access to urban opportunities.
- There will be adequate and well-distributed open spaces for recreation and sustaining biodiversity.
- The CCT communities will have adequate shelter and basic services and will have access to education, employment and recreation. The livelihoods of the citizens will be sustainable and in harmony with the natural environment.
- Water and energy resources and utilisation will be optimally and efficiently managed.

2.6 Other Relevant City Policies and Strategies

- a) City of Cape Town Environmental Agenda 2009-2014
- b) Biodiversity Strategy (2003)
- c) Local Biodiversity Strategy and Action Plan
- d) Framework for a Strategy and Action Plan for the Management of Invasive Alien Species in the City of Cape Town
- e) Coastal Zone Management Strategy
- f) Cultural Heritage Strategy
- g) Energy and Climate Change Strategy
- h) Environmental Education and Training Strategy
- i) Management of Urban Stormwater Impacts Policy (2009)
- j) City's Floodplain and River Corridor Management Policy (2009).

More information on the City's environmental policies and strategies can be found at <http://www.capetown.gov.za/environment>

3 Users

3.1 Mandated users

- The City of Cape Town, which must align the CBAs and CESAs, and the contents of the Bioregional Plan in general, into its IDP and by implication into the CTSDP, DSDPs, EMFs and environmental implementation plans (EIPs) upon review of the current plans that are in place. The review periods will be coordinated to streamline this process and ensure a seamless integration.

3.2 Recommended users

Government departments and agencies whose decisions and actions impact on biodiversity and the natural environment, but whose core business and expertise is not biodiversity conservation. These include:

- Any organ of state that must prepare an EIP or EMP in terms of Chapter 3 of NEMA (this is also required in section 48(2));
- All decision-makers who are required by section 2(1)(c) of NEMA to apply the NEMA section 2 principles in their decision-making. Such decision-makers are required to consider amongst other things sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar ecosystems which require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure. CBAs identified in a bioregional plan should be considered as such areas, and should therefore be considered by decision-makers in the course of the decision making process. This would mean that bioregional plans should be considered by, amongst others:
- National Department of Agriculture Forestry and Fisheries, which must take the bioregion, Bioregional Plan and identified CBAs into account in their authorisations (e.g. for ploughing virgin land, for subdivision of agricultural land and in the programmes which they develop);
- Department of Water Affairs, which must take the bioregion, bioregional plan and identified CBAs into account in their decision-making, for example in granting water licences;
- Catchment Management Agencies, which must integrate the bioregion, bioregional plan and identified CBAs in their decision-making about water allocations;
- Department of Mineral Resources (DMR), which must take the bioregion, Bioregional Plan and identified CBAs into account in their authorisations for prospecting and mining.
- Neighbouring local and district municipalities should take the Cape Town Bioregional Plan into account if and when they develop bioregional plans.
- National and Provincial environment departments, which should take the provisions of Bioregional Plans into account in the development of provincial supplements to the NEMA

EIA regulations (such as maps of sensitive areas) in terms of section 24A and in developing EMFs and National and Provincial Guidelines in terms of the Chapter 8 EIA regulations;

- Provincial conservation authorities, which should use Bioregional Plans to guide their inputs into land-use planning, land-use decision-making and natural resource management, if they have these functions;
- Provincial departments responsible for spatial planning, which should take Bioregional Plans into account in the development of provincial spatial plans or frameworks, and in their support to or approval of municipal spatial plans such as SDFs;
- Department of Land Affairs, which should take Bioregional Plans into account in planning and implementing land reform programmes, and in the development of policy, legislation or guidelines for land-use planning and management;
- The Provincial Department of Local Government and Housing, which should avoid CBAs in identifying suitable sites for new housing developments;
- The Department of Public Works, which should take Bioregional Plans into account in identifying appropriate locations and routes for roads and other infrastructure; and
- Working for Water, Working for Wetlands, LandCare, CoastCare, and other programmes that deal with maintaining and restoring natural resources, which should take Bioregional Plans into account in planning and scheduling their activities, prioritising CBAs where possible;
- Environmental and planning consultants undertaking Strategic Environmental Assessments, Environmental Impact Assessments, or the updating of the City's IDP, SDF or EMFs.
- Conservation NGOs (i.e. organisations whose core business is biodiversity conservation). These organisations should use Bioregional Plans to guide their comments on planning tools such as SDFs and on development applications.
- Private landowners – individuals and companies – who want more information about the biodiversity value of their landholdings and who wish to make a contribution to conserving the nation's natural heritage by ensuring that the use of their land is compatible with biodiversity conservation and/or by securing priority sites in stewardship contracts.

4 Boundary of the Bioregion

This CCT bioregion covers the municipal boundaries of the Cape Town Metropolitan Municipality and is approximately 2460km² in extent (**see Map 1**). There are three neighbouring municipalities namely the West Coast District Municipality to the north, the Winelands District Municipality to the east and the Overberg District Municipality to the southeast.

The bioregion also includes approximately 300km of coastline, with the warm Indian Ocean on the east coast and the cold Atlantic Ocean on the west coast. Robben Island, a world heritage site, Seal Island in False Bay and several rocky outcrops along the near shore coastline also fall within the boundary of the bioregion.

The bioregion covers the adjacent marine environment. The interdependencies of these marine and terrestrial ecosystems should not be overlooked in the context of broader spatial and environmental planning and the potential impacts (both positive and negative) on the natural environment. Map 5 is provided as context in this regard.

The Cape Town bioregion also overlaps with sections of three Biosphere Reserves, namely the Cape West Coast Biosphere Reserve, the Cape Winelands Biosphere Reserve and the Kogelberg Biosphere Reserve.



<p>City of Cape Town Bioregional Plan</p>	<p>Map 1: Coverage of the City of Cape Town Bioregion</p>			
<p>Map produced by City of Cape Town Environmental Compliance Department ECONOMIC, ENVIRONMENT & SPATIAL PLANNING email: Enviro.Gis@capetown.gov.za Date: January 2012</p>	<p>Map Legend</p> <p>Neighbour Municipalities</p> <ul style="list-style-type: none"> Cape Winelands Municipality Overberg Municipality West Coast Municipality 	<ul style="list-style-type: none"> City of Cape Town Bioregion Provincial Nature Reserves Protected Areas Conservation Areas 	<ul style="list-style-type: none"> Critical Biodiversity Areas Other Natural Vegetation Urban Development 	<div style="text-align: center;">  <p>0 2 4 8 Kilometers</p> </div> <div style="text-align: right;">  <p>CITY OF CAPE TOWN ISIXEKO SASEKAPA STAD KAAPSTAD</p> </div>

Map 1: Boundary of the Bioregion

5 Developing the City of Cape Town Systematic Biodiversity Plan

The identification and prioritization of the City' Biodiversity Network has been a collaborative process between the Environmental Resource Management Department (ERMD) and key conservation partners, namely the South African National Biodiversity Institute (SANBI), Table Mountain National Park (TMNP), CapeNature Conservation, Provincial Government departments and several environmental specialists.

5.1 Terrestrial Biodiversity Network Map

The City of Cape Town committed to implementing a Biodiversity Strategy in 2003. This Strategy required that a Biodiversity Network be established to identify Critical Biodiversity Areas (CBAs) and ensure their conservation and /or rehabilitation in the long-term. Selection of sites was based on systematic biodiversity planning principles and methods.

The CBAs represent the minimum area of terrestrial and freshwater habitat that is required to meet the City's biodiversity targets. A systematic biodiversity planning process was initiated in 2002 that established biodiversity targets and identified the priority areas of the CCT. The analysis included a *priori* selection of existing protected areas and Core Flora Sites (Maze & Rebelo 1999). The Core Flora Sites are not all formally protected, but are required to conserve Cape Town's unique lowland flora.

In May 2006, MLA-Sustainability Matters and GISCOE (Pty) Ltd. were appointed to assist the City in a revised desk-top conservation planning analysis to identify and re-prioritise an updated Biodiversity Network on the basis of:

- A revised vegetation map for the City, compiled in partnership with the South African National Biodiversity Institute (SANBI) and developed by Rebelo and Low (2007), which has aligned the City Vegetation map (Low 2000) and the National Vegetation Map (Mucina, Rutherford and Powrie 2005);
- A revised spatial layer representing the remaining Natural Habitat Remnants (areas of remaining natural habitat) in the City, which was prepared using 2005 aerial imagery in partnership with CapeNature and SANBI.

In 2008, GeoCline Consulting cc was appointed to re-run the analysis using updated information on the CCT's natural vegetation remnant layer. The re-analysis followed a survey of remnant habitat condition in the field (ground-truthing) and the capturing of this information in the updated remnant layer. Other changes to the re-analysis included the following:

1. Inclusion of species location data from the CREW (Custodians for Rare and Endangered Wildflowers) project database
2. Use of national biodiversity targets for vegetation types as derived for the National Spatial Biodiversity Assessment (Rouget et al. 2004).
3. Subdivision of large (>100ha) planning units to increase the efficiency of the selection in terms of hectares required towards biodiversity targets.
4. Use of C-Plan (Pressey 2008) and MARXAN (Possingham 2000)/CLUZ during the assessment process

5. The inclusion of a threat surface, with threat score used as a MinSet rule in C-Plan and a cost surface during the MARXAN analysis.
6. Inclusion of expert mapped corridors in the assessment process.

In August 2009, the ERMD team re-ran the systematic biodiversity planning analysis, using an updated remnant layer and updated SASFlora⁴ data from Coastec⁵. The BioNet analysis report (Holmes & Stipinovich 2009) can be accessed at

http://www.capetown.gov.za/en/EnvironmentalResourceManagement/publications/Documents/BioNet_Analysis-2009_Methods+Results_report_2009-12.pdf

In November 2011, the team updated the systematic biodiversity plan again. This update included further refinements to the vegetation remnants layer; small modifications to the methodology to include specific climate change adaptation strategies and an updated threats layer (refer Annexure 2). The BioNet 2011 analysis report (Holmes, Stipinovich & Purves 2012) can be accessed at <http://www.capetown.gov.za/EnvironmentalResourceManagement/Pages/Bioregional-Plan.aspx>

5.2 The Rivers and Wetlands Map

In addition to its rich terrestrial biodiversity, Cape Town supports a variety of rivers and wetlands. Historically, a large proportion of lowland Cape Town was dotted with seasonal and perennial wetlands interconnected via the groundwater system. As a result of urbanisation, most of the wetlands and rivers on the Cape Flats have been modified, with wetlands drained and the rivers canalized or channelized. An example is the Kuils River, which used to meander across the Cape Flats landscape on its way to the sea and many adjacent oxbow lakes were integral to the catchment.

As a result of urban development, the Kuils River was straightened and canalised over the years and the links between most of these unusual wetlands and the main stream have been lost. The oxbows and other riparian wetlands consequently dried up, were filled in and developed. The wetlands were mainly seasonal but the few remaining have been made permanent, resulting in loss of seasonal habitat for waders and other wetland fauna. Other examples include the Lotus River (flowing into Zeekoevlei) which was historically a series of wetlands, but was canalised to facilitate development. Additionally, wetlands were historically saturated during the winter rainfall season only, but now receive urban stormwater and are constricted via weirs and canals and thus many have become permanently flooded systems (e.g. Zeekoevlei and Princessvlei), giving them artificial characteristics similar to permanent lakes. Other wetlands were drained and filled in. Some examples of seasonal marsh wetlands still exist, for example *Isoetes vlei* in Edith Stephens Nature Reserve, but these are now rare (Day 1987).

The development of a comprehensive wetlands map for the CCT was recognised in 2006 as an urgent requirement both for planning purposes as well as management of the City's wetland resources. In particular, a comprehensive wetlands layer, including information on wetland type, was urgently needed for prioritization of areas to be included in the CCT BioNet.

The Freshwater Consulting Group (FCG) (Phases 1, 3 and 4) and Jeffares and Green (Pty) Ltd (Phase 2) completed a desktop spatial wetlands layer for the City of Cape Town, referred to as the City Wetlands Map, in June 2008. The City Wetlands Map was produced from a largely desktop

⁴ SaSflora = Site and Species flora database (Coastec)

⁵ Coastecs' SAS Flora Database, comprising data for 365 sites with plant species data and linked localities & coordinates. This data is © Coastec and is used with permission.

assessment of aerial photography, with the limited inclusion of information from field assessments completed by FCG and other consultants for separate studies. Where field verification was undertaken, the confidence with which the wetlands were mapped was high, while a low confidence was associated with the desktop mapping of most of the CCT wetlands.

In order to increase the confidence with which the wetlands have been mapped, in terms of location, and classification, a sub-set of the wetlands included on the map were ground-truthed between December 2008 and June 2009. Since then, wetlands in City conservation areas have been ground-truthed and those outside of reserves are being verified gradually, with the wetlands map updated accordingly. In order to incorporate the City wetlands map into the terrestrial BioNet, through the incorporation of a representative set of wetland types, it was necessary to prioritise the full complement of the CCT natural and semi-natural wetlands for the conservation of biodiversity. The Freshwater Consulting Group (FCG) was appointed in February 2009 to complete the Prioritization of the CCT Wetlands Report (Snaddon et al, 2009). The top priority wetlands nested within natural vegetation were assigned CBA status.

The rivers layer for the City was used in the rivers and wetlands map. The determination of river buffers is done according to the City's Floodplain and River Corridor Management Policy (2009).

6 Integration of the Biodiversity Network within the CCT planning tools

The Biodiversity Network is integrated into the Cape Town Spatial Development Framework (CTSDF) in its entirety as the primary biodiversity informant for the City. The CTSDF has been approved by Council as a sectoral component of the Integrated Development Plan (IDP). Both these municipal planning tools embody the principles of sustainable development. The Bioregional Plan objectives and guidelines find expression through the CTSDF and the District SDPs and EMFs as the key biodiversity informant of the eight district Spatial Development Plans / Environmental Management Frameworks (EMFs). The District SDPs/EMFs inform and respond to the CTSDF and future City plans and programmes and are the tools used on a daily basis to guide statutory land use decision-making

The process followed within the City was to integrate the Bioregional Plan into the CTSDF and the integrated district SDPs/EMFs to facilitate the implementation of the plan. This also allowed for one public participation process to be run that covered a suite of planning tools. It also facilitated the adoption of the plans by Council, as these would be approved by Council once the public participation (PP) process was completed and all the comments had been integrated into the plans.

This also facilitated the alignment of the PSDF with the CTSDF, the DSDPs/EMFs and the Bioregional Plan. It also was important to align the BioNet categories with the Metropolitan Open Space System (MOSS) categories to ensure consistency throughout the various plans. Figure 2 shows the alignment of the Cape Town Bioregional Plan with the PSDF and MOSS. Integrating the Bioregional Plan into the CTSDF also ensured that there was closer involvement of all relevant City departments in developing the plan, especially Spatial Planning and Urban Design, who are responsible for forward planning in the City. The resolution of areas of potential impact would also be facilitated by having an integrated CTSDF and Bioregional Plan.

Part B:

7 Biodiversity Profile

7.1 Overview of Biodiversity Significance

Cape Town lies in the heart of the Cape Floristic Region (CFR), which is the smallest and richest for its size of only six floral kingdoms in the world and a global biodiversity hotspot. A biodiversity hotspot is a species-rich area exhibiting high levels of endemism (70% in the case of the CFR) and that is under threat of extinction (Myers et al. 2000). The CFR is one of the global conservation priorities.

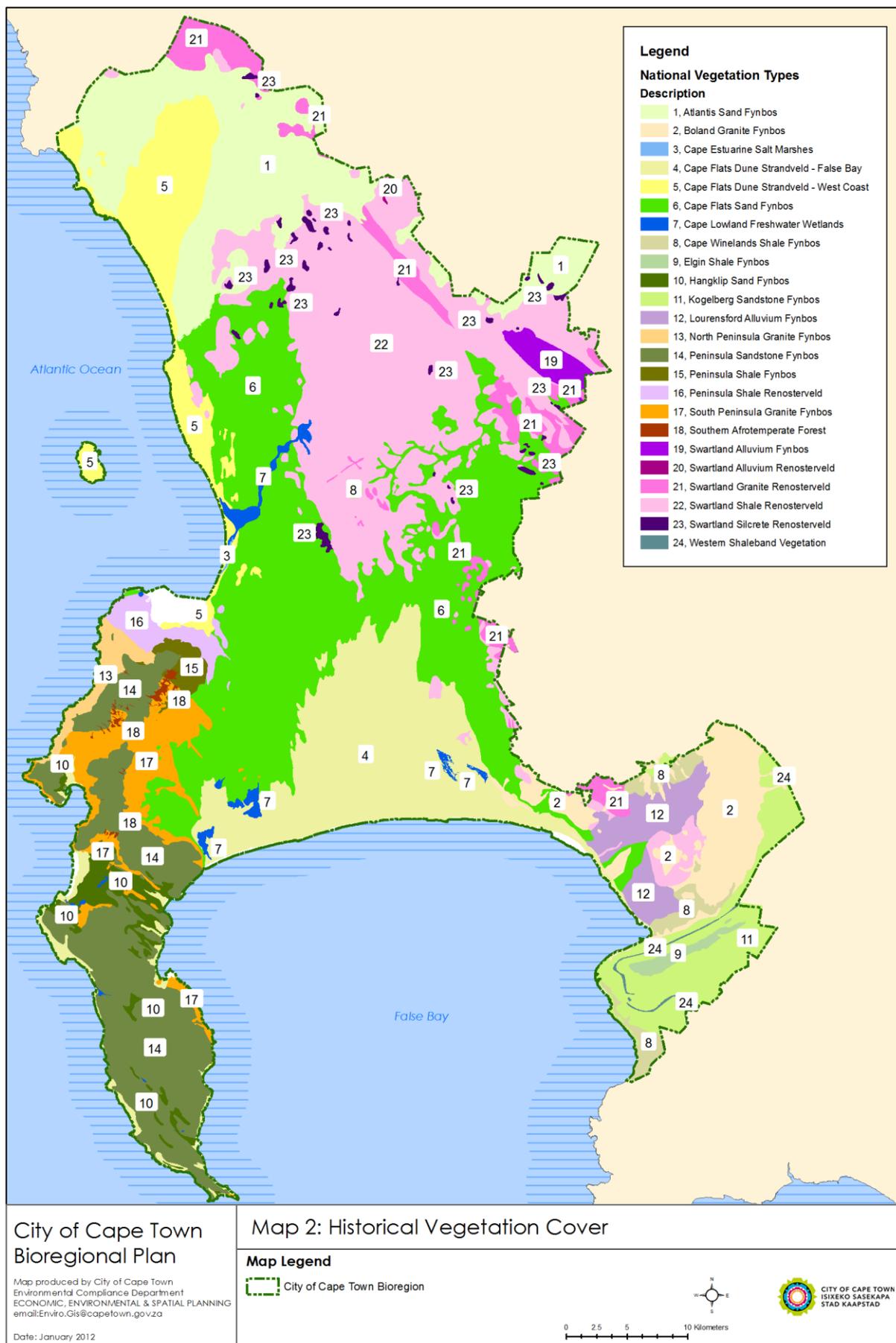
The Cape Town municipal area (CCT) is only 2,460km² or <3% of the CFR, yet encompasses one third (>3300) of the CFR's plant species and 52% of South Africa's Critically Endangered vegetation types. Six national vegetation types are endemic to the city and may only be conserved here, while >190 plant species are locally endemic and >300 plant species are Red Listed as threatened, with 13 already extinct or extinct in the wild (Holmes et al. 2008, Rebelo et al. 2011). The exceptionally high richness and uniqueness of Cape Town's biodiversity relates to the four local centres of plant endemism that occur here (Holmes et al. 2012). Amongst the vertebrate fauna 69 species are Red Listed as threatened and two amphibian species are locally endemic.

Cape Town is also rich in fresh water and marine ecosystems. Historically the Cape Flats comprised an inter-connected system of streams, vleis, seasonal wetlands and vernal pools. However, today a large proportion of the lowland wetland system has been modified or lost (Brown & Magoba 2009).

Intact natural ecosystems not only support biodiversity, but deliver many ecosystem services and thus are essential components of sustainable development. Cape Town's natural environment is worth an estimated R4 billion per annum (de Wit et al. 2009). The natural environment underpins tourism, one of the most important industries in promoting employment opportunities, and plays an important role in mitigating global climate change and building resilience in climate change adaptation strategies (ERMD 2011 Biodiversity & Climate Change report).

7.2 Terrestrial Ecosystems in the Bioregion

The CCT encompasses 18 major national terrestrial vegetation types, one wetland vegetation type and several other, mostly azonal, smaller types. The City recognizes 56 vegetation subtypes based mainly on soil factors. Map 2 shows the historical national vegetation type distribution and Map 3 shows the remaining vegetation remnants. Table 1 lists the national vegetation types, their respective areas remaining, areas required for national biodiversity targets and their latest national ecosystem threat status. Nationally, eleven of the major vegetation types are Critically Endangered, three are Endangered, three are Vulnerable, with only two considered Least Concern: Southern Afrotropical Forest and Western Coastal Shaleband Vegetation (Table 2). For detailed descriptions of vegetation types, refer to Rebelo et al. (2006).



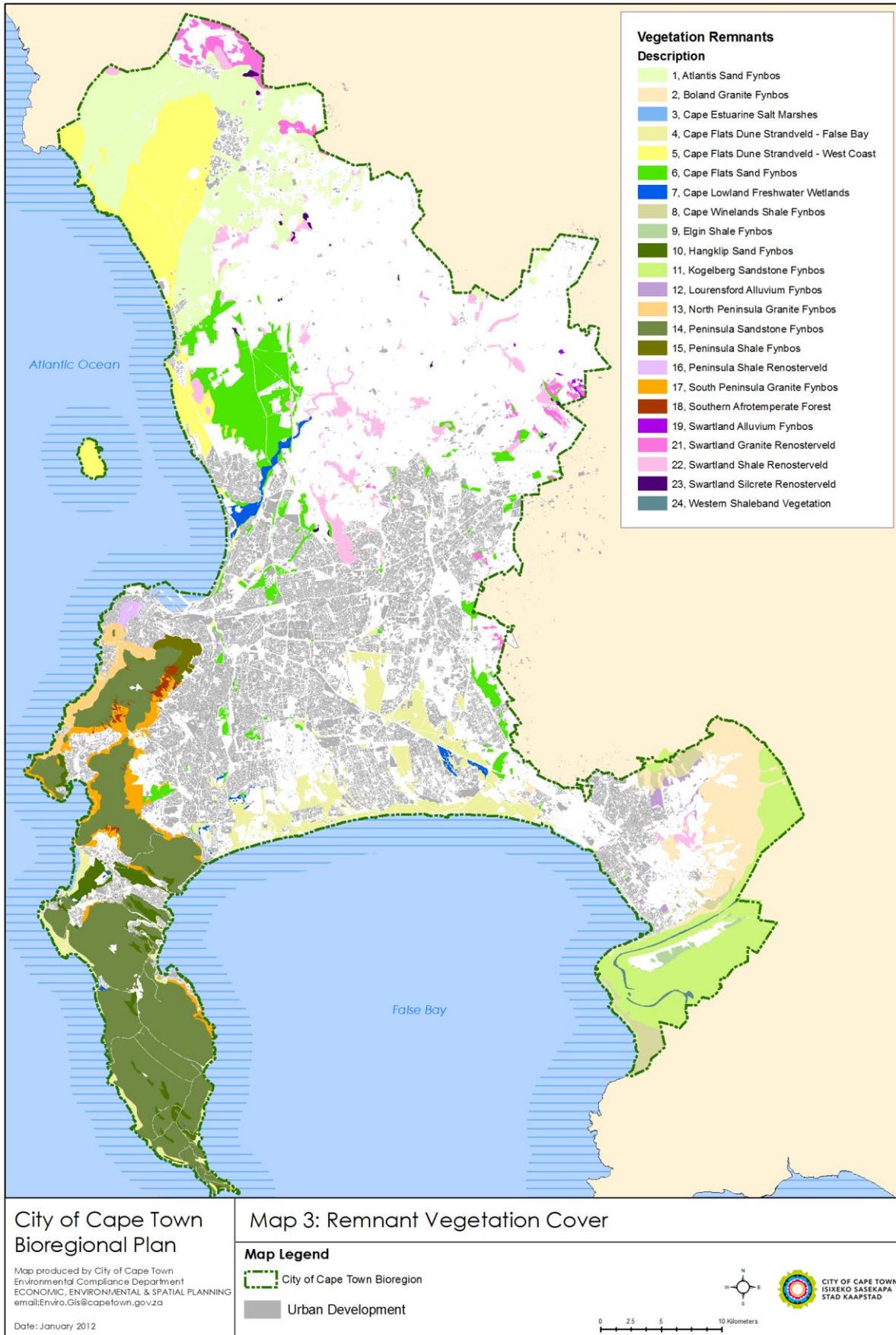
Map 2: Historical Distribution of Vegetation

Table 1: National vegetation types showing historic and remaining extent, biodiversity targets & ecosystem protection levels
These statistics are for the vegetation extent within City of Cape Town only and exclude portions of the vegetation type occurring outside city boundaries. However six national vegetation types – marked with “*” are endemic to the CCT; subt. = regionally important subtype.

Vegetation type	Historic extent (ha)	Current extent (ha)	% Remaining from Historic Extent	National Bio-diversity Target %	Bio-diversity Target Area (ha)	Selected in BioNet (P.A.s/Conservation Areas/CBA 1s & 2s) (ha)	% Bio-diversity Target Selected in BioNet	Bio-diversity Target met in selected BioNet	Extent In Proclaimed P.A.s - In Perpetuity/F or Limited Period (ha)	% Bio-diversity Target met in proclaimed P.A.s	National Ecosystem Threat Status	SANBI National Ecosystem Protection Level (NSBA 2004)
Atlantis Sand Fynbos	25177.30	15475.05	61.46	30	7553.19	10585.25	140.14	YES	236.10	3.13	CR	Poorly protected
Boland Granite Fynbos	9379.03	5649.03	60.23	30	2813.71	4796.16	170.46	YES	296.19	10.53	VU	Poorly Protected
Cape Estuarine Salt Marshes	40.55	30.73	75.79	24	9.73	30.57	314.18	YES	30.57	314.18	VU	Well Protected
Cape Flats Dune Strandveld - False Bay subt. *	27823.37	7762.95	27.90	24	6677.61	7156.56	107.17	YES	2736.77	40.98	EN	Poorly Protected
Cape Flats Dune Strandveld - West Coast subt. *	12734.27	10447.66	82.04	24	3056.23	6248.58	204.45	YES	2669.23	87.34	EN	Poorly Protected
Cape Flats Sand Fynbos *	54334.76	7888.65	14.52	30	16300.43	7888.65	48.40	NO	937.61	5.75	CR	Hardly Protected
Cape Lowland Freshwater Wetlands	1655.59	850.97	51.40	24	397.34	818.87	206.09	YES	492.19	123.87	VU	Well Protected
Cape Winelands Shale Fynbos	4005.90	2278.89	56.89	30	1201.77	2074.43	172.61	YES	1379.06	114.75	VU	Poorly Protected
Elgin Shale Fynbos	841.18	327.39	38.92	30	252.35	325.92	129.15	YES	325.46	128.97	CR	Poorly Protected
Hangklip Sand Fynbos	3295.04	1839.64	55.83	30	988.51	1598.34	161.69	YES	1372.65	138.86	VU	Moderately Protected
Kogelberg Sandstone Fynbos	9435.21	9196.62	97.47	30	2830.56	8934.77	315.65	YES	8220.39	290.42	CR	Well Protected
Lourensford Alluvium Fynbos *	3585.27	303.19	8.46	30	1075.58	303.19	28.19	NO	8.85	0.82	CR	Poorly Protected
Peninsula Granite Fynbos – North subt. *	2070.10	1438.91	69.51	30	621.03	1351.04	217.55	YES	982.16	158.15	CR	Well Protected
Peninsula Granite Fynbos – South subt. *	7157.69	2421.94	33.84	30	2147.31	2243.62	104.49	YES	1727.46	80.45	CR	Well Protected
Peninsula Sandstone Fynbos *	21935.69	20975.66	95.62	30	6580.71	20399.12	309.98	YES	17516.66	266.18	EN	Well Protected
Peninsula Shale Fynbos ⁶	1262.79	658.20	52.12	30	378.84	654.99	172.90	YES	651.75	172.04	VU	Well Protected
Peninsula Shale Renosterveld *	2384.27	292.85	12.28	26	619.91	292.85	47.24	NO	238.92	38.54	CR	Moderately Protected
Southern Afrotemperate Forest	347.52	345.87	99.53	34	118.16	344.10	291.23	YES	271.62	229.89	LT	Moderately Protected
Swartland Alluvium Fynbos	1734.06	71.48	4.12	30	520.22	71.48	13.74	NO	0.00	0.00	CR	Poorly Protected
Swartland Alluvium Renosterveld	60.78	0.00	0.00	26	15.80	0.00	0.00	NO	0.00	0.00	CR	Not Protected
Swartland Granite Renosterveld	7291.68	1876.40	25.73	26	1895.84	1851.29	97.65	NO	137.53	7.25	CR	Poorly Protected
Swartland Shale Renosterveld	47315.	3924.24	8.29	26	12302.12	3924.24	31.90	NO	530.27	4.31	CR	Hardly Protected

⁶ Peninsula Shale Fynbos is now recognized nationally as a different vegetation type to Cape Winelands Shale Fynbos.

	84											
Swartland Silcrete Renosterveld	1091.09	177.67	16.28	26	283.68	177.67	62.63	NO	0.03	0.01	CR	Hardly Protected
Western Shaleband Vegetation	317.39	316.70	99.78	30	95.22	316.69	332.60	YES	298.09	313.06	LT	Well Protected
TOTAL (ha)	245276.4	94550.69			68735.85	82388.38			41059.56			



Map 3: Vegetation Remnants

7.2.1 Sand Fynbos

Cape Town has three types: Cape Flats Sand Fynbos, which is endemic to the city, Hangklip Sand Fynbos, which occurs on the Peninsula as well as east of False Bay, and Atlantis Sand Fynbos, which extends north of Cape Town (Table 1). Sand Fynbos occurs on moderately undulating and flat plains on leached, acid Tertiary sand. The vegetation comprises dense, moderately tall, ericoid-leaved shrubland containing scattered emergent tall shrubs. Common ericoid shrubs include *Metalasia densa*, *Staavia radiata*, *Erica*, *Phyllica* and *Passerina* species. Proteoid and restioid fynbos are the dominant structural types, with asteraceous and ericaceous fynbos occurring in drier and wetter areas, respectively. All three Sand Fynbos types are species-rich and contain a number of local endemic plant species: for example, *Erica margaritacea* in Cape Flats Sand Fynbos and *Leucospermum parile* in Atlantis Sand Fynbos.

7.2.2 Alluvium Fynbos

Cape Town has two types: Lourensford Alluvium Fynbos, which is endemic to the city, and Swartland Alluvium Fynbos, which extends north of the city. Alluvium Fynbos is either found on low-lying plains with duplex, silty soils or on granite and shale metasediments often with small cobbles and pebbles embedded. They are medium to dense shrublands with a short graminoid understorey. Structurally, restioid and asteraceous fynbos are dominant, although there is some evidence that proteoid fynbos might once have been dominant. Some remnants, such as Harmony Flats Nature Reserve are exceptionally rich in bulbs. Daisies such as *Athanasia*, *Stoebe* and *Marasmodes* species and grasses *Themeda triandra* and *Tribolium uniolae* are common.

7.2.3 Granite Fynbos

Cape Town has two types: Peninsula Granite Fynbos, which is endemic to the Cape Peninsula, and Boland Granite Fynbos, which extends to the north-east of the city. Granite Fynbos occurs on moderately undulating plains and hills or on steep to gentle slopes below the sandstone mountain slopes, with soils varying from extensive and deep, to localised deep soils between large granite domes and sheets. Structurally it is described as a fairly dense, 1–2 m tall closed shrubland with occasional low, gnarled trees dotted through the landscape. It is a diverse type, dominated by scrub, asteraceous and proteoid fynbos, but with patches of restioid and ericaceous fynbos in wetter areas. Waboomveld (with *Protea nitida* overstorey) is very typical and extensive within Granite Fynbos. On the Peninsula, groves of Silver Trees (*Leucadendron argenteum*) occur on the wetter slopes. Local endemic species include *Leucospermum grandiflorum* (Boland Granite Fynbos) and *Hermannia micrantha* (Peninsula Granite Fynbos).

7.2.4 Sandstone Fynbos

Cape Town has two types: Peninsula Sandstone Fynbos, which is endemic to the Peninsula Mountain Chain, and Kogelberg Sandstone Fynbos, which extends to the south-east of the city. Sandstone Fynbos occurs in the high mountains, on steep to gentle slopes, and on undulating plains and hills of varied aspect. The soils are acidic lithosols derived from Ordovician sandstones of the Table Mountain Group (Cape Supergroup). The general structure of the vegetation is a low, closed shrubland with scattered emergent tall shrubs. Proteoid, ericaceous and restioid fynbos dominate, while asteraceous fynbos is rare. Patches of thicket or scrub fynbos are common in rocky outcrops. Numerous seeps and seasonally saturated mountain-plateau wetlands (locally called 'suurvlake') are very common and support restioid and ericoid (dominated by Bruniaceae) fynbos. Both these vegetation types are extremely species-rich with a staggeringly high concentration of local endemic species (>130 in each). Examples are *Mimetes fimbriifolius* and *Leucadendron strobilinum* on the Peninsula and *Erica sitiens*, *Leucospermum bolusii* and *Aspalathus acanthiloba* on the Kogelberg.

Western Coastal Shale Band vegetation is a narrow 80–200 m linear feature nested within Sandstone Fynbos and extends eastwards from the Kogelberg range. Within the city, the shale band supports proteoid fynbos shrublands.

7.2.5 Shale Fynbos

Two types occur in higher rainfall areas where the shale soils are sufficiently leached of nutrients: Cape Winelands Shale Fynbos, which extends north-east of the city, and Elgin Shale Fynbos which extends to the east of the city. Shale Fynbos occurs on moderately undulating plains and steep slopes against the mountains. Soils are acidic, moist clay-loams. Vegetation structure is an open to medium-dense tall proteoid shrubland over a matrix of moderately tall and dense evergreen shrubs, dominated by proteoid, asteraceous and closed-scrub fynbos, with ericaceous fynbos in the wetter sites. A large portion of Elgin Shale Fynbos in the city is under pine plantations and the flooded area of the Steenbras Dam, whereas most remaining Shale Fynbos on the Peninsula is conserved in the Table Mountain National Park. Cape Winelands Shale Fynbos is also conserved in the Helderberg, Kogelberg and Hottentots Holland Nature Reserves. Many species are shared with Granite Fynbos and include several local endemics (e.g. *Leucadendron argenteum*, *L. daphnoides* and *Leucospermum grandiflorum*).

7.2.6 Cape Flats Dune Strandveld

This vegetation type is endemic to the city and shares affinities with coastal thicket vegetation to the east and succulent karoo vegetation to the north. Cape Flats Dune Strandveld occurs on flat to slightly undulating dune field landscapes. The soils are alkaline

sands derived from Tertiary to recent calcareous sand of marine origin. Outcrops of limestone occur, particularly along the False Bay coastline. Structurally, strandveld is a tall, evergreen, hard-leaved shrubland with abundant grasses, annual herbs and succulents in the gaps. Examples of prominent shrub species include *Euclea racemosa*, *Metalsia muricata*, *Olea exasperata*, *Osteospermum monilifera* and *Roepera flexuosum*. Strandveld has few local endemic species compared to fynbos, but one example is the succulent, *Lampranthus tenuifolium*.

Cape Seashore Vegetation may be considered as a community of strandveld that occurs predominantly on the unstable fore-dunes above the beaches. Structurally, it is an open herbaceous and dwarf shrubby vegetation often dominated by a single pioneer species. Characteristic species include *Pelargonium capitatum*, *Tetragonia decumbens*, *Didelta carnosus* and *Carpobrotus acinaciformis*.

7.2.7 Renosterveld

Cape Town has four types: Peninsula Shale Renosterveld which is endemic to the Cape Peninsula, and three other types which extend north of the city on their respective soil types: Swartland Granite, Shale and Silcrete Renosterveld. Renosterveld occurs on soils with a heavier texture (clays and loams) where rainfall is not sufficiently high to leach out the nutrients (<600mm p.a.). Clay soils are derived from Malmesbury Group Shales, and loams from Cape Granite or silcrete parent materials. Renosterveld is mainly found in the moderately undulating lowlands and foot slopes. Structurally the vegetation is a cupressoid and small-leaved, open, low to moderately tall shrubland with many succulents, dominated by renosterbos (*Dicerothamnus rhinocerotis*). Grasses are a prominent component and prior to European colonization, the vegetation may have been grassland. Heuweltjies (termitaria) cause distinctive vegetation spots on the landscape and give the Tygerberg Hills their name. Groups of small trees and tall shrubs are associated with heuweltjies and rocky outcrops. Some renosterveld vegetation is rich in bulbs. Endemic plants include Asteraceae, succulents and bulb species (e.g. *Marasmodes oligocephala*, *Lampranthus dilutus*, *Babiana longiflora*).

7.2.8 Southern Afrotropical Forest

Southern Afrotropical Forest occurs throughout South Africa on a variety of substrata. In the Mediterranean-climate areas of the CFR forest is confined to fire-protected kloofs in the mountains. The emergent tree species have a subtropical affinity and are mostly widespread throughout South Africa. Tree species which occur in Cape Town forest patches include *Podocarpus latifolius*, *Rapanea menaphloeos*, *Cunonia capensis*, *Curtisia dentata* and *Kiggelaria africana*.

7.3 Fresh Water Features in the Bioregion

7.3.1 Wetlands

At the national vegetation mapping scale most of the large wetlands, such as Rondevlei, fall into the Cape Lowland Freshwater Wetlands type, with some of the estuarine wetlands classed as Cape Inland Saltpans. Cape Vernal Pools no longer occur in the city. Seasonal wetlands form discrete plant communities within their respective terrestrial vegetation types. The CCT wetlands have been mapped and classified in a detailed desktop study according to the National Wetland Classification System (Ewart-Smith et al. 2006). This is a hierarchical system, dividing wetlands into increasingly refined categories at four levels. A subsequent study ground-truthed a sample of the 54 recognized wetland types (all inland wetlands except for three estuarine types) for occurrence, condition and typing (Snaddon et al. 2009). Wetlands were then prioritized based on contribution to biodiversity pattern and process (Snaddon & Day 2009). As for the terrestrial ecosystems, wetlands in lowland areas are the highest priority. Today seasonal vleis mostly are modified to perennial systems, but one extant example of this rare type is *Isoetes* Vlei at Edith Stephens Nature Reserve.

7.3.2 Rivers

The Cape Town Bioregion has approximately 41,837 km of rivers, although only some upper reaches of the rivers are still in a natural or good ecological state. Three rivers inside protected areas are nationally recognized as Freshwater Ecosystem Priority Areas (FEPAs): Silvermine, Schusters and Steenbras Rivers; with some sections of the Diep recognized as Phase 2 FEPAs (Nel et al. 2011). Lowland river reaches generally are in a poor ecological state as a result of surrounding developments. Significant stretches of most rivers have been canalised, have poor water quality, modified flows and abundant alien fish and plant life. The ecological functioning and delivery of goods and services by these rivers have been severely reduced and many rivers require rehabilitation (State of Rivers Report, 2005).

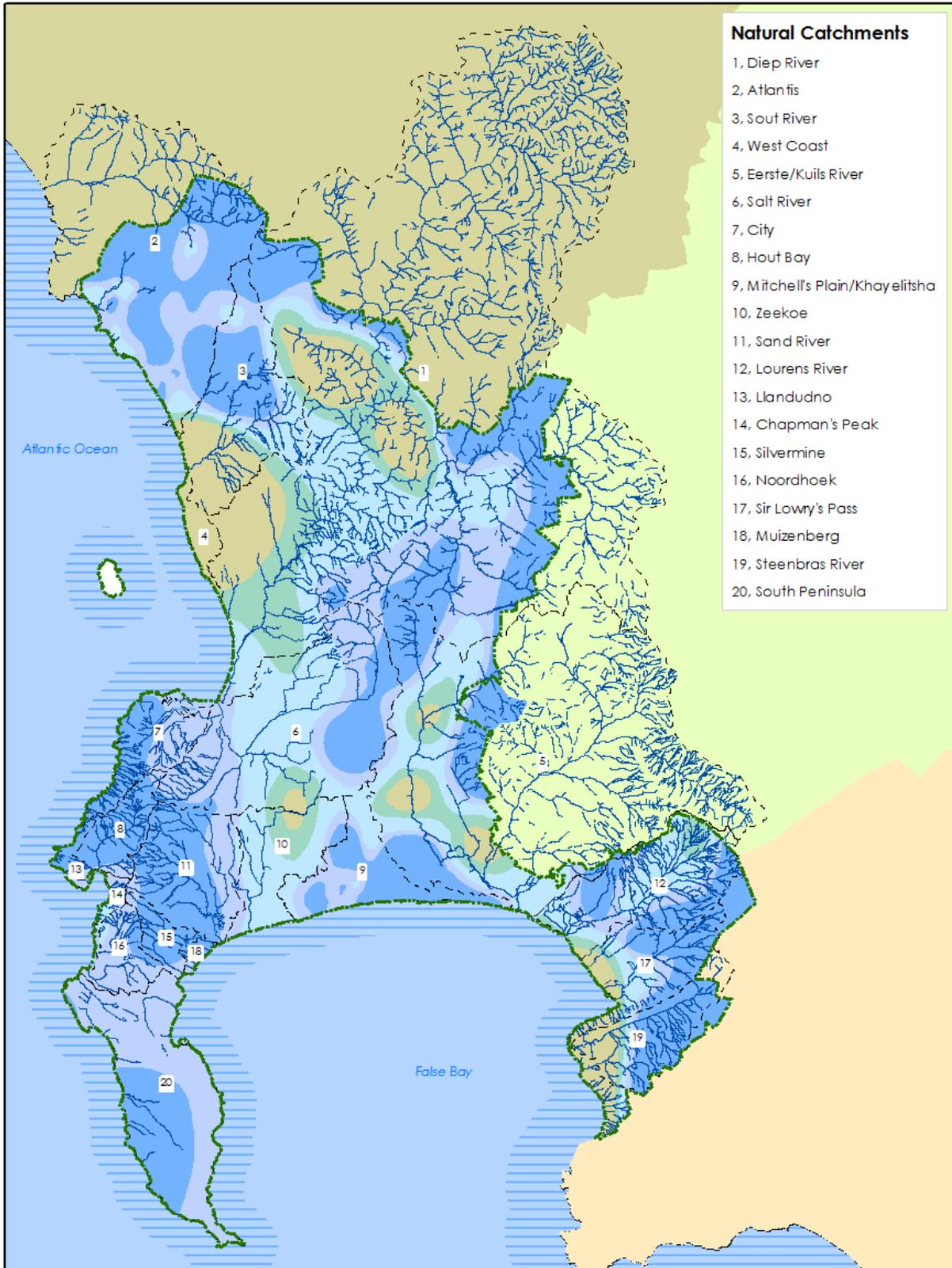
The main river and vlei catchments in the Cape Town Bioregion are the rivers of the City Bowl, Liesbeek, Elsieskraal and Black, Diep (Milnerton), Salt, Zeekoevlei, Rondevlei and Zandvlei, Sand/Diep (Constantia), Keyzers and Westlake, Houtbay, Noordhoek wetlands and streams, Kuils, Eerste, Lourens and Steenbras (Brown & Magoba 2009).

7.3.3 Groundwater

The fynbos ecosystems are aquifer-dependant; they rely on groundwater base flows from the Table Mountain Group (TMG) aquifer to sustain the wetlands, streams and fynbos vegetation, particularly through seasonal and longer-term drought periods. The TMG aquifer is a fractured rock system, with groundwater confined to faults, joints and bedding planes in the quartzite (CCT 2004). Rivers, estuaries, wetlands and seeps have been identified as being the

most vulnerable to changing groundwater conditions. It is estimated that less than 5% of rain directly enters a stream during and immediately after a rainfall event. Rather, the rainfall rapidly percolates into the groundwater and the streams are fed by base flow from the groundwater (Midgley et al. 2001).

In 2004 the City initiated an investigation into the TMG aquifer as a potential, sustainable source, of water in the future (City Aquifer Report). However, this study was focused on the deep water (>100m) aquifer. In the Cape Town Bioregion, the shallow water aquifer that occurs between depths of 0.3m and 3m is critically important to the functioning of the local ecosystems. It also faces the largest threats from pollution, salt water intrusion and over abstraction. Map 4 shows the location of the rivers and groundwater aquifers.



- Natural Catchments**
- 1, Diep River
 - 2, Atlanfis
 - 3, Sout River
 - 4, West Coast
 - 5, Eerste/Kuils River
 - 6, Salt River
 - 7, City
 - 8, Hout Bay
 - 9, Mitchell's Plain/Khayelitsha
 - 10, Zeekoe
 - 11, Sand River
 - 12, Lourens River
 - 13, Llandudno
 - 14, Chapman's Peak
 - 15, Silvermine
 - 16, Noordhoek
 - 17, Sir Lowry's Pass
 - 18, Muizenberg
 - 19, Steenbras River
 - 20, South Peninsula

<p>City of Cape Town Bioregional Plan</p> <p>Map produced by City of Cape Town Environmental Compliance Department ECONOMIC, ENVIRONMENTAL & SPATIAL PLANNING email: Enviro.Gis@cape.gov.za</p> <p>Date: January 2012</p>	<p>Map 4: Catchments, Rivers and Grounwater</p> <p>Map Legend</p> <table border="0"> <tr> <td></td> <td>City of Cape Town Bioregion</td> <td></td> <td>< 70</td> <td></td> <td>Rivers</td> </tr> <tr> <td></td> <td>Cape Winelands Municipality</td> <td></td> <td>70 - 150</td> <td></td> <td>Natural Catchments</td> </tr> <tr> <td></td> <td>Overberg Municipality</td> <td></td> <td>150 - 370</td> <td></td> <td>N</td> </tr> <tr> <td></td> <td>West Coast Municipality</td> <td></td> <td>370 - 520</td> <td></td> <td>E</td> </tr> <tr> <td></td> <td></td> <td></td> <td>> 520</td> <td></td> <td>S</td> </tr> </table> <p>0 3 6 12 Kilometers</p> <p></p>		City of Cape Town Bioregion		< 70		Rivers		Cape Winelands Municipality		70 - 150		Natural Catchments		Overberg Municipality		150 - 370		N		West Coast Municipality		370 - 520		E				> 520		S
	City of Cape Town Bioregion		< 70		Rivers																										
	Cape Winelands Municipality		70 - 150		Natural Catchments																										
	Overberg Municipality		150 - 370		N																										
	West Coast Municipality		370 - 520		E																										
			> 520		S																										

Map 4: Catchments, Rivers and Groundwater

7.4 Coastal Zone Features in the Bioregion

The coastal zone can be defined as the strip of inshore coastal waters (+/- 5km), including additional controlled zones and Marine Protected Areas that fall outside of this 5km buffer, up to the high water mark. Coastal and terrestrial ecosystems are inextricably linked, with the interface being defined as the inter-tidal zones and estuaries. The latter are important ecosystems and require intact adjacent marine and terrestrial ecosystems to function well.

7.4.1 The Coastline

The City administers 307 km of coastline, one of its greatest economic and social assets. The coast provides a range of social and economic opportunities including recreational and amenity areas and sought after housing and development opportunities. In addition, the coast is a dynamic ecological system that supports a high richness of algae and invertebrate fauna, and a variety of ecological systems and associated ecological services. However, as a result of the benefits associated with living close to the coast, it is becoming subject to increasing anthropogenic pressures. Thus the extent of coastal systems to yield productive and valuable services is declining at a rapid rate, with social, economic and aesthetic consequences.

7.4.2 Intertidal Habitats

The inter-tidal zone within the bioregion consists of sandy beaches and rocky shores. It is a high energy coastline making the sandy areas unstable and inhospitable to most species. In contrast, the rocky shores have much higher species richness owing to the diversity of microhabitats within this zone. The sub-tidal rocks provide a substrate for kelp beds (*Ecklonia* species) to establish. Rocky reef systems are also common.

During summer, the west coast experiences upwelling of nutrient-rich, cold water, that supports rapid plankton growth, which in turn supports large-scale food webs, including vast shoals of pelagic fish such as Anchovies (*Engraulis japonicus*), Pilchards (*Sardinops sagax*) and Snoek (*Thysites atun*).

7.4.3 Breeding Sites

The city coast includes breeding sites of seabirds and seals on offshore islands. Unique features of the Cape Peninsula are the sea cliffs at Cape Point and Wolfgat Nature Reserve which provide secure breeding habitats to many seabirds. There are important tern roosts at the mouth of the Lourens River (the western bank) where up to 20,000 terns roost in summer and at Die Eiland in Kommetjie. Colonies of African Penguin breed at Boulders beach and Burgher's Walk, just outside Simonstown, and on Robben Island.

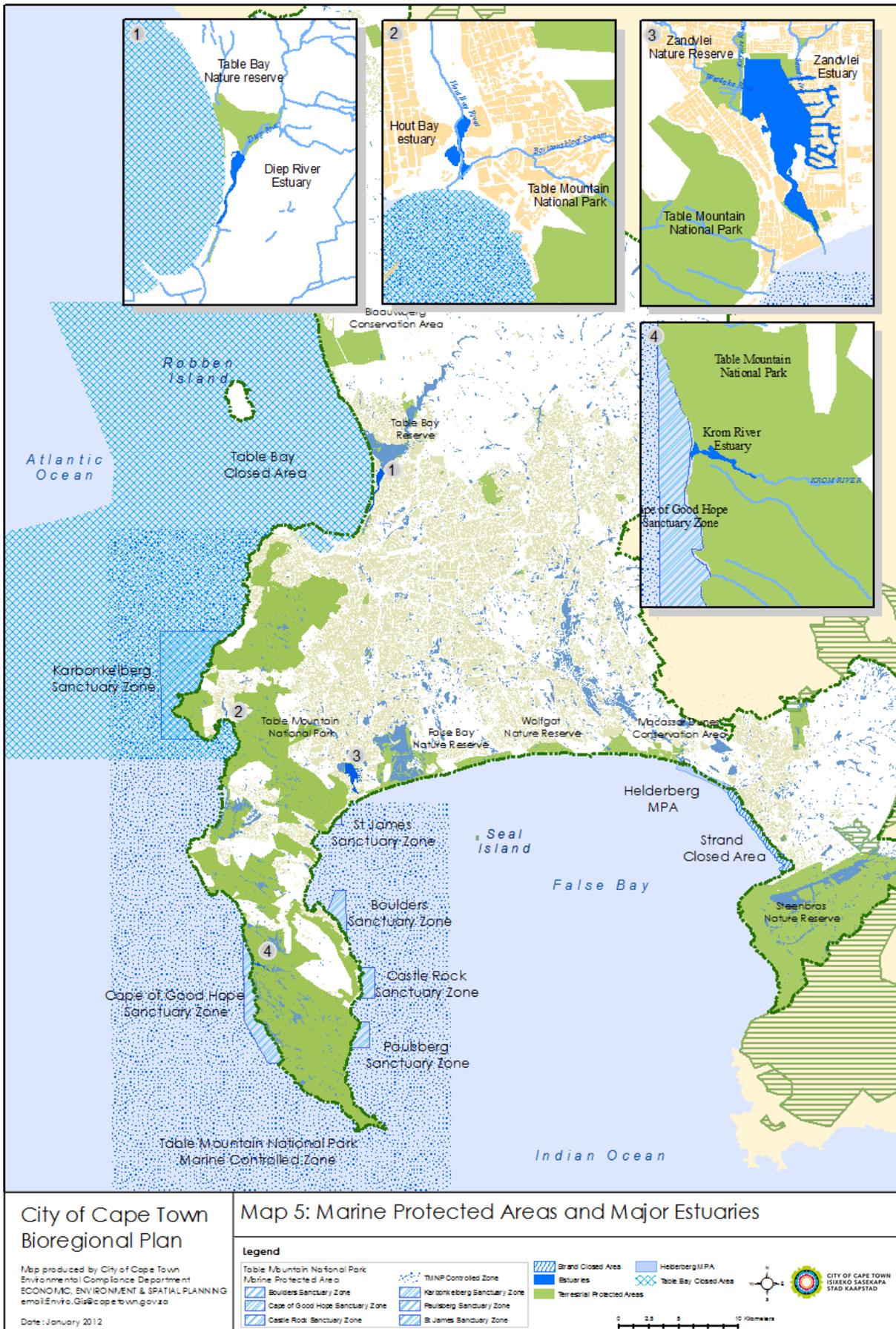
7.4.4 Estuaries

Cape Town has two main estuaries at Diep River and Zandvlei estuaries and two minor estuaries at Hout Bay and the Krom River (Map 5). Although these estuaries suffer immense development and pollution pressures, they are still critically important and the two main estuaries are recognized as national priorities in the National Estuary Biodiversity Plan that forms part of the 2011 National Biodiversity Assessment. Zandvlei supports a wide variety estuarine fish such as Southern Mullet (*Liza richardsonii*); and Garrick (*Lichia amia*), White Steenbras (*Lithognathus lithognathus*), Flathead Mullet (*Mugil cephalus*), White Stumpnose (*Rhabdosargus globiceps*), and Longsnout Pipefish (*Syngnathus acus*), as well as freshwater fish, crustaceans and birds. The estuaries are a mix of vegetated depressions and flats, and sandy channels. Estuaries receive polluted water from upstream, with discharge regimes that are not natural. As a result, they are threatened and urgent action is needed.

There are several smaller estuaries and river mouths along the coastline.

7.4.5 Marine Protected Areas and Closed Areas

There are several Marine Protected Areas and closed areas along Cape Town's coastline. These are important for the protection and conservation of fish stocks and sensitive inshore marine environments (see Map 5).



Map 5: Marine Protected Areas and Estuaries

8 Important Ecological Corridors and Features

Several ecological corridors are critical components of the BioNet.

These include:

1. The False Bay corridor, linking the Cape Peninsula and Helderberg regions.
2. The Kuils River corridor, linking Macassar Dunes Conservation Area and Driftsands Nature Reserve.
3. The West Coast corridor, linking the Blaauwberg and Koeberg Nature Reserves.
4. The Diep River fynbos corridor, linking the Table Bay and Blaauwberg Nature Reserves.
5. The Dassenberg Coastal Catchment Corridor, which is one of the protected area expansion priorities for the Western Cape and links the provincial Riverlands Nature Reserve (immediately outside the City boundary) to the West Coast.

Birdlife South Africa recognizes five Important Bird Areas (IBAs) in the city:

1. Boulders Beach & Burghers Walk
2. False Bay Nature Reserve
3. Robben Island
4. Table Bay Nature Reserve (Rietvlei)
5. Eastern Mountains (Steenbras Nature Reserve/Kogelberg)

Various Ecological Support Areas are included in the BioNet to accommodate home ranges and movement of larger mammal species. This includes some farm land on the Cape Peninsula for Baboons and north of the Blaauwberg Nature Reserve for Honey Badgers.

The Atlantis dune field area is a key ground water recharge area and conserving it will protect the huge economic asset of potable water in the aquifer.

The endangered Western Leopard Toad survives in the transformed landscape of the Southern Suburbs. This species requires that local wetlands are conserved and that open space is managed in an appropriate way (e.g. no waterway cleaning or mowing during breeding season and migration periods). This is managed through MOAs with the City Parks and Roads & Stormwater Departments.

9 Ecosystem Protection Level within the Bioregion

The current conservation network encompasses 51,773 ha of land, representing 60.91% of the BioNet (Table 2), of which 40,721 ha is conserved in perpetuity and a further 11052 ha have been submitted for perpetuity conservation.

All ecosystems, except those in the mountains, are under-conserved (refer Appendix 2). Remaining habitat in the lowlands is thus a high conservation priority, both locally and nationally.

In 2009 only 35.62% of the BioNet was conserved. Since then the conservation estate in Cape Town has grown to 60.91%, an increase of 25.29%, and met the 2014 IMEP biodiversity target of 60% of BioNet protected.

Table 2: Breakdown of Conserved Land in Cape Town

Category:	Area (ha)	% of BioNet
City Nature Reserves (in process)	11500	13.53
City Nature Reserves (existing)	4016	4.72
Conserved: SANParks	25048	29.47
CapeNature Provincial Nature Reserves	7505	8.83
Perpetuity Stewardship Reserves	3704	4.36
Total:	51773	60.91

10 Major Land Use and Resource Use Pressures in the Bioregion

10.1 Threats

The CCT coincides with an extremely high concentration of unique biodiversity, making it almost impossible to completely avoid negative impacts of urban development. High immigration rates to Cape Town, particularly during the past two decades, and associated inappropriate development in the form of urban sprawl, constitutes the greatest threat to remaining biodiversity in the CCT. Details of the many threats to biodiversity are outlined in Rebelo et al. (2011) and the City Environmental Management Frameworks (EMFs). The main direct threats are the following:

- a) Urban Development (habitat loss and fragmentation effects)
- b) Invasive Species (especially alien trees that form dense stands)
- c) Agriculture (habitat loss and fragmentation effects; Map B3)
- d) Over-exploitation (overgrazing; unsustainable harvesting - particularly of marine, reptile and geophytes species)
- e) Inappropriate Fires (e.g. too-frequent, wrong season)
- f) Mowing (eliminates most perennial species)
- g) Pollution (in terrestrial, fresh water, marine systems and ground water)
- h) Altered hydrology (e.g. through storm water flows, drainage, over-abstraction)
- i) Mining (especially sand mining)

- j) Crime (e.g. dumping, poaching, land invasion, violent muggings – affects staff safety)
- k) Global climate change

10.2 Areas of Potential Impact

Addressing the areas of potential impact between biodiversity and competing land uses (e.g. urban development, mining etc.) in the DSDPs and EMFs is an on-going process between the Environmental Resource Management Department and other City Departments, State Departments and developers.

The process of identifying and dealing with areas of potential impact is dealt with in detail in the Process and Consultation Report (refer Annexure 1).

A summary of the areas of potential impact resolution process is listed below:

10.2.1 Procedure for dealing with areas of potential impact within the City of Cape Town

The EMF/DSDP compilation process resulted in the identification of most of the potential areas of potential impact, but it is possible that more will come to light in future as further information becomes available and development pressures intensify. When a possible area of potential impact is identified the following steps should be taken:

Step 1: Contact the ERMD District Environment & Heritage Management and Biodiversity Management branches and any other departments likely to be affected by or have a key interest in the project, e.g. the Roads and Stormwater Department.

Step 2: Together determine a fair and transparent process for addressing the areas of potential impact. This may include:

- Determining information requirements to enable decision making and how this information needs to be obtained and timed in relation to proposed project milestones. Determine if a statutory (National Environmental Management Act) environmental assessment and/or specific environmental studies are required in order to inform decision making and how these may affect the nature and timing of the proposed project;
- Identification of key parties who may have an interest in or need to make input to the process. This may include authorities or organisations from outside the City;
- Investigation of feasible alternatives;
- If use of the site is unavoidable, exploring mitigation options;
- Setting up the necessary meetings to explore different options to address the problem.

Step 3: Record the proposed process and ensure that there is general agreement thereon.

General Description of Categories

The main categories presented in the BioNet from the fine-scale systematic biodiversity planning analysis are described in Table 3. The more detailed subcategories (e.g. CBA1a, CBA1b) are described in the systematic biodiversity planning assessment report (Annexure 2). The national biodiversity targets (Rouget et al. 2004) were adopted as vegetation biodiversity targets in this analysis. Wetlands were analysed separately, as sub communities of the terrestrial vegetation types. Those wetlands considered a top priority were assigned CBA status (either CBA1 or CBA2) and the remainder CESA (if in good ecological condition or nested within a natural vegetation remnant) or else OESA (if in poor condition or in a transformed landscape (Annexure 2)).

Table 3: Description of Categories in the Fine-scale Systematic Biodiversity Planning Analysis

Category	Code	Description	Land Management Objective
Protected Area 1	PA1	Protected areas include: National Parks, Provincial Nature Reserves, Local Authority Nature Reserves and private contractual stewardship sites with perpetuity title deed restrictions; proclaimed under NEM:PAA (Act 57 of 2003) or signed agreements in perpetuity under WCNCB Act; managed by one of three tiers of government, a parastatal (e.g. Eskom) or private landowner.	To be maintained as Protected Areas.
Protected Area 2	PA2	Conservation areas pending proclamation under NEMPAA, and stewardship sites pending proclamation under WCNCB Act, those without perpetuity title deed restrictions and private nature reserves.	To be proclaimed and maintained as Protected Areas.
Critical Biodiversity Area 1	CBA1	Non-protected terrestrial and aquatic features that are critical for conserving biodiversity and maintaining ecosystem function. Comprise the minimum set of high and medium condition remnants required to meet vegetation and species pattern and process biodiversity targets. Includes Critically Endangered remnants in poor condition that buffer higher condition remnants.	To be managed for biodiversity conservation purposes, restored where required and incorporated into the Protected Area network
Critical Biodiversity Area 2	CBA2	Remaining Critically Endangered remnants (i.e. 100% irreplaceable in terms of biodiversity targets) in poor (restorable) condition. CBA2 is also assigned to natural wetlands that are a lower priority than CBA1 wetlands	To be restored and managed for biodiversity conservation purposes and incorporated into the Protected Area network
Critical Ecological Support Area	CESA	Natural areas, including wetlands, essential for ecological function, connectivity and viability of CBA biodiversity elements.	To be managed for biodiversity conservation purposes, restored where required.
Other Ecological Support Area	OESA	Transformed (e.g. extensive agriculture) sites with conservation importance for ecological function, faunal movement and viability of CBA biodiversity elements. This includes canalized rivers and wetlands in poor condition	Current land use should be maintained, or else restored to a more natural state.
Other Natural Vegetation	ONV	Natural vegetation areas not required to meet biodiversity targets	As per the City district EMF
Transformed	TRAN	Areas transformed by human activities, including urban and rural development, cultivated land and mines.	As per the City district EMF

PART C

11 Critical Biodiversity Area Maps

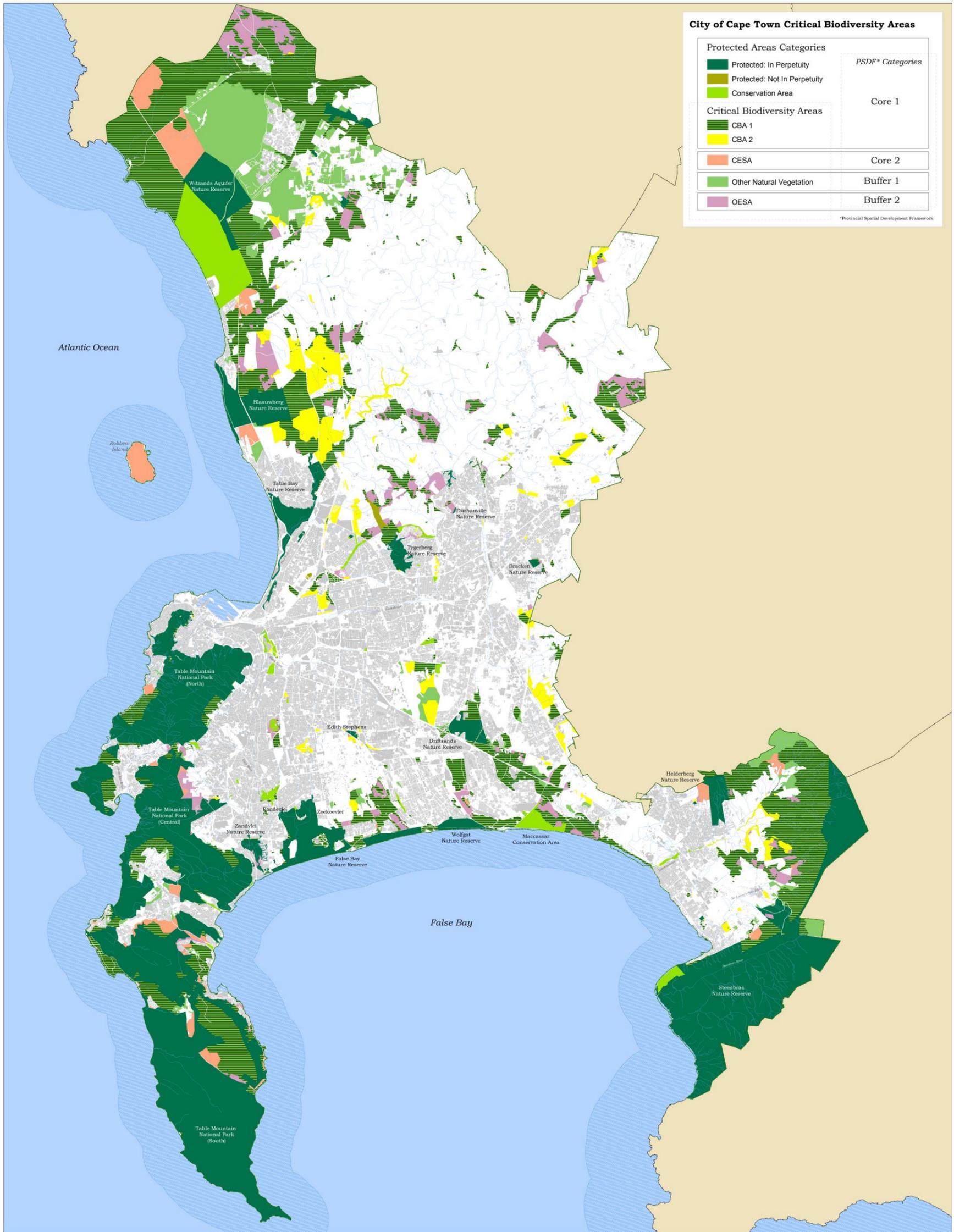
The CCT Biodiversity Network maps are presented in a series of three Maps. Map 1 is the terrestrial CBAs, Map 2 is the Wetlands and Rivers and Map 3 is a composite map. The scale at which these maps are presented in the report is very small and it is difficult to distinguish some of the features clearly.

The maps are available in high resolution digital format for download off the CCT ERMD website;

Please visit

<http://www.capetown.gov.za/en/EnvironmentalResourceManagement/Pages/Bioregional-Plan.aspx>

11.1 Map 1: City of Cape Town Bioregional Plan: Critical Biodiversity Areas



City of Cape Town
 Bioregional Plan

Map produced by City of Cape Town
 Environmental Compliance Department
 ECONOMIC, ENVIRONMENTAL & SPATIAL PLANNING
 Produced by Aime Purves
 Enquiries to: enviro.gis@capetown.gov.za

Date: January 2012

Map C1: Critical Biodiversity Areas

Legend

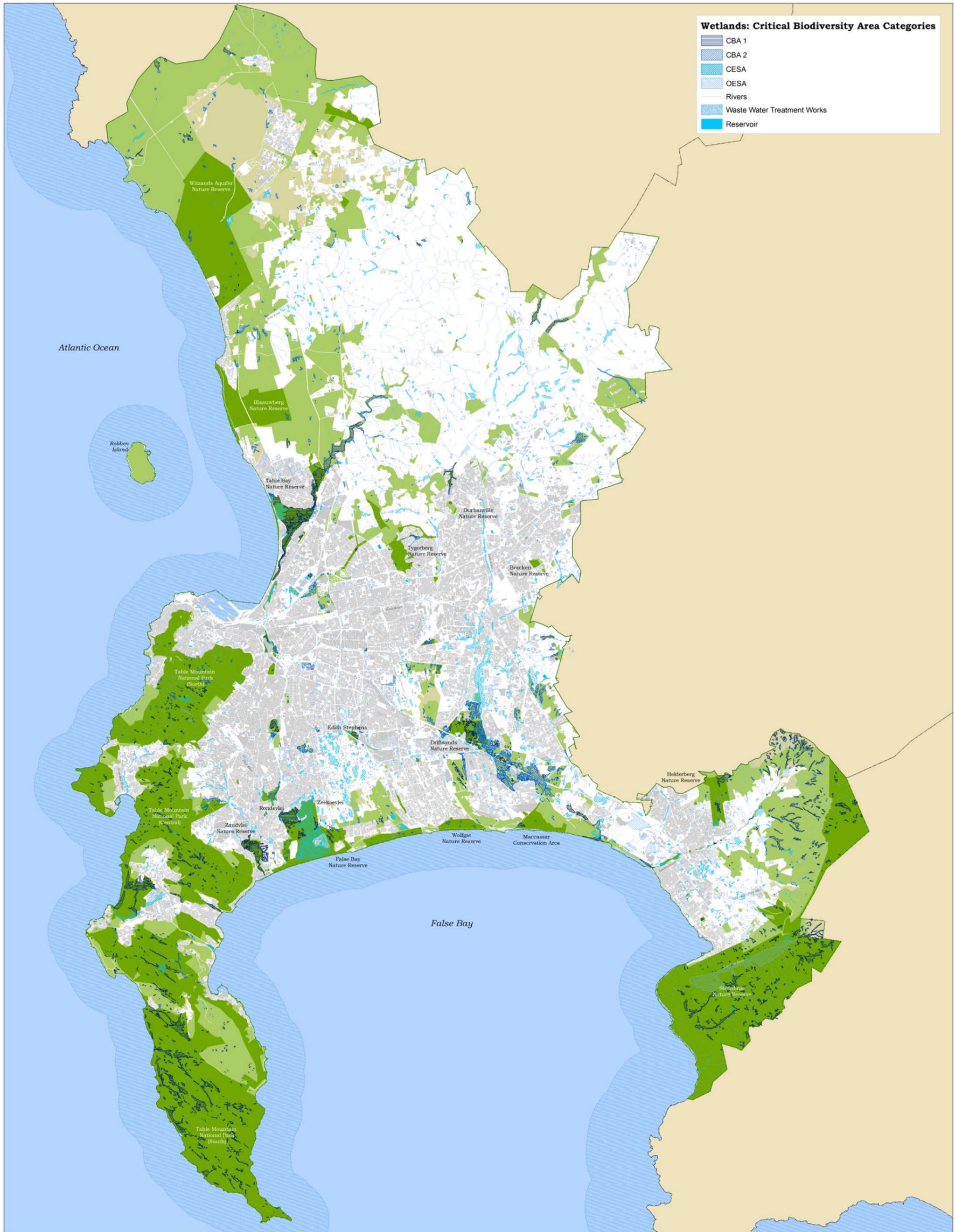
- City of Cape Town Bioregion
- Neighbour Municipalities
- CCT Urban Development
- Marine Environment
- Rivers



0 3 6 12 Kilometers



11.2 Map 2: City of Cape Town Bioregional Plan: Rivers and Wetlands



Wetlands: Critical Biodiversity Area Categories

- CBA 1
- CBA 2
- CESA
- OESA
- Rivers
- Waste Water Treatment Works
- Reservoir

**City of Cape Town
 Bioregional Plan**

Map produced by City of Cape Town
 Environmental Compliance Department
 ECONOMIC, ENVIRONMENTAL & SPATIAL PLANNING
 Produced by Arne Purnies
 Enquiries to: enviro.gis@capetown.gov.za

Date: January 2012

Map C2: Wetland Critical Biodiversity Areas

Legend

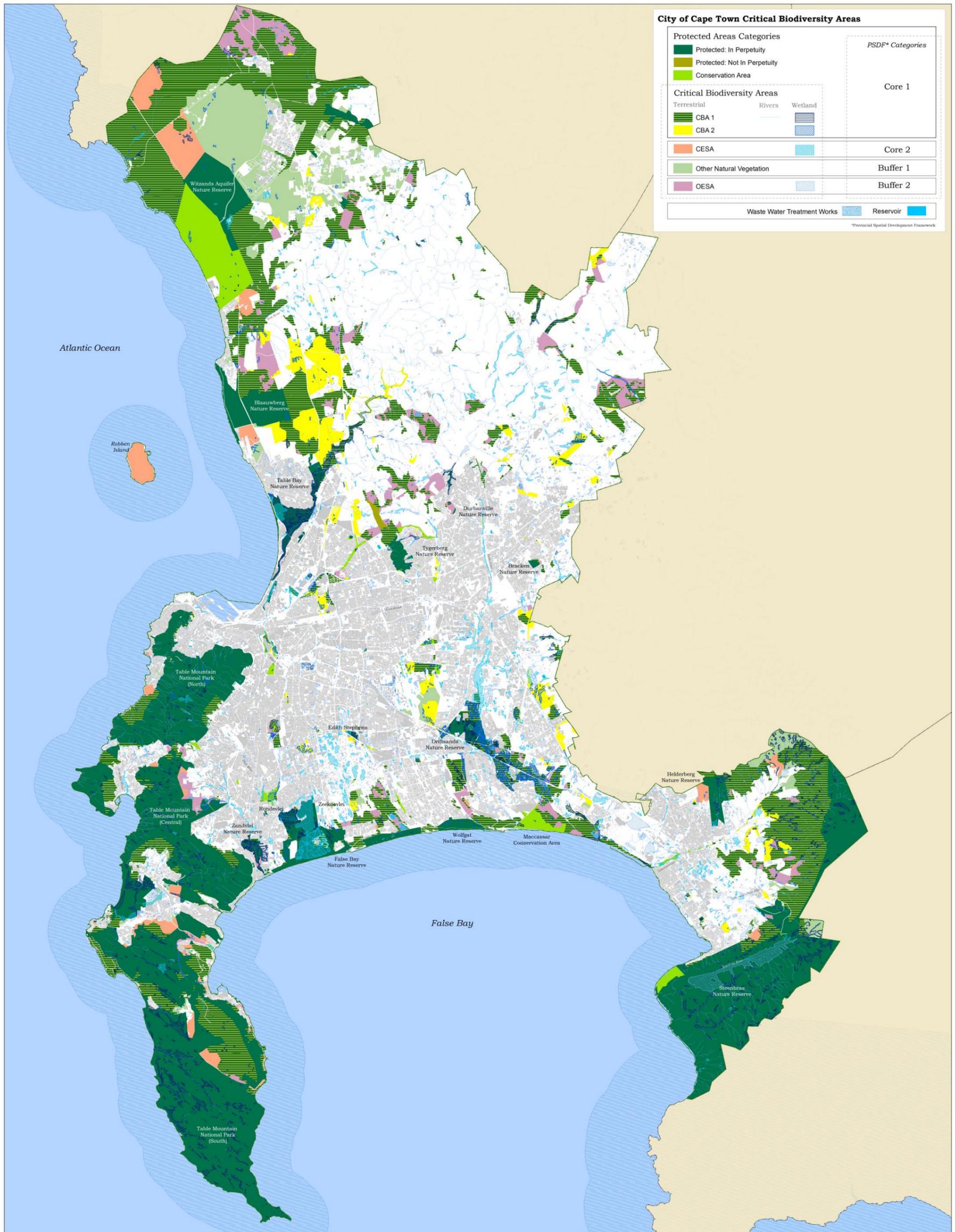
- City of Cape Town Bioregion
- Protected Areas
- Marine Environment
- Neighbour Municipalities
- BioNet
- Other Natural Vegetation
- CCT Urban Development



**CITY OF CAPE TOWN
 ISIXEKO SASEKAPA
 STAD KAAPSTAD**



11.3 Map 3: City of Cape Town Bioregional Plan: Composite Map



City of Cape Town Critical Biodiversity Areas

Protected Areas Categories		PSDF* Categories
Protected: In Perpetuity	Protected: Not In Perpetuity	
Critical Biodiversity Areas		Core 1
Terrestrial	Rivers	Core 2
CBA 1	Wetland	Buffer 1
CBA 2		Buffer 2
CESA		
Other Natural Vegetation		
OESA		
Waste Water Treatment Works	Reservoir	

*Provincial Spatial Development Framework

City of Cape Town Bioregional Plan

Map produced by City of Cape Town
 Environmental Compliance Department
 ECONOMIC, ENVIRONMENTAL & SPATIAL PLANNING
 Produced by Arne Purves
 Enquiries to: enviro.gis@capetown.gov.za
 Date: January 2012

Map C3: Critical Biodiversity Areas: Terrestrial, Rivers & Wetlands

Legend

City of Cape Town Bioregion	Marine Environment
Neighbour Municipalities	
CCT Urban Development	



CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD



Part D

GUIDELINES FOR LAND-USE PLANNING AND DECISION MAKING

Broad, generic environmental principles are provided in the tables below. Detailed land use guidelines are listed in the integrated district SDP/EMF documents. These are available on the CCT website here:

<http://www.capetown.gov.za/en/Planningportal/Pages/SpatialDevelopmentFramework.aspx>

12 Protected Areas (PAs)

12.1 National Parks, National Botanical Gardens, Provincial Nature Reserves, Local Authority Nature Reserves and Contractual Nature Reserves signed in perpetuity (Protected Area 1).

Description
Declared in terms of the National Environmental Management: Protected Areas Act. Forms part of the National Protected Area estate for the country and are listed in the National Protected Areas Register and includes privately-owned contract nature reserves.
Significance of the Habitat
Local, national and international significance. Loss of habitat will probably result in the localized extinction of some species and the possible extinction of endemics species. Loss would result in an inability to attain biodiversity targets and a rapid degradation of the natural environment within the bioregion.
Objective
<ul style="list-style-type: none"> ❖ Conservation of biodiversity and watershed protection. ❖ Maintain natural ecosystems, restore degraded land to natural and manage for no further degradation. ❖ These sites should become valued assets to surrounding communities.
Action (Immediate)
<ul style="list-style-type: none"> ❖ Management plans are required and must be implemented, monitored and reviewed. ❖ Invasive alien species (IAS) control programmes should be prioritized and implemented in accordance with the IAS Strategy for the bioregion. ❖ Legal boundaries must be surveyed and permanently marked.
Compatible Activities
<ul style="list-style-type: none"> ❖ Conservation (Non-consumptive). ❖ Low Impact recreation and ecotourism and environmental education. ❖ Development on existing footprints only, or in adjacent degraded areas and in accordance with the PA Zonation plan. ❖ Job creation through national programmes and expanded public works programmes (Working for Water, Working for Fire and Working for Wetlands) ❖ Research by registered research institutions.

12.2 State-owned sites with Conservation Management

<p>Description</p> <p>City & State (National or Provincial government departments) land adjacent to and managed as part of existing formal protected areas, or managed core flora sites as described by Maze and Rebelo (1999). They have no formal protected area status i.t.o. the NEM: PAA.</p>
<p>Significance of the Habitat</p> <p>Local, national and international significance. Loss of habitat will probably result in the localized extinction of some species and the possible extinction of endemic species. Loss would result in an inability to attain biodiversity targets and a rapid degradation of the natural environment within the bioregion</p>
<p>Objective</p> <ul style="list-style-type: none"> ❖ Conservation of biodiversity and watershed protection. ❖ Maintain natural ecosystems, restore degraded land to natural and manage for no further degradation. ❖ These sites should become valued assets to surrounding communities.
<p>Action (1-5yrs)</p> <ul style="list-style-type: none"> ❖ Ensure appropriate stewardship category is obtained and site managed accordingly. ❖ Management plans are required and must be implemented, monitored and reviewed in terms of the stewardship contract. ❖ Invasive alien species control programmes should be prioritized and implemented in accordance with the IAP Strategy for the bioregion and as agreed in the stewardship contract. ❖ Stewardship sites boundaries must be surveyed and permanently marked.
<p>Compatible Activities</p> <ul style="list-style-type: none"> ❖ Low Impact recreation and ecotourism and environmental education. ❖ Development on existing footprints only, or in adjacent degraded areas and in accordance with the PA Zonation plan. ❖ Job creation through national programmes and expanded public works programmes (Working for Water, Working on Fire and Working for Wetlands) as agreed in the stewardship contract. ❖ Research by registered research institutions. ❖ Natural Resource Harvesting according to set standards and guidelines as stipulated in the PA management plan. ❖ No further extension of intensive agriculture into these areas

12.3 Private Conservation Areas

Description
Privately owned sites that have been declared as private nature reserves by the Provincial conservation authority, or which have been secured as Biodiversity Agreements (non-perpetuity agreements), under the auspices of the CapeNature Stewardship programme.
Significance of the Habitat
Local, national and international significance. Loss of habitat will probably result in the localized extinction of some species and the possible extinction of endemics species. Loss would result in an inability to attain biodiversity targets and a rapid degradation of the natural environment within the bioregion. Loss of these areas would also result in increased fragmentation of the conservation estate.
Objective
<ul style="list-style-type: none"> ❖ Conservation of biodiversity and watershed protection. ❖ Maintain natural ecosystems, restore degraded land and wetlands to a natural state and manage for no further degradation.
Action (1-5yrs)
<ul style="list-style-type: none"> ❖ Ensure appropriate stewardship category is obtained and site managed according to the approved management plan which must be monitored and reviewed in terms of the stewardship contract. ❖ Invasive alien species control programmes should be prioritized and implemented in accordance with the IAP Strategy for the bioregion and as agreed in the stewardship contract. Stewardship site boundaries must be surveyed and permanently marked.
Compatible Activities
<ul style="list-style-type: none"> ❖ Low Impact recreation and ecotourism and environmental education. ❖ Development on existing footprints only, or in adjacent degraded areas. ❖ Job creation through national programmes and expanded public works programmes (Working for Water, Working on Fire and Working for Wetlands) as agreed in the stewardship contract. ❖ Research by registered research institutions. ❖ Natural Resource Harvesting according to set standards and guidelines as stipulated in the Stewardship Site management plan. ❖ No further expansion of intensive agriculture into these areas should be permitted.

13 Critical Biodiversity Areas (CBAs)

Critical Biodiversity Areas (CBAs) are unprotected terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning.

13.1 CBA 1(a-e)

Description
<p>CBA 1a: Irreplaceable Core Flora Sites <i>Unprotected, irreplaceable Core Flora Sites, and associated rivers and wetlands, with historical and critical biodiversity significance.</i></p>
<p>CBA 1b: Irreplaceable high and medium condition sites <i>Irreplaceable high and medium condition sites and associated rivers and wetlands. Critically endangered vegetation of high and medium quality that is needed to meet national biodiversity targets.</i></p>
<p>CBA 1c: Minimum Set: High and medium condition sites <i>High and medium condition vegetation, including associated rivers and wetlands, that are threatened or non-threatened and are selected on the BioNet for meeting national and city biodiversity targets. Loss could be mitigated by selecting an alternative, specific, unselected natural vegetation site/s of the same type and condition. Loss will result in fewer available options to attain biodiversity targets and a decline in the resilience of the natural environment within the bioregion. These vegetation sites are non-negotiable unless alternative, equivalent sites not on the BioNet are identified and secured first.</i></p>
<p>CBA 1d: Irreplaceable consolidation sites <i>Critically Endangered vegetation, and associated rivers and wetlands, of <u>restorable condition</u>. Essential for management consolidation and viability of CBA 1a, CBA 1b and Protected Sites. These areas are required to make existing critical remnants ecologically viable. Loss will result in higher condition remnants being lost through degradation of ecological processes and exponentially greater management costs associated with small, fragmented areas.</i></p>
<p>CBA 1e: Connectivity Sites <i>High and medium condition vegetation, and associated rivers and wetlands, which are Endangered or Vulnerable and selected on the BioNet for <u>connectivity</u>. These areas are required to make existing critical remnants ecologically viable. Loss will result in higher condition remnants being lost through degradation of ecological processes and exponentially greater management costs associated with small, fragmented areas. Also required to maintain large-scale ecosystem processes, climate change mitigation, animal movement corridors and other large-scale ecosystem processes. (E.g. ground water recharge).</i></p>
Significance of the Habitat
<p>Local, National and International Significance. Loss of habitat will probably result in the localized extinction of some species and the possible extinction of endemics species. Loss would result in an inability to attain biodiversity targets and a rapid degradation and</p>

fragmentation of the natural environment within the bioregion.

Objectives

- ❖ Secure formal protected area status and maintain natural ecosystems, restore degraded land to natural and prevent any further degradation.
- ❖ Manage for conservation of critical biodiversity, watershed, and ground water protection and ensure the continued delivery of high quality ecosystem services.

Action (1-5yrs)

- ❖ Obtain appropriate formal protected area status. These sites are high priority and high urgency. Interim measures to secure their long-term protection should be implemented.
- ❖ These sites need to be monitored for negative activities that are impacting on their critical biodiversity and referred to the environmental compliance agencies (e.g. unauthorized mining/prospecting).
- ❖ Management plans are required and must be implemented, monitored and reviewed.
- ❖ Invasive alien species control programmes should be prioritized and implemented in accordance with the IAP Strategy for the bioregion.
- ❖ Core Flora sites boundaries must be surveyed and permanently marked.

Compatible Activities

- ❖ Low Impact recreation and ecotourism and environmental education.
- ❖ Development on existing transformed footprints only or in adjacent areas.
- ❖ Job creation through national programmes and expanded public works programmes (Working for Water, Working on Fire and Working for Wetlands).
- ❖ Research by registered research institutions.
- ❖ Natural Resource Harvesting according to set standards and guidelines as stipulated in the management plan.
- ❖ No expansion of intensive agriculture into these areas.

13.2 CBA 2: Restorable Irreplaceable Sites

<p>Description</p> <p>Critically Endangered vegetation and associated rivers and wetlands of <u>restorable condition</u>. Required to meet national biodiversity targets, but not for management consolidation, connectivity or viability of critical BioNet sites.</p>
<p>Significance of the Habitat</p> <p>Local, National and International Significance. Although irreplaceable these sites are degraded, and their loss will have a lower impact than for high quality remnants. Also required to maintain large-scale ecosystem processes, climate change mitigation, animal movement corridors and other large-scale ecosystem processes. (E.g. ground water recharge).</p>
<p>Objective</p> <ul style="list-style-type: none"> ❖ Secure formal protected area status where possible. ❖ Maintain natural ecosystems, restore degraded land to natural and manage for no further degradation. ❖ Manage for conservation of biodiversity, watershed and ground water protection. Restoration of ecological processes where these have become degraded or obstructed.
<p>Action (1-5yrs)</p> <ul style="list-style-type: none"> ❖ Obtain appropriate formal protected area status. These sites are medium priority and low urgency. Interim measures to secure their long-term protection should be implemented e.g. conservation agreements. ❖ These sites need to be monitored for negative activities that are impacting on their critical biodiversity and referred to the environmental compliance agencies (e.g. unauthorized mining/prospecting). ❖ Management plans are required and must be implemented, monitored and reviewed. ❖ Invasive alien species control programmes should be prioritized and implemented in accordance with the IAP Strategy for the bioregion.
<p>Compatible Activities</p> <ul style="list-style-type: none"> ❖ Medium Impact recreation and ecotourism. ❖ Medium impact development on existing footprints or in adjacent degraded areas. ❖ Any low impact development should not have any significant environmental impact on ecological processes or management programmes for the site and/or surrounding sites. ❖ Research by registered research institutions. ❖ No further expansion of intensive agriculture into these areas

14 Ecological Support Areas

14.1 Critical Ecological Support Areas

<p>Description</p> <p>CESA (Critical Ecological Support Areas) <i>Non-transformed sites of conservation significance and associated rivers and wetlands, required for additional consolidation and ecological support). Essential for management consolidation, connectivity and viability of biodiversity elements in CBA 1a, CBA 1b and protected sites</i></p>
<p>Significance of the Habitat</p> <p>Local, national and international significance. These sites are required to make existing remnants ecologically viable and to reduce the edge/area ratio, making conservation actions more financially sustainable in the long-term. Also required to maintain large-scale ecosystem processes, climate change mitigation, animal movement corridors and other large-scale ecosystem processes.</p>
<p>Objective</p> <ul style="list-style-type: none"> ❖ Secure appropriate land-use zoning or formal protected area status where possible. ❖ Maintain natural ecosystems, restore degraded portions to improve ecological functioning and manage for reduced level of impact on remaining natural systems. ❖ Manage for ecological functioning, watershed and ground water protection. Restoration of ecological processes where these have become degraded or obstructed.
<p>Action (1-5yrs)</p> <ul style="list-style-type: none"> ❖ Determine zoning and obtain appropriate formal protected area status. These sites are high priority and low urgency. Interim measures to secure their long-term protection should be implemented e.g. conservation agreements. ❖ These sites need to be monitored for negative activities that are impacting on their critical biodiversity and referred to the environmental compliance agencies (e.g. unsustainable farming practices). ❖ Management plans of surrounding CBAs should refer to these CESAs and ensure appropriate management interventions where required. ❖ Alien vegetation eradication programmes should be prioritized and implemented in accordance with the Invasive Alien Species Strategy for the bioregion.
<p>Compatible Activities</p> <ul style="list-style-type: none"> ❖ Generally areas outside of the urban edge. Agricultural practices should continue, but the intention should be to ensure that these agricultural practices are not detrimental to the surrounding/adjacent CBAs. ❖ Any low impact development should not have any significant environmental impact on ecological processes or management programmes for the site and/or surrounding sites.

14.2 Other Ecological Support Areas

<p>Description</p> <p>OESA (Other Ecological Support Areas) <i>Transformed (E.g. Extensive Agriculture) sites and associated wetlands, with conservation importance. Important for management consolidation, connectivity and viability of biodiversity elements in CBA1, CBA 2 and protected sites. These sites can contain other natural areas (mostly degraded) located in an extensive or intensive agricultural matrix as the dominant land use.</i></p>
<p>Significance of the Habitat</p> <p>Local significance. These sites are required to make existing remnants ecologically viable and to reduce the edge/area ratio, making conservation actions more financially sustainable in the long-term. Also required to maintain large-scale ecosystem processes, climate change mitigation, animal movement corridors and other large-scale ecosystem processes (e.g. ground water recharge) required to ensure that ecosystem goods and services are still delivered.</p>
<p>Objective</p> <ul style="list-style-type: none"> ❖ Manage for sustainable development of current land use in the area. ❖ Secure appropriate land-use zoning or formal protected area status if appropriate and possible. ❖ Maintain or restore ecosystem functioning and manage for reduced level of impact on remaining natural systems. ❖ Enhance biodiversity, watershed and ground water protection through innovative agricultural practices. ❖ Restore ecological processes where these have become degraded or obstructed. ❖ Minimize fragmentation of remaining natural habitats and corridors.
<p>Action (1-5yrs)</p> <ul style="list-style-type: none"> ❖ These sites are high priority and low urgency. Interim measures to secure their long-term protection should be implemented e.g. conservation agreements. ❖ These sites need to be monitored for negative activities that are impacting on their provision of ecosystems goods and services and referred to the environmental compliance agencies (e.g. unsustainable farming practices). ❖ Management plans of surrounding CBAs should refer to these OESAs and ensure appropriate management interventions are included where required. ❖ Alien vegetation eradication programmes should be prioritized and implemented in accordance with the Invasive Alien Species Strategy for the bioregion.
<p>Compatible Activities</p> <ul style="list-style-type: none"> ❖ Generally areas outside of the urban edge. Agricultural practices should continue, but the intention should be to ensure that these agricultural practices are not detrimental to the surrounding/adjacent CBAs. ❖ Development should not have a significant environmental impact on existing intact ecological corridors and processes or management programmes for the site and/or surrounding sites.

15 Other Natural Vegetation

Description
Vegetation in good or poor condition that has not been selected as national biodiversity targets are met elsewhere in the BioNet.
Significance of the Habitat
Loss of CBAs might mean that other natural vegetation may become CBAs or ESAs in future, resulting in a less efficient and more land-hungry BioNet configuration.
Objective
❖ Sustainable management within general rural land-use principles.
Action (1-5yrs)
<ul style="list-style-type: none"> ❖ Negotiable. Low priority and low urgency. ❖ Invasive alien species control programmes should be prioritized and implemented in accordance with the IAP Strategy for the bioregion.
Compatible Activities
<ul style="list-style-type: none"> ❖ These areas may become important in the future as other areas in higher categories are lost. They may also become important if the national biodiversity targets are revised. ❖ Some higher impact activities and sustainable development may be considered. For critically endangered or endangered vegetation types (listed under Criterion D1) this would be subject to the normal EIA process. ❖ No further extension of intensive agriculture into these areas.

16 No Natural Habitat (Transformed)

Description
Unselected Transformed sites with little or no conservation value, including areas transformed by human activities, including urban and rural development, cultivated land and mines.
Significance of the Habitat
Little or no conservation value. These areas could contain degraded wetlands.
Objective
❖ Sustainable management applying accepted land-use principles as outlined in the district SDPs
Action (1-5yrs)
❖ In terms of biodiversity conservation, no action required.
Compatible Activities
❖ As per the District SDPs/EMFs.

Part E

ADDITIONAL MEASURES FOR EFFECTIVE MANAGEMENT OF BIODIVERSITY IN THE BIOREGION

The implementation measures outlined below relate to the various organisations with operational mandates in the city, including SANParks, CapeNature and the Cape West Coast and Kogelberg Biosphere Reserves as well as the CCT Municipality, as and where appropriate.

17 Protected Area Expansion

Many critically endangered ecosystems are found within the CCT boundaries and the National Protected Area Expansion Strategy (NPAES) emphasizes that all threatened ecosystems are important for protected area expansion. However the NPAES focus areas are large, intact and unfragmented areas suitable for creating large protected areas. One such area in Cape Town is also a provincial priority - the Dassenberg Coastal Catchment Corridor. It is also one of the most important climate change adaptation corridors in the Cape Floristic Region (Pence 2009). This corridor stretches from the Riverlands Provincial Nature Reserve, located just outside the City boundary, to the West Coast and encompasses large areas of the BioNet in the north of the city.

The City's Local Biodiversity Implementation Plan (LBIP), which is part of the Local Biodiversity Strategy and Action Plan (LBSAP) approved by Council in June 2009 and currently is being updated. This outlines the BioNet focus areas and priority implementation nodes.

These are:

- Expansion of the Table Mountain National Park to include land within the Cape Peninsula Protected Natural Environment;
- Core Flora Sites and Dassenberg Coastal Catchment Corridor sites on the West Coast towards the north of the city;
- False Bay Coastline, including Core Flora Sites and Kuils River Corridor
- Critically Endangered remnants (mainly renosterveld) in the Tygerberg district;

Strategic Objective 2 of the LBSAP is to: "Secure formal conservation status, manage, maintain and restore identified and existing terrestrial and wetland priority sites". Many of our conservation areas currently do not have statutory protection, owing to outdated legislation, and a process has begun to proclaim these sites under the National Environmental Management: Protected Areas Act (NEM:PAA; Act No. 57 of 2003).

The total land area being proclaimed is 11,500 ha, or 13.5%, of the BioNet. The City biodiversity target under IMEP (2009) was to secure at a minimum 60% of areas identified to meet biodiversity targets under formal management, including proclamation and stewardship agreements. This target was attained by the end of 2014. The new target is to secure 65% of the BioNet by 2019.

17.1 Public Land

It is important to ensure that all municipal, public and state-owned land aligned to the LBIP priority implementation areas achieves acceptable conservation protection and the necessary mechanisms and resources in place to ensure adequate management.

These sites are the non-conservation areas of high CBA status. Once identified, their biodiversity credentials are reviewed through the statutory body (CapeNature Protected Area Expansion Committee), and a request is made to the relevant government department for conservation protection of the specific site. If all parties are in agreement, the site is proclaimed as a Contract Nature Reserve under NEM: PAA. An example is various sections of the False Bay coastal corridor between the False Bay and Wolfgat Nature Reserves.

In addition, biodiversity areas managed by other City line functions (e.g. City Parks, Bulk Water) that are reviewed, but do not warrant Contract Nature Reserve status, become Biodiversity Agreement sites, and the Biodiversity Management Branch enters into a Memorandum of Agreement with the specific line department to ensure that the biodiversity on site is managed according to an agreed biodiversity management plan.

17.2 Private Land

Although 63.4% of the BioNet is public land versus 36.6% in private ownership, a much larger proportion of public land has been proclaimed for conservation compared to private land. Of the remaining non-conserved BioNet land 45.7% is public versus 54.3% in private ownership. Therefore in order to achieve biodiversity targets through growing the conservation estate, it will be essential to consider mechanisms to secure private land.

Stewardship is one of the promising implementation tools that may appeal to landowners, especially outside of the urban edge, as it offers incentives such as rates rebates and biodiversity management advice and assistance. For landowners inside the urban edge, where development rights may exist, there is the possibility of land swaps, limited development rights or biodiversity offsets in combination with enhanced development rights as part of the conditions of approval in an Environmental Impact Assessment or Land Use Planning Ordinance process.

17.2.1 Stewardship Programme

The Stewardship Programme is a voluntary conservation initiative that focuses on biodiversity conservation on private land identified as a priority in the LBIP. Once a property has been identified, the landowner is approached and a relationship is developed.

Landowners are informed of the ecological value and global significance of their property as well as potential fiscal and other conservation incentives. A landowner then either proceeds with this process by going into an agreement with a conservation organization or the property is identified as a site for land acquisition.

Stewardship currently is being implemented in the city by the SANParks Land Consolidation Unit for areas in the Cape Peninsula CPPNE, and CCT-wide by CapeNature and the City Biodiversity

Management Branch. Currently, several landowners in the CCT are in process of signing perpetuity conservation contracts.

18 Biodiversity Offsets

Conservation areas may be secured reactively as part of the Environmental Authorization process through a biodiversity offset (according to the 2007 Provincial Draft Guidelines on Biodiversity Offsets and 2011 Provincial Information Document on Biodiversity Offsets).

Where a significant negative impact to biodiversity cannot be minimized or mitigated, desirable developments may be approved based either on an on-site offset (which would include a stewardship agreement and management mechanism for the conservation area set aside) or an off-site offset to conserve biodiversity at an alternative site. In many cases pragmatic decision-making can result in greater gains for conservation than the “no development” option.

19 Priority Areas for Rehabilitation and Restoration

Most of the CCT biodiversity remnants and wetlands contain degraded areas therefore restoration is a priority management activity once these areas have been secured in perpetuity. Invasive alien vegetation control is an integral part of restoration and in many cases careful invasive alien control, followed by a prescribed burn to stimulate indigenous plant recruitment, with alien follow-up control, is sufficient to restore an area.

In other cases, indigenous seed banks are depleted and plant re-introduction is also required. Planning therefore needs to be done to prioritize areas for restoration. In 2009-10 conservation partners across the CCT formed a working group to devise a protocol (Holmes, et al. 2010, unpublished report) for prioritizing restoration areas and collaboration.

Key informants are the ecosystem threat status of the vegetation and the importance of restoration for ecological processes. The priority ecosystem for restoration in the CCT is Cape Flats Sand Fynbos, which is Critically Endangered with half of its remaining habitat in a very poor ecological state. Some restoration activities already are in progress at the following sites:

1. Diep River Fynbos Corridor: Cape Flats Sand Fynbos
2. TMNP: Tokai Park section: Cape Flats Sand Fynbos and Peninsula Granite Fynbos
3. Bracken Nature Reserve: Cape Flats Sand Fynbos
4. Blaauwberg Nature Reserve: Cape Flats Sand Fynbos
5. Harmony Flats Nature Reserve & corridor: Lourensford Alluvium Fynbos
6. Morkels Cottages: Lourensford Alluvium Fynbos
7. Table Bay Nature Reserve (Rietvlei Section): Cape Lowland Freshwater Wetlands
8. Bothasig Nature Reserve: Cape Flats Sand Fynbos
9. Skilpadsvlei: Cape Lowland Freshwater Wetlands
10. False Bay Nature Reserve: Cape Flats Dune Strandveld
11. Helderberg Nature Reserve: Cape Winelands Shale Fynbos
12. Tygerberg Nature Reserve: Swartland Shale Renosterveld.

Future restoration activities will focus on priorities in reserves and other secure CBA sites on the BioNet.

20 Coastal Protection Zone and Coastal Flood Risk Areas

In terms of the Integrated Coastal Management Act (NEM: ICM, 2008) the City of Cape Town will develop and implement a Coastal Protection Zone (CPZ) and identify Coastal Flood Risk Areas (CFRAs).

The CPZ and the CFRAs for the City are strategic interventions aimed at promoting the long-term sustainability of coastal development within the CCT. These interventions are designed to protect both natural and human assets along the coast through establishing a 'buffer' zone that allows and encourages dynamic coastal processes to take place.

The term 'natural assets' is used for natural coastal ecosystems, as the coastal zone yields valuable ecosystem services, as do the other natural ecosystems across the CCT. Through the protection of these services within the framework of a shared and common resource, the potential to harness economic benefits and improve the livelihoods of coastal communities is increased.

These mechanisms are geared towards improving the ability of coastal communities to gain access to, and to benefit from, such resources.

The main aim of the CPZ is:

- (a) To promote access to the coast;
- (b) To minimise the impacts of risk associated with sea level rise and storm surge events;
- (c) To promote the conservation of biodiversity, and
- (d) To allow and to encourage coastal dynamic process to take place.

21 Invasive Species Management (ISM)

Invasive alien species in the CCT are managed according to the Framework for a Strategy and Action Plan for the Management of Invasive Alien Species in the CCT (2008). This strategy was implemented in September 2008 and was adopted by Council on the 25 November 2008.

The strategy is concerned with terrestrial, freshwater and marine invasive species. It provides for a collaborative strategy among all the relevant stakeholders and partners in the CCT to combat and deal with IAS in an integrated, coordinated manner. There is close collaboration among Table Mountain National Park, CapeNature and City Biodiversity Management Branch staff.

21.1 Invasive Alien Plants

The 2009 assessment indicated the occurrence of 16,854 hectares of invasive alien vegetation within City conservation areas, excluding Critical Biodiversity Areas (CBAs) that are not protected or managed. The 2015/6 goals for alien control are the following:

- a) 40% of the surface area of the Protected Areas will be in maintenance (defined as cleared with three follow-up operations);
- b) 60% of the surface area of City-owned land and Stewardship sites, other than Protected Areas and the BioNet will be in maintenance;
- c) 5% of City owned land adjacent to protected areas and the BioNet will be in maintenance;
- d) Aquatic invasive plant species will be reduced to 60% of the 2009 coverage in the city's water bodies;
- e) Target Invasive Species Programme will be expanded to 15 species, including emerging species as well as wide spread problem species. The programme will actively manage these species to reduce the impact of these species across the City

Invasive alien plants include annual grasses, and woody and herbaceous perennial species which are already established or emerging as invasive species. In most cases complete eradication is no longer possible therefore the species must be controlled through laborious clearing efforts. The threats represented by these species in terms of biodiversity loss, fire hazard, water availability and shelter for criminal acts all constitute major concerns to the City administration.

Systematic planning and prioritization of areas must precede control operations to ensure the highest impact and long-term success. Management interventions include a range of actions such as prevention, early detection and rapid response, control, eradication and containment, depending on the nature of the site and the management objectives thereof.

Areas must be cleared systematically and not in an *ad hoc* fashion and this requires synchronization of clearing operations amongst neighbouring landowners. Forward planning and prioritization ensures optimal utilization of resources through proactive, long-term clearance of areas. Before any clearance can be effective, an overall assessment of the current status should be conducted, including data capture, mapping and regular updates of the information.

Subsequently a general prioritisation must be achieved to rank areas for clearance based on the major issues and constraints facing the City. The on-going work plan will stem from this prioritisation, which includes appropriate weightings of a range of factors such as biodiversity priority, ecosystem protection level, fire, water, and safety amongst others.

21.2 Invasive Alien Animals

The negative impacts of invasive alien animal species on CCT's biodiversity should not be underestimated. Species-specific control programmes are to be developed and implemented. Activities such as the illegal pet trade and the introduction of invasive alien animals will be addressed in the species-specific programmes. Early warning and detection systems are essential to prevent the arrival and establishment of new IAS.

In terms of the IMEP biodiversity targets, it is planned to eradicate populations of three invasive alien animal species by 2015/6:

- ❖ Indian House Crow – to under 300 birds,
- ❖ Guttural Toad - measures implemented to prevent further expansion of the current distribution
- ❖ Mallard Duck – removed from three sites across the City

- ❖ Invasive wasps – wasp control will be established and capacity built to conduct surveys and respond to call outs

22 Protected Area Management and Biodiversity Management Plans

22.1 Integrated Reserve Management Plans

It is fundamental that all land acquired for conservation is managed appropriately. To ensure that all biodiversity targets and objectives are reached, management activities should be guided by strategic, site-specific Integrated Reserve Management Plans (IRMPs). These management plans recently have been completed for all City-run reserves.

Management activities also need to be monitored and evaluated to review and improve management activities. This is done through the Management Effectiveness Tracking Tool (METT-SA), a rapid, site-level assessment tool adapted from the World Bank and World-Wide Fund for Nature's system, supplemented by personal performance evaluations. Reserves also require subsidiary plans, e.g. for fire management, in order to guide Annual Plans of Operation.

For coastal ecosystems falling outside of managed conservation areas, the City has recognized that coastal management plans are required to strategically manage coastal processes and biodiversity and this is being implemented in accordance with the requirements of the Integrated Coastal Management Act (Act 24 of 2008). This is being achieved through the development of various coastal planning and regulatory mechanisms.

22.1.1 Management Effectiveness Tracking Tool (METT) & Protected Area review

The Biodiversity Management Branch has implemented the internationally accepted METT on all the reserves and initiated a Protected Areas Review which assesses the management on the reserves each year. Results from these processes feed into CAPE Monitoring and Evaluation systems.

22.2 Threatened Ecosystem Management Plans

Nearly all the CCT's ecosystems are nationally threatened; exceptions are two small vegetation types: Southern Afrotemperate Forest (well protected in TMNP) and Western Coastal Shale Band vegetation (well protected in Kogelberg Biosphere Reserve, including the City's Steenbras Nature Reserve).

Whereas it is not necessary to have specific management plans for each vegetation type, certain broad vegetation groupings require different management interventions and generic ecological management plans for these groups, e.g. Sand Fynbos, Sandstone Fynbos, strandveld, renosterveld etc, would better inform operational management on reserves and potentially improve ecological management. These should be compiled as a useful annexure to the IRMPs.

22.3 Threatened Species Management Plans

The city encompasses several local centres of endemism and has a high concentration of rare and endangered species. Currently 13 plant species are extinct or extinct in the wild, 318 are Red Listed as threatened and 27 animals are Red Listed as threatened (Holmes et al. 2008, Raimondo et al. 2009).

There are too many threatened species to monitor and an urgent requirement is to prioritize the most important species and agree on a subset to monitor in order to assess management impacts and make changes to management if required. The Table Mountain National Park recently undertook such a prioritization exercise and the City Biodiversity Management Branch plans to run a similar process. It will be important to collaborate with other initiatives, such as Friends Groups and Custodians of Rare and Endangered Wildflowers, in order to tackle the challenging monitoring requirement.

Two animal species have received particular attention in relation to management: Chacma Baboon and Western Leopard Toad.

Although not a threatened species, Baboons live in a number of troops in the national park and problems arise on the Cape Peninsula when they leave the protected area and come into conflict with residents and visitors. Since 1998 a Baboon Management Team has been in operation, which comprises the relevant authorities and stakeholder groups. The team has compiled a draft management plan "*A Cape Peninsula Baboon Management Plan*" which addresses the conflicts and currently is being finalized.

The Western Leopard Toad is a charismatic and endangered species with a distribution confined to the southern suburbs of Cape Town extending eastwards to Hermanus. Much of its distribution overlaps with suburban development and as its survival depends upon migration from gardens to local wetlands for breeding during winter, and emergence of toadlets from wetlands in early summer, potential conflicts arise with activities of other line functions, such as mowing of grass verges and clearing of storm water drains and waterways. A committee has been convened comprising the relevant authorities and stakeholders, known as the "*Western Leopard Toad Conservation Committee*". This committee has successfully arranged Memoranda of Agreement, with City Parks, Catchment, Rivers and Stormwater Department and the Invasive Species Unit, to prevent damaging clearance activities during peak migration times. A Western Leopard Toad Management Plan currently is being drafted by the committee.

23 Opportunities for sustainable development and livelihoods

Several studies emphasize the importance of the natural environment in underpinning livelihoods in the CCT, both directly through job creation and indirectly through various ecosystem services. A recent study of the economic value of the City's natural assets (de Wit et al. 2009) indicates that it is worth in the order of R2-6 billion annually. Well-managed conservation areas can add further value to this figure in various ways, including job creation and access to safe open space areas for recreation and tourism.

23.1 Tourism

Cape Town is a leading destination for local and international tourists and many people are attracted to the city by its outstanding natural beauty and biodiversity. Total tourism values associated with natural assets in the city are estimated to lie between R965 million and R2.95 billion per annum.

Conservation areas are geared to receive visitors, from the Table Mountain National Park to the local nature reserves. Most reserves have designated areas for high, medium and low impact activities and visitors are guided to these areas as required in order to minimize negative impacts on biodiversity. Most CCT-run reserves recently have produced a Conservation Development Framework to capture the needs and impacts of various types of infrastructure for staff and user groups and have aligned these to the sensitivity zones in the reserve.

There is huge potential to increase the tourism value of some conservation areas and other CBA sites across the city, especially in low-income suburbs where currently these areas may be seen by the local communities as unsafe and undesirable. Unlocking the potential of such sites would provide opportunities for local businesses to benefit from reserve-based ecotourism ventures.

23.2 Expanded Public Works Programmes

In addition to permanent employment opportunities on the reserves, the Green Jobs Unit (GJU) and in the environmental law enforcement sector, resource management in general has the potential to create many temporary job opportunities. Through the National Expanded Public Works Programmes (EPWP) many employment opportunities are created in conservation areas, other natural remnants and the GJU (through the Kadar Asmal Programme) across the city and at the same time receive important skills development training which assists them in finding another job should they exit from the programme.

Several EPWP programmes are currently operating across the city: the Kader Asmal Programme (a cross-cutting, interdepartmental programme), Working for Water, Working for Wetlands, Working on Fire and CoastCare. In the 2014-15 financial year, City-run reserves alone created 127,000 person days (553 FTE) of temporary employment through EPWP programmes and other contract work. In the current financial year, the City Biodiversity Management Branch received a further injection of funding (R5M) from the City via the Kader Asmal memorial project to coordinate CCT-wide integrated catchment management. The bulk of this funding will go towards contractor teams to undertake invasive alien vegetation clearing. Through the Kader Asmal Programme aquatic weeds, terrestrial plants, invasive animals restoration, revegetation and environmental infrastructure initiatives are undertaken across the City. The success of the Programme and its integrated invasive species control programme have enabled the City to leverage partnership funding through EPWP (R20 million), SANBI (R3 million) and NRMP (R7 million) for the GJU over the past financial year.

Furthermore, the Natural Resource Management Programmes and Working for Wetlands have entered into 3-year implementing agreements with the City. The City is adding an additional R12 million in total for the GJU.

23.3 Natural Resource Harvesting

The potential for sustainable and equitable natural resource harvesting in conservation areas and CBA remnants is limited owing to the highly threatened nature of biodiversity in the CCT and the very large and rapidly increasing human population (currently estimated at 4.0 million). Even the managed conservation areas are experiencing increasing pressure on biodiversity owing to illegal harvesting of many indigenous species.

At present therefore, we can only support resource harvesting of species that currently can have permits issued (e.g. various fish and shellfish species, Arum Lilies and Sour Figs). For all other species the City Biodiversity Management Branch currently has a policy of no harvesting from conservation areas. However, we also have a policy to support research on any useful, common and widespread species (e.g. reeds) to ascertain sustainable levels of harvesting. Provided harvesting can be done sustainably and the impacts of harvesting monitored, then the issuing of a harvesting permit could be considered in future for certain species.

24 Communication, Education and Public Awareness (CEPA)

Activities related to CEPA are key interventions to maintain support for biodiversity conservation initiatives and to communicate the importance of conserving the natural environment in order to underpin sustainable development. All conservation organizations operating in the CCT contribute to CEPA.

The City recently completed a Biodiversity Communications Strategy and Action Plan to guide activities and has 15 nature-based education programmes running at City nature reserves. Additional activities are run at schools and in total about 35,000 learners from 500 schools are exposed to City environmental education programmes.

Part F

Monitoring and Review

The City of Cape Town's Environmental Resource Management Department is responsible for updating the Cape Town Bioregional Plan.

The updating of the plan will be carried out in consultation with the Provincial Department of Environmental Affairs, SANParks (Table Mountain National Park), CapeNature, SANBI, other City Departments and relevant stakeholders.

25 Monitoring

25.1 Monitoring Instruments

Effective monitoring is reliant on accurate and up-to-date information. The City and bioregion have several programmes, initiatives and reporting protocols that are on-going which can be used as sources for monitoring information and data for the Bioregional Plan.

These include:

- ❖ Previous and future fine-scale systematic biodiversity planning products
- ❖ CTSDF Goals and Objectives
- ❖ City Invasive Alien Control Strategy
- ❖ Biodiversity Management Plans
- ❖ Protected Area Management Plans
- ❖ Management Effectiveness Tracking Tool (METT)
- ❖ CCT State of Environment reports
- ❖ Stewardship Agreements
- ❖ Western Cape Protected Area Strategy
- ❖ CCT Protected Area Expansion Strategy
- ❖ TMNP Protected Area Strategy
- ❖ National Protected Area register

25.2 Monitoring Indicators

These indicators are provided as a baseline for the first review process that will follow the adoption of the plan as City policy. The first two indicators are the most important. The indicators will be refined during the initial review process based on available data.

- ❖ Percentage (and hectares) of CBAs and ESAs (i.e. BioNet) that are formally protected
- ❖ Percentage (and hectares) of CBAs and ESAs (i.e. BioNet) that have been lost to other land uses
- ❖ Area of natural vegetation restored or rehabilitated (hectares/ecosystem threat status or CBA-ESA category)
- ❖ Management Effectiveness on Protected Areas (based on METT results).
- ❖ Stewardship Agreements (number of signed agreements with approved management plans)

26 Revision of the Bioregional Plan

The Cape Town Bioregional Plan will be reviewed and updated every five years. The review and update process and timeline will be coordinated with the updating of the City's spatial planning documents (SDF, EMFs & DSDPs), to ensure a seamless integration of the documents.

Owing to the rapid pace of development in the CCT it is necessary to update the BioNet remnant layer on an ongoing basis. This is also necessitated by the requirement to report annually on progress on securing the BioNet and reaching the City biodiversity targets that have been set.

Major revisions of the fine-scale biodiversity plan have been done at intervals of 2-4 years during the past decade. If the pace of development in Cape Town continues at current levels it may be necessary to re-run the analysis within the next five years.

PART G

27 GIS Files

The GIS data layers used in the compilation of the maps, including the City's BioNet spatial layer are available on request from enviro.gis@capetown.gov.za.

For reference, the 3 primary data layers used are listed in the table below. Requests for this data are subject to the CCT's Terms and Conditions for the Supply of Digital Data.

The primary spatial layer, the BioNet layer, will be made available on the City's intranet, spatial viewers and publicly through SANBI's Biodiversity Advisor website at the following links:

<http://biodiversityadvisor.sanbi.org/>
<http://bgis.sanbi.org>

Table 4: Cape Town Bioregional Plan primary data layers

No:	Shapefile
1	Biodiversity Network
2	Wetlands
3	Rivers

28 References

Benn, G. 2009. City of Cape Town Bionet: Analysis Manual. City of Cape Town Internal Report.

Brown, C.B. Magoba, R. (editors). 2009. Rivers and Wetlands of Cape Town: Caring for our rich aquatic heritage. Water Research Commission. Report No. TT376/08.

Cape Town Spatial Development Framework. 2011. City of Cape Town Internal Report.

CCT, Ecological and Environmental Report. 2004. Prepared by the TMG Aquifer Alliance as part of the Preliminary Phase of the Table Mountain Group Aquifer Feasibility Study and Pilot Project.

CCT, Floodplain and River Corridor Management Policy 2009. Balancing flood risk, ecological and socio-economic considerations in developments near watercourses and wetlands. Catchment, Stormwater and River Management Branch.

CCT, Framework for a Strategy and Action Plan for the Management of Invasive Alien Species. 2008. www.capetown.gov.za/environment follow links to "publications" then "strategies and policies".

CCT, 2003. Integrated Metropolitan Environmental Policy (IMEP). Internal Report http://www.capetown.gov.za/en/EnvironmentalResourceManagement/publications/Documents/IMEP_Eng%20v2.pdf.

CCT, 2004. Ecological and Environmental Report. Prepared by the TMG Aquifer Alliance as part of the Preliminary Phase of the Table Mountain Group Aquifer Feasibility Study and Pilot Project.

CCT, Local Action for Biodiversity (LAB). 2011. City of Cape Town Biodiversity and Climate Change Assessment Report. Step 1 of LAB Pioneer Biodiversity and Climate Change Project. www.capetown.gov.za/environment.

CCT, Biodiversity Management Branch Strategic Plan. 2009. Local Biodiversity Strategy and Action Plan 2009-2019; www.capetown.gov.za/environment follow links to "publications" then "strategies and policies".

De Wit, et al. 2010. Investing in Natural Assets: A business case for the environment in the City of Cape Town. Unpublished report for City of Cape Town.

www.capetown.gov.za/environment

Driver, A et al. 2005. National Spatial Biodiversity Assessment 2005: Priorities for biodiversity conservation in South Africa. *Strelitzia* 17. SANBI, Pretoria.

Ewart-Smith, J., Ollis, D., Day, J. & Malan, H. 2006. National Wetland Inventory: Development of a Wetland Classification System for South Africa. Report prepared for the Water Research Commission and South African National Biodiversity Institute.

Holmes P. M. et al. 2010. Protocol for Collaboration in Ecological Restoration. Unpublished report, City of Cape Town.

Holmes, P. M., Dorse C., Wood, J. 2008. City of Cape Town biodiversity report. Local Action for Biodiversity. www.iclei.org/lab

Holmes, P. M., Rebelo, A.G., Dorse C., Wood, J. 2012. Can Cape Town's unique biodiversity be saved? Balancing conservation imperatives and development needs. *Ecology and Society*. 17(2): 28

Holmes P. M. & Stipinovich A. 2009. City of Cape Town's Biodiversity Network: C-PLAN & MARXAN ANALYSIS: 2009 METHODS & RESULTS. (Available for download from ERMD website)

IMEP. 2009. City of Cape Town Environmental Agenda (2009-2014). Unpublished report City of Cape Town; www.capetown.gov.za/environment follow links to "publications" then "strategies and policies".

Laros, M. & Associates. 2007. The identification and prioritisation of a biodiversity network for the City of Cape Town. CCT Internal Report.

Maze, K. Rebelo, A.G. 1999. Core flora conservation areas on the Cape Flats. FCC Report 99/1. Botanical Society of South Africa, Claremont.

Midgley, J.J, Scott, D.F, Harris. C. 2001. How do we know how much groundwater is stored in the southwestern Cape Mountains. *SA Journal of Science*. 97. July/August 2001.

Mucina, I., Rutherford, M.C., & Powrie, L.W. (Editors.). 2005. *Vegetation map of South Africa, Lesotho, and Swaziland 1:1 000 000 scale sheet maps*. South African National Biodiversity Institute, Pretoria. ISBN 1-919976-22-1.

Nel, J.L., Driver, A., Strydom, W.F., Maherry, A., Petersen, C., Hill, L., Roux, D. J., Nienaber, S., van Deventer, H., Swartz, E. and Smith-Adao, L.B. 2011. ATLAS of FRESHWATER ECOSYSTEM PRIORITY AREAS in South Africa: Maps to support sustainable development of water resources Report to the Water Research Commission. WRC Report No. TT 500/11

Pence, G.Q.K., 2009. Climate Adaptation Scenarios for the Cape Floristic Region: Technical Report. Unpublished Report, Table Mountain Fund, World Wildlife Fund-South Africa, Cape Town.

Pence G. 2011. Incorporating Climate Change Adaptation Strategies into the Updating of the City of Cape Town's Biodiversity Network Analysis. Unpublished Report. City of Cape Town.

Possingham, H. P., I. R. Ball and S. Andelman (2000) Mathematical methods for identifying representative reserve networks. In: S. Ferson and M. Burgman (eds) Quantitative methods for conservation biology. Springer-Verlag, New York, pp. 291-305.

Pressey, R.L., Watts, M.E., Barrett, T.W. and Ridges, M.J. (2008). The C-Plan conservation planning system: origins, applications, and possible futures. In: Spatial Conservation Prioritization. Eds. A. Moilanen, H.P. Possingham and K.A. Wilson. Oxford University Press, Oxford (in press)

Raimondo, D., von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A., Manyama, P.A. (editors). 2009. Red List of South African Plants. *Strelitzia* 25, South African National Biodiversity Institute, Pretoria.

Rebello, A.G. & Low, A.B. 2007. City of Cape Town Vegetation Map. Vegetation map compiled as a synthesis of the National Vegetation Map (Mucina, Rutherford & Powrie 2005) and a vegetation study by Coastec (2000) to inform mining operations of sensitive environments within the then Cape Metropolitan Area.

Rebello, A. G., Boucher, C., Helme, N., Mucina, L., Rutherford, M. C., et al. 2006. Fynbos Biome. In: Mucina L. and Rutherford M. C. (editors) The Vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19, SANBI, Pretoria.

Rebello, A. G., Holmes, P. M., Dorse, C., and Wood, J. 2011. Impacts of urbanization in a biodiversity hotspot: conservation challenges in Metropolitan Cape Town. *South African Journal of Botany* 77:20-35.

Rouget, M., Reyers, B., Jonas, Z., Desmet, P., Driver, A., Maze, K., Egoh, B., Cowling, R.M., 2004. South African National Spatial Biodiversity Assessment. Technical Report Volume 1: Terrestrial Component. SANBI, Pretoria.

Snaddon, K. Day, L. Nel, J. Maherry, A. 2009. Prioritisation of City Wetlands. City of Cape Town report.

Snaddon, K. Turner R., Job N., Ollis, D. and Jones, L. 2009. City Wetlands Map: Phase 5 – Ground-truthing and map update. Unpublished report, City of Cape Town.

South Africa's National Biodiversity Framework. 2009. GN No. 813. 3 August 2009. Dept. Environmental Affairs and Tourism.

State of Rivers Report. 2005. Greater Cape Town's Rivers. River Health Programme 2005. Department of Water Affairs and Forestry, Pretoria ISBN No: 0-620-34026-6.

Western Cape Provincial Spatial Development Framework. 2009. Statutory report: Directives and Guidelines. Dept of Environmental Affairs and Development Planning.

29 Annexures:

Annexure 1: CCT Bioregional Plan Process and Consultation Report.

Annexure 2: The Biodiversity Network for Cape Town. C-Plan and Marxan Analysis: 2011
Methods and Results.

Annexure 3: Report to Executive Mayor, No LLSP1698, July 9th 2015