INTEGRATED

RESERVE MANAGEMENT PLAN

TYGERBERG NATURE RESERVE

June 2011

CITY OF CAPE TOWN NATURE CONSERVATION | ULONDOLOZO LWENDALO | NATUURBEWARING

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AUTHORIZATION PAGE

This Integrated Management Plan for the Tygerberg Nature Reserve was drafted by the Area Manager and recommended by the Reserve Planning Team, a multi-disciplinary team consisting of:

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INTEGRATED RESERVE MANAGEMENT PLAN

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City of Cape Town

Tygerberg Nature Reserve

June 2011

ISBN NUMBER

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LIST OF ABBREVIATIONS USED

APO	**annual plan of operations**
C.A.P.E	**Cape Action for People and the Environment**
CapeNature	**Western Cape provincial conservation authority**
CDF	**Conservation Development Framework**
CFR	**Cape Floristic Region**
CREW	**Custodians for Rare and Endangered Wildflowers**
EIA	**environmental impact assessment**
FoTH	**Friends of the Tygerberg Hills**
GIS	**geographic information system**
IDP	**Integrated Development Plan**
IUCN	**International Union for Conservation of Nature**
IMEP	**Integrated Metropolitan Environmental Policy**
IRMP	**Integrated Reserve Management Plan**
LBSAP	**Local Biodiversity Strategy and Action Plan**
METT-SA	**Management Effectiveness Tracking Tool South Africa**
MOU	**memorandum of understanding**
NEMA	**National Environmental Management Act**
NEM:BA	**National Environmental Management Biodiversity Act**
NGO	**non-govermental organisation**
RPC	**Reserve Planning Committee**
SAPS	**South African Police Service**
SANBI	**South African National Biodiversity Institute**
SANDF	**South African National Defence Force**
SANParks	**South African National Parks**
SDF	**spatial development framework**
SWOT	**strengths, weaknesses, opportunities and threats**
TAUC	**Tygerberg Antennae User Committee**
TOR	**terms of reference**
WPSP	**Workplace Skills Plan**

PART 1

DESCRIPTION

1. INTRODUCTION

Tygerberg Nature Reserve lies in the northern suburbs of Cape Town. Proclaimed as a local-authority nature reserve in 1973, it supports one of the last remnants of the critically endangered Swartland Shale Renosterveld vegetation type.

The reserve covers 309 ha and boasts 562 plant species, of which 23 are Red Data threatened species, eight are endemic to Cape Town, and three are endemic to Tygerberg itself. The diversity of species found here is vast, with some 24 different mammal species, 137 bird species, 22 reptile and seven frog species, as well as numerous different butterfly species.

The eastern slope of Tygerberg Nature Reserve consists of old ploughed fields that are in the process of being restored, while the western slope comprises high-conduction Swartland Shale Renosterveld.

The view from the top of the hill is magnificent and gives visitors a 360° view of Cape Town, but also emphasises just how meagre the patches of natural vegetation are amid the urban sprawl.

The strategic management planning process (which resulted in the development of an Integrated Reserve Management Plan, or IRMP) for Tygerberg Nature Reserve began with the definition of the vision followed by the purpose for the reserve. This purpose is then supported by desired states for the reserve. The reserve objectives contribute to realising the purpose and desired states. For each desired state, a number of management objectives are identified. These management objectives are then implemented through the identification of outputs. Objectives for each desired state are prioritised for the five-year time horizon of the plan. Time frames, deliverables, performance indicators and targets are then allocated to each objective, or a group of linked outputs contributing to the desired state.

1.1 Aim of the Integrated Reserve Management Plan

The aim of the IRMP is to ensure that Tygerberg Nature Reserve has clearly defined objectives and activities to direct the protection and sustainable use of its natural, scenic and heritage resources over a five-year period. The IRMP thus provides the medium-term operational framework for the prioritised allocation of resources and capacity in the management, use and development of the reserve. The IRMP intends to add value and continuity by clearly stating management objectives, scheduling action, and providing management guidelines.

The planning process for Tygerberg Nature Reserve takes place against the backdrop of (i) the City of Cape Town's Integrated Development Plan (IDP) (Anon 2010); (ii) the City of Cape Town's Integrated Metropolitan Environmental Policy (IMEP) (Anon 2003[1]); (iii) the biodiversity strategy (Anon 2003[2]) and Local Biodiversity Strategy and Action Plan (LBSAP) (Anon 2009[1]), and (iv) the bioregion (Cape Action for People and the Environment, or C.A.P.E). The major elements of the IRMP are this document (overall strategy, vision and context); the detailed subsidiary plans (as required), and an annual plan of operations (APO). The IRMP for Tygerberg Nature Reserve is supported by a State of Biodiversity report (Holmes *et al.* 2008), operational guidelines, and a monitoring and evaluation framework to ensure ongoing implementation and review of protected-area management activities (figure 1).

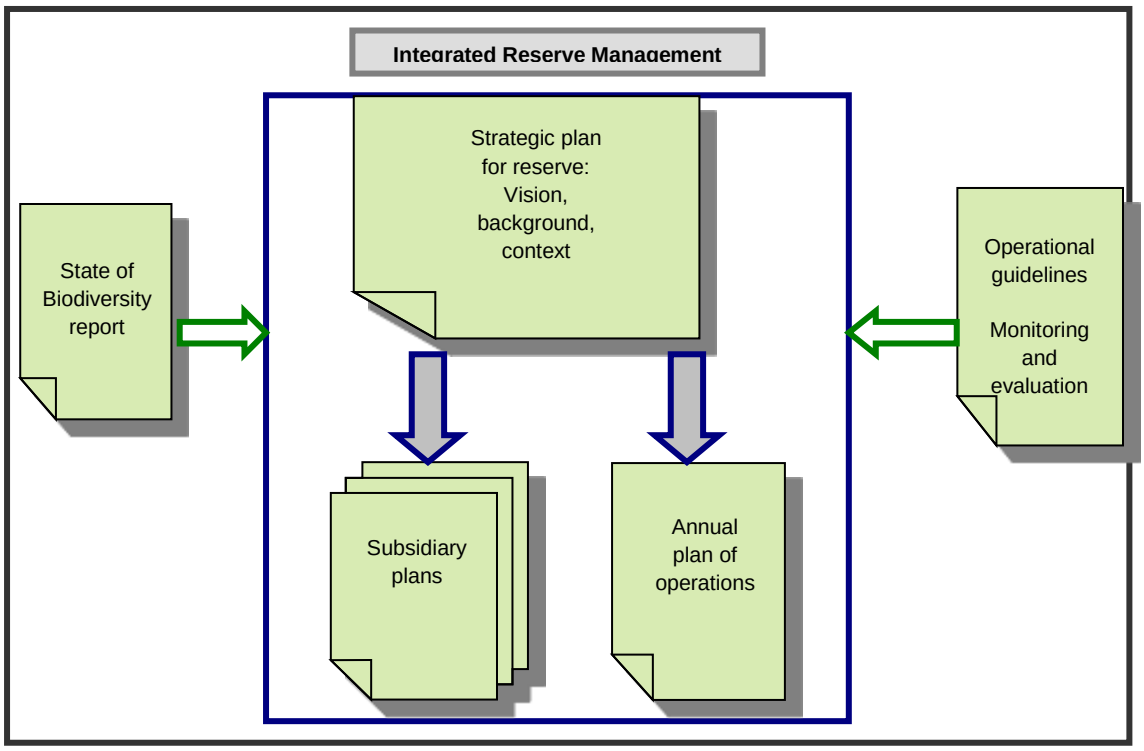


Figure 1: Elements of the IRMP

The IRMP for Tygerberg Nature Reserve forms part of a tiered series of policies, legislation and related planning documents at the sector, institutional, agency and local levels (see figure 2).

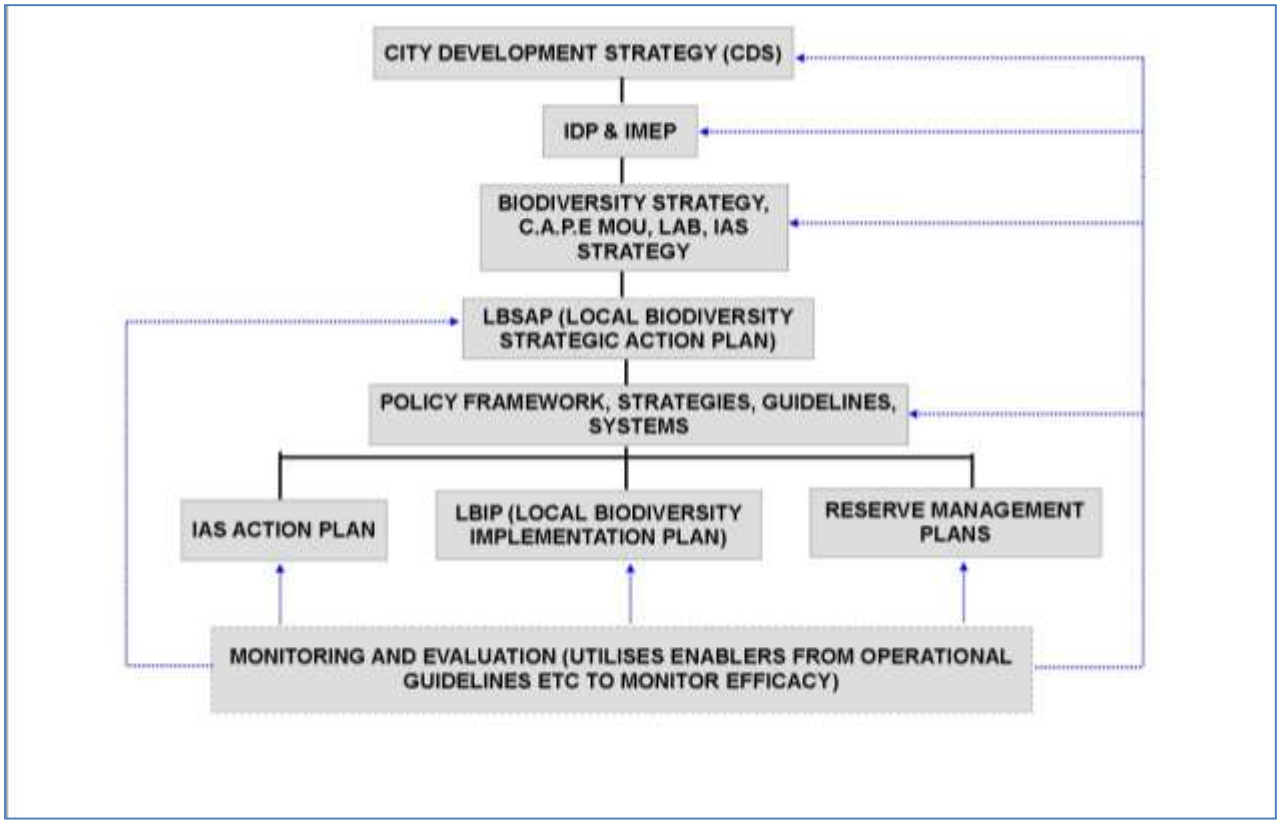


Figure 2: Legal and planning framework for the IRMP

Where possible, emphasis has been placed on the following:

- Assigning responsibility for management interventions
- Scheduling said management interventions
- Quantifying management costs

This approach is specifically intended to create a mechanism whereby management intervention can be monitored and audited on an annual basis. In context, this IRMP is a dynamic document, and the detailed subsidiary plans should be updated on an annual basis or as soon as new information comes to light that may better inform decisions on responsible land management. The IRMP should be updated every five years.

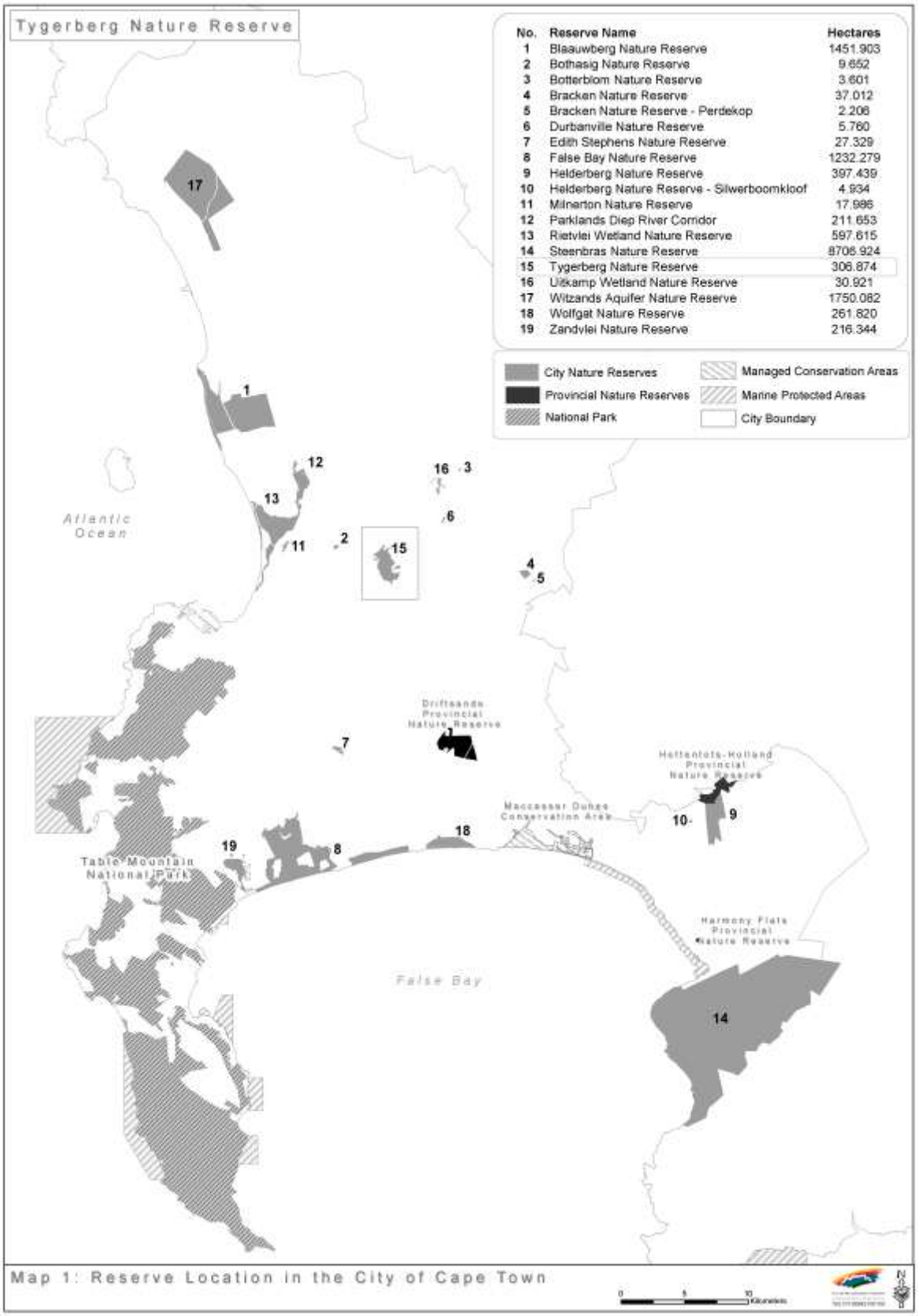
The drafting of this IRMP been guided by a small interdisciplinary Reserve Planning Committee (RPC) comprising the branch manager, the regional manager, the area manager, various specialists, and other interested and affected persons. Repeated drafts of the IRMP were presented to, and discussed by, the RPC before broader circulation for public participation.

Pre-engagement workshops were held with community partners from March to May 2010. This afforded key community partners an opportunity to provide their input at an early stage.

Where practical, the ideas and outputs from the workshops have been incorporated into the IRMP.

1.2 Location and extent

Tygerberg Nature Reserve, some 309 ha in extent, is situated between 33º52'15.63"S and 18º35'47.79"E in Cape Town. It lies between the suburbs of Bellville and Plattekloof on the Tygerberg Hills (see map 1 and 2). The reserve is bounded by the N1 national road to the south, high-income residential developments to the west and east, while the northern boundary currently remains undeveloped. Baronetcy Developers own the western slope abutting the reserve, a portion of the remainder of Farm 1511. North of this property, the remaining western slope of the Tygerberg (De Grendel farm) is owned by the De Villiers Graaff Trust. Pieter Ebersohn (Kanonberg) owns the property abutting the reserve on the eastern slope. Various other landowners are located along the hill to the north.


Tygerberg Nature Reserve
No. Reserve Name Hectares
1 Blaauwberg Nature Reserve 1451.903
2 Bothasig Nature Reserve 9.652
3 Botterblom Nature Reserve 3.601
4 Bracken Nature Reserve 37.012
5 Bracken Nature Reserve - Perdekop 2.206
6 Durbanville Nature Reserve 5.760
7 Edith Stephens Nature Reserve 27.329
8 False Bay Nature Reserve 1232.279
9 Helderberg Nature Reserve 397.439
10 Helderberg Nature Reserve - Silwerboomkloof 4.934
11 Milnerton Nature Reserve 17.986
12 Parklands Diep River Corridor 211.653
13 Rietvlei Wetland Nature Reserve 597.615
14 Steenbras Nature Reserve 8706.924
15 Tygerberg Nature Reserve 306.874
16 Uitkamp Wetland Nature Reserve 30.921
17 Witzands Aquifer Nature Reserve 1750.082
18 Wolfgat Nature Reserve 261.820
19 Zandvlei Nature Reserve 216.344
City Nature Reserves
Provincial Nature Reserves
National Park
Managed Conservation Areas
Marine Protected Areas
City Boundary
Atlantic Ocean
Driftsands Provincial Nature Reserve
Hottentots-Holland Provincial Nature Reserve
Macassar Dunes Conservation Area
Table Mountain National Park
Harmony Flats Provincial Nature Reserve
False Bay
Map 1: Reserve Location in the City of Cape Town

Map 2: Reserve Boundary

2. DESCRIPTION OF LANDHOLDINGS AND OWNERSHIP

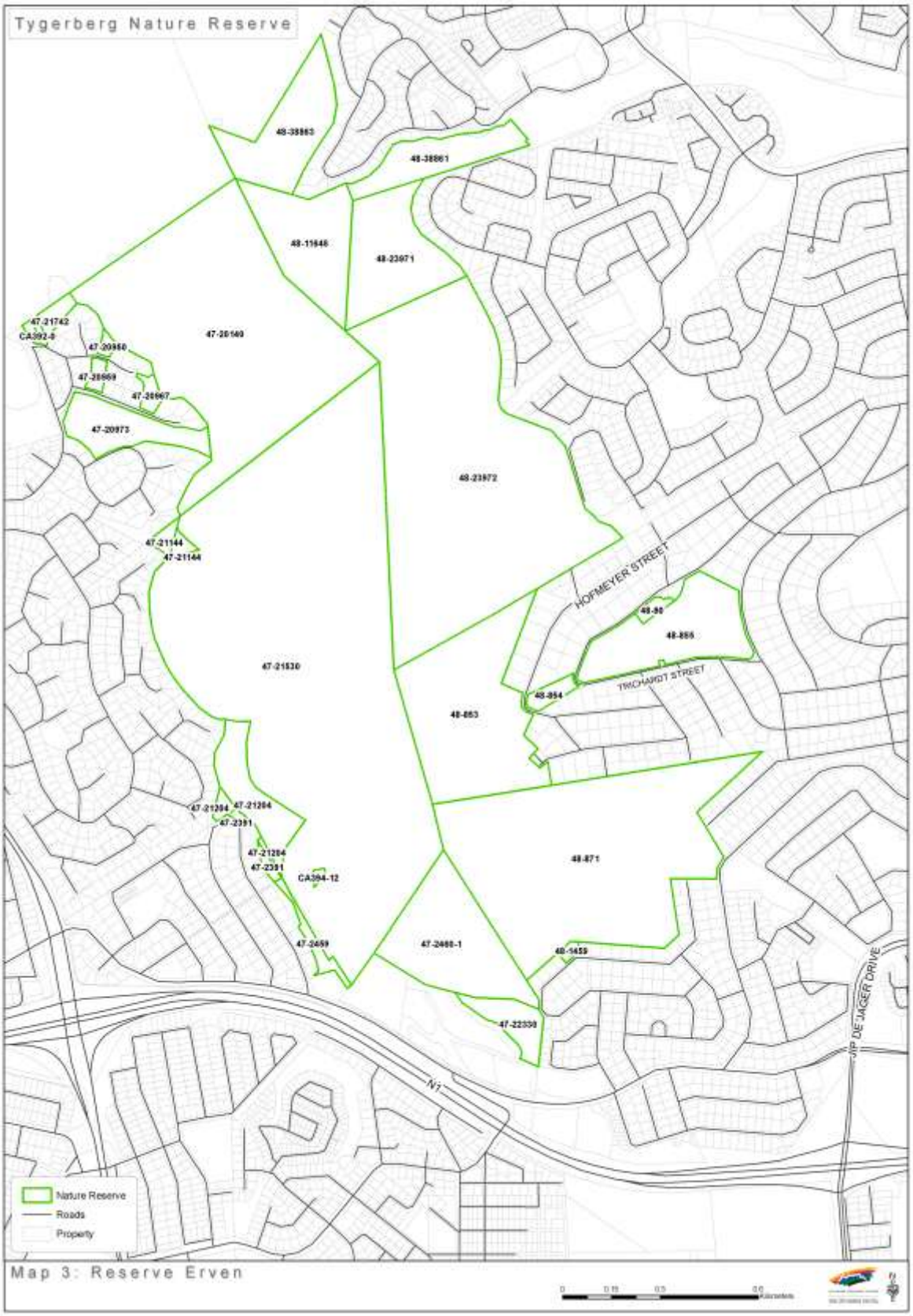
2.1 Property details and title deed information

The current reserve was proclaimed as a local-authority nature reserve on 7 October 2005 (PN338/2005) (See appendix 3 for provincial gazette). Tygerberg Nature Reserve, some 309 ha in extent, is situated on the Tygerberg Hills, and is owned and managed by the City of Cape Town municipality. Five reservoirs are situated within the reserve boundaries, and are managed by the Bulk Water Department of the municipality. Eight communication towers/masts are located on the hill within the reserve: Two are City of Cape Town facilities, while the other six are leased from the City of Cape Town by the South African National Defence Force (SANDF), the South African Police Service (SAPS), Sentech, Eskom and two private companies. The one dam (TGB9a) within the reserve boundaries is co-managed by the reserve management and the Roads and Stormwater Department of the City of Cape Town.

City of Cape Town-owned erf numbers included in the reserve are as follows (see map 3):

48-853; 48-23972; 48-23971; 48-38861 & 38821; 38863; 11645; 20140; 20973; 21530; 21204; 2460; 871; 854; 855, and new 2010 additions 21742; 20959; 20950; 20967; 2391; 2459, and 22330

See appendix 4 for copies of Surveyor General Diagrams for erven.


Tygerberg Nature Reserve
48-38863
48-38861
48-11648
48-23971
47-21742
CA392-8
47-20960
47-20969
47-20967
47-20973
47-20949
48-23972
47-21144
47-21144
HOFMEYER STREET
48-86
48-855
47-21530
TWOHAWDT STREET
48-854
48-853
47-21284
47-21284
47-2391
47-21284
47-2391
CA394-12
48-871
47-2459
47-2460-1
48-1459
47-22330
JP DE JAGER DRIVE
N1
Nature Reserve
Roads
Property
Map 3: Reserve Erven

2.2 Landscape perspective

Tygerberg Nature Reserve falls within the Cape Floristic Region (CFR). The CFR is the smallest yet richest of the world's six floral kingdoms, and the only one to be found entirely within one country. This rich biodiversity is under serious threat for a variety of reasons, including conversion of natural habitat to permanent agricultural area, inappropriate fire management, rapid and insensitive development, overexploitation of water resources, and infestation by alien species. The region has been identified as one of the world's 'hottest' biodiversity hot spots (Myers *et al*. 2000).

In response to this challenge, a process of extensive consultation involving various interested parties, including local government and non-governmental organisations (NGOs), resulted in the establishment of a strategic plan (C.A.P.E Project Team 2000) referred to as Cape Action Plan for the Environment, which identified the key threats and root causes of biodiversity losses that need to be addressed in order to conserve the floral kingdom. This resulted in a spatial plan identifying areas that need to be conserved and a series of broad programme activities that need to take place over a 20-year period. Based on the situation assessment and analysis of threats, three overarching, mutually complementing and reinforcing themes were developed:

- To establish an effective reserve network, enhance off-reserve conservation, and support bioregional planning
- To strengthen and enhance institutions, policies, laws, cooperative governance and community participation
- To develop methods to ensure sustainable yields, promote compliance with laws, integrate biodiversity concerns with catchment management, and promote sustainable eco-tourism

The Cape Action for People and the Environment (C.A.P.E) partnership was formed and works together to implement the C.A.P.E vision and plan by strengthening institutions, supporting conservation efforts, enhancing education, developing tourism benefits, and involving people in conservation. The City of Cape Town was one of the 19 founding signatories of the C.A.P.E memorandum of understanding (MOU).

Tygerberg Nature Reserve forms an important platform and integral link in the City of Cape Town's biodiversity network (Anon 2009[2]). This network ensures that parcels of land worthy of conservation are included in a protective network, connected to other parcels of conservation-worthy land.

2.3 Physical environment

2.3.1 Climate

The climate of the reserve and surrounding areas is typically Mediterranean, with rain falling predominantly in the winter, between the months of May and September (figure 3). Average precipitation (mm per annum) as recorded at the nearest weather stations, Wingfield (to the west), Cape Town International Airport (to the south) and Diemersdal (to the east), is 524 mm, 508 mm and 481 mm respectively (Refer to Appendix 1: Rainfall table, for rainfall specific to Tygerberg). The summers are hot, with the maximum temperatures ranging from 20,8 ºC to 38,4 ºC, while the average minimum temperatures in June (mid-winter) are between 1,3 ºC and 13,2 ºC. The western slopes of Tygerberg and Kanonberg are influenced by fog and sea breezes. The strongest and most frequent winds blow predominantly in summer from the south to south-east. During the winter months, the winds blow mostly from the north-west.

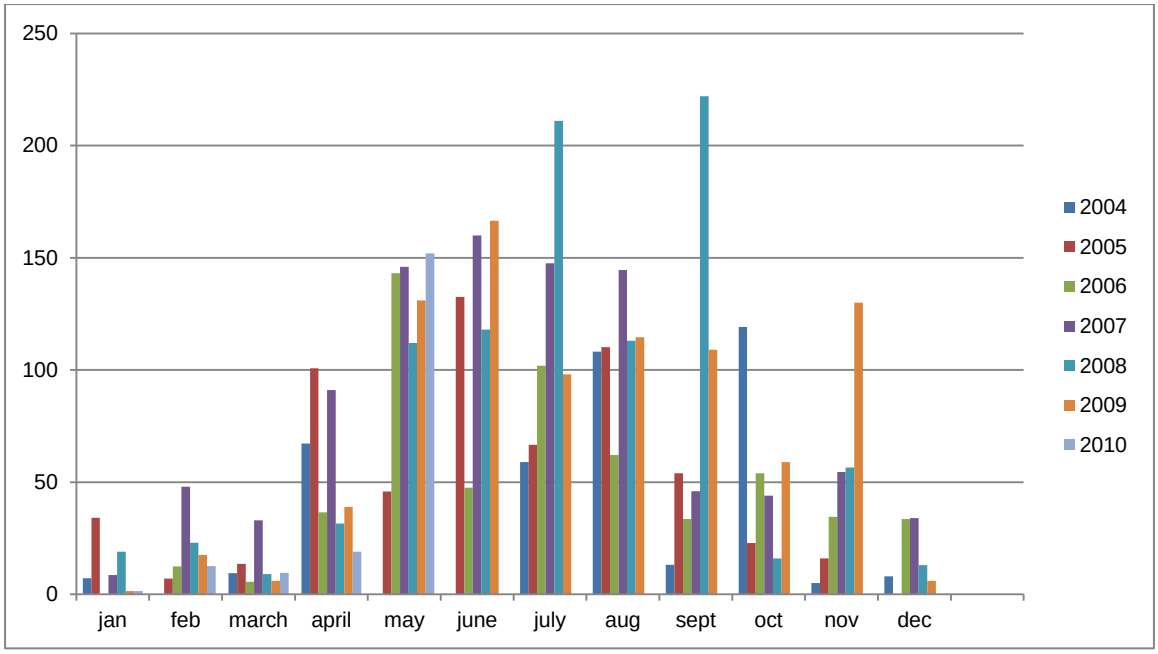


Figure 3: Rainfall data from January 2004 to August 2010 as recorded from the Welgemoed gate house rain gauge.

2.3.2 Geology, geomorphology, soils and land types

The highest point of the reserve is 460 m above sea level. The north-south-lying Tygerberg, with its steep western slopes and gentle eastern slopes, is the most prominent feature. This hill is particularly noticeable, as its southern tip borders the low-lying Cape Flats area. Tygerberg Nature Reserve is the southern area of the Tygerberg Hills, which include the Tygerberg, Kanonkop, Humeklip and Hoogekraal.

The geology of the reserve is almost exclusively the Tygerberg formation of the Malmesbury group. This consists predominantly of irregular layers of grey and green phyllitic shale, siltstone, and medium to fine-grained greywacke (dirty sandstone). A few thin layers of lava, pyroclastics, quartzite, grit and conglomerate are also present. Some small areas of granite are found locally.

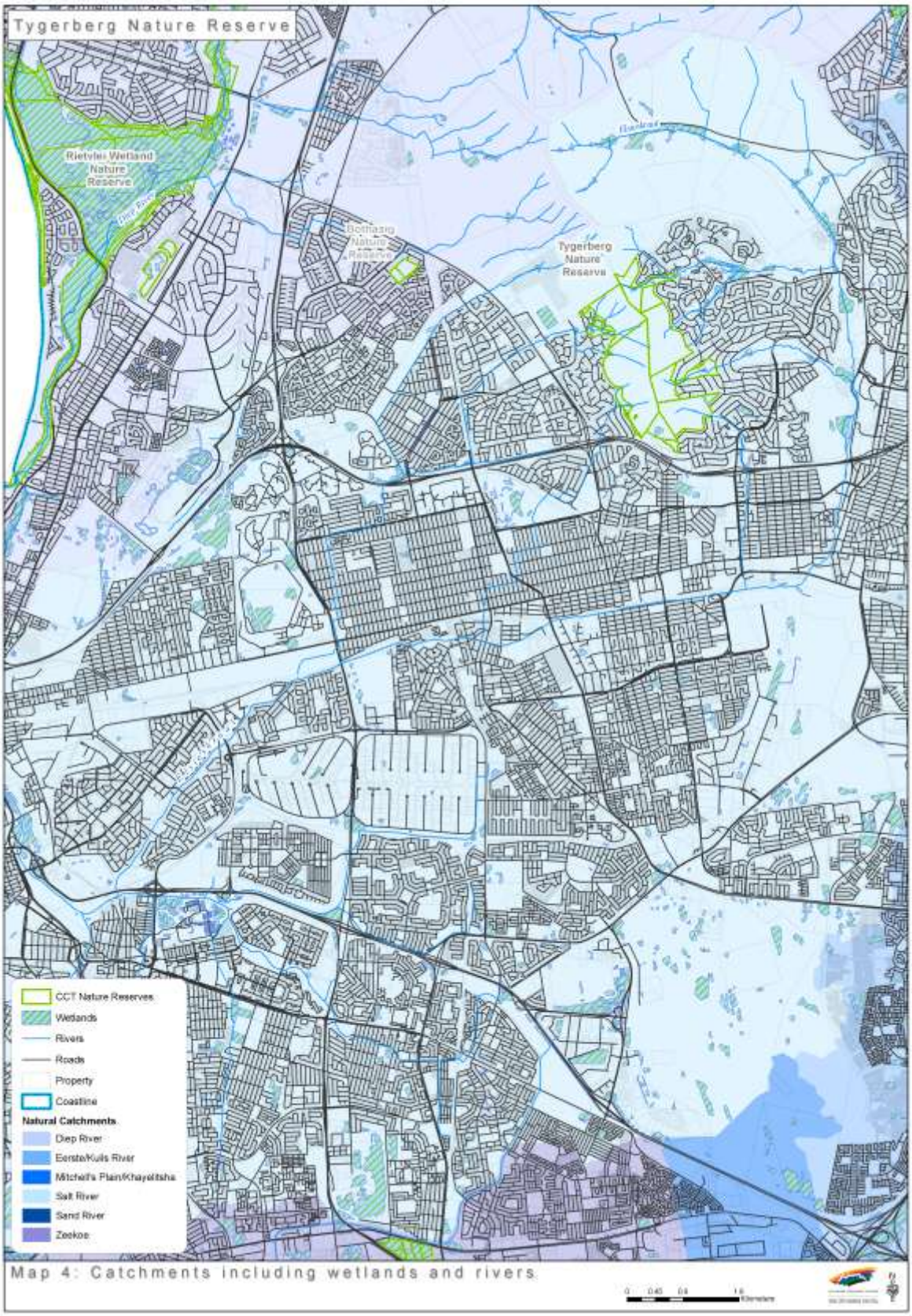
Clay soils are derived from Malmesbury group shales (specifically the Porterville formation in the north and east, and the Moorreesburg formation in the west). The soils contain prismacutanic and pedocutanic diagnostic horizons, and Glenrosa and Mispah forms are predominant. The characteristic rocky outcrops of the reserve consist chiefly of greywacke or dirty sandstone, which are more resistant to weather.

Four major soil types occur in the area:

- **Deep-red terrace soils** are confined to the eastern slopes of the Tygerberg Hills. These are dominated by the Hutton soil form. Oakleaf and Westleigh forms are much less wide-spread. They are well drained and usually have a clay content of less than 15%. These soils are considered to have good agricultural potential, and where they are untransformed, they usually support West Coast Renosterveld.
- **Residual soils** cover most of the ridges and the western slopes of the reserve. They are fairly shallow, fine to coarse textured, and tend to be acidic. This area is characterised by Swartland, Glenrosa and Mispah soil forms, which have relatively low agricultural potential. West Coast Renosterveld is the natural vegetation type where these soils have not been cultivated or otherwise transformed.
- **Alluvial soils** are present in the valley floors. These soils, predominantly Oakleaf and Hutton forms, have a high agricultural potential. The original dominant vegetation type is West Coast Renosterveld, although some Sand Plain Fynbos can occur.
- **Light-grey to pale-red sandy soils** occur in the low-lying areas. These have low agricultural potential, and support Sand Plain Fynbos.

2.3.3 Hydrology and aquatic systems

No major groundwater system is underlying the reserve. However, the hill slope seep wetlands are probably fed by elements of groundwater (see map 4). Numerous seasonal wetlands and streams occur on the southern and western slopes. The reserve also has three man-made dams – Welgemoed, Plattekloof and Kanonberg – and five reservoirs managed by the City of Cape Town's Bulk Water and Catchment Management Department.



Map 4: Catchments including wetlands and rivers

2.3.4 Catchments

The reserve lies in the upper regions of the Elsieskraal catchment, which, lower down, forms part of the greater Salt catchment (see map 4).

2.4 Biological environment

The reserve conserves one of the last and largest remnants of critically endangered Swartland shale renosterveld. According to the last National Spatial Biodiversity Assessment (2004), only 9% of Swartland Shale Renosterveld is left in the country – of this, only 9,8% lies in the City of Cape Town area (90,2% outside City of Cape Town boundaries). Only 408 ha is protected, with Tygerberg making up 309 ha of this. The national target for conservation is 26%, and this vegetation type is known as 'hardly protected'. Tygerberg Nature Reserve forms part of the Elsies river catchment area, and is a refuge to birds, mammals, reptiles, amphibians and invertebrates – all associated with this vegetation type.

This remnant is an important green lung for Cape Town, and a critical node in the biodiversity network, creating connectivity with surrounding open spaces and reserves, allowing genetic interchange, and providing for species with relatively large home ranges.

To date, 562 flora, 137 avifauna, 24 mammal, seven amphibian and 22 reptile species and numerous butterfly species have been recorded in Tygerberg Nature Reserve. Of these, 23 Red Data threatened plant and three mammal species have been confirmed.

2.4.1 Vegetation

The following are the broad vegetation communities that occur in Tygerberg Nature Reserve, and their approximated percentage cover:

- Swartland Shale Renosterveld shrublands – 192 ha/64%
- Forest patches – 5 ha/1,6%
- Wetlands – 5 ha/1,6%
- Old ploughed fields – 57 ha/19%
- Alien invasive species (entire reserve area) – 30 ha/10%
- Infrastructure, roads, fire breaks – 3,8%

Swartland Shale Renosterveld (Rebelo *et al*. 2006)

Distribution: Western Cape: Large, generally continuous areas of the Swartland and the Boland on the West Coast lowlands, from Het Kruis in the north, southwards between the Piketberg and Olifantsrivierberge, widening appreciably in the region around Moorreesburg between Gouda and Hopefield, and encompassing Riebeek Kasteel, Klipheuwel, Philadelphia, Durbanville, Stellenbosch to the south, and Sir Lowry's Pass Village near Gordon's Bay. Altitude 50–350 m. Of this vegetation type, 9,8% occurs within and 90,2% outside the City of Cape Town boundaries. Similar transformation rates occur nationally (92%) and inside City of Cape Town borders (91%).

Vegetation and landscape features: Moderately undulating plains and valleys supporting low to moderately tall leptophyllous shrubland of varying canopy cover, as well as low, open shrubland dominated by renosterbos. Hillocks (heuweltjies) are a very prominent local feature of the environment, forming 'hummockveld' near Piketberg, and giving the Tygerberg Hills its name. Stunted trees and thicket are often associated with the hillocks. Disturbed areas are dominated by *Athanasia trifurcata* and *Otholobium hirtum*. Patches of *Cynodon dactylon* ('grazing lawns') also occur in abundance.

Geology and soils: Clay soils derived from Malmesbury group shales (specifically the Porterville formation in the north and east, and the Moorreesburg formation in the west). The soils contain prismacutanic and pedocutanic diagnostic horizons, and Glenrosa and Mispah forms are predominant.

Climate: Winter-rainfall regime, with an average annual precipitation of 270–670 mm (mean: 430 mm), peaking from May to August. Mean daily maximum and minimum temperatures are 29,6 °C and 6,3 °C for February and July respectively. Frost occurs on three or four days per year. Mists are common in winter.

Endemic taxa: Three endemic plant species are found within the Swartland Shale Renosterveld vegetation at Tygerberg Nature Reserve, including *Aspalathus acanthophylla.*

Conservation: This is a Critically Endangered vegetation type. The minimum national conservation target is 26%, but, since 90% of the area has been totally transformed (mainly for cropland), the target remains unattainable. The remnants are found in isolated pockets, usually on steeper ground. So far, only a few patches have been included in conservation schemes (e.g. Elandsberg and Paardenberg) (Rebelo *et al.* 2006).

Please see appendix 5 for indigenous and alien plant species list.

2.4.2 Mammals

Although a faunal species list for the area is largely incomplete, the expected historical species list for the entire area would include most of the larger mammals, such as the *Diceris bicornis* (Black Rhinoceros), *Loxadonta africana* (African Elephant), *Panthera leo* (Lion), *Panthera pardus* (Leopard), *Synerus caffer (*Cape Buffalo) and *Taurotragus oryx* (Eland). These species have become locally extinct as a result of hunting, habitat shrinkage, and encroachment by township developments and agriculture. Nevertheless, species diversity is still fairly high, and species such as the *Galerella pulverulenta* (Small Grey Mongoose), *Hysterix adricaeaustralis* (Cape Porcupine), *Octocyon megalotis* (Bat-eared Fox), *Rhabdomys puilio* (Striped Field Mouse) and *Rhaphicerus melanotis* (Grysbok) are often encountered in the reserve.

In 2010, approximately 24 mammal species were confirmed, including *Vulpes chama* (Cape Fox), *Mellivora capensis* (Honey Badger) and *Poecilogale albinucha* (Striped Weasel) (see appendix 6). These species are a significant indication that ecological corridors are still available through and around the reserve, and that these areas can cater for the needs of species with large home ranges, such as the *Mellivora capensis* (Honey Badger).

2.4.3 Birds

A total of 137 bird species for the area have been recorded by the Tygerberg Bird Club, which indicates a fair degree of richness, considering the relatively small area of the reserve. Three species – *Falco peregrines* (Peregrine Falcon), *Hydroprogne caspia* (Caspian Tern) and *Pelecanus onocrotalus* (White Pelican) – are listed as Near Threatened in the latest Red Data book of birds (see appendix 7).

2.4.4 Reptiles

Thirty-four reptile species have been recorded or are thought to occur in the reserve. Of significance is the *Bradypodium pumilum* (Cape Dwarf Chameleon), which is endemic to the Western Cape (see appendix 8 for a complete species list).

2.4.5 Amphibians

Eight amphibians have been recorded or are thought to occur in the reserve. The vulnerable *Breviceps gibbosus* (Cape Rain Frog) is endemic to the Western Cape, and is thought to be the only threatened amphibian in the reserve (see appendix 9).

2.4.6 Fish

Four exotic freshwater fish species were recorded previously, and removed/eradicated in 2008. However, there is no evidence of indigenous fish species occurring within Tygerberg Nature Reserve.

2.4.7 Invertebrates

The species of invertebrates for the reserve have not yet been assessed. However, the predominant vegetation type and its condition are considered to be a good surrogate for invertebrate diversity. As Swartland Shale Renosterveld is classified as Critically Endangered, it is concluded that Tygerberg Nature Reserve is of conservation significance for terrestrial invertebrate fauna.

2.4.8 Invasive species

Approximately 43 invasive plant species have been identified and recorded (see appendix 5), while the list of invasive animal species currently stands at three, namely *Scirurus carolinenfis* (Grey Squirrel), *Acridotheres tristis* (Common Starling) and *Anas platyrhynchos* (Mallard Duck).

2.5 Socio-political context

2.5.1 History

Very little is documented about the archaeology of the area, but the Tygerberg area has been influenced by humankind for thousands of years. According to a heritage survey, *Tygerberg Heritage Mapping Project,* undertaken by Renni Scurr Architects (Anon 2005), region-specific information on the extent and exact location of archaeological traces of early inhabitants is limited, as no systematic archaeological surveys have been done in this area. However, pre-colonial people inhabited the Tygerberg region, and early Stone Age tools have been found in the Durbanville area. In the report, Tim Hart from the University of Cape Town's Archaeological Contracts Office also states that archaeological material from the early and middle Stone Age period is likely to occur within the Tygerberg area. It should therefore be assumed that, in the absence of detailed archaeological studies, there could be archaeological sites in Tygerberg Nature Reserve.

Before the arrival of Europeans (17th century), the area was inhabited by the San (21 000–2 000 years before present) and, later, the Khoi (2 000–1 600 before present). These people would have had an impact on the vegetation through burning and/or grazing, a process followed by early European colonists, who transformed much of the area for

large-scale monoculture, such as wheat fields and vineyards. The Tygerberg Hills were one of the first farmlands to be established by settlers, and the blotches visible on the hill reminded them of the leopard's skin. Consequently, these hills were named the Luipaerts Berghen (1657) and, later, Tijgerberghen (1661). Around 1860, signalling cannons were set up on high-lying areas around Cape Town: Kanonkop and Kanonberg on the Tygerberg Hills were included.

A mausoleum dating from 1862 occurs on the western side of the reserve on Meyboom Road, which apparently holds the remains of three brothers of the original owner of the farm Plattekloof. A graveyard found near to this is on private land, and belongs to the Graaff family who owns De Grendel.

Tygerberg Nature Reserve, some 309 ha in extent today, was proclaimed a local-authority nature reserve in 1974 (Government Notice 172, 1980) by the then Bellville municipality in terms of the Provincial Nature and Environmental Conservation Ordinance, No 19 of 1974. This property was approximately 88 ha in extent. Anglo American Properties donated a further 50 ha, which, together with 150 ha open space donated by the then Parow municipality, extended the reserve to the existing 300 ha in 1997. The current reserve was proclaimed as a local-authority nature reserve on 7 October 2005 (see appendix 3, PN338/2005). In 2010, Kanonberg Housing Estate donated 7,9361 ha to the City of Cape Town, whose Parks Department consequently handed over 13,1733 ha to the management of the reserve, extending the boundaries to 309,3688 ha in July 2010.

Today, Tygerberg Nature Reserve is well utilised by local residents, visitors, tourists and school groups. Approximately 23 000 visits to the reserve took place during the financial year July 2009 to June 2010. The reserve has a strong Friends group and a bird club who contribute to the management of Tygerberg Nature Reserve.

2.5.2 Socio-economic context

Social attributes

The main visitor activities on Tygerberg Nature Reserve occur over weekends and public holidays. Recreational activities allowed include hiking, running, sightseeing, picnicking and bird-watching, while bi-annual events such as the Trail Series run and mountain bike race are organised in conjunction with the reserve management. The Friends of the Tygerberg Hills (FoTH) and the Tygerberg Bird Club host monthly talks on various subjects that are open to the public, as well as weekly guided walks and monthly alien-clearing hacks. A wheelchair-friendly path and facilities are available. Numerous scenic picnic areas are also available as well as 13 km of trails and an environmental education centre. The reserve boasts a 360° view of Cape Town.

Tygerberg Nature Reserve has a polarised socio-economic society surrounding it – two distinct groups (affluent and disadvantaged), who put different pressures on resources: The affluent people have a greater environmental footprint, while disadvantaged people put pressure on natural resources for survival and cultural needs. The cultural and natural resources are sensitive to human disturbances.

Tygerberg Nature Reserve falls under the jurisdiction of Subcouncil 3, which encompasses the Tygerberg Hills, Welgedacht, Edgemead, Monte Vista, Bothasig, Plattekloof Glen, Tygerdal and Goodwood. The area surrounding the reserve is mostly affluent, and it is assumed that the employment rate is high (95%). There are an estimated 93 438 residents in Subcouncil 3, the majority of whom being white females between the ages of 35 and 54. Most residents have achieved Grade 12 and speak both English and Afrikaans (City of Cape Town intranet 2010).

The management of Tygerberg Nature Reserve works in conjunction with forums such as the TAUC (Tygerberg Antennae User Committee), advisory board, FoTH and the Tygerberg Bird Club, who are passionate stakeholders. Some are organised in structured NGOs, which strengthen relationships and act as ambassadors. Furthermore, solid institutional coordination occurs with CapeNature (the Western Cape provincial conservation authority), SANParks (South African National Parks), the South African National Biodiversity Institute (SANBI), CREW (Custodians for Rare and Endangered Wildflowers) and C.A.P.E.

Economic attributes of reserve

Tygerberg Nature Reserve has many economic attributes, of which the ecosystem services, such as the water catchments and wetlands, are the most important. The area also serves as a green lung for Cape Town, provides a scenic landscape, and has a very positive impact on property values.

The reserve contributes to the economy through job creation and poverty relief, specifically with the alien-clearing projects. Over and above this, the reserve is a well-known tourist location, offering affordable gate entry fees, which, in turn, contribute to the City of Cape Town’s income.

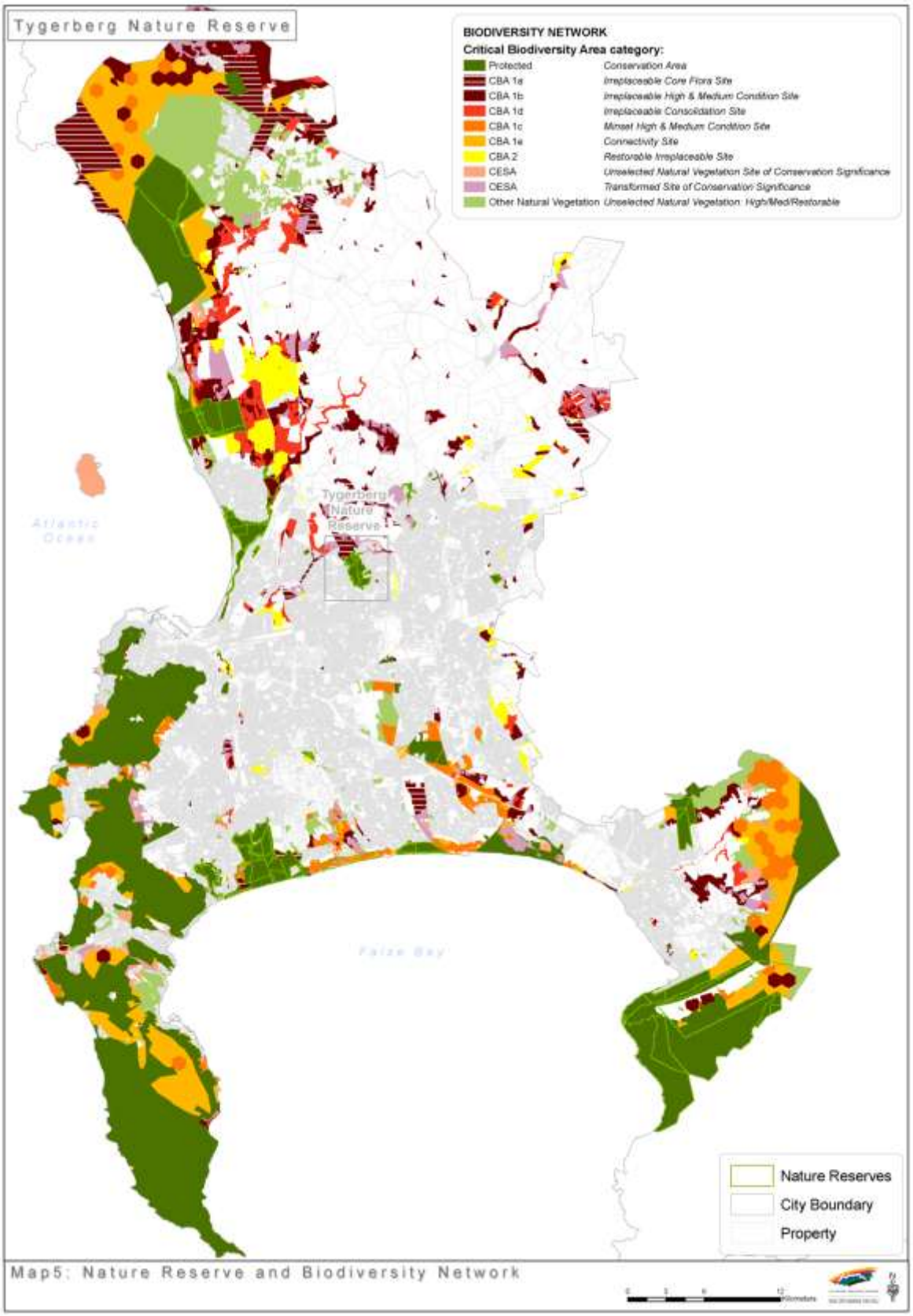
Further income is generated through environmental education groups of learners and adults, as well as events in the reserve, and bookings of the Kristo Pienaar Centre.

2.6 Protected-area expansion

Tygerberg Nature Reserve, an important ecological component of the biodiversity network (see map 5) (www.capetown.gov.za/environment), is connected to public open space on the eastern and western areas, as well as Baronetcy and Peter Ebersohn to the north, which allow connectivity to the remainder of the Tygerberg Hills. Both these areas are high-priority stewardship sites, and discussions are under way to secure their conservation status. The western slopes of the Tygerberg within De Grendel farm to the north-west is currently protected through a ten-year biodiversity agreement with CapeNature. This farm also serves as a corridor to the N7, with a possible link along the power line servitude to Garden Cities land and Blaauwberg Nature Reserve in the north-west (and on to the West Coast). To the north-east, linkage is created through private vineyards such as Altydgedacht, to form a link with Durbanville and Uitkamp Wetland nature reserves. These connections to open spaces and other conserved sites allow for genetic interchange, and caters for species with large home ranges.

The expansion of Tygerberg Nature Reserve remains important for the City of Cape Town in its attempt to consolidate the essential ecological patterns and processes associated with the vegetation type Swartland Shale Renosterveld. The proposed expansion programme is in full alignment with the biodiversity network. In this regard, the reserve forms part of the wider regional C.A.P.E programme, which is aimed at building a comprehensive protected-area system in the CFR that is fully integrated with the regional land use mosaic. The envisaged expansion would include a number of different land agreements across terrestrial and wetland environments, and, as such, is expected to be affected by the environmental legislation governing these different environments. The desired state of the reserve, in the context of the reserve expansion, includes the following:

- The consolidated ecological linkages from the north along the Tygerberg Hills
- Encourage conservation-friendly land management activities in the surrounding land use mosaic, and catchments to further the identified important aquatic processes


Tygerberg Nature Reserve
BIODIVERSITY NETWORK
Critical Biodiversity Area category:
Protected
Conservation Area
CBA 1a
Irreplaceable Core Flora Site
CBA 1b
Irreplaceable High & Medium Condition Site
CBA 1d
Irreplaceable Consolidation Site
CBA 1c
Mimset High & Medium Condition Site
CBA 1e
Connectivity Site
CBA 2
Restorable Irreplaceable Site
CESA
Unselected Natural Vegetation Site of Conservation Significance
CESA
Transformed Site of Conservation Significance
Other Natural Vegetation
Unselected Natural Vegetation: High/Med/Restorable
Tygerberg Nature Reserve
Atlantic Ocean
False Bay
Nature Reserves
City Boundary
Property
Map5: Nature Reserve and Biodiversity Network

3. PURPOSE, VISION/MISSION, SIGNIFICANCE/VALUE

3.1 Purpose of the protected area

- The protection and conservation of largest conserved remnant of Swartland shale renosterveld
- The protection and conservation of all biological diversity, not limited to associated faunal species, including invertebrates
- The protection and maintenance of the ecosystems on which all associated floral and faunal species rely for their survival
- The protection of a landscape of unique beauty and cultural heritage resources
- The provision of environmental education to all ages and races
- The provision of a safe and fulfilling visitor experience, providing a place of peace and tranquility to all visitors

The purposes of a protected area are described in section 17, chapter 3 of the National Environmental Management: Protected Areas Act. The management plan must state the relevant criteria in section 17 that are used to establish the purpose of this protected area.

The purposes of declaring protected areas are as follows:

- To protect ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes in a system of protected areas
- To preserve the ecological integrity of those areas
- To conserve biodiversity in those areas
- To protect areas representative of all ecosystems, habitats and species naturally
- To protect South Africa's threatened or rare species
- To protect an area that is vulnerable or ecologically sensitive
- To assist in ensuring the sustained supply of environmental goods and services
- To provide for the sustainable use of natural and biological resources
- To create or augment destinations for nature-based tourism

3.2 Vision and mission

3.2.1 Vision in context of broader policy and programmes

Integrated Development Plan vision

The vision of the City of Cape Town remains as follows:

- To be a prosperous city that creates an enabling environment for shared growth and economic development

- To achieve effective and equitable service delivery
- To serve the citizens of Cape Town as a well-governed and effectively run administration

To achieve this vision, the City of Cape Town recognises that it must:

- actively contribute to the development of its environmental, human and social capital;
- offer high-quality services to all who live in, do business in, or visit the city as tourists; and
- be known for its efficient, effective and caring government.

C.A.P.E vision

We, the people of South Africa, are proud to be the custodians of our unique Cape Floristic Region, and share its full ecological, social and economic benefits now and in the future.

Environmental Resource Management Department vision

To ensure that sustainable and equitable development is combined with sound environmental practice for a healthy local environment, which sustains people and nature, provides protection for our unique resources, and results in an enhanced quality of life for all.

Tygerberg Nature Reserve vision

To manage and restore the natural assets of Tygerberg Nature Reserve by partnering with people to ensure the area's survival for present and future generations.

Biodiversity Management Branch vision

(This vision was accepted by Council in June 2009.)

To be a City that leads by example in the protection and enhancement of biodiversity; a City within which biodiversity plays an important role, and where the right of present and future generations to healthy, complete and vibrant biodiversity is entrenched; a City that actively protects its biological wealth, and prioritises long-term responsibility over short-term gains.

Biodiversity Management Branch goals

Biodiversity in the City of Cape Town is conserved and restored, where appropriate; has resulted in significant involvement, and has delivered benefits to its present and future citizens, in a way that is endorsed by the City.

3.2.2 Mission

Biodiversity Management Branch mission

- To manage biodiversity proactively and effectively
- To ensure an integrated approach to biodiversity between the City of Cape Town's line functions and departments, and actively pursue external partnerships
- To adopt a long-term approach to biodiversity
- To ensure sustainability of our rich biodiversity
- To adopt a holistic and multifaceted approach to biodiversity
- To continue to measure and monitor the City of Cape Town's performance in the protection and enhancement of biodiversity
- To continue to measure and monitor the state of biodiversity in Cape Town

Principles that underpin the Biodiversity Management Branch strategy

- The importance of both biodiversity patterns and ecological processes
- Best management practice
- Promotion of biodiversity as an asset in all communities
- No ecology without equity – no equity without ecology
- Conservation, enhancement and protection of biodiversity across the entire City of Cape Town
- Recognition of the unquestionable importance of all of Cape Town's biodiversity
- Equitable access to biodiversity for all
- Social upliftment and economic development through the conservation and enhancement of biodiversity
- Open, transparent and responsible governance
- Participation and partnerships
- Integrated, coordinated planning and management
- Responsible stewardship of our unique biodiversity
- Commitment to biodiversity goals
- The precautionary principle

Tygerberg Nature Reserve mission

To restore and maintain the natural environment and its associated ecological processes and services through the implementation of the management objectives of Tygerberg Nature Reserve

3.3 Significance of property (biodiversity, heritage and social)

- The natural area of the property contains Swartland Shale Renosterveld, classified as Critically Endangered by the National Spatial Biodiversity Assessment (2004). It is referred to as ‘hardly protected’.

- Parts of the property consist of seasonal wetlands and are part of catchment areas, and the reserve is also a green lung for Cape Town.

- The reserve is a refuge for approximately 562 plant, 137 avifauna, 24 mammal, seven amphibian and 22 reptile species. To date, 23 Red Data plant and three mammal species have been confirmed, and numerous invertebrate species exist.

- The property adjoins other properties with unfragmented endangered vegetation. The conservation of this property will therefore facilitate the ecological management of the greater (protected) area.

- The property provides a north/south ecological corridor, connecting this reserve to private land in the north, and then west-wards linking to Blaauwberg Nature Reserve, and is specifically important for species with large home ranges.

- The reserve provides an important social service through environmental educational programmes.

- The reserve has heritage value, as it was a site used by the Khoisan people and early settlers.

- The reserve provides essential social benefit by providing scenic views of Cape Town and the surrounding areas, 13 km of hiking/running trails to suit all fitness levels, bird-watching, picnic areas, a conference/workshop/function facility and kitchen, and peace and tranquility to visitors.

- Due to its position and altitude, Tygerberg Nature Reserve is also essential for communication and water storage throughout the City of Cape Town. Not only are there radio and telephone communication masts, but also television and radio transmitters housed at the site. The reserve contains four reservoirs.

PART 2

MANAGEMENT POLICY FRAMEWORK

4. ADMINISTRATIVE AND LEGAL FRAMEWORK FOR THE MANAGEMENT AUTHORITY

4.1 Legal framework

Table 1: Legislation The following is a list of legislation applicable to the management of City of Cape Town's Biodiversity Management Branch. Repealed legislation has been included in greyed-out text for information purposes only.

Legislation: **Acts, ordinances, bylaws**	**Relevance:** **Description**	**Amendment:** **Latest amendment date**	**Comment:** **Other notes**
Constitution of the Republic of South Africa, Act 108 of 1996	Lists South African citizens' environmental rights	N/A	Chapter 2: Bill of Rights assigns citizens with particular rights
ENVIRONMENTAL LEGISLATION			
National legislation			
National Environmental Management Act (NEMA), Act 107 of 1998	One of the most important environmental laws relating to most aspects of the environment, including environmental impact assessments (EIAs), environmental information and legal standing, etc.	• Amendment Act 56 of 2002 • Amended by GN 26018, Vol 464 of 13 February 2004	Provides for cooperative environmental governance
National Environmental Management: Biodiversity Act, Act 10 of 2004	The objectives of the Act are to provide for: • the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; • the protection of species and ecosystems that warrant national protection; • the sustainable use of indigenous biological resources; • the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources; and • the establishment and functions of a South African National Biodiversity Institute. In essence, the Act was put in place to safeguard the important biodiversity attributes in the country, while allowing people to benefit	N/A	The development of the IRMP will assist in ensuring that the objectives of this Act are achieved in the reserve.

	equally from the natural resources. In order to achieve these goals, the Act made provision for the South African National Biodiversity Institute (SANBI), which has been designated certain functions and afforded powers and duties in respect of this Act.		
National Environmental Management: Protected Areas Act, Act 57 of 2003	To provide for: • the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes and seascapes; • the establishment of a national register of all national, provincial and local protected areas; • the management of those areas in accordance with national norms and standards; • intergovernmental cooperation and public consultation on matters concerning protected areas; and • matters in connection therewith.	• Amendment Act 62 of 2008 • Amendment Act 15 of 2009	Regulations Notice 1029 of 2009 lists specific regulations for reserves proclaimed by the Member of the Executive Council (MEC) (draft August 2009).
Conservation of Agricultural Resources Act (CARA), Act 43 of 1983	The CARA regulations contain a list of alien invasive vegetation categorised according to their legal status. The Act regulates the sale, position and use of listed species.	• Amended by GN R 2687 of 6 December 1985 and GN R 280 of 30 March 2001	Alien invasive plant legislation to be included under the Biodiversity Act in future
National Veld and Forest Fire Act, Act 101 of 1998	Relates to veld fire prevention, fire protection associations, fire danger indexing, enforcement of fire legislation, and the fighting of fires	N/A	A detailed fire management plan will be developed.
Marine Living Resources Act, Act 18 of 1998	Regulates conservation of the marine ecosystem and the long term sustainable utilisation of marine living resources		
Environment Conservation Act, Act 73 of 1989	The Environment Conservation Act is the other law that relates specifically to the environment. Although most of this Act has been replaced by NEMA, some important sections still remain in operation. These sections relate to: • protected natural environments; • littering; • special nature reserves; • waste management; • limited-development areas;	• Environment Conservation Amendment Act 98 of 1991 • Environment Conservation Amendment Act 79 of 1992 • Environment Conservation Second Amendment Act 115 of 1992 • Environment Conservation Amendment Act 94 of 1993 • Environment Conservation	

	• regulations on noise, vibration and shock; and • EIAs.	Second Amendment Act 52 of 1994 • Proclamation R27 of 1995 • Proclamation R43 of 1996 • National Environment Management Act 107 of 1998	
National Water Act, Act 36 of 1998	Relates to all use of water and the management of all water resources in South Africa	•	
National Environmental Management: Air Quality Act, Act 39 of 2004	To provide for enhancing the quality of ambient air for the sake of securing an environment that is not harmful to the health and well-being of the people		Promulgated to give effect to section 24(b) of the Constitution. The South African Air Quality Information System is a web-based system that provides information on the quality of ambient air across the country.
Animal Protection Act, Act 71 of 1962	To consolidate and amend the laws relating to the prevention of cruelty to animals	Animal Matters Amendment Act, Act 42 of 1993	
Animal Diseases Act, Act 35 of 1985	Provides for control measures relating to animal diseases		
Animal Health Act, Act 7 of 2002	Regulates animal health		
Game Theft Act, Act 105 of 1991	Regulates the ownership and protection of game		
Mountain Catchment Areas Act, Act 63 of 1970	Provides for catchment conservation		Administered under the Western Cape Nature Conservation Board Act, Act 15 of 1998
National Heritage Resources Act 25 of 1999	Provides for the protection of heritage resources		N/A
World Heritage Conservation Act 49 of 1999	Incorporates the World Heritage Convention into South African law		N/A
Problem Animal Control Ordinance, Ordinance 26 of 1957	Regulates problem animals		Administered under the Western Cape Nature Conservation Board Act, Act 15 of 1998
Mineral and Petroleum Resources Development Act, Act 28 of 2002	Provides for equitable access to, and sustainable development of, mineral and petroleum resources		
Atmospheric Pollution Prevention Act, Act 45 of 1965		Entire Act repealed on 1 April 2010 in favour of the National Environmental Management: Air	

		Quality Act, Act 39 of 2004	
Provincial legislation			
Land Use Planning Ordinance, Ordinance 15 of 1985	The purpose of the Ordinance is to regulate land use and to provide for incidental matters related to land use.	• Assented to on 22 November 1985 • Western Cape Land Use Planning Ordinance, 1985, Amendment Act, 2004	Although it might not have a direct application in the management of nature reserves, it does affect the surrounding properties, and could possibly be used to control activities/developments around the reserves to minimise negative effects, for example in applying zoning restrictions.
Cape Nature and Environmental Conservation Ordinance, Ordinance 19 of 1974	The purpose of this Ordinance is to regulate wild animals and plants, and the establishment of nature reserves.	Publication date 1 September 1975	Administered under the Western Cape Nature Conservation Board Act, Act 15 of 1998
Western Cape Nature Conservation Board Act, Act 15 of 1998	The purpose of this Act is to promote and ensure nature conservation, render services and provide facilities for research and training and to generate income		Biodiversity agreements are signed under this Act.
Municipal legislation			
Integrated Metropolitan Environmental Policy (IMEP), 2001	Envisages a set of Citywide aligned strategies dealing with all aspects of the environment.		Influenced the Biodiversity Strategy, 2003
Biodiversity Strategy, 2003	To be a city that leads by example in the protection and enhancement of biodiversity	• Draft amendment for 2009–2019	Influenced the development of the IRMP
City of Cape Town Bylaw relating to Stormwater Management, LA 31420	To provide for the regulation of stormwater management in the area of the City of Cape Town, and to regulate activities that may have a detrimental effect on the development, operation or maintenance of the stormwater system	• Publication date 23 September 2005	Communication strategy and action plan will take effect to address the issues with the relevant departments
City of Cape Town Air Pollution Control Bylaw, LA 12649	The purpose of this bylaw is to give effect to the right contained in section 24 of the Constitution of the Republic of South Africa Act (Act 108 of 1996) by controlling air pollution within the area of the Council's jurisdiction; to ensure that air pollution is avoided, or, where it cannot be altogether avoided, is minimised and remedied.	• Publication date 4 February 2003	

Bylaw relating to Community Fire Safety, Province of the Western Cape, LA 11257	The purpose and scope of the bylaw is to promote the achievement of a fire-safe environment for the benefit of all persons within the municipality's area of jurisdiction, and to provide for procedures, methods and practices to regulate fire safety within the municipal area.	• Publication date 28 February 2002	A fire management plan to be designed
City of Cape Town Draft Animal Bylaw, 2009	The purpose of the Bylaw is to formulate a new single bylaw, including ten different municipal dog bylaws and the Animal Protection Act of 1962. The Bylaw includes chapters on dogs, cats, poultry and working equines.	• Draft, 2009	
HUMAN RESOURCES/ADMINISTRATION LEGISLATION			
National legislation			
Occupational Health and Safety Act, 1993	To provide for the health and safety of persons at work, and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety, and to provide for matters connected therewith.	Occupational Health and Safety Amendment Act, No 181 of 1993	
Basic Conditions of Employment Act, Act 3 of 1997	Provides for control measures pertaining to employment	• Amendment Act 11 of 2002	
Labour Relations Amendment Act, Act 66 of 1995	The Act aims to promote economic development, social justice, labour peace and democracy in the workplace.	• Labour Relations Amendment Act, 42 of 1996 • Afrikaans Labour Relations Amendment Act, 1998 • Labour Relations Amendment Act, 127 of 1998 • Labour Relations Amendment Act, 2000 • Amendment Act 12 of 2002	
Local Government Municipal Systems Act,	Establishes core principles, processes and mechanisms relating to		

Act 32 of 2000	local government		
Promotion of Equality/Prevention of Unfair Discrimination Act, Act 4 of 2000	Provides for the prevention of discrimination and other related matters		
Criminal Procedure Act, Act 51 of 1977	Makes provision for procedures and related matters in criminal proceedings	• Criminal Procedure Amendment Act, Act 65 of 2008	
Firearms Control Act, Act 60 of 2000	To establish a comprehensive and an effective system of firearms control and, to provide for matters connected therewith		
Civil Aviation Act, Act 13 of 2009			
Fencing Act, Act 31 of 1963	Regulates all matters relating to fencing		
Hazardous Substances Act, Act 15 of 1973	Controls substances that may cause injury or ill health to, or death of, human beings by reason of their toxic nature		
Land Survey Act, Act 8 of 1997	Regulates land surveying, beacons and other related matters		
Promotion of Access to Information Act, Act 2 of 2000	Promotes access to information		
Promotion of Administrative Justice Act, Act 3 of 2000	Provides for the promotion of administrative justice	• Amendment Act 53 of 2002	
Regional Services Council Act, Act 109 of 1985	Regulates and controls land, land use and other related matters		
Skills Development Act, Act 97 of 1998	Promotes the development of skills		
State Land Disposal Act, Act 48 of 1961	Regulates the disposal of state-owned land		
Subdivision of Agricultural Land Act, Act 70 of 1970	Regulates the subdivision of agricultural land		
Tourism Act, Act 72 of 1993	Provides for the promotion of tourism, and regulates the tourism industry		A tourism strategy is envisaged.
Public Resorts Ordinance, Ordinance 20 of 1971	Regulates nuisance and pollution control		
Municipal Ordinance, Ordinance 20 of 1974	Regulates pollution and waste management		
South African National Road Agency Limited and National Roads Act, Act 7 of 1998			
Aviation Act, Act 74 of 1962	Provides for the control, regulation and encouragement of aviation activities in the Republic of South Africa	• Repealed in favour of the Civil Aviation Act, Act 13 of 2009	

Provincial legislation			
Western Cape Land Administration Act, Act 6 of 1998	Regulates land and land use		
Western Cape Planning and Development Act, Act 7 of 1999	Regulates planning and development within the province		
Municipal legislation			
City of Cape Town Bylaw relating to Filming, LA30441	The purpose of the Bylaw is to regulate and facilitate filming in Cape Town.	• Provincial Gazette 6277, 24 June 2005	
City of Cape Town Bylaw relating to Streets, Public Places and the Prevention of Noise Nuisances, 2007	The purpose of the Bylaw is to regulate activities in streets and public places, and to prevent excessive noise nuisance	• Promulgated 28 September 2007, PG 6469; LA 44559	
City of Cape Town Bylaw relating to signage		•	

4.2 Administrative framework

Tygerberg Nature Reserve is managed by the City of Cape Town's Biodiversity Management Branch of the Environmental Resource Management Department in the Strategy and Planning Directorate (see appendix 2 for area organogram). The reserve is located in the central region, and falls under the supervision of the regional manager. Furthermore, it is the management responsibility of an area manager, assisted by five permanent staff. The operational management of Tygerberg Nature Reserve is supported by the City of Cape Town's Biodiversity Management Branch, Law Enforcement, Fire & Rescue, Bulk Water, Water & Sanitation, Parks, Human Resources, and Finance. The reserve management is supported by the central-district advisory board and FoTH.

External departments:

The reserve has five reservoirs, which are managed by the City of Cape Town's Bulk Water Department. Eight communication towers/masts are located on the hill within the reserve: Two are City of Cape Town facilities, while the other six are leased from the City of Cape Town by the SANDF, SAPS, Sentech, Eskom and two private companies. One of the three dams (TGB9a) in the reserve boundaries is co-managed by the reserve management and the City of Cape Town's Roads & Stormwater Department.

5. PROTECTED-AREA POLICY FRAMEWORK & GUIDING MANAGEMENT PRINCIPLES

5.1 Management objectives

5.1.1 Biodiversity and heritage objectives

Table 2: Biodiversity and heritage objectives

High-level objective	*Objective*	*Sub-objective*	*Initiative*	*Low-level plan*
CONSERVATION OF REPRESENTATIVE, FUNCTIONAL ECOSYSTEMS To conserve a representative sample of the region's ecosystems in a linked landscape, and maintain or restore environmental processes to enable natural spatial and temporal variation in structural, functional and compositional components of biodiversity	**Representative ecosystems** To incorporate a spectrum of viable aquatic and terrestrial ecosystems characteristic of Tygerberg Nature Reserve, and to re-introduce missing elements where possible	**Consolidation and expansion of land areas** Consolidate protected areas, focusing on underrepresented ecosystems, functional linkages and processes	(1) Identify underrepresented habitats/ecosystems (2) Consolidate reserve boundaries (3) Incorporate untransformed renosterveld (4) Establish corridors linking Tygerberg Nature Reserve with other areas to the north, east and west	Reserve expansion plan (to be compiled)
		Re-introduction of biota Where possible, re-establish locally extinct or depleted biodiversity components and populations in accordance with International Union for Conservation of Nature (IUCN) principles and guidelines	(1) Re-establish indigenous herbivore complement within constraints of reserve size and urban setting	Faunal management plan
		Fire management Apply appropriate fire regime in fynbos areas (frequency, season, intensity, size)	(1) Implement a fire management plan in accordance with objectives of conserving biodiversity and threatened biota (2) Monitor impact of fire management regime	Fire management plan (to be revised)
		Threatened biota Maintain viable populations of threatened species in order to meet obligations in terms of international agreements and conventions	(1) Maintain viable populations of rare/threatened plant and animal species (identify, locate and monitor populations of priority species)	Branch-wide threatened-biota plan (to be compiled)

		Monitoring plan Implement and maintain an approved monitoring plan for the reserve	(1) Implement and maintain a biological monitoring programme for the reserve	(1) Branch-wide monitoring plan (to be compiled) (2) Erosion plan (to be compiled)
	Rehabilitation Rehabilitate degraded areas, including the re-establishment of natural biodiversity patterns, and the restoration of key processes that support the long-term persistence of biodiversity	**Vegetation** Re-establish physical, chemical and biological processes in degraded vegetation areas	(1) Rehabilitate all old, degraded sites	Flora management plan (to be compiled)
		Alien plants and other alien biota Control and, where possible, eliminate alien biota to facilitate re-establishment of natural biodiversity patterns and process in invaded areas	(1) Establish the distribution and density of invasive species (2) Prioritise areas for alien removal, focusing on biodiversity restoration (3) Implement removal programmes for priority species and areas	(1) Invasive-plant management plan (2) Invasive-animal management plan (draft management plan to be completed)
MITIGATE INTERNAL and EXTERNAL PRESSURES To reduce threats and pressures and limit environmental impacts resulting from non-biodiversity management aspects and operations on surrounding land and resource use	**Reconciling biodiversity with other reserve objectives** To ensure that non-biodiversity management aspects of reserve operations (revenue generation, including visitor, resource use, developments, management activities, etc) are informed and	**Internal developments** Minimise the impacts associated with the development of visitor and reserve management infrastructure, and ensure that such developments do not compromise biodiversity objectives **Internal activities** Minimise the impacts associated with visitor and reserve management activities, and ensure that such activities do not compromise biodiversity objectives	(1) Reserve zoning (2) Develop and implement Conservation Development Framework (CDF) (3) Develop in accordance with environmental impact assessment (EIA) process (NEMA) and corporate policies (4) Establish visitor carrying capacities (5) Implement green standards and environmental best practice based on corporate policy	(1) CDF (to be compiled) (2) Infrastructure plan for high-intensity use zone (to be compiled) (3) Infrastructure maintenance plan (to be compiled)

	constrained by biodiversity conservation objectives, and that the impacts of these activities on biodiversity are minimised	**Extractive resource use** Minimise the impacts of extractive resource use, and ensure that such activities are aligned with corporate guidelines, are within management capacity constraints, and do not compromise biodiversity objectives	(1) Quantify current extractive resource activities (2) Define opportunities and constraints in line with corporate guidelines (3) Regulate resource use according to adaptive management process	
	Reconciling biodiversity with external threats To reduce external threats and pressures, and limit impacts of surrounding land and resource use on biodiversity conservation within the reserve	**External developments** Minimise the impacts associated with inappropriate developments outside the reserve	(1) Engage regional land management authorities, including IDPs and spatial development frameworks (SDFs) at local and regional level (2) Align with bioregional planning, including explicitly identified areas for the maintenance of important biodiversity patterns and processes with appropriate land use guidelines (3) Provide input into planning and decision-making processes for external development that may compromise reserve and biodiversity network objectives (4) Negotiate to ensure that external developments are not visually obtrusive or out of character with the park	Branch-wide communications strategy (in draft)
		External activities Negotiate to ensure that external resource and land use does not detrimentally affect ecological processes within the reserve	(1) Negotiate to mitigate or improve the management of external, potentially detrimental impacts (2) Encourage eco-friendly resource use and land management practices on adjacent properties (3) Mitigate the impacts of oil and other pollution events through appropriate contingency planning	Risk management plan (to be compiled)

		Hydrological and water chemistry changes Participate in activities for the maintenance of river flow regimes and water chemistry within limits for the maintenance of ecosystem processes in aquatic ecosystems within the reserve	(1) Encourage enforcement of legislation applicable to the management and protection of aquatic resources (2) Address the issue of sewage and other point-source pollution of aquatic systems	Environmental risk plan (to be compiled)
		Illegal harvesting of resources Prevent the illegal collection, removal and destruction of physical and biological resources	(1)Public liaison (2)Law enforcement	(1) Safety and security plan (2) Branch-wide security operational manual (to be compiled)
WILDNESS/ REMOTENESS To maintain and restore wildness/remoteness in Tygerberg Nature Reserve so that the spiritual and experiential qualities of wildness are maintained, enhanced or, where necessary, restored	**Range of experiences** Provide a range of visitor experiences		(1)Reserve zoning (2) Develop CDF and sensitivity-value analysis	(1) CDF (to be compiled) (2) Reserve expansion plan (to be compiled)
	Sense of place Maintain or restore appropriate sense of place		(1) Implement and update CDF (2) Establish and apply appropriate visitor carrying capacity (3) Negotiate to ensure that external developments are not visually obtrusive or out of character with the reserve	
CULTURAL HERITAGE MANAGEMENT To investigate and manage all cultural assets	Conserve and manage cultural heritage assets	N/A	(1) Develop a database of all tangible and intangible cultural assets, including inventory, maps and relevant documentation (2) Develop site management plans for each cultural heritage site, with monitoring systems in place for management priorities and prescripts	

			(3) Facilitate appropriate interpretation of cultural heritage associated with the reserve	

5.1.2 Socio-economic objectives

Table 3: Socio–economic objectives

High-level objective	*Objective*	*Sub-objective (where required)*	*Initiative*	*Low-level plan*
Nurture productive and mutually beneficial partnerships that result in gains in economic and/or biodiversity equity	Enhance socio-economic benefits to local communities	N/A	(1) Contribute to local community development by supporting the Expanded Public Works Programme/poverty relief projects (2) Contribute to local skills development by supporting the skills and learnership programmes (3) Identify and facilitate the creation of business opportunities in association with the reserve (4) Support community-based social development initiatives	Branch-wide local socio-economic development plan (to be compiled)
	Increase environmental awareness and encourage participation in conservation initiatives	Inspire visitors and communities to consider the environment as an interrelated and interdependent system, of which they are an integral part	(1) Develop and implement an interpretation plan that feeds into both the education and zoning plans (2) Implement environmental education and youth development programmes suited to the needs of each focus group (i.e. tailor-made programmes for each focus group)	(1)Branch-wide education strategy and action plan (to be compiled) (2)Regional environmental education and community involvement strategy (to be compiled)
		Educate learners, educators and other community focus groups to be able to take environmental action		
		Support educators and community leaders with resource and information materials	(1) Establish and market an environmental resource centre and outdoor classrooms, with a range of interpretive and information	

			resources	
Support cooperative governance that will build custodianship	Maintain good reserve/community/ stakeholder relations	N/A	(1) Identify and involve all relevant stakeholders in the reserve advisory forum (2) Develop effective communication mechanisms and responsibilities for representatives	(1) Branch-wide communications strategy (in draft) (2) Branch-wide stakeholder relations plan (to be compiled)
	Effective cooperative governance	Minimise degrading impact and consequences of inappropriate development in and around the reserve	(1) Establish and maintain good working relationships with relevant government departments as well as internal City of Cape Town departments	
		Ensure support/buy-in for management decisions through participatory decision-making processes	(1) Define roles and responsibilities with stakeholder groups, partnerships and government through written agreements/ terms of reference (TORs) and MOUs	
			(1) Plan for visitor infrastructure and facilities, as identified by the CDF (2) Develop and implement the infrastructure management plan (in compliance with State of Infrastructure report) (3) Compile a State of Infrastructure report	(1)Infrastructure management plan (to be compiled) (2)Branch visitor facilities plan (to be compiled)

	Conserve and manage cultural heritage assets		(1) Develop a database of all tangible and intangible cultural assets, including inventory, maps and relevant documentation (2) Facilitate appropriate interpretation of cultural heritage associated with the reserve	
Grow the domestic visitor profile to be representative of South African society	Grow the domestic visitor profile of the reserve to be representative of regional demographics	N/A	(1) Promote and manage access to the reserve (2) Develop and support dedicated access programmes (3) Actively market reserve resources and services	
Enhance the City of Cape Town's reputation	Enhance the reserve's reputation	N/A	(1) Develop and implement a communication plan to promote reserve activities	
Advance strategic human resource management	To ensure good human resource management	N/A	(1) Implement and support learnerships and volunteer programmes (2) Ensure that all staff have access to training initiatives, as per the Workplace Skills Plan (WPSP) (3) Ensure that all corporate human resource policies are adhered to	Regional standard operational procedures manual (to be updated)
Financial management	To ensure sound financial management practices are applied to and underpin the	N/A	Manage cost spending appropriately	Branch business plan (to be compiled)

	reserve			
Achieve good corporate governance/ management	Effective management of risk profile	N/A	Conduct legal review	

5.2 SWOT (strengths, weaknesses, opportunities, threats) analysis

Strengths

- Conserves last remaining remnant of Critically Endangered Swartland Shale Renosterveld
- Local knowledge and expertise of areas under jurisdiction
- Proclaimed as a local-authority nature reserve
- Staff buy-in and positive attitude of neighbouring landowners
- Strong community involvement and active Friends group
- Good existing radio and telephonic communication systems
- Good information technology infrastructure and communications platform
- Management commitment to compiling and implementing management plans and biodiversity action plans
- Legislative support – municipal bylaws, Nature Conservation Ordinance and NEMA
- Constitutional support
- All staff and management have experience and knowledge of managing protected areas
- Existing corporate support services
- Reserve entry and exit are controlled by visitor access booms and gates
- Defensible boundaries
- Access to specialist services and databases
- Well-resourced reserve in terms of infrastructure and equipment
- Staff determination and will to succeed
- Existing, fully functional ecosystems, which support critically endangered Swartland shale renosterveld
- Biological monitoring systems are implemented and monitored regularly
- Altitude – mitigate climate change, reduce pollution risk and inability to develop
- Adds value to neighbouring communities
- Aesthetic value

Weaknesses

- Lack of capacity in reserve staff component – unable to fulfil all functions and requirements; need reserve managers, environmental education officer, conservation compliance officers, visitor access control officers, foreman, handyman, small-plant operators, workers
- Areas along inefficient fencing allow illegal access
- Public's ignorance of applicable environmental legislation and bylaws
- Inadequate operational office/yard area limiting operational management
- No staff accommodation on site, resulting in impeded response time to emergencies
- Insufficient operational funding

- Lack of vehicular access to all areas of reserve in case of emergencies, such as firebreaks and boundaries
- Lacking capacity and funding of the management authority and conservation agency to implement the management plan
- Law enforcement difficulties in large areas, and lack of capacity in reserve and relevant departments
- Lack of coordination and cooperation between government departments
- Lack of collaborative mechanisms for natural resource management and decision making
- Lack of awareness and mainstreaming of biodiversity best practice at sector level
- Lack of access to disadvantaged communities, i.e. limited access via public transport
- Negative visual impact of communication antennae

Opportunities

- Expansion of reserve size through stewardship agreements with neighbouring landowners
- Aesthetic beauty of the reserve attracts over 20 000 visitors per annum
- Creating buy-in among key stakeholders and role players
- Increased community ownership
- Job creation, and career succession and planning
- Accessing funds for Expanded Public Works/Sustainable Livelihoods programmes to assist in job creation and reserve infrastructure maintenance and development
- Continuous liaison with, and support for, Friends groups
- Linking up with surrounding landowners, sharing knowledge and resources in order to manage the biodiversity network effectively
- Promoting the reserve as a destination for outdoor eco-activities

Threats

- Unsustainable illegal harvesting of flora
- Lack of adequate law enforcement component and education to counter illegal harvesting
- Garden escapee alien plant species invading reserve – current invasive alien species list stands at 43 species
- Severe erosion problems along firebreaks and tracks
- Climate change – potential climate change impacts on the environment, e.g. fire risk, extreme changes in climate
- Inappropriate/unauthorised development – could affect protected area through edge effect; reduce viability of protected area through further fragmentation of the habitat
- Fragmentation of the Tygerberg Hills due to transformation of land through agriculture

- Unauthorised access – risk of criminal activity; fire risks; off-road vehicles (4x4s and quad bikes); pollution; swimming pool backwash water; trespassing; cable theft; vandalism; dumping over fence
- Threats and intimidation of conservation staff when enforcing legislation
- Lack of appropriate training
- Personal safety of staff
- Growing external communities with increasing needs
- Increased incidence of crime and illegal activities
- Lack of sustainable funding for students and interns
- Lack of sustainable operational funding
- Change in local government political structures

5.3 Protected-area policy framework and guiding management principles

5.3.1 Biodiversity conservation management

In the management and control of the conservation area, the management undertakes to conserve the biodiversity that is indigenous to this area, in order to ensure that its character is retained and that it functions optimally as an ecosystem. (This will take place in partnership and consultation with CapeNature.)

5.3.1.1 Community-based natural resource management

The harvesting of natural resources in Tygerberg Nature Reserve is currently not permitted. Research on the amount of harvesting and the species harvested across the city is currently under way. Some investigations as to the types and extent of harvesting in the reserve have started, but, to date, no detailed or conclusive data have come to light to determine where current harvesting is sustainable and/or what potential threats are foreseen should these activities persist.

5.3.1.2 Fire management

Fire plays an essential ecological role in the life cycle of renosterveld species. Fire is crucial to the long-term conservation of species within Tygerberg Nature Reserve, and is therefore considered an important component of reserve management. Fire management involves varying the season, frequency (five to ten years) and intensity of fires, and reconciling ecological and practical requirements. Too frequent fires, or fires that burn out of phase with the natural burning regime, present a threat to slower-growing species, which may be entirely eliminated. If fire is excluded from the area, forest species can invade, resulting in renosterveld species being lost. Conversely, if vegetation is allowed to burn too frequently, the area becomes degraded, and alien species, especially grasses, invade. Grasses maintain a shorter fire cycle, and permanently change the vegetation structure and biodiversity value.

The fire management programme for Tygerberg Nature Reserve involves the monitoring of large wildfires as well as smaller fires, whether natural or unnatural. Historical records of fire events in the reserve area as well as post-fire monitoring records assist in the documentation of veld ages, which, in turn, influence fire management. Minimal interference takes place when naturally ignited fires occur. In cases where human induced fires occur that would simulate a natural fire, the same management responses would apply. Natural fires are limited in spread within the constraints of ecological, project and public safety requirements. All possible actions are taken to prevent the spread of fire onto the adjacent properties. All unnatural fires that threaten the reserve ecologically, or pose a threat to infrastructure and/or public safety, are controlled.

Prescribed burning of vegetation is a management option in areas where vegetation becomes senescent (old) and there is a risk of species loss. The use of prescribed burning practices would assist in maintaining a vegetation mosaic that promotes plant and animal diversity. Accurate fire records and post-fire monitoring data will facilitate the initiation of prescribed burns in the core area of the reserve when needed. The decision to administer prescribed burns is considered on an annual basis and, if required, planned and implemented accordingly. Fire may be used to keep fuel loads low so as to reduce the risk of uncontrolled fires, particularly on the urban edge and in areas that pose a potential risk to infrastructure and public safety. Firebreaks and other fire control measures required by law will be implemented where necessary and feasible.

The nature of the area's terrain, property boundaries and extensive areas of natural veld increase the chances of fire spreading both into and out of the reserve. Reasonable pre-fire protection measures are necessary, as well as a plan of action in the event of wildfire. Interaction with various City of Cape Town departments and independent stakeholders, and continuous public and private landowner involvement, are essential. The development of fire protection and response plans is an important component of the reserve's fire management regime.

Fire management implementation in Tygerberg Nature Reserve involves the following:

- Application of guidelines on seasonal burning intervals and species requirements acquired from relevant documentation and biophysical specialists
- Accurate record keeping of all fires, including details and maps
- Use of fire data and geographic information systems (GIS) for recording and mapping
- Application of post-fire monitoring programmes
- Application of fire data to determine prescribed burning needs
- Development and implementation of a fire protection and response plan, including affected stakeholders, such as additional City of Cape Town departments and private landowners neighbouring Tygerberg Nature Reserve

5.3.1.3 Soil erosion and control

Within Tygerberg Nature Reserve, natural erosion processes are allowed to take their course without interference, except where necessary. In the case of human-induced and natural areas that are aggravated, appropriate management action will be taken.

Potential human impacts should be avoided through correct planning and maintenance of infrastructure. Areas that had previously been degraded by human activities, and that are no longer in use, will be restored as close as possible to their natural state. Disturbed areas and areas affected by unnatural accelerated erosion will be controlled by means of appropriate methods. The cause and management of problem erosion sites will also be considered.

Soil management implementation in Tygerberg Nature Reserve includes the following:

- Identification and recording of all soil erosion sighted, including the assessment and development of restoration plans where required
- Use of soil erosion data and GIS for recording and mapping
- Application of fixed-point monitoring programmes at identified soil erosion sites
- Accurate documentation of management actions applied to restoration sites, including results from areas responding to these actions

5.3.1.4 Invasive-species management – an invasive-species control and eradication strategy (according to section 76 of the National Environmental Management Biodiversity Act)

The management of invasive species is a priority in Tygerberg Nature Reserve. Alien biota should be controlled and, where possible, eliminated in order to facilitate the re-establishment of natural biodiversity and processes in invaded areas.

Invasive-species management in Tygerberg Nature Reserve is applied in accordance with the City of Cape Town's invasive alien species strategy and in coordination with various government-funded initiatives, including Working for Water and Working for Wetlands. Invasive alien plant species could spread rapidly should management fail to continue to implement a properly planned and coordinated programme.

Until recently, invasive species management has mainly focused on woody alien plant species, such as Port Jackson, Eucalyptus, Pines and Rooikrans. Herbaceous weeds had been largely ignored. However, recent monitoring and the development of an extensive herbaceous weed and annual species survey for the reserve have shown that some herbaceous species already pose a risk to biodiversity in the area, while others have the potential to become one.

In order to protect indigenous species from invasive aliens, the following is required:

- Prioritisation of areas for alien removal, focusing on biodiversity restoration

- The implementation of removal programmes for priority species and areas
- The development and implementation of an invasive-alien management plan as well as a management plan for alien biota

The eradication of invasive and alien faunal species is also carried out in the reserve. Formal plans outlining the monitoring of the removal of identified species is however required.

5.3.1.5 Species introductions – naturally occurring and according to CapeNature policies

Species historically indigenous to the Tygerberg, and for which suitable habitat and eco-niches are available, may be re-introduced. Several fauna species that previously occurred in the Tygerberg are no longer present or are down to small numbers.

Prior to the re-introduction of any species, a full proposal is required. Investigation into the availability of suitable habitat for the species with reference to public utilisation of areas is required, as is a full investigation into the historical occurrence and status of the species. The effect of re-introducing species to the area must also be researched. Re-introduction of potentially dangerous or problematic species may also require public participation. An investigation of suitable sources is also necessary.

All proposed re-introductions need to be recommended and approved by the operational director as well as provincial authorities before implementation. The implementation of any re-introduction programmes must be specified in a plan of action, and documented accurately.

5.3.2 Financial and human resources

For the implementation of the management plan, the following is essential:

- Planning
- Budgeting
- Funding
- Auditing
- Capacity building

5.3.3 Community participation

Tygerberg Nature Reserve will strive to nurture productive and mutually beneficial partnerships, which, in turn, will result in economic and/or biodiversity equity. This will be achieved through the creation of job opportunities in support of the Expanded Public Works Programme and poverty relief projects. Participation in skills development and learnership programmes will contribute to the development of local skills. Through the support of community-based social development initiatives, the reserve can also enhance socio-economic benefits to local communities.

Through the development of an education plan, Tygerberg Nature Reserve will contribute to raising environmental awareness, and will encourage participation in conservation initiatives.

The main aims of the reserve education plan will be:

- to inspire visitors and communities to consider the environment as an interrelated and interdependent system, of which they are an integral part;
- to educate learners, educators and community focus groups to take environmental action, assisted by resource and information materials;
- to develop and implement environmental education programmes suited to the needs of various focus groups;
- to develop and implement an interpretation plan that complements the education plan.

In order to develop and maintain good reserve/community/stakeholder relations, all relevant stakeholders need to be identified. An effective communication system needs to be developed in order to liaise with interested and affected parties. Where necessary, task teams and working groups may be established in order to assist the reserve with key issues.

Volunteers

- FoTH
- Tygerberg Bird Club
- School learners
- South African Students' Travel Service volunteers (future)
- Work-shadow learners
- University and technikon students

Reserve liaison committee, community participation

- FoTH
- Central-district advisory board
- Public participation process

5.3.4 Safety and security

Tygerberg Nature Reserve received a high threat rating in the independent security audit done in October 2010 by Plan-it and Thorn-ex, in that the reserve experiences high incidences of trespassing, vandalism and poaching.

The effective management of security issues is essential to ensure the conservation of biodiversity on site and to ensure the safety of visitors. This can only be done with the appointment of permanent conservation officers, who are dedicated to law enforcement (see appendix 11).

5.3.5 Culture-historical, archaeological and paleontological management

The effective management and conservation of the culture-historical, archaeological and paleontological heritage are essential to conserve the historical character and characteristics of the area for future generations, and will be done through mapping, evaluating and establishing guiding principles for the usage of the areas.

5.3.6 Tourism development and management

Tourism needs to be managed effectively and responsibly in order not to negatively affect the biodiversity of Tygerberg Nature Reserve through the development of a CDF.

5.3.7 Infrastructure management

In the conservation area, infrastructure is essential for effective management, and for use by visitors. It is essential to manage the infrastructure in a manner that has no negative impacts on the environment or on the experience of visitors, through regular maintenance of roads, routes and parking areas as well as any other relevant infrastructure.

5.3.8 Strategic research

Research subjects beneficial to the management of Tygerberg Nature Reserve need to be identified. These subjects can then be prioritised and further pursued. Research does currently take place in the reserve, and is supported by management. However, many of the projects are conducted by outside student researchers and organisations, and are not initiated by the reserve's needs. An effort needs to be made to obtain copies of data and results from projects conducted within the reserve's boundaries.

The collection of baseline data is essential for determining the presence of species, and to determine the extent to which management actions should take place. Monitoring is essential for determining the success of management actions as well as to provide an indication of long-term change. Research on the property is essential for obtaining more knowledge on the environment.

Research will be permitted via formal agreements. Projects will need to be registered. Research projects that contribute to the overall objectives of the reserve should be encouraged, and, essentially, 'pure' research will be allowed, providing it is considered to be of sufficient merit and is not in conflict with the objectives of the reserve. Partnerships with local academic institutions should be further developed. Where necessary, CapeNature permits need to be obtained in conjunction with reserve-issued permits.

5.4 Sensitivity analysis of Tygerberg Nature Reserve

Tygerberg Nature Reserve is a considerable asset to the City of Cape Town, and significantly contributes to national conservation targets of threatened vegetation types, as listed in the National Spatial Biodiversity Assessment (Driver *et al*. 2005), as well as provides a service and facilities to local residents and schools.

The development of the sensitivity and zoning plan is one of the steps required in compiling a CDF for the reserve. CDFs are tools to reconcile the various land use needs, and to delineate visitor user zones and the positioning and nature of new infrastructure, access points, roads and facilities.

The CDF process has grown in response to the requirements of the National Environmental Management Biodiversity Act (2004), and seeks to comply with the spatial planning requirements of this Act. The CDFs will ensure that best practice and sustainable development principles are integrated with spatial planning in protected areas.

The sensitivity-value analysis is the landscape analysis portion of the broader CDF. It is a multi-criteria decision-support tool for spatial planning that is designed to present the best available information in a format that allows for defensible and transparent decision making. The sensitivity-value process is based on the principle that the acceptability of a development (or placement of a structure) at a site is based on that site's value (arising from the site's biodiversity, heritage, aesthetic or other values) and its sensitivity or vulnerability to a variety of disturbances (Holness 2005).

The sensitivity-value analysis, the CDF and the associated zoning plan should form part of an adaptive management system. They will grow and change over time as the understanding of the landscapes and ecosystems improves. However, they will never replace the need for detailed site and precinct planning and EIA compliance at site level.

The small size of Tygerberg Nature Reserve did not warrant an extensive analysis, resulting in a fairly straightforward subsequent zoning process. The methodology used for both the sensitivity-value analysis and the zoning process was adapted from Holness and Skowno (2008) and SRK Consulting (2008[1]; 2008[2]).

All geographic information work was carried out in ESRI's ArcMap, version 9.3.1, using the ArcInfo licence level, with Spatial Analyst and 3D Analyst extensions. See appendix 10 for the complete sensitivity-value analysis and zoning process.

5.5 Zoning plan of Tygerberg Nature Reserve

5.5.1 Zoning informants

This section briefly outlines the values underlying the identification of broad tourism use zones. It is important to remember that the landscape/biodiversity analysis is just one of the informants in the zoning process. Although the biodiversity analysis is intrinsically a relatively objective scientific process, other informants to the zoning process are not.

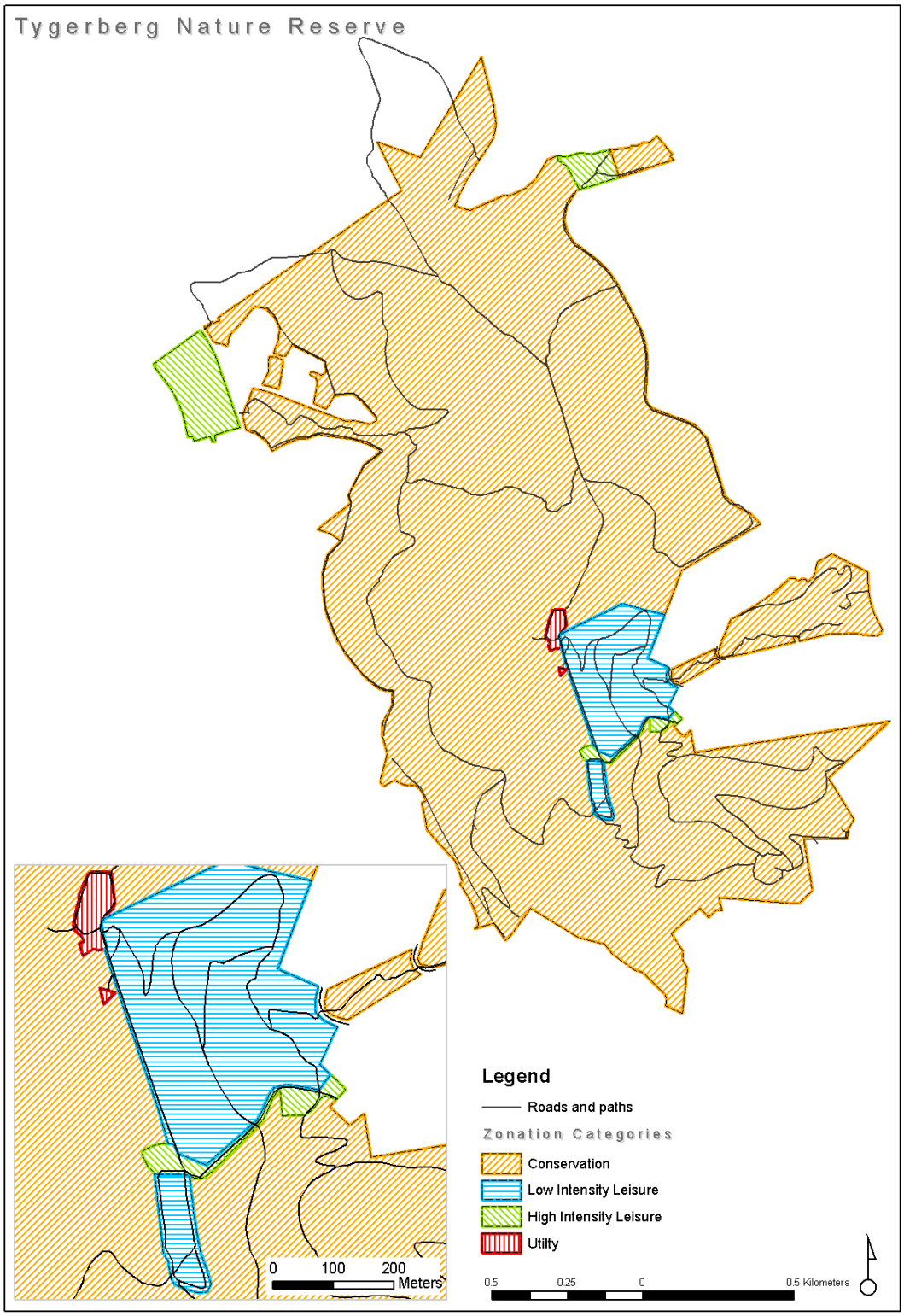
Although every attempt is made to place high sensitivity-value sites into more protected zones where possible, the zoning process is essentially a compromise between environment and development. In particular, the identified high-value sites are often the key biodiversity assets that need to be made available to the eco-tourism market in an appropriate manner. The biodiversity layers and the spatial management of the reserve are directly linked during the identification of special management areas (where applicable). Even within broad high-tourist use zones, some areas are likely to be subject to very tight conservation controls (potentially involving complete exclusion of human impacts from an area).

Underlying decision-making rules used in the zoning process

- The zoning process is aimed at striking a *balance* between environmental protection and the development required to meet the broader economic and social objectives of the reserve.
- The zoning process takes into account existing development footprints and tourism access routes.
- This is based on the underlying principle that, all else being equal, an existing transformed site is preferable to a greenfield site, from a biodiversity perspective.
- Infrastructure costs are dramatically increased when developments take place away from existing infrastructure.
- Existing tourism nodes and access routes are a reality of the economic landscape, and it would not be possible to shut down existing tourism sites that compromise the development objectives of the reserve.
- Where existing development nodes, tourist sites and access routes occur in areas with high sensitivity-value, the broad-use zoning aims to keep the development footprint as small as is realistically possible, preferably within the existing transformed site.
- Where possible, sites with high biodiversity sensitivity-value are put into stronger protection zones.
- Peripheral development is favoured and should, where possible, be located outside the conservation area.
- Two key points need to be emphasised:
    - The designation of a broad-use zone does not imply that all sites within that zone would be suitable for all the development types anticipated. Detailed site level planning is still required, and many sites may prove to be unsuitable at a site/precinct/EIA level of planning.
    - Special management areas/overlays need to be formalised and linked to the management plans.

5.5.2 Zoning definitions and descriptions

The zoning definitions and descriptions were workshopped with area and regional managers. Four categories were decided on, namely primary conservation zone, conservation zone, low-intensity leisure zone and high-intensity leisure zone (see appendix 10). Please see map 6, which outlines the proposed zoning and zone descriptions. The process is still linked to the zoning used for the CapeNature reserves (Holness & Skowno 2008), as there should be general alignment of the broader-use zones to enable comparison and integration if provincial documents so require.



Map 6: Zoning map for Tygerberg Nature Reserve

6. DEVELOPMENT PLAN

A comprehensive development plan for Tygerberg Nature Reserve is required. This document would include detailed precinct plans for high-intensity use zones. It will indicate suitable development nodes, and would be guided by the infrastructure and zoning management plans.

Existing infrastructure at Tygerberg Nature Reserve is as follows:

- Kristo Pienaar Environmental Education Centre/offices/yard
- Welgemoed gate house
- Plattekloof gate house
- Kanonberg district office
- Duiker trail
- Golden Mole trail
- Induli trail
- Tortoise trail
- Ukhetshe trail
- Watsonia trail
- Wild Olive trail
- Five water reservoirs (various sites)
- 15 picnic benches (various sites)
- 11 viewing benches (various sites)

7. COSTING PLAN

The following costing plan is based on Tygerberg Nature Reserve receiving 25% of the entire central-district budget. The budget below is not a true reflection of costs, but merely a guideline. A true costing plan can only be drafted once the CDF has been finalised, with associated building and maintenance costs.

The costing plan details the broad-category breakdown for management interventions for Tygerberg Nature Reserve for the period 2011–2016.

Table 5: Broad category breakdown for Management Interventions for the Tygerberg Nature Reserve for the period 2011 – 2016

Management action	Funding source	Approximate costs 2011–2012	Approximate costs 2012–2013	Approximate costs 2013–2014	Approximate costs 2014–2015	Approximate costs 2015–2016
1. Invasive alien plant programme • Clearing of important alien plants 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, 15	Invasive alien species funding	R90 000,00	R94 500,00	R99 225,00	R104 186,25	R109 395,81
2. Fire management • Maintenance of fire belts • Planned ecological burn	Head office operating	R77 000,00	R80 850,00	R84 892,50	R89 137,13	R93 593,98
3. Repairs and maintenance •	Operating	R31 052,11	R32 604,71	R34 234,95	R35 946,69	R37 744,02
4. Fencing •	Capital expenditure					
8. Infrastructure development •	Capital reserve fund		-	-	-	-
6. Human resources • Salaries, wages • Employee-related costs • Employee costs	Operating	R963 090,78 R216 648,58 R1 179 739,36	R1 040 138,00 R233 980,46 R1 274 118,40	R1 123 349,00 R252 698,89 R1 376 047,80	R1 213 216,90 R272 914,80 R1 486 131,60	R1 310 274,20 R294 747 ,98 R1 605 022,10
7. General expenses • General operating costs • Other materials • Contracted services	Operating	R213 349,84 R20 694,62 R6 574,87	R224 017,33 R20 729,35 R6 903,61	R235 218,19 R21 765,17 R7 248,79	R246 979,09 R22 853,46 R7 611,23	R259 328,04 R23 996,13 R7 991,79
8. Special projects •	Capital expenditure	-		-	-	-

Note:
Human resource costs are escalated at 8% per annum.
Operating expenditure is escalated at 5% per annum.

PART 3

MONITORING & AUDITING

5. MONITORING & AUDITING

8.1 Annual audit procedure

8.1.1 Management Effectiveness Tracking Tool South Africa (METT-SA)

The METT-SA is a rapid, site-level assessment tool adapted from the World Bank and Worldwide Fund for Nature (WWF) system (second edition, 2007). The system is based on the idea that good protected-area management follows a process comprising six distinct stages or elements:

It begins with understanding the **context** of existing values and threats (where are we now?), then progress through **planning** (where do we want to be?), followed by allocation of resources (**inputs**) (what do we need?). As a result of management actions (**processes**) (how do we go about it?), it eventually produces products and services (**outputs**) (what were the results?), which result in impacts or **outcomes** (what did we achieve?).

This version has been compiled so that it can be applied to the full range of protected areas managed by all C.A.P.E partners. It also applies to protected areas in other regions, and, with minor adaptations, could be applied outside of South Africa as well. It may also be used for marine protected areas (MPAs) and islands, but, in the long run, it may become necessary to amend the system to be more specific to these areas. In addition, a system for off-reserve conservation areas, such as conservancies or stewardships, may need to be developed.

When applying METT-SA, it is important for the following to be kept in mind:

- The METT-SA is intended to report on the reserve's progress. Thus, the score is the baseline against which future assessments are made to see if there has been an improvement.
- It is site-specific and must therefore not be used to compare scores between different protected areas.
- It is a useful tool to give indications of management trends. In this version, the six elements of the management process, as defined in the original version, are scored as subsets of the total. This gives an indication of where management should strive for improvement.
- It is not intended to replace more detailed assessments as part of adaptive management systems.
- The METT-SA has limitations in the quantitative measurement of outcomes, and these should be measured by more objective and quantitative systems.
- This version adjusts the total score where questions are irrelevant.

- Often, low scores on some questions could be a reflection on the organisation as a whole, and do not necessarily point to issues over which the protected-area manager has control. **The performance of managers should therefore under no circumstances be measured against the METT-SA results.**

Tracking the trends of management effectiveness is a long-term process, and instant improvements are unlikely. Generally, the METT-SA is applied at three-year intervals, but an annual application is acceptable if it is understood that changes may only be slight. The METT-SA for Tygerberg Nature Reserve was undertaken in 2007, and the results are presented in appendix 12. The METT-SA will be repeated in approximately September 2011.

8.1.2 Protected-area review (PAR)

The PAR is an internal review conducted annually to assist managers in reviewing their sites, and to allow for adaptive management actions to be taken where required (and within managers' control).

8.2 Management plan review

Every five years, this IRMP should be reviewed and adjusted where necessary. To achieve this, the following questions (and others as needed) should be addressed:

- Did this management plan make a meaningful contribution to the management of Tygerberg Nature Reserve?
- Were individual management 'prescriptions' realistic and achievable? Were they written unambiguously or was there room for misunderstanding?
- Were budgets for each management activity realistic? Were the allocated budgets too much or too little?
- Were sufficient staff members of the right qualifications allocated to each management activity?

There will be some overlap between the review and the audit, and they should therefore be done on the same day, by the same team.

8.3 Biodiversity monitoring

Biodiversity monitoring is essential, as this is a vital tool for managers to ascertain what biodiversity exists in their reserves, and how best to manage ecosystems. Management actions can be implemented as a result of data obtained from monitoring.

Table 6: Biodiversity monitoring

Action	Responsible Party	Means of Verification	Frequency
Biodiversity database Records of fauna and flora in order to update species lists	Reserve staff, students and manager	Monthly database entries	Monthly
Vegetation monitoring Invasive alien plants Aspects to be monitored include the effectiveness of the operation, the effectiveness of the follow-up, methods used, compliance with the alien-clearing schedule, and environmental damage such as herbicide spillage	Reserve staff Reserve manager, students and interns	Weekly inspections Final inspections Field verification sheet	Weekly Once-off – completion of contract Annually – to determine management unit clearing plan
Fire mapping All veld fires must be accurately mapped and recorded to build up a useful record that will assist with veld interpretation. These records will take the guesswork out of the effects of fire when it occurs on the property. A simple map indicating the extent and date of the burn is the minimum requirement. Actions to be monitored include fire belts – are they in place and maintained – and the management and scheduling of burns.	Reserve staff Reserve manager, students and interns	Veld age map, fire map	Post-fire
Post-fire recruitment	Reserve staff Reserve manager, students and interns	Stratified sampling plots	Post-fire Six months 12 months Annually for three years
Abundance, density and structure	Reserve staff Reserve manager, students and interns	Fixed-point photography Presence, abundance, density	Annually

Threatened species	Reserve staff Reserve manager, students and interns	Field observation sheet	Seasonally
<u>Soil erosion monitoring</u> Actions to be monitored include frequently used foot paths by visitors, management tracks and fire breaks. Erosion sites must be accurately mapped and recorded to build up an accurate record that will assist in rehabilitation.	Reserve staff Reserve manager, students and interns	Fixed-point photography	Annually
<u>Faunal monitoring</u> Actions to be monitored include population size, rare and endangered species, fixed-point photography, veld health, burn cycle, bird monitoring and bontebok monitoring.			
Bontebok behaviour	Dr A Wasilewski Marborg University, Germany	Field observation	Biannually
Iimbovane ant project	Prof S Chown Stellenbosch University	Fixed transects Field observation sheets	Biannually
Nocturnal species counts	Reserve staff Reserve manager, students and interns	Modified vehicle	Monthly

Bird diversity Bird distribution	Reserve staff Reserve manager, students and interns Tygerberg Bird Club Tygerberg Bird Club Reserve staff Reserve manager, students, interns and field staff	Field observations Bird ringing	Weekly Biannually
Small mammals	Reserve staff Reserve manager, students, interns and field staff	Stratified random Sherman trap array	Seasonally
Fauna distribution		Motion-activated camera trapping	Monthly
<u>Water monitoring</u> Rainfall figures are to be collected at the Welgemoed and Plattekloof gate houses.	Reserve staff Reserve manager, students, interns	Field collection equipment	Daily

PART 4

REFERENCES

9. REFERENCES

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Wood. J & Low. B 1995. Environmental Survey and Management Guidelines for the Tygerberg and Environs, Part 2. National Botanical Institute. Cape Town.

Websites -

- IDP
  http://www.capetown.gov.za/IDP

- IMEP
  http://www.capetown.gov.za/en/EnvironmentalResourceManagement/publications

- C.A.P.E
  Please note that this is not a City-hosted website.
  http://www.capeaction.org.za

- Bionet
  CCT Biodiversity Network Analysis:
  http://www.capetown.gov.za/en/EnvironmentalResourceManagement/publications
- Wetlands work (if this is to long use Publications)
  Prioritisation of City Wetlands Report:
  http://www.capetown.gov.za/en/EnvironmentalResourceManagement/publications

- Nature Reserve Booklet
  www.capetown.gov.za/naturereserves
- LBSAP
  http://www.capetown.gov.za/en/EnvironmentalResourceManagement/publicatio

PART 5

10. APPENDICES

Charts and Tables

Appendix 1: Rainfall Table

Rainfall-Welgemoed	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Total
year	mm												
2004	7.2	0	9.4	67.2	0	0	58.9	108.1	13.1	119.1	5	8	**396mm**
2005	34.1	7	13.6	100.7	45.8	132.6	66.6	110.1	54	22.9	16	0	**603.4mm**
2006	0	12.4	5.6	36.6	143.10	47.5	101.9	62	33.5	54	34.5	33.5	**564.66mm**
2007	8.5	48	33	91	146	160	147.5	144.5	46	44	54.5	34	**957mm**
2008	19	23	9	31.5	112	118	211	113	222	16	56.5	13	**944 mm**
2009	1.5	17.	6	39	131	166.5	98	114.5	109	59	130	6	**878mm**
2010	1.5	12.5	9.5	19	152	136	58	77	19	51.5	39	14	**589mm**

Appendix 3: Legal Agreements

Gazette for Reserve Proclamation:

PROVINCE OF WESTERN CAPE

Provincial Gazette

6306

Friday, 7 October 2005

PROVINSIE WES-KAAP

Provinsiale Koerant

6306

Vrydag, 7 Oktober 2005

Registered at the Post Office as a Newspaper

As 'n Nuusblad by die Poskantoor Geregistreer

CONTENTS

*(*Reprints are obtainable at Room 9-06, Provincial Building, 4 Dorp Street, Cape Town 8001.)*

(Continued on page 1716)

INHOUD

*(*Hendrukke is verkrygbaar by Kamer 9-06, Provinsiale-gebou, Dorpstraat 4, Kaapstad 8001.)*

(Vervolg op bladsy 1716)

P.N. 337/2005 7 October 2005

RECTIFICATION

CITY OF CAPE TOWN

REMOVAL OF RESTRICTIONS ACT, 1967

Notice is hereby given that the Minister of Environment, Planning and Economic Development, properly designated as competent authority in terms of paragraph (a) of State President Proclamation No. 160 of 31 October 1994, in terms of section 2(1) of the Removal of Restrictions Act, 1967 (Act 84 of 1967), and on application by the owners of Erf 1305, Green Point, in the Municipality of Cape Town, Cape Division, removes title deed conditions C.(c) and C.(d) contained in Deeds of Transfer T.33811 of 1996 and T.62683 of 1999.

Provincial Notice P.N. 312 of 23 September 2005 is hereby cancelled.

P.K. 337/2005 7 Oktober 2005

REGSTELLING

STAD KAAPSTAD

WET OP OPHEFFING VAN BEPERKINGS, 1967

Kennis geskied hiermee dat die Minister van Omgewing, Beplanning en Ekonomiese Ontwikkeling, behoorlik aangewys as die bevoegde gesag ingevolge paragraaf (a) van Staatspresident Proklamasie Nr. 160 van 31 Oktober 1994 kragtens artikel 2(1) van die Wet op Opheffing van Beperkings, 1967 (Wet 84 van 1967), en op aansoek van die eienaars van Erf 1305, Groenpunt, in die Munisipaliteit van Kaapstad, Afdeling Kaap, hef titelakte voorwaardes C.(c) en C.(d) vervat in Transportaktes T.33811 van 1996 en T.62683 van 1999, op.

Provinsiale Kennisgewing P.K. 312 van 23 September 2005 word hierby gekanselleer.

P.N. 338/2005 7 October 2005

CITY OF CAPE TOWN

EXTENSION OF BOUNDARIES OF A LOCAL NATURE RESERVE:
TYGERBERG LOCAL NATURE RESERVE

Notice is hereby given in terms of section 7(7) of the Nature Conservation Ordinance, 1974 (Ordinance 19 of 1974), that the City of Cape Town has, with the approval of the Minister of Environmental Affairs and Development Planning altered the boundaries of the Tygerberg Local Nature Reserve as defined in Proclamation 387/1973 dated 30 October 1973 by the inclusion of Erf 2460 as indicated on a map filed in the office of the Acting Chief Executive Officer: CapeNature, CapeNature House, Belmont Office Park, 14 Belmont Road, Rondebosch.

P.K. 338/2005 7 Oktober 2005

STAD KAAPSTAD

UITBREIDING VAN GRENSE VAN 'N PLAASLIKE NATUURRESERVAAT:
TYGERBERG PLAASLIKE NATUURRESERVAAT

Kennisgewing geskied hierby kragtens artikel 7(7) van die Ordonnansie op Natuurbewaring, 1974 (Ordonnansie 19 van 1974), dat die Stad Kaapstad met die goedkeuring van die Minister van Omgewingsake en Ontwikkelingsbeplanning die grense van die Tygerberg Plaaslike Natuurreservaat soos omskryf in Proklamasie 387/1973 gedateer 30 Oktober 1973 gewysig het deur die toevoeging van Erf 2460 soos aangedui op 'n kaart geliasseer in die kantoor van die Waarnemende Hoof- Uitvoerende Beampte: CapeNature, CapeNature-huis, Belmont Park Kantoorkompleks, Belmontweg 14, Rondebosch.

CITY OF CAPE TOWN (TYGERBERG REGION)

REMOVAL OF RESTRICTIONS

• Erf 15978, Goodwood *(first placement)*

Notice is hereby given in terms of section 3(6) of the Removal of Restrictions Act, Act 84 of 1967 that the undermentioned application has been received and is open to inspection at the office of the Municipal Manager, Voortrekker Road, Goodwood and any enquiries may be directed to Mr D Stevens, Town Planner, PO Box 100, Goodwood 7459, 1st Floor, Municipal Offices, Voortrekker Road Goodwood, Darrel.Stevens@capetown.gov.za, tel (021) 590-1422. fax (021) 590-1420.

The application is also open to inspection at the office of the Director, Integrated Environmental Management, Region A, Provincial Government of the Western Cape, at Room 201, 1 Dorp Street, Cape Town, from 08:00-12:30 and 13:00-15:30 (Monday to Friday). Telephonic enquiries in this regard may be made at (021) 483-8780 and the Directorate's fax number (021) 483-3633.

Any objections, with full reasons therefor, should be lodged in writing at the office of the abovementioned Director: Integrated Environmental Management, Region A, at Private Bag X9086, Cape Town 8000, with a copy to the abovementioned Municipal Manager, Attention: Mr M Jones on or before 14 November 2005, quoting the above Act and the objector's erf number. Any comments received after the aforementioned closing date may be disregarded. *(File no:* W18/6/1/168)

Applicant: C F Haasbroek Attorneys

Nature of application: Removal of restrictive title conditions applicable to Erf 15978, Goodwood, to enable the owner to utilise the existing property for industrial purposes.

WA Mgoqi, City Manager

STAD KAAPSTAD (TYGERBERG-STREEK)

OPHEFFING VAN BEPERKINGS

• Erf 15978, Goodwood *(eerste plasing)*

Kennis geskied hiermee ingevolge artikel 3(6) van die Wet op Opheffing van Beperkings, Wet 84 van 1967 dat die onderstaande aansoek ontvang is en ter insae lê by die kantoor van die Munisipale Bestuurder, Tygerbergstraat, Voortrekkerweg, Goodwood. Enige navrae kan gerig word aan mnr. D Stevens, Stadsbeplanner, Posbus 100, Goodwood 7459; Eerste Verdieping, Munisipale Kantore, Voortrekkerweg, Goodwood of Darrel.Stevens@capetown.gov.za, tel (021) 590-1422, faks (021) 590-1420.

Die aansoek lê ook ter insae by die Kantoor van die Direkteur: Geïntegreerde Omgewingsbestuur, Streek A, Provinsiale Regering van die Wes-Kaap, by Kamer 201, Dorpstraat 1, Kaapstad, vanaf 08:00-12:30 en 13:00-15:30 (Maandag tot Vrydag). Telefoniese navrae in hierdie verband kan gerig word aan (021) 483-8780 en die Direktoraat se faksnommer is (021) 483-3633.

Enige besware, met die volledige redes daarvoor, moet skriftelik by die kantoor van die bogenoemde Direkteur: Geïntegreerde Omgewingsbestuur, Streek A, Privaat Sak X9086, Kaapstad 8000, met 'n afskrif aan die bogenoemde Munisipale Bestuurder (vir aandag: mnr M Jones), ingedien word voor of op 14 November 2005, met vermelding van die bogenoemde Wet en die beswaarmaker se erfnommer. Enige kommentaar wat na die voorgemelde sluitingsdatum ontvang word, mag moontlik nie in ag geneem word nie. (Lêer nr W18/6/1/168)

Aansoeker: C F Haasbroek Prokureurs

Aard van aansoek: Opheffing van beperkende titelvoorwaardes van toepassing op erf 15978, Goodwood, ten einde die eienaar in staat te stel om die bestaande eiendom vir industriële doeleindes aan te wend.

WA Mgoqi, Stadsbestuurder

Appendix 4: Surveyor General (SG) diagrams-

ERF 853 –a

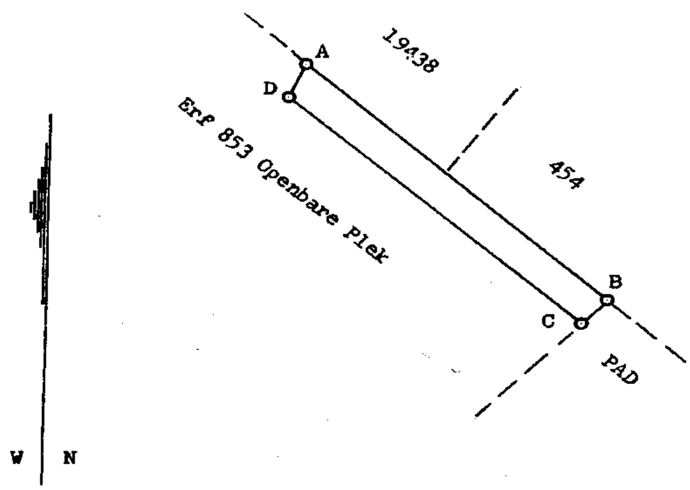
DE HAAN & HOFMEYR
Landmeters

SERWITUUTKAART

KANTOORAFSKRIF

SYE METER		RIGTINGS-HOEKE	KOÖRDINATE Y	Stelsel Lo 1[illegible]°	X	L.G. No.
		Konstante:	+	0,00+	3 700 000,00	1467/82
AB	32,80	313.15.40	A	+ 3[illegible]51,47	+ 49849,03	Goedgekeur
BC	3,00	43.13.40	B	+ 36927,58	+ 49871,51	
CD	31,81	133.15.40	C	+ 36929,63	+ 49873,70	
DA	3,16	204.55.30	D	+ 3[illegible],80	+ 49851,89	vir Landmeter-generaal
		Kanonberg	Δ	+ 36369,50	+ 44145,68	1982-04-14
		Altyd. Res	Δ	+ 34467,86	+ 45314,39	

Bakens: A,B,C,D : 12mm Ronde ysterpen.



Skaal 1 : 500

Die figuur A B C D

stel voor 97 vierkante meter grond, synde

'n Serwituutgebied op Erf 853, ~~Publieke Plek~~, Bellville,

geleë in Welgemoed Dorp in die Bellville Munisipaliteit, Administratiewe Distrik

van die Kaap, Provinsie Kaap die Goeie Hoop.

Opgemeet in Februarie 1982,

deur my. Landmeter

Hierdie kaart is geheg aan No. A/S K 540/825 gedateer t.g.v. Registrateur van Aktes	Die oorspronklike kaart is. No. 550/1978 geheg aan Transport/~~Grondbrief~~ ~~No.~~ 1982 22673	Lêer No. S/22/29 M.S. No. E[illegible]457/82 Komp. ~~BH-8GA/V5(1270)~~ BHST-3311 (M562) Alg. Plan T.P. 1122

Serw. 1467/82

ERF 853 –b

DE HAAN, HOFMEYR en PRICE
Landmeters

SERWITUUTKAART

KANTOORAFDRUKKRIF

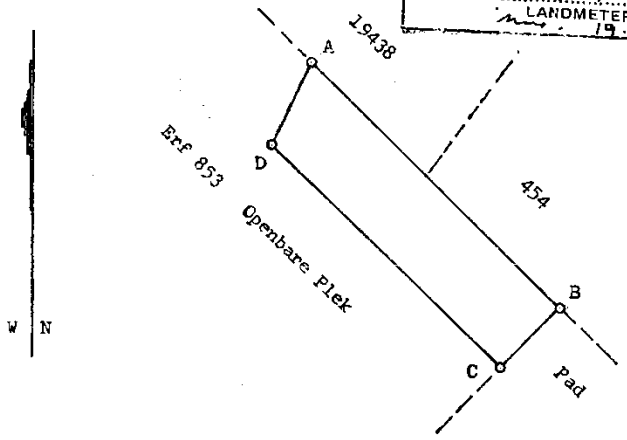
SYE METERS		RIGTINGS-HOEKE		KOÖRDI Stelsel	Lo 19°	X
		Konstante:	+	0,00	+	6 700 000,00
AB	32,80	313.15.40	A	+ 36951,47	+	49849,03
BC	8,00	43.13.40	B	+ 36927,38	+	49871,51
CD	30,16	133.16.00	C	+ 36933,06	+	49877,34
DA	8,42	204.55.30	D	+ 36955,02	+	49856,67
		Kanonberg	△	+ 36369,50	+	44145,68
		Altyd Res.	△	+ 34467,86	+	45314,39

L.G. No.
5 5 1/78

Goedgekeur
Landmeter-generaal
22/3/1978

Bakens: A,B,C,D 12mm Ronde ysterpen.

TERUGGETREK
SIEN LÊER S/ 22/29 BLS. 377
LANDMETER-GENERAAL
19.5.1982



Skaal 1: 500

Die figuur A B C D

stel voor 252 vierkante meter grond, synde

~~in Serwituut-gebied op~~ ~~Erf 21059 in Gedeelte van~~ Erf 853, Publieke Plek, Bellville,

geleë in Welgemoed Dorp in die Bellville Munisipaliteit, Administratiewe Distrik van d. : Kaap, Provinsie Kaap die Goeie Hoop.

Opgemeet in Februar : 1977,

deur my,

Landmeter

Hierdie kaart is geheg aan No. gedateer t.g.v. Registrateur van Aktes	Die oorspronklike kaart is. No. 550/1978 geheg aan Transport/Grondbrief No.	Lêer No. S/22/29 M.S. No. E. 380/77 Komp. BH-8CA/V5(1270) Alg. Plan T.P. 1122

21059

ERF 853-c

DE HAAN, HOFMEYR & PRICE
Land Surveyors

550/78 GENERAL PLAN T.P. 1122

SIDES Metres		ANGLES OF DIRECTION	CO-ORDINATES Y	System	X
AB	344,40	240.56.00			
BC	161,33	239.25.50			
CD	311,45	20.47.40			
DE	73,15	293.31.00			
EF	22,99	13.27.50			
FG	21,13	356.35.00			
GH	22,49	315.34.00			
HJ	20,82	290.21.10			
JK	68,74	24.55.20			
KL	59,98	3131.15.50			
LM	39,36	43.15.50			
MN	45,34	313.15.50			
NP	31,17	229.49.10			
PQ	73,73	35 110.55.30			
QR	369,47	80.55.30			
RA	428,70	163.53.30			

Beacons: A 12mm Round iron peg 30cm North of Rail corner fence Post.
B. Rail corner fence Post.
C,D,E,F,G,H,J,K,L,M,N,P,Q : 12mm Round iron peg.
R : Rail corner fence post in concrete.

The figure A B C D E F G H J K L M N P Q R
represents 18,0879 Ha of land, being
Erf 853 Bellville (Public Place)
situate in Welgemoed Township in the Municipality of Bellville,
Administrative District of the Cape, Province of Cape of Good Hope.
~~Surveyed in~~ Framed in terms of Section 39 of Act No. 9 of 1927
by me, in August 1977

Land Surveyor

C

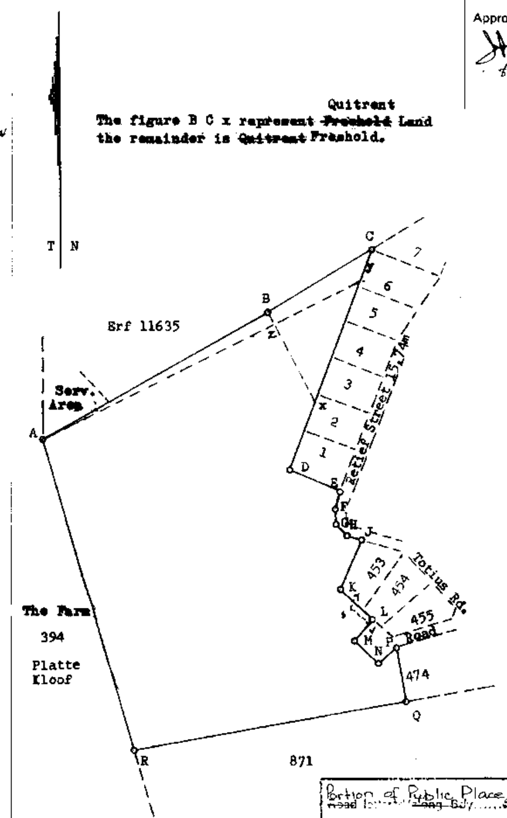
This diagram is annexed to	The original diagram is	File No. S/22/29 M 562
No. 22673/82 dated	No. annexed to	S.R. No. Framed
i.f.o.	Transfer/Grant	Comp. BH-8CA/V5 (1270) BH-8CA/V42 (1267) BH-8AC/Z44 (6121) BH-8AC/Z53 (6123)
Registrar of Deeds	No. FOR ENDORSEMENTS SEE BACK OF DIAGRAM	Gen. Plan T.P. 1122

GENERAL PLAN. T.P. 1122.

OFFICE COPY

S.G. No. 550/78
Approved
Surveyor-General
22.3.1978

The figure B C x represent ~~Freehold~~ Quitrent Land the remainder is ~~Quitrent~~ Freehold.



Portion of Public Place ~~Road~~ S.T.L.V.
closed. Vide 3.3.78.
File S. 22/29 p. 302
SURVEYOR GENERAL
Date. 20/3/78

Scale: 1: 5000

ERF 11645

OFFICE COPY
KANTOOR AFSKRIF

SIDES Cape Feet			DIRECTIONS °			CO-ORDINATES System Lo 19	Y		X		off. Desig.
					Constant		+100000	0	+11,870000	0	
AB	747	9	286	07	30	A	+20234	2	+34259	8	
BC	395	5	245	50	20	B	+19515	7	+34467	5	
CD	88	7	338	59	20	C	+19154	8	+34205	6	
DE	98	0	338	38	40	D	+19123	0	+34388	4	
EF	1269	9	3	21	50	E	+19087	3	+34479	7	
FG	808	6	132	02	30	F	+19161	8	+35747	4	
GA	1057	3	153	29	20	G	+19762	3	+35205	9	
Aa	2	8	106	07	30	a	+20236	9	+34259	0	
Connection:											
AH	571	5	153	29	20	H	+20489	3	+33748	4	

Beacons:
A. - Not beaconed.
B.C. - 4" diameter iron corner fence posts in concrete.
D.E. - Rail corner fence posts in concrete.
F. - ½" round iron peg alongside rail corner fence post.
G. - Rail corner fence post.
a. - 1" diameter iron peg 3' long. (Indicatory beacon)
H. - Bottom of rail corner fence post leaning to east.

ERF 11645 BELLVILLE

1. The figure A.B.C.D.b.c.d. representing Portion 8 of Van Riebeeks Hof.
Vide Diag. Nº 11318/1965 annexed to D/T 1966 7992

2. The figure D.E.F.G.d.c.b. representing Lot Schweppes.
Vide Diag. Nº 6068/58, annexed to C.C.T. 1958-327-16333.

~~Riebeek Water~~ No. ~~391~~

CAPE

The figure A.B.C.D.E.F.G.
represents 10·2801 Morgen of land being

LOT RIEBEEK WATER
and comprises the properties specified above.
situate near Durbanville,
Administrative District of Cape Province of Cape of Good Hope.
Surveyed in Oct. 1955, July 1964 by me
4 June 1965

Land Surveyor.

This diagram is annexed to Cert. of Consol. Title No. 7993/66
dated
i.f.o.

Registrar of Deeds.

The Original Diagrams No. are as quoted above.
~~Transfer/Grant~~
No.

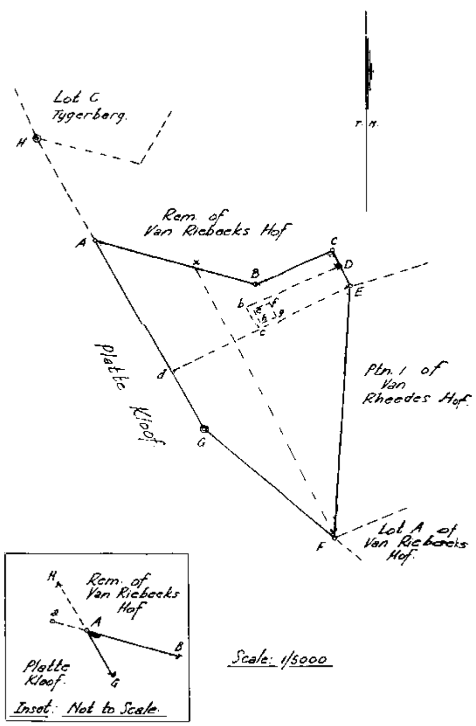
File No. S/6584/1
S.R. No. E 559/65
Comp. M 1191 2(6092)
M 1194 4(6037)

Artors ft, C.T.

S.G. No. 11319/65

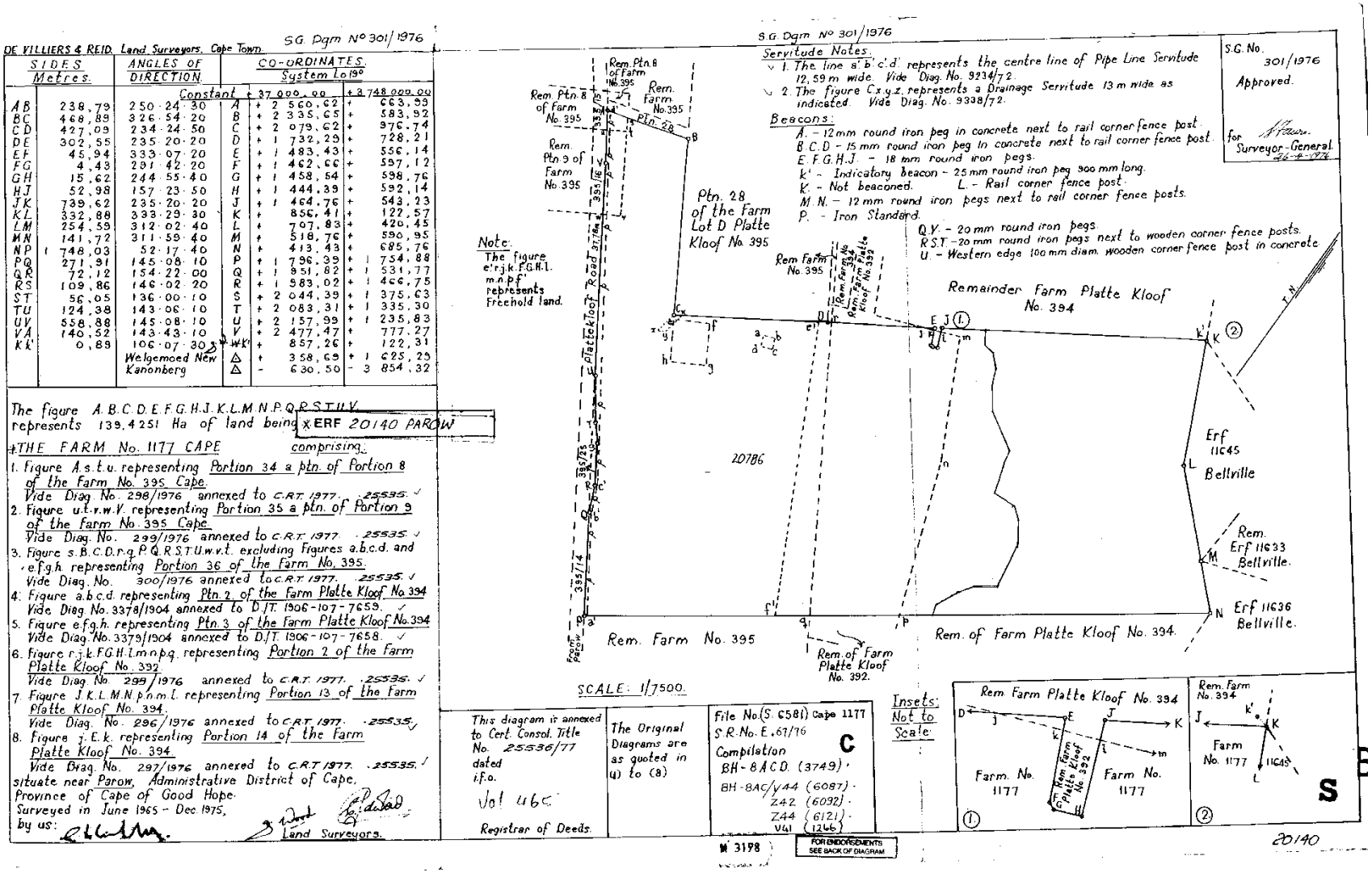
Approved

Surveyor-General.
10·1·1966



Scale: 1/5000

ERF 20140


DE VILLIERS & REID, Land Surveyors, Cape Town.
S.G. Dgm N° 301/1976
SIDES Metres
ANGLES OF DIRECTION
CO-ORDINATES System Lo 19°
Constant + 37 000.00 + 3 748 000.00
AB 238.79 250·24·30 A + 2 560.62 + 663.99
BC 468.89 326·54·20 B + 2 335.65 + 583.92
CD 427.09 234·24·50 C + 2 079.62 + 976.74
DE 302.55 235·20·20 D + 1 732.29 + 728.21
EF 45.94 333·07·20 E + 1 483.43 + 556.14
FG 4.43 291·42·20 F + 1 462.66 + 597.12
GH 15.62 244·55·40 G + 1 458.54 + 598.76
HJ 52.98 157·23·50 H + 1 444.39 + 592.14
JK 739.62 235·20·20 J + 1 464.76 + 543.23
KL 332.88 333·29·30 K + 856.41 + 122.57
LM 254.59 312·02·40 L + 707.83 + 426.45
MN 141.72 311·59·40 M + 518.76 + 596.95
NP 1 748.03 52·17·40 N + 413.43 + 685.76
PQ 271.91 145·08·10 P + 1 796.39 + 1 754.88
QR 72.12 154·22·00 Q + 1 851.82 + 1 531.77
RS 109.86 146·02·20 R + 1 983.02 + 1 466.75
ST 56.05 136·00·10 S + 2 044.39 + 1 375.63
TU 124.38 143·06·10 T + 2 083.31 + 1 335.30
UV 558.88 145·08·10 U + 2 157.99 + 1 235.83
VA 140.52 143·43·10 V + 2 477.47 + 777.27
KK' 0.89 106·07·30 W + 857.26 + 122.31
Welgemoed New △ + 358.69 + 1 625.29
Kanonberg △ − 630.50 − 3 854.32
The figure A.B.C.D.E.F.G.H.J.K.L.M.N.P.Q.R.S.T.U.V.
represents 139,4251 Ha of land being ERF 20140 PAROW
THE FARM No. 1177 CAPE comprising:
1. Figure A.s.t.u. representing Portion 34 a ptn. of Portion 8 of the Farm No. 395 Cape. Vide Diag. No. 298/1976 annexed to C.R.T. 1977. 25535.
2. Figure u.t.r.w.V. representing Portion 35 a ptn. of Portion 9 of the Farm No. 395 Cape. Vide Diag. No. 299/1976 annexed to C.R.T. 1977. 25535.
3. Figure s.B.C.D.r.q.P.Q.R.S.T.U.w.v.t. excluding Figures a.b.c.d. and e.f.g.h. representing Portion 36 of the Farm No. 395. Vide Diag. No. 300/1976 annexed to C.R.T. 1977. 25535.
4. Figure a.b.c.d. representing Ptn 2 of the Farm Platte Kloof No 394 Vide Diag. No. 3378/1904 annexed to D.J.T. 1906-107-7658.
5. Figure e.f.g.h. representing Ptn 3 of the Farm Platte Kloof No. 394 Vide Diag. No. 3379/1904 annexed to D.J.T. 1906-107-7658.
6. Figure r.j.k.F.G.H.l.m.n.p.q. representing Portion 2 of the Farm Platte Kloof No. 392 Vide Diag. No. 299/1976 annexed to C.R.T. 1977. 25535.
7. Figure J.K.L.M.N.p.n.m.l. representing Portion 13 of the Farm Platte Kloof No. 394. Vide Diag. No. 296/1976 annexed to C.R.T. 1977. 25535.
8. Figure j.E.k. representing Portion 14 of the Farm Platte Kloof No. 394 Vide Diag. No. 297/1976 annexed to C.R.T. 1977. 25535.
situate near Parow, Administrative District of Cape, Province of Cape of Good Hope.
Surveyed in June 1965 - Dec. 1975,
by us:
Land Surveyors.
S.G. Dgm N° 301/1976
Servitude Notes:
1. The line a'.b'.c'.d' represents the centre line of Pipe Line Servitude 12,59 m wide. Vide Diag. No. 9234/72.
2. The figure C.x.y.z. represents a Drainage Servitude 13 m wide as indicated. Vide Diag. No. 9338/72.
Beacons:
A. - 12 mm round iron peg in concrete next to rail corner fence post.
B.C.D. - 15 mm round iron peg in concrete next to rail corner fence post.
E.F.G.H.J. - 18 mm round iron pegs.
k' - Indicatory beacon - 25 mm round iron peg 900 mm long.
K. - Not beaconed. L. - Rail corner fence post.
M.N. - 12 mm round iron pegs next to rail corner fence posts.
P. - Iron Standard.
Q.V. - 20 mm round iron pegs.
R.S.T. - 20 mm round iron pegs next to wooden corner fence posts.
U. - Western edge 100 mm diam. wooden corner fence post in concrete.
S.G. No. 301/1976 Approved. for Surveyor-General.
Note: The figure e'.r.j.k.F.G.H.l. m.n.p.f' represents Freehold land.
Ptn. 28 of the Farm Lot D Platte Kloof No. 395
Rem. Ptn. 8 of Farm No. 395
Rem. Farm No. 395
Rem. Ptn 9 of Farm No. 395
Rem Farm No. 392
Rem. Farm Platte Kloof No. 392
Remainder Farm Platte Kloof No. 394
Platte Kloof Road
20786
Erf 11645 Bellville
Rem. Erf 11633 Bellville.
Erf 11636 Bellville.
Rem. Farm No. 395
Rem. of Farm Platte Kloof No. 392.
Rem. of Farm Platte Kloof No. 394.
SCALE: 1/7500.
Insets: Not to Scale
Rem Farm Platte Kloof No. 394
Farm No. 1177
Rem. Farm No. 394
Farm No. 1177
This diagram is annexed to Cert. Consol. Title No. 25536/77 dated i.f.o.
Registrar of Deeds.
The Original Diagrams are as quoted in (1) to (8)
File No. (S. 6581) Cape 1177
S.R. No. E. 61/76
Compilation C
BH-BACD. (3749)
BH-BAC/Y44 (6087)
Z42 (6092)
Z44 (6121)
V41 (1246)
M 3198
FOR ENDORSEMENTS SEE BACK OF DIAGRAM
S
20140

ERF 21742

"Blignaut & Rommelaere" PN.32 3128/92

SYE		RIGTINGS-HOEKE		KOÖRDINATE Y	Stelsel Lo19°		X
	Meter						
		Konstante:		+	0,00	+	3 700 000,00
A B	40,00	325 20 50	A	+	38 364,38	+	48 473,79
B C	79,07	41 57 10	B	+	38 341,64	+	48 506,69
C D	53,36	39 03 00	C	+	38 394,50	+	48 565,49
D E	31,10	12 01 20	D	+	38 428,12	+	48 606,93
E F	17,00	112 00 00	E	+	38 434,59	+	48 637,35
F G	22,58	97 30 20	F	+	38 450,35	+	48 630,98
G H	8,95	124 03 00	G	+	38 472,74	+	48 628,03
H J	30,00	150 35 30	H	+	38 480,15	+	48 623,02
J K	27,00	145 20 50	J	+	38 494,88	+	48 596,89
K L	32,62	235 20 50	K	+	38 510,23	+	48 574,68
L M	45,91	333 06 00	L	+	38 483,40	+	48 556,13
M N	4,44	291 49 30	M	+	38 462,63	+	48 597,07
N P	15,63	244 48 50	N	+	38 458,51	+	48 598,72
P Q	52,98	157 23 20	P	+	38 444,37	+	48 592,07
Q A	122,00	235 20 50	Q	+	38 464,74	+	48 543,16
		528 Welgemoed Wes	△	+	37 427,02	+	49 602,90
		365 Witduin	△	+	39 938,53	+	50 922,83

Beskrywing van Bakens.
A, B, C, D, E, F, G, H, J, K : 12mm ronde ysterpen
L, M, N, P : 18mm ronde ysterpen
Q : 20mm ronde ysterpen

Komponente:

(1) Die figuur ABCqEFGHJKLMNPQ stel Erf 20937 Parow voor.
Volgens Algemene Plan No. 11764

(2) Die figuur DEq stel die Restant van Erf 20938 Parow voor.
Volgens ~~Algemene Plan No. 11764~~ Kaart 3126/92

RAZ

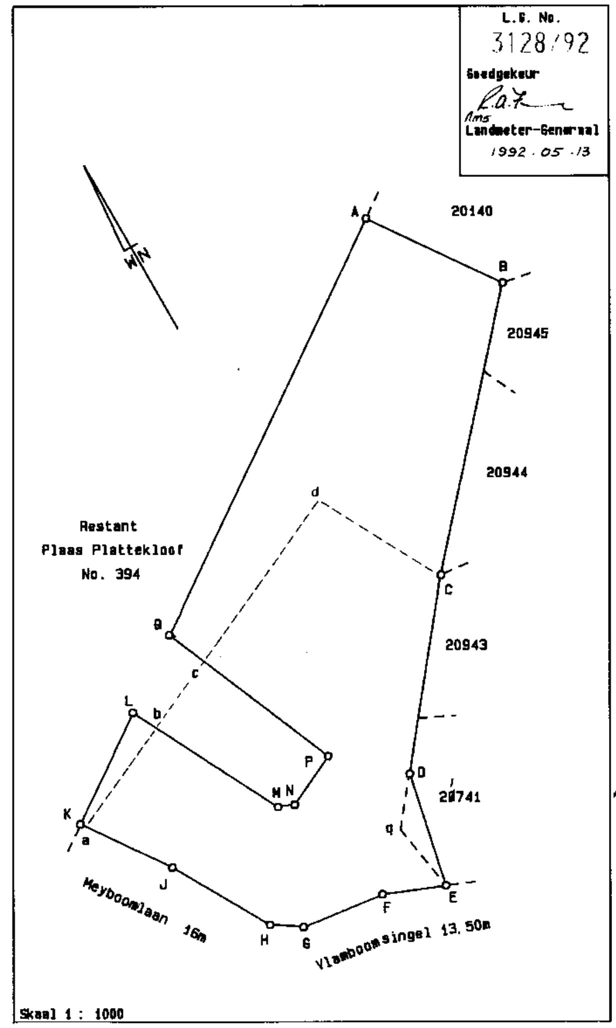
* Openbare Plek

Die figuur A B C D E F G H J K L M N P Q
stel voor 1,0128 hektaar grond, synde
ERF 21742 PAROW * en bevat (1) en (2) soos hierbo beskrywe
geleë in die Munisipaliteit van Parow
Administratiewe Distrik Kaap Provinsie Kaap die Goeie Hoop.
Opgemeet in April 1986 – Augustus 1987
en September 1990 deur ons,

P.E. Blignaut en R.A.C. Lewis Landmeters

Hierdie kaart is geheg aan No. 46155/92 gedateer t.g.v. Registrateur van Aktes	Die oorspronklike kaarte is soos hierbo beskrywe	Lêer No. Cape 1177 M.S. No. E 874/92 Komp. BH55-4263(M4568) Algemene Plan No. 11764

KANTOORAFSKRIF



ERF 2397

P. O'NEILL, Land Surveyor, CAPE TOWN. 6865/81

SIDES Metres		ANGLES OF DIRECTION	CO-ORDINATES Y System Lo 19		X
		Constant		+ 30 000,00	+3 740 000,00
AB	229,04	252.32.10	A	+ 7 495,29	+ 8 192,01
BC	62,~~88~~91	31.~~52.10~~53·50	B	+ 7 276,81	+ 8 123,27
CD	42,265	9.~~56.00~~52·50	C	+ 7 310,045	+ 8 176,6~~7~~78
DE	42,26	347.58.50	D	+ 7 317,30	+ 8 218,30
EF	42,265	326.~~03.20~~04·40	E	+ 7 308,50	+ 8 259,63
FG	106,356	307.~~18.20~~17·50	F	+ 7 284,902	+ 8 294,69
GH	47,16	315.19.00	G	+ 7 200,31	+ 8 359,14
HJ	39,58	324.37.40	H	+ 7 167,15	+ 8 392,67
JK	409,63	66.04.30	J	+ 7 144,24	+ 8 424,94
KA	399,74	183.21.10	K	+ 7 518,67	+ 8 591,07
		▲386 Welgemoed New		+ 7 358,69	+ 9 625,29
		▲417 Welgemoed North		+ 7 313,04	+ 9 523,28

Servitude Notes:

1. The figure AByx represents a servitude area. Vide Dgm. No. 10340/1955 annexed to D/T 1958.327.16330.
2. The lines a.~~c.d.e~~.b.c.d. represent the southern boundary of a servitude right of way 7 metres wide. Vide Dgm. No.2349/82~~/1984~~ annexed to D/S

Description of Beacons.

A. Rail +1 metre
All others are 12mm round iron pegs.

Servitude Notes (Cont.)

3. The line ef represents the centre line of a servitude water pipeline 3 metres wide. Vide Dgm. No.2349/1982 annexed to D/S K 973/1982 S

The figure ABCDEFGHJK
represents 9,490~~8~~5 hectares of land, being
ERF 23971 PORTION ERF 11633 BELLVILLE,
situate in the Municipality of Bellville, Administrative District
of Cape, Province of Cape of Good Hope.
Surveyed in April to August, 1981
by me,

Land Surveyor

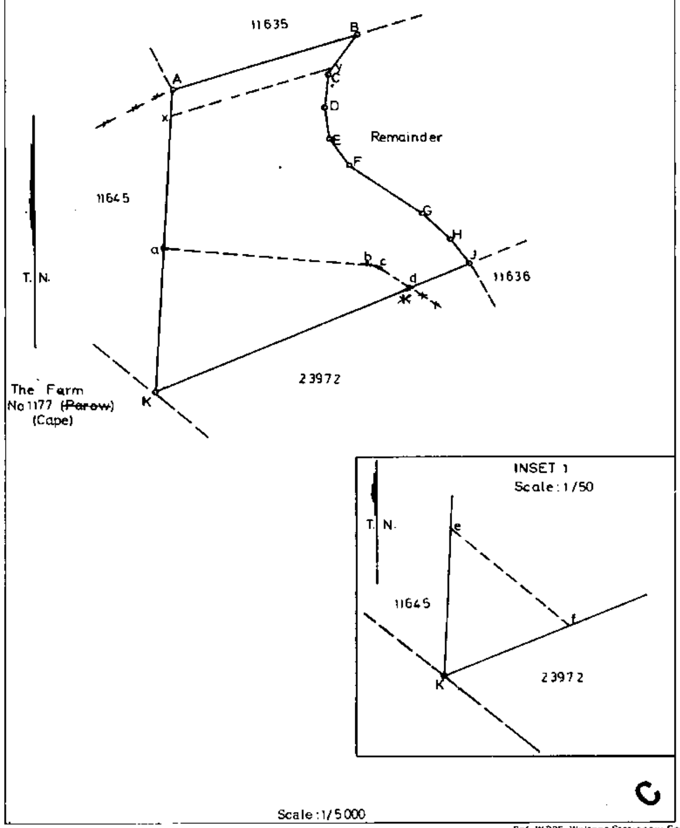
This diagram is annexed to	The original diagram is	
Deed of Transfer No. 5956/1983 dated i.f.o. Registrar of Deeds	No. 10340/1955 annexed to Transfer/Grant No. 1958.327.16330	File No. S/6581/1 S.R. No. E 2198/81 Comp. ~~BH-8AC/Y44 & Y53~~ BHSS-4264 (M1194) -4262 (M1191)

OFFICE COPY

S.G. No. 6865/81

Approved

Surveyor-General
1982-04-28



Ref. W325 Waltons Stationery Co. P.O. Box 11358, Cape Town.

ERF 23972

P.O'NEILL, Land Surveyor, CAPE TOWN. 6866/81

SIDES Metres		ANGLES OF DIRECTION	CO-ORDINATES Y System Lo 19		X
		Constant		+ 30 000,00	+3 740 000,00
AB	409,63	246.04.30	A	+ 7 518,67	+ 8 591,07
BC	7,59	324.37.50	B	+ 7 144,24	+ 8 424,94
CD	166,50	332.38.20	C	+ 7 139,85	+ 8 431,13
DE	59,89	342.52.50	D	+ 7 063,33	+ 8 579,00
EF	59,86	354.42.30	E	+ 7 045,70	+ 8 636,24
FG	108,80	4.57.10	F	+ 7 040,18	+ 8 695,84
GH	23,97	341.38.30	G	+ 7 049,57	+ 8 804,23
HJ	23,97	314.17.30	H	+ 7 042,02	+ 8 826,98
JK	148,60	290.58.50	J	+ 7 024,86	+ 8 843,72
KL	30,19	307.10.00	K	+ 6 886,11	+ 8 896,93
LM	30,19	326.20.50	L	+ 6 862,05	+ 8 915,17
MN	203,82	342.32.20	M	+ 6 845,32	+ 8 940,30
NP	33,54	310.03.10	N	+ 6 784,16	+ 9 134,73
PQ	33,53	271.58.00	P	+ 6 758,49	+ 9 156,31
QR	102,82	239.33.20	Q	+ 6 724,98	+ 9 157,46
RS	87,90	329.25.00	R	+ 6 636,34	+ 9 105,36
ST	554,48	59.26.20	S	+ 6 591,62	+ 9 181,03
TU	344,36	60.55.30	T	+ 7 069,07	+ 9 462,97
UV	945,49	177.22.10	U	+ 7 370,03	+ 9 630,32
VA	141,61	132.00.10	V	+ 7 413,44	+ 8 685,83
		Δ386 Welgemoed New		+ 7 358,69	+ 9 625,29
		Δ417 Welgemoed North		+ 7 313,04	+ 9 523,28

Servitude Notes:

1. The figure fghUnmlk represents a servitude area. Vide Dgm. No. 6692/1963 annexed to D/S 1965./97.214;
2. The figure klmn represents a servitude area. Vide Dgm. No. 6058/1958 annexed to D/S 1960./25.414;
3. ~~The lines a.b.c. represent the western and c.d.e. the southern boundaries of a servitude right of way 7 metres wide. Vide Dgm. No. 2350/1982 annexed to~~ K.G.

Note: The figures Axy and zTU are Freehold.

SERVITUDE NOTE 3, DELETED
VIDE S/.......
SURVEYOR-GENERAL
1994-05-13

Description of Beacons
12mm round iron pegs. A.B.C.D.E.F.G.H.J.K.L.M.N.P.Q.R.
12mm round iron peg in concrete. S.
Section standard. T.
Rail +1 metre /corner fence post. V.
Not beaconed. U

The figure ABCDEFGHJKLMNPQRSTUV

represents 51,4429 hectares of land, being

ERF 23972 PORTION ERF 11636 BELLVILLE,

situate in the Municipality of Bellville, Administrative District

of Cape, Province of Cape of Good Hope.

Surveyed in April to August, 1981
by me,

Land Surveyor

This diagram is annexed to	The original diagram is	File No. S/3581/3
No. 29654/93 dated		S.R. No. E 2196/81
i.f.o.	No. 4815/1935 annexed to Transfer/~~Grant~~	Comp. ~~BH-8AC/Z42, Z44, Z51 and Z53~~
Registrar of Deeds	No. ~~1935. .7452.~~ 1936-141-7452	BHSS-3171(M1071) BHSS-4292(M1197) BHST-3173(M1077) -4294(M1200) -4264(M1194) -4432(M604) K.G.

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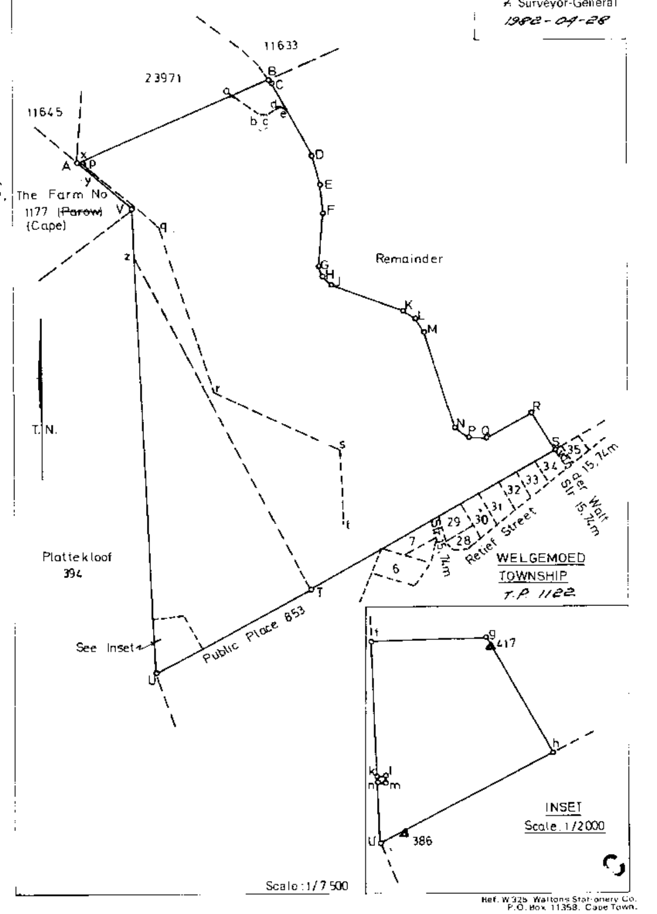
Servitude Notes (cont.)

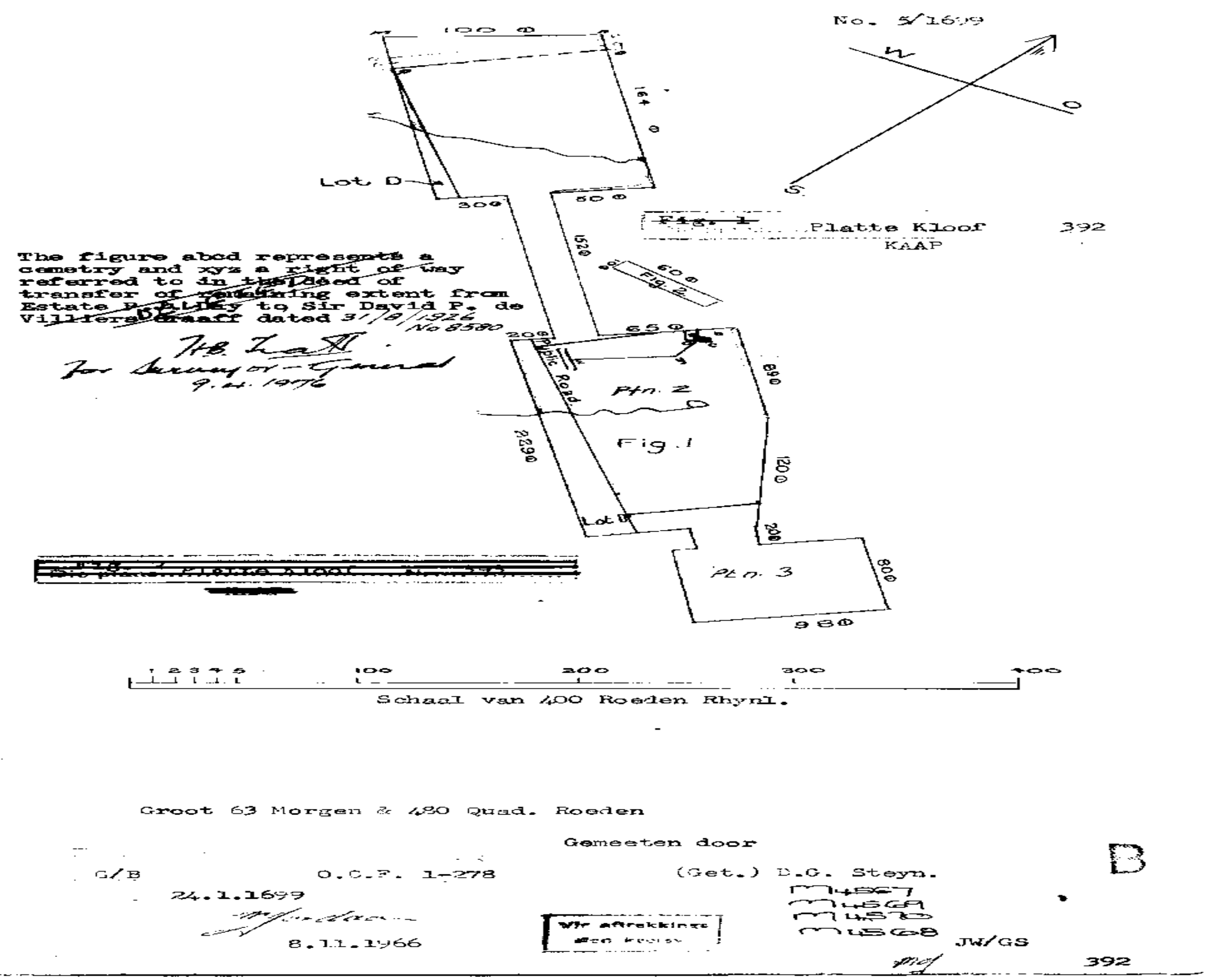
~~4. The lines pq, qr, rs, st represent the centre line of a servitude water pipeline 3 metres wide. Vide Dgm. No. 2250/1982 annexed to D/S~~

S.G. No. 6866/81

Approved
Surveyor-General
1982-04-28

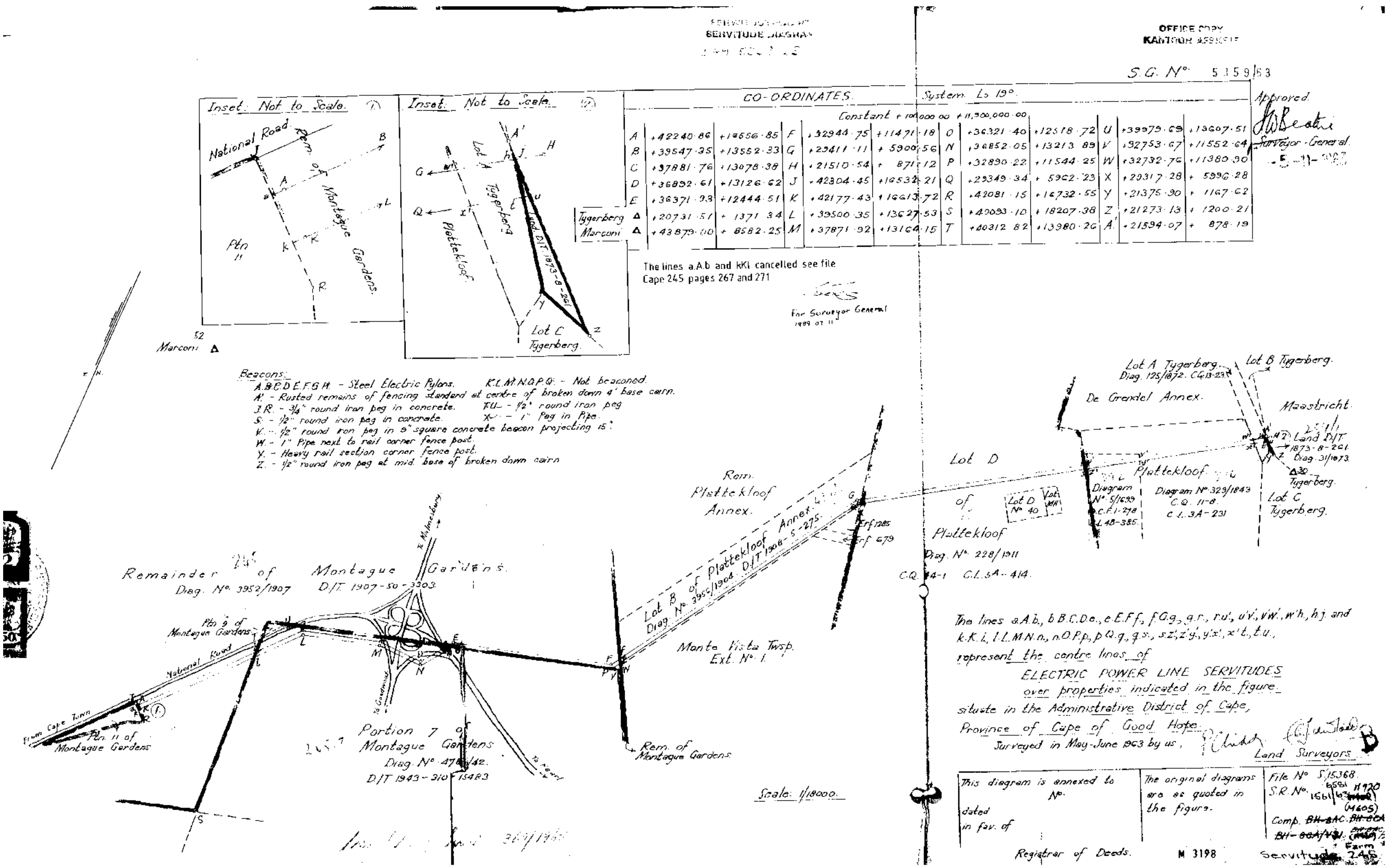


ERF 392



No. 5/1699
Lot D
Platte Kloof 392
KAAP
The figure abcd represents a cemetry and xyz a right of way referred to in the deed of transfer of remaining extent from Estate ... to Sir David P. de Villiers Graaff dated 31/8/1926 No 8580
Public Road
Ptn. 2
Fig. 1
Lot D
Ptn. 3
Schaal van 400 Roeden Rhynl.
Groot 63 Morgen & 480 Quad. Roeden
Gemeeten door
G/B
O.C.F. 1-278
(Get.) D.G. Steyn.
24.1.1699
8.11.1966
JW/GS
392

ERF 392a


SERVITUDE DIAGRAM
OFFICE COPY
S.G. Nº 5359/63
CO-ORDINATES
System Lo 19°
Constant +100,000 00 +11,300,000 00
A +42240·86 +19656·85 F +32944·75 +11471·18 O +36321·40 +12518·72 U +39979·69 +13607·51
B +39547·35 +13552·33 G +29411·11 + 5900·56 N +36852·05 +13213·89 V +32753·67 +11552·64
C +37881·76 +13078·38 H +21510·54 + 871·12 P +32890·22 +11544·25 W +32732·76 +11380·90
D +36892·61 +13126·62 J +42304·45 +16532·21 Q +29349·34 + 5962·23 X +20317·28 + 5996·28
E +36371·93 +12444·51 K +42177·43 +16613·72 R +42081·15 +14732·55 Y +21375·90 + 1167·62
Tygerberg Δ +20731·51 + 1371·34 L +39500·35 +13627·53 S +40093·10 +18207·38 Z +21273·13 + 1200·21
Marconi Δ +43879·00 + 8582·25 M +37871·92 +13164·15 T +40312·82 +13980·26 A' +21594·07 + 878·19
Approved
Surveyor-General
The lines a.A.b and kKl cancelled see file
Cape 245 pages 267 and 271
For Surveyor General
Inset. Not to Scale.
National Road
Rem. of Montague Gardens.
Ptn 11
Inset. Not to Scale.
Lot A Tygerberg
Lot C Tygerberg.
Plattekloof
Marconi Δ
Beacons:
A.B.C.D.E.F.G.H. - Steel Electric Pylons. K.L.M.N.O.P.Q. - Not beaconed.
A' - Rusted remains of fencing standard at centre of broken down 4' base cairn.
J.R. - 3/4" round iron peg in concrete. T.U. - 1/2" round iron peg
S. - 1/2" round iron peg in concrete. X - 1" Peg in Pipe.
V. - 1/2" round iron peg in 9" square concrete beacon projecting 15".
W. - 1" Pipe next to rail corner fence post.
Y. - Heavy rail section corner fence post.
Z. - 1/2" round iron peg at mid. base of broken down cairn
Lot A Tygerberg Diag. 125/1872.
Lot B Tygerberg.
De Grendel Annex.
Maastricht.
Lot D
Plattekloof
Diagram Nº 323/1843
Lot C Tygerberg.
Rem. Plattekloof Annex.
Lot B of Plattekloof Annex.
Of Plattekloof
Diag. Nº 228/1911
C.L. 5A - 414.
Remainder of Montague Gardens
Diag. Nº 3952/1907
D/T 1907-50-3303
Monte Vista Twsp. Ext. Nº 1.
Portion 7 of Montague Gardens
Diag. Nº 478/42.
D/T 1943-310 15483
Ptn 11 of Montague Gardens
Rem. of Montague Gardens.
National Road
From Cape Town
Scale: 1/18000.
The lines a.A.b., b.B.C.D.e., e.E.F.f., f.G.g., g.r., r.u', u'v', v.W', w'h, h.j. and
k.K.l., l.L.M.N.n., n.O.P.p., p.Q.q., q.s., s.z', z'y', y'x', x't., t.u.,
represent the centre lines of
ELECTRIC POWER LINE SERVITUDES
over properties indicated in the figure
situate in the Administrative District of Cape,
Province of Cape of Good Hope.
Surveyed in May-June 1963 by us,
Land Surveyors
This diagram is annexed to Nº
dated
in fav. of
Registrar of Deeds.
The original diagrams are as quoted in the figure.
File Nº S/15368.
Comp.
M 3198
Servitude 245

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Friedlaender, Burger & Volkmann - Land Surveyors

SIDES Metres		ANGLES OF DIRECTION		CO-ORDINATES System WG 19° Y		X
		Constants :			0,00	0,00
AB	361,80	247 30 50	A	+ 39454,94		+ 3747975,57
BC	610,73	330 58 40	B	+ 39120,65		+ 3747837,19
CD	171,58	61 20 10	C	+ 38824,36		+ 3748371,23
DE	552,78	330 48 30	D	+ 38974,91		+ 3748453,53
EF	137,25	245 37 40	E	+ 38705,29		+ 3748936,10
FG	249,05	55 21 00	F	+ 38580,28		+ 3748879,46
GH	22,51	146 54 40	G	+ 38785,15		+ 3749021,06
HJ	37,41	242 50 00	H	+ 38797,44		+ 3749002,20
JK	567,82	151 04 00	J	+ 38764,16		+ 3748985,12
KL	78,79	62 03 30	K	+ 39038,88		+ 3748488,18
LM	520,33	146 53 50	L	+ 39108,49		+ 3748525,10
MA	129,60	151 16 40	M	+ 39392,66		+ 3748089,22
NP	37,03	200 14 30	N	+ 38773,82		+ 3748691,67
PQ	220,21	294 38 50	P	+ 38761,01		+ 3748656,93
QR	36,47	25 35 20	Q	+ 38560,86		+ 3748748,77
RS	216,77	114 31 40	R	+ 38576,61		+ 3748781,66
ST	21,70	245 36 20	S	+ 38543,32		+ 3748862,73
TU	41,58	337 26 00	T	+ 38523,56		+ 3748853,77
UV	15,60	64 55 10	U	+ 38507,60		+ 3748892,17
VW	4,43	111 44 30	V	+ 38521,74		+ 3748898,78
WS	38,59	153 05 00	W	+ 38525,85		+ 3748897,14
INDICATORY DATA						
XV	0,03	73 12 16	X	+ 38521,71		+ 3748898,77
		3DC12	⊕	+ 40288,70		+ 3748323,73
		4DC12	⊕	+ 39926,32		+ 3748629,87

S.G. No.
497/2004
Approved.
for
Surveyor - General
Date : 2004.03.23

SHEET 1 OF 3 SHEETS

The figures ABCDEFGHJKLM, NPQR and STUVW
represent 26,8721 hectares of land, being

REMAINDER OF FARM PLATTE KLOOF NO.392

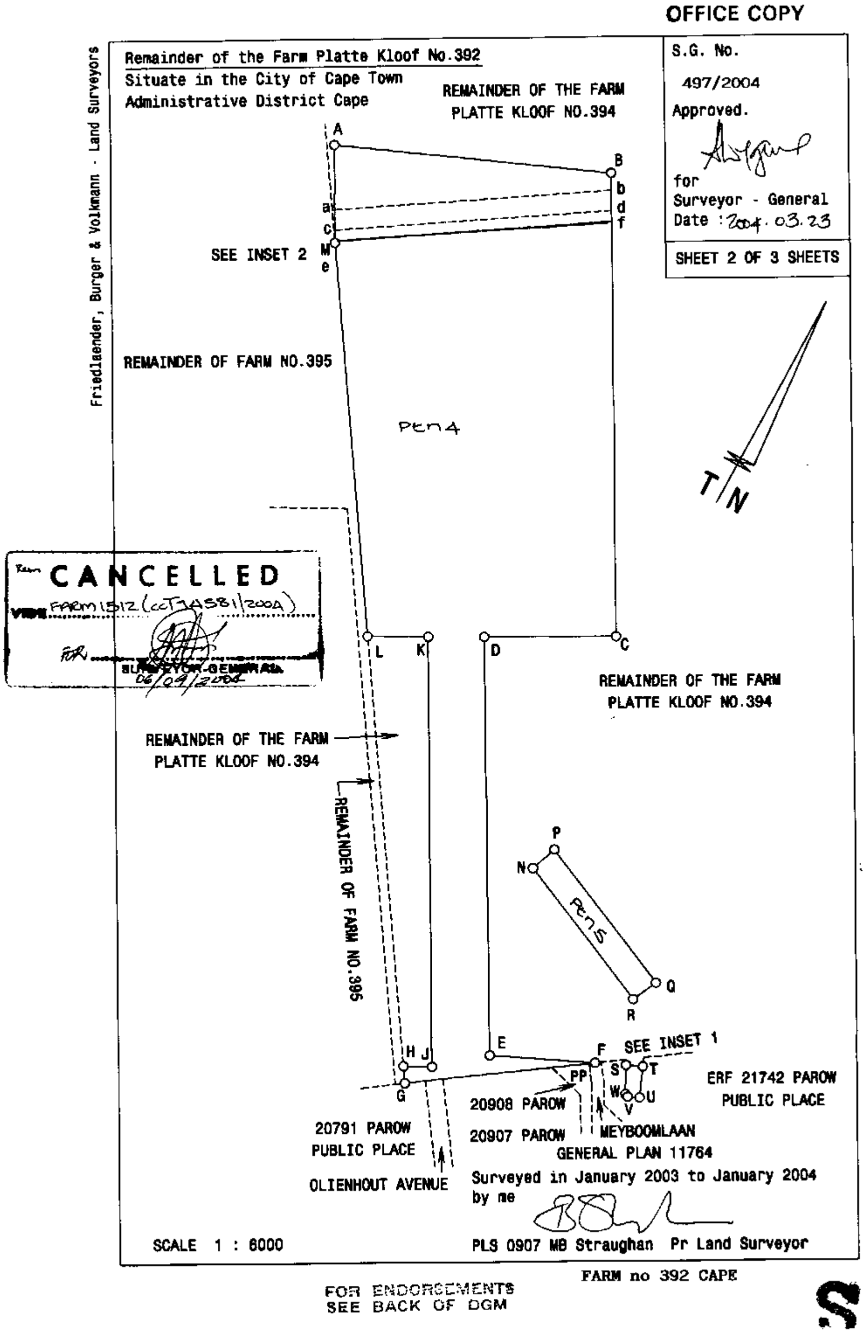
Situate in the City of Cape Town
Administrative District of Cape
Province of Western Cape
Surveyed in January 2003 to January 2004
by me

PLS0907 MB Straughan Pr Land Surveyor

This diagram is annexed to No. Dated i.f.o. Registrar of Deeds	The original diagram ~~is~~ ~~No.~~ for which this is Substituted is No 5/1699 Annexed to O.C.F 1-278 LPI C0160000	File No. Cape.392 S.R. No. E 191/2004 Comp. BHSS-42 M1201 BHSS-4254 M4567 BHSS-4263 M4568 BHSS-4282 M4569

REM OF FARM 392 CAPE

ERF 392c


OFFICE COPY
Remainder of the Farm Platte Kloof No.392
Situate in the City of Cape Town
Administrative District Cape
REMAINDER OF THE FARM
PLATTE KLOOF NO.394
S.G. No.
497/2004
Approved.
for
Surveyor - General
Date : 2004.03.23
SHEET 2 OF 3 SHEETS
Friedlaender, Burger & Volkmann - Land Surveyors
SEE INSET 2
REMAINDER OF FARM NO.395
T/N
CANCELLED
SURVEYOR-GENERAL
06/09/2004
REMAINDER OF THE FARM
PLATTE KLOOF NO.394
REMAINDER OF THE FARM
PLATTE KLOOF NO.394
REMAINDER OF FARM NO.395
SEE INSET 1
ERF 21742 PAROW
PUBLIC PLACE
20908 PAROW
20907 PAROW
MEYBOOMLAAN
GENERAL PLAN 11764
20791 PAROW
PUBLIC PLACE
OLIENHOUT AVENUE
Surveyed in January 2003 to January 2004
by me
SCALE 1 : 6000
PLS 0907 MB Straughan Pr Land Surveyor
FARM no 392 CAPE
FOR ENDORSEMENTS
SEE BACK OF DGM

ERF 392d

OFFICE COPY

Friedlaender, Burger & Volkmann - Land Surveyors

Remainder of the Farm Platte Kloof No.392
Situate in the City of Cape Town
Administrative District Cape

S.G. No.
497/2004
Approved.
for
Surveyor - General
Date : 2004.03.23

SHEET 3 OF 3 SHEETS

Inset 2
REM. FARM NO.394
S T W V X U
SEE INSET 3
21762
ERF ~~20786~~ PAROW
PUBLIC PLACE
GENERAL PLAN 11764
SCALE 1:1500

T/N

Inset 1
C M
Scale 1:600

Inset 3
V X
Scale 1:10

Beacon descriptions
U, W, X _____ 15mm iron peg
All other beacons are not marked

Servitudes

1. The lines ab and cd represent the centre lines Electric Power Line Servitudes.
   Vide Diagram No.5359/1963

2. The figure ABfe represents a Servitude Area.
   Vide Diagram No.6711/68 annexed to Deed of Servitude No.K160/1975s

Surveyed in
by me January 2003 to January 2004

PLS 0907 MB Straughan Pr Land Surveyor

FARM no 392 CAPE

OFFICE COPY

SIDES metres		ANGLES OF DIRECTION		CO-ORDINATES Y System: Lo19°	X
			Constants	+0, 00	+3 700 000, 00
A B	184, 58	301.30.20	A	+37 430, 39	+50 498, 53
B C	158, 15	284.38.40	B	+37 273, 02	+50 594, 99
C D	120, 09	272.23.00	C	+37 120, 01	+50 634, 98
D E	80, 98	292.36.10	D	+37 000, 03	+50 639, 97
E F	29, 82	328.48.00	E	+36 925, 27	+50 671, 10
F G	248, 66	6.19.40	F	+36 909, 82	+50 696, 60
G H	11, 60	81.32.40	G	+36 937, 23	+50 943, 74
H J	17, 52	100.58.30	H	+36 948, 71	+50 945, 44
J K	48, 95	103.34.40	J	+36 965, 90	+50 942, 11
K L	42, 93	108.46.50	K	+37 013, 48	+50 930, 62
L M	167, 23	115.09.40	L	+37 054, 13	+50 916, 80
M N	41, 07	117.07.10	M	+37 205, 49	+50 845, 70
N P	39, 35	125.43.20	N	+37 242, 04	+50 826, 98
P Q	36, 86	124.36.50	P	+37 273, 99	+50 804, 00
Q R	45, 56	123.27.10	Q	+37 304, 33	+50 783, 06
R S	45, 81	120.18.20	R	+37 342, 35	+50 757, 94
S T	70, 41	121.54.00	S	+37 381, 90	+50 734, 83
T U	55, 97	117.49.40	T	+37 441, 67	+50 697, 62
U V	56, 96	114.17.50	U	+37 491, 17	+50 671, 49
V W	66, 86	222.40.10	V	+37 543, 08	+50 648, 05
W A	120, 88	213.52.40	W	+37 497, 77	+50 598, 89
TOWN SURVEY MARKS					
170D13			⊕	+36 690, 46	+50 928, 32
60DC12			⊕	+37 195, 91	+50 875, 42

SG No. 869-94
Approved
for Surveyor-General
1994-04-14

Sheet 1 of 2 sheets

BEACON DESCRIPTIONS
A, B, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S, V, W : 12mm round iron pegs
T, U : Top of iron fence post

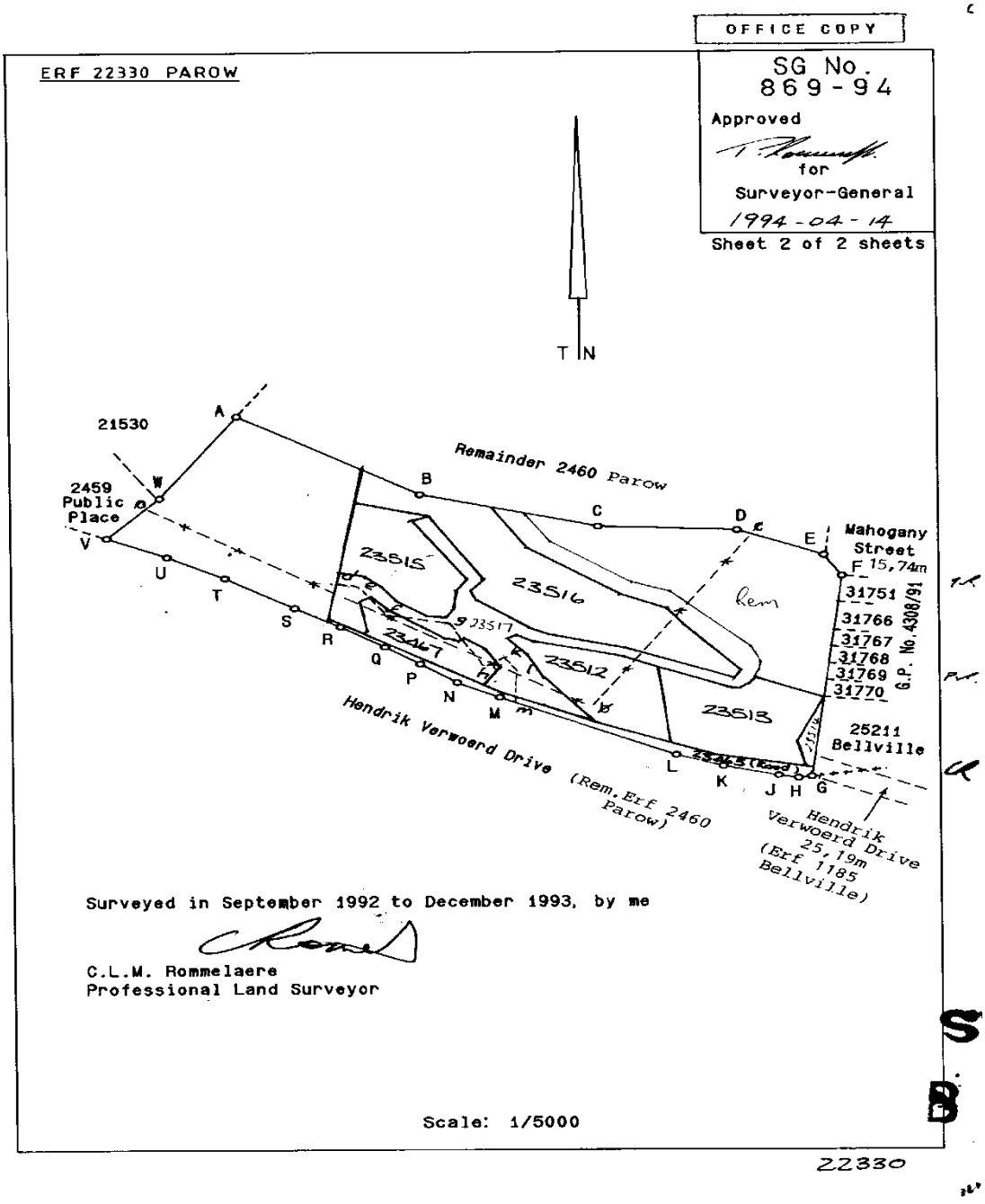
The figure A B C D E F G H J K L M N P Q R S T U V W
represents 13, 4063 hectares of land, being
ERF 22330, PORTION OF ERF 2460, PAROW
Situate in the Municipality of Parow
Administrative District of Cape, Province of Cape of Good Hope
Surveyed in September 1992 to December 1993, by me

C.L.M. Rommelaere Professional Land Surveyor

This diagram is annexed to	The original diagram is	File S/10451/6/2
No. CRT 96061/94	No. 9518/1966	S.R. No. E330/94
d.d.	Transfer No.	Comp: BHST-3341 (M574)
i.f.o.	1968- -4220	~~BHST-3343 (M580)~~
Registrar of deeds		BHSS-4462 (M616)
		~~BHSS-4464 (M622)~~

BHSS-4434(M610) 22330

ERF 22330 a


OFFICE COPY
ERF 22330 PAROW
SG No.
869-94
Approved
for
Surveyor-General
1994-04-14
Sheet 2 of 2 sheets
TN
21530
2459
Public
Place
Remainder 2460 Parow
Mahogany
Street
F 15,74m
23515
23516
Rem
23517
23512
23513
31751
31766
31767
31768
31769
31770
G.P. No. 4308/91
25211
Bellville
Hendrik Verwoerd Drive (Rem. Erf 2460 Parow)
Hendrik
Verwoerd Drive
25,19m
(Erf 1185
Bellville)
Surveyed in September 1992 to December 1993, by me
C.L.M. Rommelaere
Professional Land Surveyor
Scale: 1/5000
22330

Species Checklists

Appendix 5: Plants

TYGERBERG NATURE RESERVE PLANT SPECIES LIST					
FAMILY	**SPECIES**	**COMMON NAME**	**HERBARIUM**	**NOTES**	**ALIEN**
AIZOACEAE	Aizoon sarmentosum		TNR Herbarium		
AIZOACEAE	Antimima aristulata			**FOT 672** 8-2-2008	
AIZOACEAE	Carpanthea pomeridiana	Vetkousie			
AIZOACEAE	Carpobrotus acinaciformis	Suurvy	TNR Herbarium		
AIZOACEAE	Dorotheanthus bellidiformis	Bokbaaivygie			
AIZOACEAE	Drosanthemum calycinum		TNR Herbarium		
AIZOACEAE	Drosanthemum hispifolium		TNR Herbarium	14-03-2008	
AIZOACEAE	Drosanthemum striatum			**FOT 877** 12-11-2009	
AIZOACEAE	Erepsia anceps				
AIZOACEAE	Erepsia patula		TNR Herbarium		
AIZOACEAE	Erepsia bracteata		TNR	**FOT 686 C** 16-1-2009	
AIZOACEAE	Erepsia ramosa		**FOT 128** 14-2-2007	ID Compton	
AIZOACEAE	Galenia africana	Kraalbos, Geelbrakbos			
AIZOACEAE	Lampranthus elegans				
AIZOACEAE	Lampranthus emarginatus		**FOT 625** Compton	05-12-2008	
AIZOACEAE	Lampranthus sociorum			**FOT 716** no flowers 12-6-2009	
AIZOACEAE	Lampranthus scaber		TNR	**FOT 508** 17-8-2008	
AIZOACEAE	Lampranthus vernalis				
AIZOACEAE	Ruschia geminiflora		TNR Herbarium		
AIZOACEAE	Ruschia pulchella				
AIZOACEAE	Ruschia rubricaulis				
AIZOACEAE	Ruschia sarmentosa		**FOT 37** 15-7-2005	11-07-2008	
AIZOACEAE	Ruschia schollii		TNR Herbarium		
AIZOACEAE	Prenia pallens subsp pallens		**FOT 603**	Compton 2010 03-06	
AIZOACEAE	Tetragonia fruticosa	Klimopkinkelbossie	TNR	**FOT 557 C** 25-9-2008	
AIZOACEAE	Tetragonia nigrescens				
AIZOACEAE	Tetragonia saligna				
AIZOACEAE	Tetragonia spicata		TNR Herbarium		

ALLIACEAE	Allium dregeanum	Wildeui			
ALLIACEAE	**Allium neapolitanum**		TNR Herbarium		Mediterranean Europe
ALLIACEAE	Tulbaghia alliacea	Wildeknoffel, Wild Garlic			
ALLIACEAE	Tulbaghia capensis	Wildeknoffel, Wild Garlic	TNR Herbarium	14-03-2008	
AMARANTHACEAE	**Athriplex semibaccata**	Creeping Saltbush	TNR Herbarium		Australia
AMARANTHACEAE	**Atriplex muelleri**				Australia
AMARANTHACEAE	Manochlamys albicans	Hondebossie			
AMARYLLIDACEAE	Amaryllis belladonna	March Lily, Belladonna Lily			
AMARYLLIDACEAE	Crossyne guttata	Sambreelblom	TNR Herbarium	14-03-2008	
AMARYLLIDACEAE	Gethyllis afra	Kukumakranka			
AMARYLLIDACEAE	Haemanthus coccineus	April Fool			
AMARYLLIDACEAE	Haemanthus sanguineus	Velskoenblaar	TNR Herbarium		
AMARYLLIDACEAE	Strumaria tenella			**FOT 730** 9-6-2009	
ANACARDIACEAE	Rhus angustifolia	Wilgerkorentebos	TNR Herbarium		
ANACARDIACEAE	Rhus dissecta	Langsteelkorentebos	TNR Herbarium	**FOT 673** 8-2-2008	
ANACARDIACEAE	Rhus glauca	Bloukoeniebos	TNR Herbarium	11-07-2008	
ANACARDIACEAE	Rhus laevigata	Duinetaaibos	TNR Herbarium	14-03-2008	
ANACARDIACEAE	Rhus rhemanniana		TNR Herbarium		
ANACARDIACEAE	Rhus rosmarinifolia	Roosmaryntaaibos	TNR Herbarium		
ANACARDIACEAE	Rhus tomentosa	Korentebos	TNR Herbarium		
ANACARDIACEAE	Rhus undulata	Koeniebos			
ANEMIACEAE	Mohria caffrorum	Scented Fern	TNR Herbarium	**FOT 487 C** 13-6-2008	
ANTHERICACEAE	Chlorophytum undulatum		TNR Herbarium	**FOT 536** 10-10-2008	
APIACEAE	Annesorhiza grandiflora	Harige-Anyswortel			
APIACEAE	Arctopus echinatus	Platdoring	TNR Herbarium		
APIACEAE	Arctopus monacanthus	Platdoring		Hedi- 11-07-2008	
APIACEAE	Lichtensteinia obscura		**FOT 604 Compton**	05-12-2008	
APIACEAE	Peucedanum ferulaceum		TNR Herbarium		
APIACEAE	Peucedanum galbaniopse				
APOCYNACEAE	Cynanchum africanum	Bokhoring	TNR Herbarium		

APOCYNACEAE	Cynanchum obtusifolium				
APOCYNACEAE	Cynanchum zeyheri				
APOCYNACEAE	Gomphocarpus cancellatus	Katoenbos			
APOCYNACEAE	Gomphocarpus fruticosa		TNR		
APOCYNACEAE	**Gomphocarpus physocarpus**			16-01-2009	
APOCYNACEAE	Microloma tenuifolium	Kannetjies	TNR Herbarium		
ARACEAE	Zantedeschia aethiopica	Varkoor, Arum Lily		seen 09-09-2009	
ARALIACEAE	Centella glabrata	Persiegras, Sweetkruie			
ARALIACEAE	**Hedera helix**	English Ivy	TNR Herbarium		Europe
ASPARAGACEAE	Asparagus africanus		TNR Herbarium		
ASPARAGACEAE	Asparagus asparagoides				
ASPARAGACEAE	Asparagus capensis	Katdoring	TNR Herbarium		
ASPARAGACEAE	Asparagus declinatus		TNR Herbarium		
ASPARAGACEAE	Asparagus exuvialis		TNR Herbarium		
ASPARAGACEAE	Asparagus kraussianus		TNR Herbarium		
ASPARAGACEAE	Asparagus lignosus		TNR Herbarium		
ASPARAGACEAE	Asparagus retrofractus		TNR Herbarium		
ASPARAGACEAE	Asparagus rubicundus		TNR Herbarium		
ASPARAGACEAE	Asparagus undulatus		TNR Herbarium	11-07-2008	
ASPHODELACEAE	Bulbine alooides				
ASPHODELACEAE	Bulbine cepacea		TNR Herbarium	11-04-2008	
ASPHODELACEAE	Bulbine favosa			**FOT 667** 16-1-2009	
ASPHODELACEAE	Bulbine praemorsa		TNR Herbarium		
ASPHODELACEAE	Bulbinella cauda-felis			**FOT 510 C** 17-8-2008	
ASPHODELACEAE	Bulbinella triquetra		TNR Herbarium		
ASPHODELACEAE	Trachyandra chlamydophylla				
ASPHODELACEAE	Trachyandra divaricata				
ASPHODELACEAE	Trachyandra hispida			08-08-2008	
ASPHODELACEAE	Trachyandra muricata		TNR Herbarium		
ASPHODELACEAE	Trachyandra reflexipilosa				

ASPHODELACEAE	Trachyandra revoluta			date?	
ASPLENIACEAE	Asplenium aethiopicum	African Spleenwort	TNR Herbarium		
ASTERACEAE	Arctotheca calendula	Cape Weed	TNR Herbarium		
ASTERACEAE	Arctotheca prostrata				
ASTERACEAE	Arctotis acaulis	Renostergousblom	TNR Herbarium		
ASTERACEAE	Arctotis hirsuta	Gousblom	TNR Herbarium		
ASTERACEAE	Athanasia capitata		TNR Herbarium		
ASTERACEAE	Athanasia trifurcata	Kouterbos	TNR Herbarium		
ASTERACEAE	Athrixia capensis	Boesmantee		**FOT 622 C** 5-12-2008	
ASTERACEAE	Berkheya armata	Grootdissel	recollect		
ASTERACEAE	Berkheya carlinifolia				
ASTERACEAE	Berkheya rigida		TNR Herbarium		
ASTERACEAE	Berkheya viscosa	Taaidissel			
ASTERACEAE	Chrysanthemoides incana	Grysbietou	TNR Herbarium	11-04-2008	
ASTERACEAE	Chrysanthemoides monilifera	Bietou, Bosluisbessie	TNR Herbarium	11-04-2008	
ASTERACEAE	Chrysocoma ciliata	Bitterbos			
ASTERACEAE	**Conyza obscura**				Eastern RSA
ASTERACEAE	Conyza scabrida	Bakbesembossie, Oondbossie	TNR	11-04-2008	
ASTERACEAE	Corymbium cymosum			11-04-2008	
ASTERACEAE	Cotula turbinata	Ganskos	TNR Herbarium	08-08-2008	
ASTERACEAE	Cullumia ciliaris subsp. ciliaris	Steekhaarbos			
ASTERACEAE	Dimorphotheca nudicaulis	Witmagriet			
ASTERACEAE	Dimorphotheca pluvialis	Reënblommetjie	TNR Herbarium		
ASTERACEAE	Elytropappus rhinocerotis	Renosterbos	TNR Herbarium	**FOT 719** 12-6-2009 in flower	
ASTERACEAE	Eriocephalus africanus	Wild Rosemary, Kapokbossie	TNR Herbarium	08-08-2008	
ASTERACEAE	Euryops linifolius		TNR Herbarium	**FOT 554 C** 25-9-2008	
ASTERACEAE	Euryops thunbergii var. thunbergii				
ASTERACEAE	Felicia amoena			**FOT 502 C** 12-9-2008	
ASTERACEAE	Felicia bergerana				

ASTERACEAE	Felicia dubia		TNR Herbarium		
ASTERACEAE	Felicia filifolia	Draaibossie			
ASTERACEAE	Felicia fruticosa subsp. fruticosa	Wild Aster, Bosastertjie	TNR Herbarium		
ASTERACEAE	Felicia hyssopifolia				
ASTERACEAE	Gazania krebsiana	Rooigazania			
ASTERACEAE	Gorteria diffusa	Beetle Daisy			
ASTERACEAE	Haplocarpha cf			**FOT 811** 2-10-2009 HS	
ASTERACEAE	Helichrysum asperum				
ASTERACEAE	Helichrysum cylindriflorum		**FOT 624** Compton	05-12-2008	
ASTERACEAE	Helichrysum cymosum subsp cymosum			11-04-2008	
ASTERACEAE	Helichrysum dasyanthum				
ASTERACEAE	Helichrysum grandiflorum				
ASTERACEAE	Helichrysum hebelepis				
ASTERACEAE	Helichrysum patulum		TNR Herbarium		
ASTERACEAE	Helichrysum revolutum		TNR Herbarium		
ASTERACEAE	Helichrysum rosum		TNR Herbarium		
ASTERACEAE	Helichrysum teretifolium		TNR Herbarium	11-04-2008	
ASTERACEAE	Hippa frutescens	Rankals	TNR Herbarium		
ASTERACEAE	**Hypochaeris radicata**	Harige Skaapslaai, Hairy Wild lettuce	TNR Herbarium		Europe
ASTERACEAE	**Inula graveolens**	Cape Khakiweed, Kaapse Kakibos	TNR Herbarium	11-04-2008	Southern Europe
ASTERACEAE	**Lactuca inermis**				Tropical Southern Africa
ASTERACEAE	Leysera gnaphalodes	Skilpadteebossie, Teringteebossie			
ASTERACEAE	Nidorella foetida			11-04-2008	
ASTERACEAE	Oncosiphon suffruticosum	Stinkkruid, Wurmbossie	TNR Herbarium		
ASTERACEAE	Osteospermum polygaloides				
ASTERACEAE	Osteospermum sp.		TNR Herbarium		
ASTERACEAE	Osteospermum spinosum		recollect	**FOT 717** 12-6-2009	
ASTERACEAE	Othonna ciliata		TNR Herbarium		

ASTERACEAE	Othonna filicaulis	Bobbejaankoolklimop		09-05-2008	
ASTERACEAE	Othonna perfoliata		TNR Herbarium		
ASTERACEAE	Phyllopodium heterophyllum			**FOT 558 C** 25-9-2008	
ASTERACEAE	Printzia polifolia		TNR	collected	
ASTERACEAE	**Pseudognaphalium luteo-album**		TNR Herbarium		Southern Europe
ASTERACEAE	Pseudognaphalium undulatum		TNR Herbarium		
ASTERACEAE	Pteronia hirsuta		TNR Herbarium	14-03-2008	
ASTERACEAE	Senecio burchellii	Geelgifbos			
ASTERACEAE	Senecio elegans	Veld Cineraria			
ASTERACEAE	Senecio erosus	Sticky-leaved Groundsel			
ASTERACEAE	Senecio halimifolius	Tabakbos			
ASTERACEAE	Senecio hastatus	Groundsel	TNR Herbarium	seen 09-09-2009	
ASTERACEAE	Senecio lanifer				
ASTERACEAE	Senecio littoreus	Geelhongerblom			
ASTERACEAE	Senecio panduratus	Smooth Groundsel			
ASTERACEAE	Senecio pinifolius		TNR Herbarium		
ASTERACEAE	Senecio pubigerus	Skraalbossie	TNR Herbarium	11-04-2008	
ASTERACEAE	Senecio rosmarinifolius	Gryshongerblom	TNR Herbarium		
ASTERACEAE	Senecio scapiflorus	Perskoppie			
ASTERACEAE	Senecio spiraeifolius	Fern-leaved Groundsel			
ASTERACEAE	**Sonchus oleraceus**	Sowthistle, Sydissel	TNR Herbarium		Europe
ASTERACEAE	Stoebe capitata		collected	**FOT 921** 12-3-2010	
ASTERACEAE	Stoebe fusca				
ASTERACEAE	Stoebe plumosa	Slangbos	TNR Herbarium	11-04-2008	
ASTERACEAE	Tripteris clandestina	Trekkertjie	recollect		
ASTERACEAE	Troglophytum parvulum			2-10-2009 photo, dam	
ASTERACEAE	Ursinia anthemoides	Magriet	TNR Herbarium		
BORAGINACEAE	**Echium plantagineum**		TNR Herbarium		Europe and Asia
BORAGINACEAE	Lobostemon argenteus		TNR	seen 09-09-2009	
BORAGINACEAE	Lobostemon capitatus		TNR Herbarium	13-05-2008	

BORAGINACEAE	Lobostemon fruticosus	Douwurmbos, Luibos	TNR Herbarium		
BORAGINACEAE	Lobostemon glaber		TNR		
BORAGINACEAE	Lobostemon glaucophyllus				
BRASSICACEAE	Heliophila pusilla				
BRASSICACEAE	Lepidium africanum				
BRASSICACEAE	**Raphanus raphanistrum**	Wild Radish, Ramenas	TNR Herbarium		Europe
BRASSICACEAE	**Raphanus rugosum**	Wild Musard, Wildemosterd	TNR Herbarium		Europe
CAMPANULACEAE	Cyphia digitata		TNR Herbarium	seen 09-09-2009	
CAMPANULACEAE	Cyphia incisa		TNR Herbarium		
CAMPANULACEAE	Cyphia phyteuma				
CAMPANULACEAE	Cyphia volubilis		recollect		
CAMPANULACEAE	Lobelia erinus		TNR Herbarium		
CAMPANULACEAE	Monopsis lutea	Yellow Lobelia			
CAMPANULACEAE	Prismatocarpus cf. altiflorus		TNR Herbarium		
CAMPANULACEAE	Roella ciliata				
CAMPANULACEAE	Wahlenbergia capensis		TNR Herbarium		
CAMPANULACEAE	Wahlenbergia exilis				
CARYOPHYLLACEAE	Cerastium capense	Horingblom			
CARYOPHYLLACEAE	**Silene cretica**				Europe
CARYOPHYLLACEAE	**Silene gallica**	French Silene, Franse Silene	TNR Herbarium		Europe
CARYOPHYLLACEAE	Silene pilosellifolia		TNR Herbarium		
CARYOPHYLLACEAE	Silene undulata		TNR Herbarium	seen 09-09-2009	
CELASTRACEAE	Gymnosporia buxifolia	Stinkpendoring			
CELASTRACEAE	Putterlickia pyracantha	Basterpendoring	TNR Herbarium	11-07-2008	
CHENOPODIACEAE	Chenopodium multifidum		TNR		
CLUSIACEAE	Hypericum lalandii cf		collected	**FOT 643** 27-12-2008	
COLCHICACEAE	Androcymbium capense		TNR	11-07-2008	
COLCHICACEAE	Baeometra uniflora	Beetle Lily	TNR Herbarium	seen 09-09-2009	
CONVALLARIACEAE	Eriospermum lanceifolium		TNR	14-03-2008	
CRASSULACEAE	Crassula capensis	Cape Snowdrop	TNR Herbarium	11-07-2008	

CRASSULACEAE	Crassula ciliata		**FOT 500 C**	11-07-2008	
CRASSULACEAE	Crassula decumbens		TNR Herbarium		
CRASSULACEAE	Crassula dejecta			09-05-2008	
CRASSULACEAE	Crassula fascicularis		TNR Herbarium		
CRASSULACEAE	Crassula saxifraga			09-05-2008	
CRASSULACEAE	Tylecodon grandiflorus	Rooisuikerblom	TNR Herbarium	14-03-2008	
CUCURBITACEAE	Kedrostis nana	Ystervarkpatat	TNR Herbarium		
CYPERACEAE	Bolboschoenus maritimus	Snygras, Snyruigte			
CYPERACEAE	Carex clavata				
CYPERACEAE	Cyperus longus	Waterbiesie, Waterkweek			
CYPERACEAE	Cyperus marginatus	Matjiesgoed	TNR Herbarium		
CYPERACEAE	Cyperus tenellus				
CYPERACEAE	Cyperus thunbergii				
CYPERACEAE	Eleocharis limosa		TNR Herbarium		
CYPERACEAE	Ficinia acuminata				
CYPERACEAE	Ficinia indica				
CYPERACEAE	Ficinia nigrescens		TNR Herbarium		
CYPERACEAE	Ficinia oligantha		TNR Herbarium		
CYPERACEAE	Isolepis incomptula				
CYPERACEAE	Isolepis marginata				
CYPERACEAE	Pycreus mundii				
CYPERACEAE	Schoenoxiphium ecklonii		TNR		
CYPERACEAE	Schoenoxiphium sparteum		TNR Herbarium		
CYPERACEAE	Tetraria cuspidata		TNR Herbarium		
CYTINACEAE	Cytinus sanguineus	Aardroos	TNR Herbarium	**FOT 501** 12-9-2008	
DIPSACACEAE	Scabiosa columbaria	Jongmansknoop	TNR	seen 09-09-2009	
DROSERACEAE	Drosera cistiflora	Snotrosie, Sundew		collected	
DROSERACEAE	Drosera pauciflora				
EBENACEAE	Diospyros glabra	Bloubessiebos, Kraaibossie			
EBENACEAE	Euclea racemosa	Seegwarrie	TNR	**FOT 38** 15-7-2005	

EBENACEAE	Euclea tomentosa	Klipkers, Heuninggwarrie			
ERICACEAE	Erica coccinea		TNR Herbarium		
ERICACEAE	Erica paniculata		TNR Herbarium		
EUPHORBIACEAE	Clutia polifolia		TNR Herbarium		
EUPHORBIACEAE	Clutia pubescens				
EUPHORBIACEAE	Euphorbia arceuthobioides	Steenbokbos		08-08-2008	
EUPHORBIACEAE	Euphorbia burmanii	Steenbokmelkbos, Soetmelkbos			
EUPHORBIACEAE	Euphorbia erythrina		TNR Herbarium	1-10-2009	Img 8099, 8100
EUPHORBIACEAE	Euphorbia genistoides		TNR Herbarium	seen 09-09-2009	
EUPHORBIACEAE	**Euphorbia helioscopia**	Sambreelmelkkruid, Umbrella Milkweed	TNR Herbarium		Europe
EUPHORBIACEAE	Euphorbia tuberosa	Melkbol, Wilderamenas			
FABACEAE	**Acacia saligna**		TNR Herbarium		Australia
FABACEAE	Aspalathus acanthophylla		TNR Herbarium	11-04-2008	
FABACEAE	Aspalathus acuminata				
FABACEAE	Aspalathus cephalotes		TNR Herbarium		
FABACEAE	Aspalathus cordata		TNR Herbarium	10-07-2009	
FABACEAE	Aspalathus cymbiformis		TNR Herbarium	**FOT 644** 5-12-2008	
FABACEAE	Aspalathus ericifolia				
FABACEAE	Aspalathus flexuosa		TNR Herbarium		
FABACEAE	Aspalathus hispida		TNR Herbarium		
FABACEAE	Aspalathus puberula		TNR Herbarium	**FOT 623** 5-12-2008	
FABACEAE	Aspalathus spinescens				
FABACEAE	Aspalathus spinosa		**FOT 128** 14-2-2007		
FABACEAE	Bolusafra bituminosa	Tar Pea, Teer-ertjie			
FABACEAE	Dolichos decumbens	Butterfly Pea	TNR Herbarium	08-08-2008; collected	
FABACEAE	Indigofera digitata		TNR Herbarium	**FOT 666 C** 12-1-2009	
FABACEAE	Indigofera heterophylla		**FOT 602** Compton	5-12-2008	
FABACEAE	Indigofera psoraloides		TNR Herbarium	**FOT 663 C** 12-1-2009	
FABACEAE	Lessertia capensis	Harslagbossie			
FABACEAE	Lessertia excisa		TNR Herbarium		

FABACEAE	Lessertia frutescens	Kankerbos			
FABACEAE	Lotononis involucrata				
FABACEAE	Lotononis prostrata				
FABACEAE	Lotononis sp		TNR Herbarium		
FABACEAE	**Medicago polymorpha**	Bur Clover, Klitsklawer	TNR Herbarium		Europe
FABACEAE	**Medicago sativa**	Lucern	TNR Herbarium		Near East and Asia
FABACEAE	Otholobium hirtum		TNR Herbarium	11-07-2008	
FABACEAE	Otholobium uncinatum				
FABACEAE	Otholobium virgatum (=O. decumbens)		TNR Herbarium		
FABACEAE	Podalyria sericea		TNR Herbarium	08-02-2008	
FABACEAE	Psoralea alata				
FABACEAE	**Trifolium angustifolium**	Naroow-leaved Colver	TNR Herbarium		Europe and Asia
FABACEAE	**Trifolium campestre**		TNR Herbarium		Europe
FABACEAE	**Trifolium glomerata**	Cluster Clover	TNR Herbarium		Alien
FABACEAE	**Vicia benghalensis**	Purple Vetch	TNR Herbarium		North Africa, Europe
FABACEAE	**Vicia sativa**	Common Vetch	TNR Herbarium		Europe
FABACEAE	**Vicia sp.**		TNR Herbarium		Alien
FABACEAE	Wiborgia cf. obcordata		TNR Herbarium		
FABACEAE	Xiphotheca lanceolata		TNR Herbarium	14-3-2008	
FUMARIACEAE	Cysticapnos cracca (=Phacocapnos cracca)		TNR Herbarium		
FUMARIACEAE	**Fumaria muralis**	Duiwelskerwel	TNR Herbarium		Europe
GENTIANACEAE	Chironia baccifera	Christmas Berry, Aambeibossie	TNR Herbarium		
GENTIANACEAE	Sebaea aurea		TNR Herbarium		
GENTIANACEAE	Sebaea exacoides		TNR Herbarium		
GENTIANACEAE	Sebaea micrantha				
GERANIACEAE	**cf. Erodium sp.**		TNR Herbarium		Alien
GERANIACEAE	**Erodium moschatum**	Musk Heron's Bill, Turknael	TNR Herbarium		Europe
GERANIACEAE	**Erodium sp1.**		TNR Herbarium		Alien
GERANIACEAE	Geranium canescens		TNR Herbarium		

GERANIACEAE	Geranium incanum				
GERANIACEAE	**Geranium molle**	Dovesfoot Cranesbill	TNR Herbarium		Europe
GERANIACEAE	Pelargonium alchemilloides		TNR Herbarium		
GERANIACEAE	Pelargonium althaeoides (Guide 12)			12-12-2008	
GERANIACEAE	Pelargonium auritum				
GERANIACEAE	Pelargonium cf carnosum		TNR Herbarium		
GERANIACEAE	Pelargonium elongatum		TNR Herbarium		
GERANIACEAE	Pelargonium gibbosum		TNR Herbarium	**FOT 459** 14-3-2008	
GERANIACEAE	Pelargonium hirtum		TNR Herbarium	collected March '08	
GERANIACEAE	Pelargonium lobatum	Kaneelbol	TNR Herbarium	11-07-2008; coll 08-08-08	
GERANIACEAE	Pelargonium myrrhifolium		TNR Herbarium	**FOT 540** 10-10-2008	
GERANIACEAE	Pelargonium pinnatum			**FOT 606 C** 5-12-2008	
GERANIACEAE	Pelargonium plurisectum		TNR Herbarium	collected March '08	
GERANIACEAE	Pelargonium rapaceum		TNR Herbarium	11-07-2008; coll 01-12-08	
GERANIACEAE	Pelargonium senecioides		TNR Herbarium		
GERANIACEAE	Pelargonium sp		TNR Herbarium		
GERANIACEAE	Pelargonium tabulare				
GERANIACEAE	Pelargonium trifoliolatum		collected	5-12-2008; collected	
GERANIACEAE	Pelargonium triste	Kaneeltjie	TNR Herbarium	11-07-2008	
HAEMODORACEAE	Wachendorfia paniculata	Koffiepit			
HYACINTHACEAE	Albuca cooperi		TNR	See herbarium sheet	
HYACINTHACEAE	Albuca flaccida		TNR Herbarium	14-03-2008	
HYACINTHACEAE	Albuca fragrans			**FOT 665 C** 12-1--2009	
HYACINTHACEAE	Drimia capensis	Maerman	TNR	14-03-2008	
HYACINTHACEAE	Drimia elata		TNR	14-03-2008	
HYACINTHACEAE	Drimia exuviata	Gifbol		09-05-2008	
HYACINTHACEAE	Lachenalia liliflora		TNR Herbarium		
HYACINTHACEAE	Lachenalia longibracteata		TNR Herbarium		
HYACINTHACEAE	Lachenalia mediana		TNR Herbarium		

HYACINTHACEAE	Lachenalia mediana var mediana		TNR	**FOT 507 C** 12-9-2008	
HYACINTHACEAE	Lachenalia orchioides				
HYACINTHACEAE	Lachenalia unifolia		FOT 806	collected 09-09-2009	
HYACINTHACEAE	Ornithogalum graminifolium			**FOT 668 C** 16-1-2009	
HYACINTHACEAE	Ornithogalum thyrsoides	Chincherinchee	TNR Herbarium		
HYPOXIDACEAE	Empodium plicatum	Ploegtydblommetjie	TNR	08-May	
HYPOXIDACEAE	Spiloxene capensis	Peacock Flower, Poublom	TNR Herbarium		
HYPOXIDACEAE	Spiloxene ovata			**FOT 458** Compton kept spec	
HYPOXIDACEAE	Spiloxene schlechteri		TNR Herbarium		
HYPOXIDACEAE	Spiloxene serrata		TNR Herbarium	**FOT 489 C** 1-7-2008	
IRIDACEAE	Aristea africana		TNR		
IRIDACEAE	Aristea spiralis				
IRIDACEAE	Babiana fragrans (=B.stricta var. sulphurea)		TNR		
IRIDACEAE	Babiana stricta		TNR	2-10-2009	
IRIDACEAE	Bobartia indica		TNR		
IRIDACEAE	Chasmanthe aethiopica	Cobra Lily, Kapelpypie	TNR Herbarium		
IRIDACEAE	Chasmanthe floribunda	Cobra Lily, Kapelpypie	TNR Herbarium		
IRIDACEAE	Ferraria crispa	Krulletjie		08-08-2008	
IRIDACEAE	Geissorhiza aspera	Blousysie	TNR Herbarium	seen 09-09-2009	
IRIDACEAE	Geissorhiza inflexa	Witsyblom	TNR	seen 09-09-2009	
IRIDACEAE	Gladiolus alatus	Kalkoentjie	TNR Herbarium		
IRIDACEAE	Gladiolus priorii	Rooi Afrikaner		**FOT 718** 12-6-2009	
IRIDACEAE	Gladiolus recurvus	Voorlopertjie	TNR Herbarium		
IRIDACEAE	Gladiolus watsonius	Rooi Afrikaner	TNR Herbarium	08-08-2008	
IRIDACEAE	Hesperantha falcata	Bontrokkie	FOT 804	collected 09-09-2009	
IRIDACEAE	Hesperantha radiata		TNR	collected 11-07-2008	
IRIDACEAE	Ixia capillaris		TNR Herbarium	**FOT 53** 17-8-2005	
IRIDACEAE	Ixia dubia				
IRIDACEAE	Ixia flexuosa		TNR		

IRIDACEAE	Ixia odorata	Soetkalossie	TNR	seen 09-09-2009	
IRIDACEAE	Micranthus alopecuroides				
IRIDACEAE	Micranthus junceus				
IRIDACEAE	Moraea bellendenii	Patrysuintjie			
IRIDACEAE	Moraea bituminosa	Teeruintjie			
IRIDACEAE	Moraea ciliata				
IRIDACEAE	Moraea collina	Aasuintjie, Geeltulp			
IRIDACEAE	Moraea flaccida		TNR	12-09-2008	
IRIDACEAE	Moraea fugax	Soetuintjie			
IRIDACEAE	Moraea gawleri		TNR Herbarium		
IRIDACEAE	Moraea inconspicua	Taaiuintjie			
IRIDACEAE	Moraea lewisiae				
IRIDACEAE	Moraea miniata	Pronktulp	TNR Herbarium	seen 09-09-2009	
IRIDACEAE	Moraea ochroleuca	Apricot Tulp	TNR		
IRIDACEAE	Moraea papilionacea				
IRIDACEAE	Moraea tripetala	Blou-uintjie	TNR Herbarium		
IRIDACEAE	Moraea vegeta	Bruinuintjie	TNR Herbarium		
IRIDACEAE	Moraea villosa	Blouflappie, Peacock Moraea			
IRIDACEAE	Moraea virgata	Pypievolstruisuintjie	TNR Herbarium	**FOT 691** 12-12-2008	
IRIDACEAE	Romulea flava	Geelfroetang, Geelknikkertjie	TNR	08-08-2008	
IRIDACEAE	Romulea rosea	Rooiknikkertjie	FOT 816	collected 09-09-2009	
IRIDACEAE	Sparaxis bulbifera	Botterblom	TNR		
IRIDACEAE	Sparaxis grandiflora fimbriata	Botterblom	FOT 814	collected 09-09-2009	
IRIDACEAE	Sparaxis villosa		TNR Herbarium	seen 09-09-2009	
IRIDACEAE	Watsonia borbonica subsp borbonica				
IRIDACEAE	Watsonia marginata		TNR Herbarium		
JUNCACEAE	**Juncus bufonius**	Toadrush			Cosmopolitan
JUNCACEAE	Juncus capensis		TNR Herbarium		
JUNCAGINACEAE	Triglochin bulbosa			seen 09-09-2009	

JUNCAGINACEAE	Triglochin striata				
KIGGELARIACEAE	Kiggelaria africana	Wild Peach, Wildeperske	TNR Herbarium	08-08-2008	
LAMIACEAE	Leonotis leonurus	Wild Dagga			
LAMIACEAE	Salvia africana-caerulea	Bloublomsalie	TNR Herbarium		
LAMIACEAE	Salvia africana-lutea	Bruinsalie, Strandsalie	TNR Herbarium	08-08-2008	
LAMIACEAE	Salvis chamelaeagnea		TNR Herbarium		
LAMIACEAE	Stachys aethiopica	Katbossie	TNR Herbarium	08-08-2008	
LINACEAE	Linum brevistylum			12-01-2009	
LINACEAE	Linum thunbergii				
LYTHRACEAE	**Lythrum hyssopifolium**	Hyssop-leaved Loosestrife		**FOT 605**	Eurasia
MALVACEAE	Anisodontea biflora		TNR Herbarium		
MALVACEAE	Anisodontea scabrosa	Sandroos			
MALVACEAE	Anisodontea sp.		TNR Herbarium		
MALVACEAE	Hermannia alnifolia		TNR Herbarium		
MALVACEAE	Hermannia althaeifolia		TNR Herbarium		
MALVACEAE	Hermannia decumbens			**FOT 556 C** 25-9-2008	
MALVACEAE	Hermannia hyssopifolia				
MALVACEAE	Hermannia multiflora				
MALVACEAE	Hermannia prismatocarpa		TNR Herbarium	**FOT 552 C** 25-9-2008	
MALVACEAE	Hermannia rugosa			2007	
MALVACEAE	Hermannia sp		FOT 812	collected 09-09-2009	
MALVACEAE	**Hibiscus trionum**	Flower of an hour			Old World tropics
MELIANTHACEAE	Melianthus major	Kruidjie-roer-my-nie			
MENISPERMACEAE	Cissampelos capensis	Davidjies	TNR Herbarium		
MOLLUGINACEAE	Adenogramma glomerata				
MOLLUGINACEAE	**Corrigiola litoralis**	Strapwort			Africa
MOLLUGINACEAE	Pharnaceum incanum				
MONTINIACEAE	Montinia caryophyllacea	Peperbos			
MYRICACEAE	Morella quercifolia	Maagpynbossie	TNR Herbarium		
MYRSINACEAE	Myrsine africana	Cape Myrtle			

MYRTACEAE	**Leptospermum laevigatum**	Australian Myrtle	TNR Herbarium		Australia
OLEACEAE	Olea europaea subsp africana	Wild Olive	TNR Herbarium	08-08-2008	
ONAGRACEAE	**Epilobium tetragonum**	Square-stalked Willowherb			Europe
ONAGRACEAE	**Oenothera indecora**	Evening Primrose	TNR Herbarium		South America
ORCHIDACEAE	Corycium orobanchoides	Monkshood		collected	
ORCHIDACEAE	Disa bracteata (=Monadenia bracteata)		TNR Herbarium		
ORCHIDACEAE	Disperis villosa		TNR Herbarium	seen 09-09-2009	
ORCHIDACEAE	Holothrix villosa		TNR Herbarium	11-07-2008	
ORCHIDACEAE	Pterygodium alatum			25-9-2008	
ORCHIDACEAE	Pterygodium catholicum		TNR Herbarium	seen 09-09-2009	
ORCHIDACEAE	Pterygodium volucris			collected	
ORCHIDACEAE	Satyrium coriifolium	Ewwa Trewwa			
ORCHIDACEAE	Satyrium bicorne		Photo for herb	seen 09-09-2009	
ORCHIDACEAE	Satyrium odorum	Soet Trewwa	Photo for herb	seen 09-09-2009	
OROBANCHACEAE	**Orobanche ramosa**		TNR Herbarium		Eurasia
OXALIDACEAE	Oxalis bifida		TNR Herbarium	10-07-2009	
OXALIDACEAE	Oxalis commutata				
OXALIDACEAE	Oxalis compressa			09-05-2008	
OXALIDACEAE	Oxalis eckloniana			**FOT 729** 9-6-2009	
OXALIDACEAE	Oxalis glabra	Tapytsuring		10-07-2009	
OXALIDACEAE	Oxalis hirta		TNR	09-05-2008	
OXALIDACEAE	Oxalis lanata		TNR, FOT 808	collected 09-09-2009	
OXALIDACEAE	Oxalis livida		TNR Herbarium	09-05-2008	
OXALIDACEAE	Oxalis luteola			09-05-2008	
OXALIDACEAE	Oxalis obtusa	Geeloogsuring	TNR Herbarium	seen 09-09-2009	
OXALIDACEAE	Oxalis pes-caprae	Geelsuring	TNR Herbarium	11-07-2008	
OXALIDACEAE	Oxalis purpurea		TNR Herbarium	11-07-2008	
OXALIDACEAE	Oxalis stellata			03-05-2009	
OXALIDACEAE	Oxalis strigosa		TNR Herbarium	**FOT 141 11-5-2007**	

OXALIDACEAE	Oxalis tenuifolia		TNR Herbarium	11-04-2008	
OXALIDACEAE	Oxalis tomentosa	Vingersuring	TNR Herbarium	09-05-2008	
OXALIDACEAE	Oxalis versicolor	Candycane Sorrel	TNR Herbarium	seen 09-09-2009	
PHYTOLACCACEAE	**Phytolacca octandra**	Inkberry, Inkbessie	TNR Herbarium		Americas
PLANTAGINACEAE	**Plantago lanceolata**	Buckhorn Plantain, Smalweëblaar	TNR Herbarium		Europe
POACEAE	**Aira cupaniana**		TNR Herbarium		Europe
POACEAE	**Avena barbata**	Wild Oats	TNR Herbarium		Asia
POACEAE	**Brachypodium distachyon**	False Brome			Europe
POACEAE	**Briza maxima**	Groot bewertjie	TNR Herbarium		Europe
POACEAE	**Briza minor**		TNR Herbarium	seen 09-09-2009	Europe
POACEAE	**Bromus catharticus**		TNR Herbarium		South America
POACEAE	**Bromus diandrus**	Langnaaldbromus	TNR Herbarium		Europe
POACEAE	**Bromus pectinatus**	Japanese Brome, Hooigras	TNR Herbarium		Asia
POACEAE	Cymbopogon marginatus	Motwortelterpentyngras	TNR Herbarium		
POACEAE	Cynodon dactylon	Kweek			
POACEAE	**Cynosurus echinatus**	Dog's Tail	TNR Herbarium		Europe
POACEAE	Ehrharta calycina	Rooigras, Polgras	TNR Herbarium		
POACEAE	Ehrharta capensis	Knol Ehrharta	TNR Herbarium		
POACEAE	Ehrharta erecta		TNR Herbarium		
POACEAE	Ehrharta longiflora		TNR Herbarium		
POACEAE	Ehrharta melicoides		TNR Herbarium		
POACEAE	Ehrharta rehmannii				
POACEAE	Ehrharta villosa	Pypgras	TNR Herbarium		
POACEAE	Eragrostis curvula	Bergsoetgras, Blousaadgras	TNR Herbarium		
POACEAE	Festuca scabra	Munniksgras	TNR Herbarium		
POACEAE	**Gastridium phleoides**		TNR Herbarium		Mediterranean
POACEAE	Helictotrichon capense		TNR Herbarium		
POACEAE	Heteropogon contortus	Pylgras			
POACEAE	Hyparrhenia hirta	Thatch Grass			

POACEAE	Koeleria capensis	Polgras, Strandgras		2-10-2009 photo, dam	
POACEAE	**Lepturus cylindricus**				North Africa
POACEAE	**Lolium multiflorum**	Italian Rye Grass, Drabok	TNR Herbarium		temperate Eurasia
POACEAE	Melica racemosa	Haakgras, Dronkgras			
POACEAE	Merxmuellera stricta	Bokbaardgras	TNR Herbarium		
POACEAE	**Paspalum distichum**	Bankrotkweek			South America
POACEAE	**Pennisetum clandestinum**	kikuyu			North Africa
POACEAE	Pentaschistis curvifolia		TNR Herbarium		
POACEAE	Pentaschistis pallida		TNR Herbarium		
POACEAE	Pentaschistis patula				
POACEAE	Pentaschistis tomentella				
POACEAE	**Phalaris minor**	Small Canary Grass, Kanariegras	TNR Herbarium		Mediterranean
POACEAE	**Polypogon viridis**		TNR Herbarium		Europe
POACEAE	Sporobolus africanus	Taaipol			
POACEAE	Stenotaphrum secundatum	Buffelsgras			
POACEAE	Tribolium acutiflorum				
POACEAE	Tribolium hispidum		TNR Herbarium		
POACEAE	Tribolium uniolae		TNR Herbarium		
POLYGALACEAE	Muraltia ononidifolia		TNR Herbarium	11-07-2008	
POLYGALACEAE	Muraltia trinervia		TNR Herbarium	08-08-2008	
POLYGALACEAE	Polygala scabra				
POLYGONACEAE	**Persicaria sp**				Alien
POLYGONACEAE	Polygonum undulatum			09-05-2008	
POLYGONACEAE	**Rumex acetosella**	Boksuring, Sheep Sorrel			Europe
POLYGONACEAE	Rumex cordatus	Tongblaar			
POLYGONACEAE	**Rumex pulcher subsp divaricatus**	Fiddle Dock			Alien
PRIMULACEAE	**Anagallis arvensis**	Scarlet Pimpernel	TNR Herbarium		Eurasia
PRIMULACEAE	**Samolus valerandi**	Brook Weed	TNR Herbarium		Cosmopolitan
PROTEACEAE	Leucadendron salignum				

PTERIDACEAE	Cheilanthes capensis	Cape Lip Fern	TNR Herbarium		
PTERIDACEAE	Cheilanthes hastata		TNR Herbarium		
RANUNCULACEAE	Knowltonia capensis		TNR		
RANUNCULACEAE	Knowltonia vesicatoria		collected	17-08-2008	
RANUNCULACEAE	**Ranunculus muricatus**	Spiny-fruited Buttercup	TNR Herbarium		Europe
RESEDACEAE	**Reseda lutea**	Dyer's Rocket, Katstert	TNR Herbarium		Eurasia
RESTIONACEAE	Ischyrolepis capensis		TNR Herbarium		
RESTIONACEAE	Restio multiflorus				
RHAMNACEAE	Phylica imberbis		TNR Herbarium		
RHAMNACEAE	Phylica pubescens	Veerkoppie, Featherhead			
ROSACEAE	Cliffortia graminea	Vleirooigras, Wilde-ertjie			
ROSACEAE	Cliffortia hirta		TNR	**FOT 140** 4-5-2007	
ROSACEAE	Cliffortia juniperina				
ROSACEAE	Cliffortia ruscifolia	Steekbos	TNR Herbarium		
RUBIACEAE	Anthospermum aethiopicum				
RUBIACEAE	Anthospermum hirtum		TNR Herbarium		
RUBIACEAE	Anthospermum sp.		TNR Herbarium		
RUBIACEAE	Anthospermum spathulatum		TNR Herbarium		
RUBIACEAE	Anthospermum spathulatum subsp. spathulum		TNR		
RUBIACEAE	Canthium inerme	Cape Date, Gewone Bokdrol	TNR Herbarium		
RUBIACEAE	Galium capense	Tiny Tots	recollect!!		
RUBIACEAE	Galium tomentosum	Kleefgras	TNR Herbarium		
RUBIACEAE	Nenax hirta			08-08-2008	
RUTACEAE	Agathosma capensis	Boegoe			
RUTACEAE	Agathosma serpyllacea		TNR	**FOT 506 C** 12-9-2008	
RUTACEAE	Diosma hirsuta			collected	
SANTALACEAE	Thesium frisea				
SANTALACEAE	Thesium funale		TNR Herbarium		
SCROPHULARIACEAE	Diascia capensis				

SCROPHULARIACEAE	Diascia elongata			collected	
SCROPHULARIACEAE	Diascia sacculata			**FOT 559 C** 25-9-2008	
SCROPHULARIACEAE	Dischisma capitatum				
SCROPHULARIACEAE	Globulariopsis adpressa (=Selago adpressa)		TNR Herbarium	**FOT 669 C** 16-1-2009	
SCROPHULARIACEAE	Hebenstretia repens			**FOT 505 C** 12-9-2008	
SCROPHULARIACEAE	Hemimeris racemosa		TNR Herbarium		
SCROPHULARIACEAE	Kickxia = Linaria spuria		collected	12-3-2010	
SCROPHULARIACEAE	Nemesia affinis				
SCROPHULARIACEAE	Nemesia barbata		TNR Herbarium		
SCROPHULARIACEAE	Phyllopodium cordatum			2-10-2009	
SCROPHULARIACEAE	Phyllopodium heterophyllum			4-9-2008 collected	
SCROPHULARIACEAE	Selago adpressa				
SCROPHULARIACEAE	Selago corymbosa		TNR Herbarium		
SCROPHULARIACEAE	Sutera uncinata		TNR Herbarium	08-08-2008	
SCROPHULARIACEAE	**Veronica angallis-aquatica**				Africa
SCROPHULARIACEAE	Zaluzianskya sp		TNR Herbarium		
SCROPHULARIACEAE	Zaluzianskya divaricata			12-09-2008	
SOLANACEAE	Lycium afrum	Kraal Honey Thorn, Kraalkriekdoring	TNR Herbarium	08-08-2008	
SOLANACEAE	Lycium ferocissimum	Slangbessie			
SOLANACEAE	**Nicotiana glauca**	Wildetabak	TNR Herbarium		South America
SOLANACEAE	Solanum guineense		TNR Herbarium		
SOLANACEAE	**Solanum linnaeanum**	Bitter Apple, Bitterappel	TNR Herbarium		South Africa
SOLANACEAE	**Solanum pseudo-capsicum**	Jerusalem Cherry	TNR Herbarium		South America
SOLANACEAE	**Withania somnifera**	Indian Ginseng	TNR Herbarium		Asia
TECOPHILAEACEAE	Cyanella hyacinthoides	Blouraaptol			
TECOPHILAEACEAE	Cyanella lutea	Geelraaptol	TNR Herbarium	10-07-2009	
THYMELAEACEAE	Gnidia inconspicua		FOT 800	collected 09-09-2009	
THYMELAEACEAE	Gnidia laxa		TNR, FOT 810	collected 09-09-2009	
THYMELAEACEAE	Gnidia setosa			sm specimen 9-9-2009	

THYMELAEACEAE	Gnidia subulata		TNR		
THYMELAEACEAE	Passerina vulgaris				
TYPHACEAE	Typha capensis	Bulrush, Papkuil			
VERBENACEAE	**Verbena bonariensis**	Purple Top, Blouwaterbossie	TNR Herbarium		South America
VISCACEAE	Viscum capense			08-08-2008	
ZYGOPHYLLACEAE	Tribulus terrestris	Dubbeltjiedoring			
ZYGOPHYLLACEAE	Zygophyllum sessilifolium	Witspekbos		08-08-2008	

Alien plant species

N0	COMMON	SCIENTIFIC
1	Port Jackson	*Acacia saligna*
2	Agapanthus	
3	sisal	*Agave sisalana*
4	Black eyed susan	
5	Blue pimpernel	*Anagallis arvensis*
6	Pepperweed	*Lepidium africanum (Brassucaceae)*
7	Madagascan periwinkle	*Catharanthus roseus*
8	Patterson's curse	*Echium plantagineum*
9	Musk herons bill/ turknael	*Erodium moschatum*
10	Fennel	*Foeniculum vulgare*
11	Ivy	*Hadera sp*
12	St John's Wort	*Hypericum perforatum*
13	Bur clover	*Medicago polymorpha*
14		*Nasturtium sp*
15	Stinkbean	*Paraserianthes lophantha*
16	Fountain grass	*Pennisetum setaceum*
17	kikuyu	*Pennisetum clandestinum*
18	Australian cheesewood	*Pittosporum undulatum*
19		*Polygala sp.*
20	Dyer's rocket	*Reseda lutea*
21	Caster oil	*Rincinus communis*
22	elderberry	*Sambucus sp.*
23	Strelitzia	*Strelitzia*
24	Purple top	*Verbena bonariensis*
25	Narrow leaved purple vetch	*Vicia sp.*

26	Wild mustard	*Rapistrum rugosum*
27	Manatoka	*Myoporum tenuifoilum*
28	Spanish broom	*Spartium junceum*
29	Thorny pigweed	*Amaranthus spinosus*
30	rooikrans	*Acacia cyclops*
31	Brazilian pepper	*Schinus terebinthifolius*
32	Shrubby milkweed	*Asclepias fruticosa*
33	Bluegum tree	
34	pines	
35	Fig	*Ficus*
36	Wild grenadilla	*Passiflora subpeltata*
37	Scotch Thistle	*Cirsium vulgare*
38	Grey poplar	*Populus x canescens*
39	Night shade	*Solanum retroflexum*
40	Palm tree	
41	poppy	*Papaver sp.*
42	Red valerian	*Centranthus ruber*
43		*Cotoneaster pannosus*

Appendix 6: Mammals

SPECIES NAME	COMMON NAME	SEEN ON	RED BOOK STATUS	ALIEN
Aonyx capensis	Cape Clawless Otter	2010/01/06	Least Concern (LC)	No
Atilax paludinosus	Water Mongoose	2010/01/06	Least Concern (LC)	No
Bathyergus suillus	Cape Dune Molerat	2010/01/06	Least Concern (LC)	No
Cryptochloris asiatica	Cape Golden Mole	2008/10/06	Data Deficient (DDD)	No
Cryptomys hottentotus	Common Molerat	2008/03/11	Least Concern (LC)	No
Damaliscus pygargus pygargus	Bontebok	31/12/2008	Vulnerable (VU)	No
Felis caracal	Caracal	14/07/2009	Least Concern (LC)	No
Galerella pulverulenta	Small Grey Mongoose	26/04/2010	Least Concern (LC)	No
Genetta genetta	Smallspotted Genet	2008/03/11	Least Concern (LC)	No
Genetta tigrina	Large-spotted Genet	18/03/2010	Least Concern (LC)	No
Herpestes ichneumon	Large Grey Mongoose	2009/01/08	Least Concern (LC)	No
Hystrix africaeaustralis	Porcupine	2010/03/03	Least Concern (LC)	No
Ictonyx striatus	Striped Polecat	26/02/2010	Least Concern (LC)	No
Mellivora capensis	Honey Badger	21/07/2010	Near Threatened (NT)	No
Mus minutoides	Pygmy Mouse	2010/02/05	Least Concern (LC)	No
Otomys irroratus	Vlei Rat	15/03/2010	Least Concern (LC)	No
Papio ursinus	Chacma Baboon	22/05/2010	Least Concern (LC)	No
Pelea capreolus	Grey Rhebok	2010/11/02	Least Concern (LC)	No
Poecilogale albinucha	Striped Weasel	2010/01/06		No
Procavia capensis	Rock Dassie	23/06/2008	Least Concern (LC)	No
Raphicerus melanotis	Cape Grysbok	16/02/2010	Least Concern (LC)	No
Rhabdomys pumilio	Striped Mouse, Striped Field Mouse	31/12/2008	Least Concern (LC)	No
Sciurus carolinensis	Grey Squirrel	29/03/2010	Not Evaluated (NE)	Yes
Vulpes chama	Cape Fox	19/04/2009	Least Concern (LC)	No

Appendix 7: Birds

1	*Accipiter melanoleucus*	Black Sparrowhawk
2	*Accipiter rufiventris*	Rufous-chested Sparrowhawk
3	*Accipiter tachiro*	African Goshawk
4	*Acrocephalus baeticatus*	African Reed-Warbler
5	*Acrocephalus gracilirostris*	Lesser Swamp Warbler
6	*Alcedo cristata*	Malachite Kingfisher
7	*Alopochen aegyptiacus*	Egyptain Goose
8	*Amblyospiza albifrons*	Thick-billed Weaver
9	*Anas sparsa*	African Black Duck
10	*Anas undulata*	Yellow-billed Duck
11	*Anhinga rufa*	African Darter
12	*Anthobaphes violacea*	Orange-breasted Sunbird
13	*Anthoscopus minutus*	Cape Penduline-Tit
14	*Anthropoides paradiseus*	Blue Crane
15	*Anthus cinnamomeus*	African Pipit
16	*Anthus similis*	Long-billed Pipit
17	*Apalis thoracica*	Bar-throated Apalis
18	*Apus affinis*	Little Swift
19	*Apus barbatus*	African Black Swift
20	*Apus caffer*	White-rumped Swift
21	*Apus horus*	Horus Swift
22	*Apus melba*	Alpine Swift
23	*Ardea cinerea*	Grey Heron
24	*Ardea melanocephala*	Black-headed Heron
25	*Ardea purpurea*	Purple Heron
26	*Aquila pennatus*	Booted Eagle
27	*Aquila verreauxii*	Verreauxs' Eagle
28	*Batis capensis*	Cape Batis
29	*Bostrychia hagedash*	Hadeda Ibis

30	*Bradypterus baboecala*	Little Rush-Warbler
31	*Bubo africanus*	Spotted Eagle-Owl
32	*Bubulcus ibis*	Cattle Egret
33	*Burhinus capensis*	Spotted Thick-knee
34	*Buteo buteo*	Steppe Buzzard
35	*Buteo rufofuscus*	Jackal Buzzard
36	*Campephaga flava*	Black Cuckooshrike
37	*Caprimulgus pectoralis*	Fiery-necked Nightjar
38	*Centropus superciliosus*	Burchell's Coucal
39	*Cercomela familiaris*	Familiar Chat
40	*Cercotrichas coryphoeus*	Karoo Scrub-Robin
41	*Cercotrichas leucophrys*	White-browed Scrub Robin
42	*Chrysococcyx caprius*	Diderick Cuckoo
43	*Chrysococcyx klaas*	Klaas's Cuckoo
44	*Circus maurus*	Black Harrier
45	*Cisticola fulvicapillus*	Neddicky
46	*Cisticola subruficapillus*	Grey-backed Cisticola
47	*Cisticola tinniens*	Levaillant's Cisticola
48	*Coccopygia melanotis*	Swee Waxbill
49	*Colius colius*	White-backed Mousebird
50	*Colius striatus*	Specked Mousebird
51	*Columba arquatrix*	African Olive-Pigeon
52	*Columba guinea*	Rock Pigeon
53	*Corvus albicollis*	White-necked Raven
54	*Corvus albus*	Pied Crow
55	*Cossypha caffra*	Cape Robin-Chat
56	*Crithagra albogularis*	White-throated Canary
57	*Crithagra flaviventris*	Yellow Canary
58	*Crithagra scotops*	Forest Canary
59	*Crithagra sulphuratus*	Brimstone Canary

60	*Cuculus solitarius*	Red-chested Cuckoo
61	*Dendropicos fuscescens*	Cardinal Woodpecker
62	*Delichon urbicum*	Common House Martin
63	*Dicrurus adsimilis*	Fork-tailed Drongo
64	*Elanus caeruleus*	Black-shouldered Kite
65	*Emberiza capensis*	Cape Bunting
66	*Estrilda astrild*	Common Waxbill
67	*Euplectes capensis*	Yellowrumped Widow
68	*Euplectes orix*	Southern Red Bishop
69	*Falco biarmicus*	Lanner Falcon
70	*Falco cuvierii*	African Hobby
71	*Falco peregrinus*	Peregrine Falcon
72	*Falco rupicolus*	Rock Kestrel
73	*Fulica cristata*	Red-knobbed Coot
74	*Gallinula chloropus*	Common Moorhen
75	*Geocolaptes olivaceus*	Ground Woodpecker
76	*Haliaeetus vocifer*	African Fish-Eagle
77	*Hieraaetus pennatus*	Booted Eagle
78	*Hirundo albigularis*	White-throated Swallow
79	*Hirundo cucullata*	Greater Striped Swallow
80	*Hirundo fuligula*	Rock Martin
81	*Hirundo rustica*	Barn Swallow
82	*Indicator indicator*	Greater Honeyguide
83	*Indicator minor*	Lesser Honeyguide
84	*Laniarius ferrugineus*	Southern Boubou
85	*Lanius collaris*	Common Fiscal
86	*Larus dominicanus*	Kelp Gull
87	*Macronyx capensis*	Cape Longclaw
88	*Megaceryle maximus*	Giant Kingfisher
89	*Milvus migrans*	Yellow-billed Kite

90	*Motacilla capensis*	Cape Wagtail
91	*Monticola rupestris*	Cape Rock-Thrush
92	*Muscicapa adusta*	African Dusky Flycatcher
93	*Nectarinia chalybea*	Southern Double-collared Sunbird
94	*Nectarinia famosa*	Malachite Sunbird
95	*Numida meleagris*	Helmeted Guineafowl
96	*Onychognathus morio*	Red-winged Starling
97	*Parisoma layardi*	Layard's Tit-babbler
98	*Parisoma subcaeruleum*	Chestnut-vented Tit-Babbler
99	*Passer domesticus*	House Sparrow
100	*Passer melanurus*	Cape Sparrow
101	*Pelecanus onocrotalus*	Great White Pelican
102	*Phalacrocorax africanus*	Reed Cormorant
103	*Plectropterus gambensis*	Spur-winged Goose
104	*Ploceus capensis*	Cape Weaver
105	*Ploceus velatus*	Southern Masked Weaver
106	*Polyboroides typus*	African-Harrier Hawk
107	*Prinia maculosa*	Karoo Prinia
108	*Prodotiscus regulus*	Brown-backed Honeybird
109	*Promerops cafer*	Cape Sugarbird
110	*Psalidoprocne albiceps*	Black Saw-wing
111	*Pternistis capensis*	Cape Spurfowl
112	*Pycnonotus capensis*	Cape Bulbul
113	*Riparia riparia*	Brown-throated Martin
114	*Serinus canicollis*	Cape Canary
115	*Sigelus silens*	Fiscal Flycatcher
116	*Sphenoeacus afer*	Cape Grassbird
117	*Stenostira scita*	Fairy Flycatcher
118	*Streptopelia capicola*	Cape Turtle-Dove
119	*Streptopelia semitorquata*	Red-eyed Dove

120	*Streptopelia senegalensis*	Laughing Dove
121	*Sturnus vulgaris*	Common Starling/European Starling
122	*Sylvia borin*	Garden Warbler
123	*Sylvietta rufescens*	Long-billed Crombec
124	*Tachybaptus ruficollis*	Little Grebe
125	*Tachymarptis melba*	Alpine Swift
126	*Telophorus zeylonus*	Bokmakierie
127	*Terpsiphone viridis*	African Paradise-Flycatcher
128	*Threskiornis aethiopicus*	African Sacred Ibis
129	*Tricholaema leucomelas*	Acacia Pied Barbet
130	*Turdus olivaceus*	Olive Thrush
131	*Upupa africana*	African Hoopoe
132	*Urocolius indicus*	Red-faced Mousebird
133	*Vanellus armatus*	Blacksmith Lapwing
134	*Vanellus coronatus*	Crowned Lapwing
135	*Vidua macroura*	Pin-tailed Whydah
136	*Zosterops pallidus*	Orange River White-Eye
137	*Zosterops senegalensis*	Cape White-eye

Appendix 8: Reptiles

SPECIES NAME	COMMON NAME
Bradypodion pumilum	Cape Dwarf Chameleon
Chersina angulata	Angulate Tortoise
Cordylus cordylus	Cape Girdled Lizard
Geochelone pardalis	Leopard Tortoise
Lamprophis capensis	Brown House Snake
Naja nivea	Cape Cobra
Pachydactylus geitje	Ocellated Thick-toed Gecko, Ocellated Thicktoed Gecko
Pseudaspis cana	Mole Snake
Tetradactylus seps	Short-legged Seps, Shortlegged Seps
Tetradactylus tetradactylus	Common Long-tailed Seps, Common Longtailed Seps
Trachylepis capensis	Cape Skink
Bitis arietans	Puff Adder, Puffadder
Crotaphopeltis hotamboeia	Herald Snake
Dasypeltis scabra	Common Eggeater
Dispholidus typus	Boomslang
Duberria lutrix	Common Slug Eater
Homopus areolatus	Parrot-beaked Tortoise, Parrotbeaked Tortoise
Lamprophis aurora	Aurora House Snake
Lamprophis inornatus	Olive House Snake
Lycodonomorphus rufulus	Common Brown Water Snake
Psammophis notostictus	Karoo Sand Snake
Psammophylax rhombeatus	Rhombic Skaapsteker

Appendix 9: Amphibians

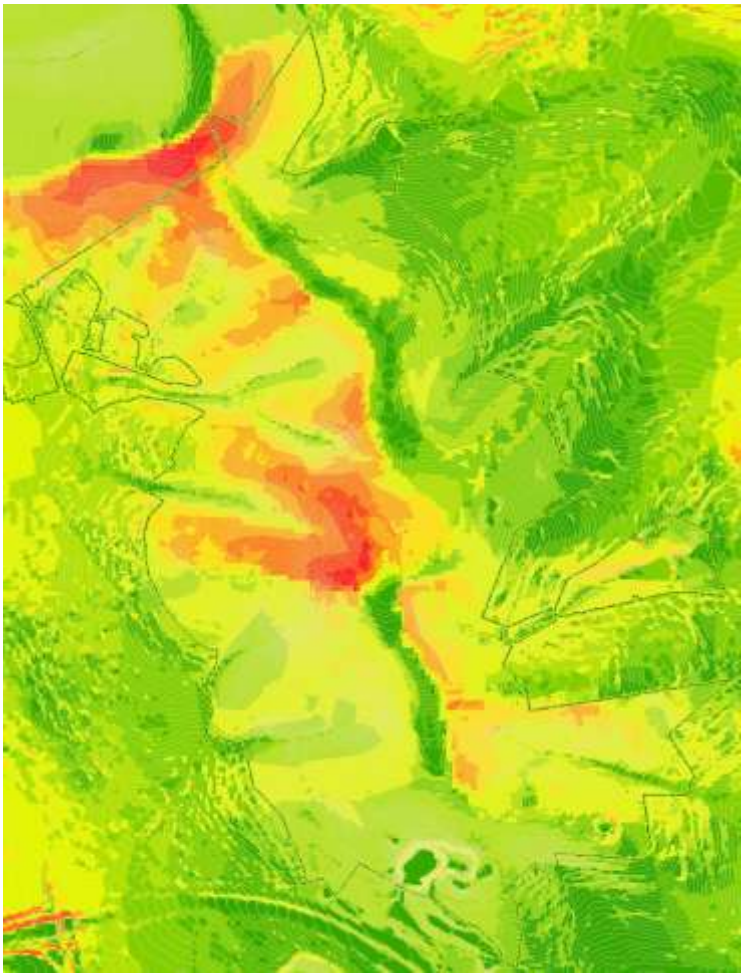
SPECIES NAME	COMMON NAME
Breviceps gibbosus	Cape Rain Frog
Strongylopus grayii	Clicking Stream Frog
Strongylopus grayii grayii	Clicking Stream Frog
Amieta fuscigula	Cape River Frog
Cacosternum boettgeri	Common Caco
Xenopus laevis	Common Platanna

Other documents as required:

Appendix 10: Sensitivity Value Analysis

SENSITIVITY- VALUE ANALYSIS AND ZONATION PROCESS:

Tygerberg NATURE RESERVE



Prepared for the Biodiversity Branch and Environmental Management Systems Branch

OCTOBER 2010

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CITY OF CAPE TOWN | ISIXEKO SASEKAPA | STAD KAAPSTAD

THIS CITY WORKS FOR YOU

1.

2. **Contents**

1 1. INTRODUCTION

Tygerberg Nature Reserve is 309 hectares in extent and is one of the few reserves conserving the critically endangered vegetation type, Swartland Shale Renosterveld. Only 9% of the historical extent of this vegetation type remains and only 3% of the remaining extent is currently within a formally protected nature reserve.

The reserve has a host of easily accessible visitor facilities and also has an environmental education centre with dedicated EE programs. The reserve is a significant asset to the City and makes a significant contribution to national vegetation targets of threatened vegetation

types as listed in the National Spatial Biodiversity Assessment (Driver *et al*. 2005), as well as providing a service and facilities to local residents and schools.

1.1 SCOPE OF REPORT

The development of the Sensitivity and Zonation plan is one of the steps required in compiling a Conservation Development Framework (CDF) for the reserve. CDFs are tools to reconcile the various land-use needs and to delineate visitor user zones and the positioning and nature of new infrastructure, access points, roads and facilities.

The CDF process has grown in response to the requirements of the NEMBA (2004) and is a strategy to comply with the spatial planning requirements of these acts. The CDFs will ensure that best practice and sustainable development principles are integrated into spatial planning within protected areas.

The Sensitivity-Value analysis is the landscape analysis portion of the broader Conservation Development Framework. It is a multi-criteria decision-support tool for spatial planning that is designed to integrate the best available information into a format that allows for defensible and transparent decisions to be made. The Sensitivity-Value process is based on the principle that the acceptability of a development (or placement of a structure) at a site is based on the site's value (either from biodiversity, heritage, aesthetic or a combination of values) and its sensitivity or vulnerability to a variety of types of disturbance (Holness *et al*, 2005).

- The Sensitivity-Value analysis, the CDF and the associated zonation plan should form part of an adaptive management system. They will grow and change over time as the understanding of the landscapes and ecosystems improve; and
- It does not replace the need for detailed site and precinct planning and EIA compliance at site level.

2 2. BACKGROUND AND BRIEF

The Sensitivity-Value analysis was undertaken by the EMS Branch's natural resource specialist. The small size of the City's nature reserve did not require an extensive analysis, with the subsequent zonation process being fairly straight forward. The methodology used for both the Sensitivity-Value analysis and the zonation process was adapted from Holness (2008) and SRK Consulting (2008).

All geographical information work was carried out in ESRI's ArcMap version 9.3.1 GIS (Geographical Information System) using the ArcInfo license level with Spatial Analyst and 3D Analyst extensions.

The brief for the project was to conduct a Sensitivity-Value analysis and zonation plan for the Tygerberg nature reserve.

3 3. SENSITIVITY-VALUE ANALYSIS

Sensitivity-Value Analysis and Zoning Process methodology

Stage 1: Data synthesis and compilation

Compilation of required data for the analysis

- Spatially define the planning domain or study area.
- Evaluate available and required datasets for the Sensitivity-Value model.
- Spatial data is collected or created for each element of the Sensitivity-Value model.

Stage 2: Layer interpretation

Layer interpretation is an important component of the Sensitivity-Value process that requires a combination of spatial data interpretation and expert knowledge.

- Using the assembled data, areas are assigned a score on a common scale for each element of the model; and
- The scores achieved for each element of the model are represented as separate input layers on a GIS.

Stage 3: Sensitivity-Value Analysis

The Sensitivity-Value analysis stage involves an iterative exploration of the input layers.

- The scores achieved for each element of the model are weighted and aggregated to obtain an overall Sensitivity-Value ranking.
- Different weightings and aggregation procedures and combinations of input layers can be explored; and
- The robustness of the Sensitivity-Value analysis is examined.

The resultant Sensitivity-Value output maps should provide an initial understanding of the spatial distribution of the important and sensitive biodiversity, landscape and heritage features.

Stage 4: Development of a draft zonation plan

The outputs of the Sensitivity-Value process are used as the foundation for the development of a draft zonation plan. The Sensitivity-Value outputs and draft zonation plan are workshopped with relevant stakeholders.

Stage 5: Refinement of the draft zonation and the identification of special management overlays

Special management areas/overlays are identified using the information derived from the Sensitivity-Value analysis. Recommendations are made regarding the management of the land-use zones and special management areas.

The draft is then presented for comment to the City and stakeholder groups to obtain broad public input into the plan prior to finalisation,

Stage 6: Final Zonation and Conservation Development Framework.

The comments and input from the public participation process are integrated into the final zonation plan. The plan is passed through Council for approval and adoption.

4 3.1 INPUT LAYERS

The study area for the CDF was defined as the current management boundary of the Tygerberg Nature Reserve.

3.1.1 BIODIVERSITY

3.1.1a Habitat Value

The habitat unit as defined by a particular vegetation community is used as the broad proxy for biodiversity. The vegetation communities are good surrogates for habitat value as it uses readily available information that clearly delineates the distribution of distinct subsets of biodiversity across the landscape.

The South African National Vegetation Map (Rebelo et al. 2006) was used to broadly define the habitat units. The NSBA (Driver *et al*, 2005) values were used to inform current ecosystem status and level of protection of vegetation types within the study area.

The following factors were also incorporated in the habitat value calculation

- The value assigned to a habitat unit should reflect the contribution that vegetation type makes to the local, provincial and national conservation estate.
- This value should reflect the rarity of the habitat, the level of transformation that occurred within the habitat type, species richness and diversity, habitat heterogeneity, and contribution to local conservation targets as identified in the City's Biodiversity Network (Benn 2008).
- The habitat value also takes into account a gap analysis (how much is in reserves), whereby habitat types that exists largely outside of protected areas receive a higher value.

Broad habitat value is a poor indication of the value of a particular site if a reserve has a history of significant transformation or degradation. Where a reserve includes transformed and/or degraded areas these need to inform the adjustment of the broad habitat value to reflect:

- The level and type of transformation that has occurred at a particular site.
- The rehabilitation/restoration potential of a site. Areas that are likely to revert, with a minimum of management intervention, to a natural or near natural state should be allocated a higher value than areas where extensive management intervention is required.
- Degraded or developed areas were considered to have lower habitat values. The habitat values were adjusted downwards according to the level and type of degradation or habitat loss that has occurred.

Data Inputs (GIS methods and sources)

Base habitat map:

The broad vegetation types as listed in the South African Vegetation Map (Rebelo *et a*l. 2006) were used as the smallest vegetation unit (see Figure 1). The values used to adjust the base habitat scores are the listed in Table 2. This is necessary in order that critically

endangered ecosystems are accurately reflected in the scoring in terms of protection status and, % transformation of the vegetation types.

Figure 1: Tygerberg National Vegetation Types

3.1.1b: Transformation Degradation Map:

Habitat transformation and degradation was mapped from recent aerial photography (2005, 2007 and 2008). Habitat modifiers are listed in Table 1 and Figure 2 shows their types and spatial extent.

Table 1: Habitat Modifiers

Type	Category	Description
Transformed	Facilities	Facilities for use by public within the reserve (Ablutions, displays, benches etc.)
	Housing and hard surfaces	Formal and informal housing, incl. old sites that still have hard surfaces etc.
	Quarries	Open excavation or burrow pits – can be current or historic
	Road & paths	The road (management and access roads), trail and boardwalk network
	Dams	Artificial water impoundments and Bulk water infrastructure
	Recreational Open Space	Primarily areas where lawns are maintained for public recreation. Often associated with non-indigenous tree planting for shade etc.
Degraded Heavy, moderate or Low	Firebreaks/fencing	Strips of cleared land maintained for fire management. Including the boundary fencing which usually incorporates a firebreak.
	Invasive Alien vegetation	These areas include sites that have an Invasive Alien Plant infestation density of more than 75%. Sites need to be assessed in terms of their restoration potential. This would also include plantation (Forestry) sites.
	Disturbed	Areas where the natural habitat is not in a near-natural state, but is also not irreversibly transformed. These areas still perform important habitat and ecosystem functions.

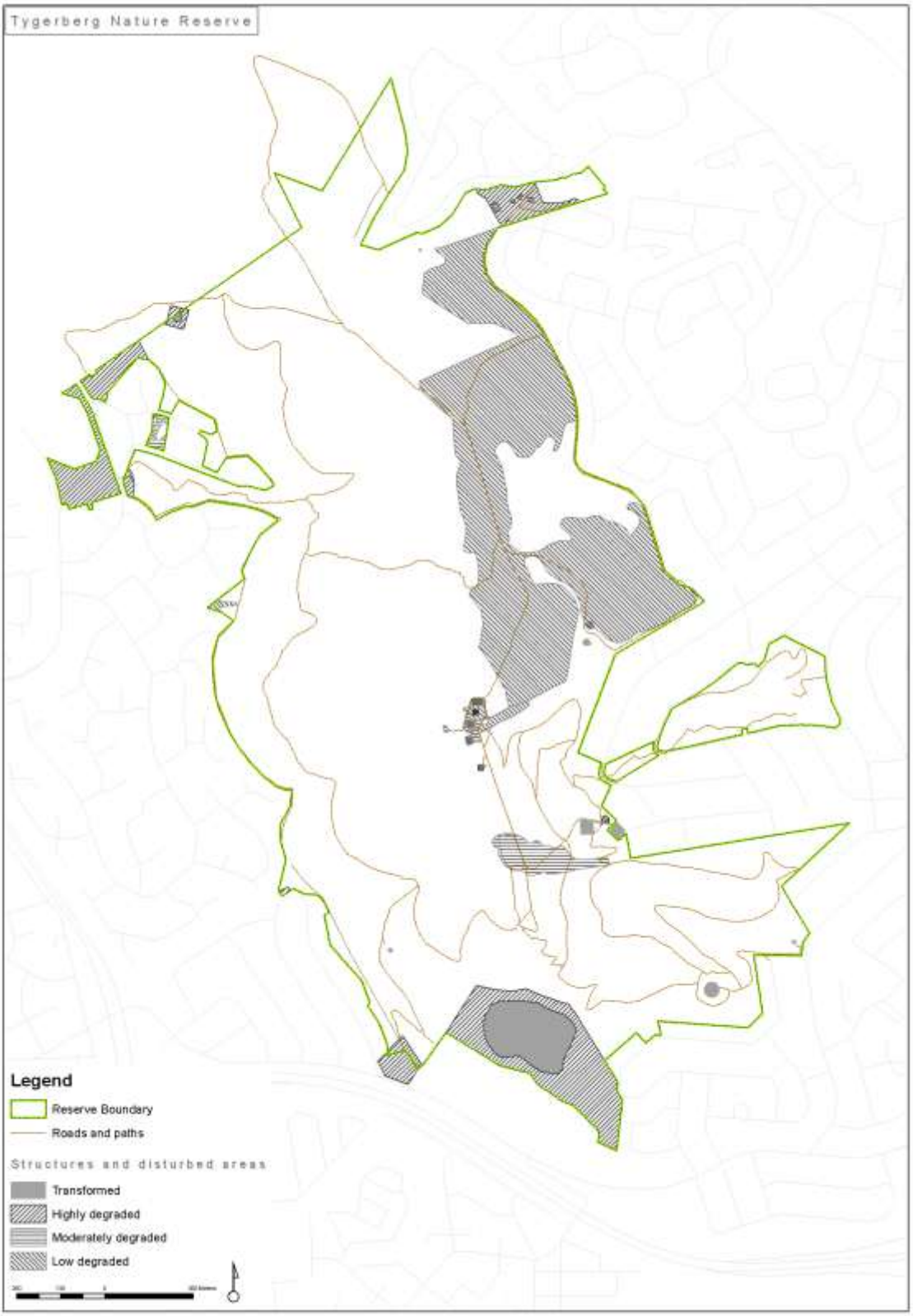

Figure 2: Tygerberg Nature Reserve Habitat Modifiers

Scoring, Logic and rationale

The scoring method derived was as follows:

1. Base values were assigned to the study area according to the ecosystem status of the vegetation types (Table 2).
2. The Base values were adjusted on the basis of habitats that are likely to receive an adjusted conservation status under the “Criterion D” listing of threatened ecosystems in terms of NEMBA (2004). This reflects vegetation types with high numbers of rare and endangered plant species. This value replaced the NSBA Conservation Status where higher and was not used in addition to them (Table 2).
3. Base values were adjusted according to the protection status of the vegetation type (Gap Analysis) as determined in the fine scale conservation plan for the City (see Appendices, Table 9).
4. Base values were adjusted according to the % Transformation that has occurred within each vegetation type within the City. (See Appendices, Table 10).
5. The values of all degraded sites were reduced according to the type of habitat degradation (Table 3); and
6. The values of all transformed areas were reduced to zero
7. Once these values were determined, the values were converted to a 0-10 range using a linear conversion method in ArcGIS.

Table 2: Habitat Value summary for each vegetation type before local adjustment for transformation/degradation

Vegetation Type	NSBA Conservation Status Score	Criterion D Score*	SANBI Conservation Status	% Transformed Score	Unmodified Score
Atlantis Sand Fynbos	6	10	5	3	18
Boland Granite Fynbos	8	6	3	3	14
Cape Estuarine Salt Marshes	4	0	-1	3	6
Cape Flats Dune Strandveld: False bay	8	8	3	10	21
Cape Flats Dune Strandveld: West Coast	4	8	3	2	13
Cape Flats Sand Fynbos	10	10	4	10	24
Cape Lowland Freshwater Wetlands	4	0	-1	2	5
Cape Winelands Shale Fynbos	8	0	3	3	14
Elgin Shale Fynbos	10	0	4	6	20
Hangklip Sand Fynbos	6	6	-1	4	9
Kogelberg Sandstone Fynbos	4	10	2	0	12
Lourensford Alluvium Fynbos	10	10	3	10	23
North Peninsula Granite Fynbos	4	0	-1	2	5
Peninsula Sandstone Fynbos	4	8	-1	0	7
Peninsula Shale Fynbos	6	0	-1	4	9
Peninsula Shale Renosterveld	10	0	3	10	23
South Peninsula Granite Fynbos	8	0	2	6	16
Southern Afrotemperate Forest	4	0	-1	0	3
Swartland Alluvium Fynbos	10	0	5	10	25
Swartland Granite Renosterveld	10	10	4	10	24
Swartland Shale Renosterveld	10	10	4	10	24
Swartland Silcrete Renosterveld	10	0	-1	10	19
Western Shaleband Vegetation	4	0	3	0	7

**This value only replaces NSBA Conservation Status Value when it's a higher value*

Table 3: Habitat Value Summary table

Type	Source	Category	Value	Notes
Base Values	NSBA Conservation Status	Critically Endangered	10	
		Endangered	8	
		Vulnerable	6	
		Least Threatened	4	
	Criterion D Status	Critically Endangered	10	Criterion D Status overrides NSBA where the value is higher
		Endangered	8	
		Vulnerable	6	
		Least Threatened	4	
Broad adjustors	Vegetation remnants % Transformed	0-14%	0	This criterion highlights the critically endangered vegetation types within the City without considering protection status.
		15-29%	2	
		30-39%	3	
		40-49%	4	
		50-59%	5	
		60-69%	6	
		70-99%	10	
	Ecosystem protection Status (Gap Analysis)	Not Protected	5	Currently not represented in formal reserves
				>5% of target in reserves
		Hardly Protected	4	5->50% of target in reserves
		Poorly Protected	3	50->100% of target in reserves
		Moderately Protected	2	100% + of target conserved in formal protected areas
		Well Protected	-1	

Modifiers				
Local adjustors	Overriding values for transformed sites	Artificial water bodies	0	Value reduced to 0
		Quarries/roads	0	Value reduced to 0
		Developed	0	Value reduced to 0
		Recreational Open Space (ROS)	0	Value reduced to 0
	Adjusting values for degraded sites	Heavily degraded	-6	High density aliens – depleted seed bank with low restoration potential Previously ploughed old fields
		Moderately degraded	-2	High density aliens – intact seed bank with high restoration potential Forestry (Pine, Gum) plantations
		Low degraded	-1	High density non-locally indigenous species Area is recovering from historic disturbance, to a near natural state. Cleared fire belt areas Modified wetlands with NB habitat value

GIS Procedure:

Habitat Value Unmodified Score

1. Export vegetation data to separate shapefile
2. Delete all fields except the “SANBI_VEG” field
3. Dissolve on field “SANBI_VEG”
4. Add fields, NSBA Conservation Status Score (NSBA_SCR), Criterion D Score (Crit_D), SANBI Conservation Status (SANBI_Cons), % Transformed (PERC_TRANS), Unmodified Score (UNMod_SCR). Use Short Integer field type.
5. Populate the attribute table with the relevant scores
6. Calculate the Unmodified Habitat Value Score. Note: The Criterion D score will override the NSBA score if the latter is a higher value.

Habitat Transformation

1. All roads, trails and boardwalks are buffered by 1 meter.
2. All transformation types were digitised from aerial photography at a scale of 1:700. Artificial water bodies were extracted from the wetlands layer.
3. All transformation layers were unioned.
4. Values were assigned as per the table. Type in field “TRANSCLASS” and the score in the field “VALUE”

Habitat Value Modified Score

1. Union the above two layers
2. Clip the union layer to the study area
3. Delete all unnecessary fields.
4. Add field “MOD_SCR”
5. Calculate the value for “MOD_SCR”. Remember to reduce the over-riding transformation values to 0
6. Covert to a 1-10 range using equal intervals and label 1-10. Ensure sampling uses all records (set to 25000).
7. Export to shapefile and label Tygerberg_HabitatValue.shp
8. Create map for report and export

Outputs

See Figure 3

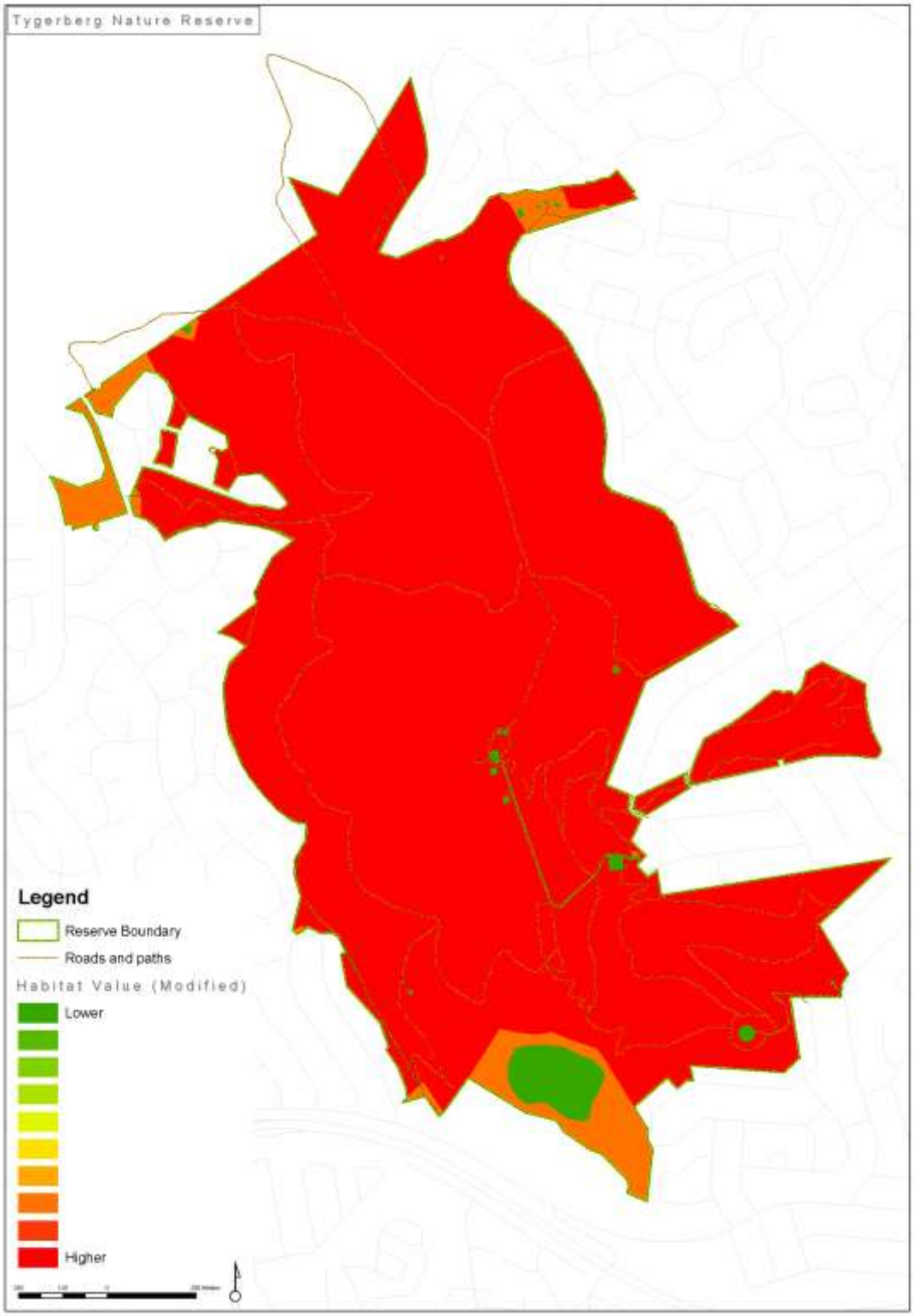

Figure 3: Tygerberg Nature Reserve Habitat Value (Modified)

Interpretation in a local context

Swartland Shale Renosterveld, a critically endangered vegetation type, occurs in the reserve. This is a heavily transformed lowland vegetation type which is poorly represented in nature reserves in the City.

Showstoppers fatal flaws and special management area informants

Development of Greenfield sites within any critically endangered vegetation type or ecosystem should be approached with extreme caution, as by definition one cannot afford further biodiversity loss in these areas within the City.

3.1.1c Special Habitat Value[1]

The value of some areas of a reserve to the biodiversity estate may not be fully reflected by the habitat proxy (vegetation units). It is critical that these areas are identified and included. However, care must be taken not to allow flawed data, selective data availability, perceptions and species/taxa bias to skew the biodiversity value of one site over another.

Key aspects that should be taken into account in this layer:

- Habitats important for supporting populations of special species.
- Care must be taken to ensure that this input fairly reflects the distribution of special species
  across the reserve.
- Where detailed and comprehensive data are available this can be based on actual distributions, but in all likelihood this will be based on expert assessment of likely habitat requirements for identified species.
- Areas containing significant biodiversity assets such as Leopard, Black eagles, Leopard toads etc. that are not specifically linked to entire habitats.
- Other habitats that have significant biodiversity value that have been omitted from the broad conservation value layer as a result of scale issues.

Data Inputs (GIS methods and sources)

Although plant species data is available from the Protea Atlas project and the SAS flora data, the point localities for the data are the centroid point for the reserve so can't be used in spatial analysis.

[1] Not used in the Tygerberg Sensitivity-Value Analysis

5 3.1.2 TOPOGRAPHIC SENSITIVITY

This layer is used to identify areas with steep slopes or with sensitive geological or geomorphologic features. Significant impacts (such as accelerated soil erosion or landslides) may occur during construction in, or with improper management.

Slope steepness is also a factor to be considered in fire prone ecosystems. Development in high fire risk areas must be avoided (i.e. crest of steep slopes).

Sensitivity to erosion was not considered in this report. The steepness and habitat values provide a good enough proxy for sensitivity to erosion.

Data Inputs (GIS methods and sources)

This layer is derived from a triangular irregular network (TIN) created in ArcView 9.3.1 using the 3D Analyst extension and ArcInfo licence level. The 2m Contour layer for the City was used to calculate the base heights for the TIN. Slope angles were calculated using the 3D Analyst extension.

Scoring, logic and rationale

Slope angles were split into categories that relate to potential impacts and the limits of construction without significant cut and fill.

Procedure:

- Buffer study area by 1000m
- Clip the 2m contour layer with the buffered boundary layer
- Create TIN using 3D Analyst and the clipped 2m contour layer
- Reclassify according to Table 4 using 3D Analyst - reclassify
- Convert raster layer to vector shapefile and clip to the reserve boundary
- Create new field “VALUE”
- Assign values according to attribute field “GRIDCODE” to shapefile field “VALUE”
- Create and export map
- Final Topographic Sensitivity layer: TYGB_topo_sensitivity.shp

Table 4: Topographic sensitivity

Source	Category	Value	Note
Slope angles calculated from 2m contour layer	45° - <90°	10	Very high potential for erosion and slope instability
	30° - <45°	9	Strong potential for erosion and slope instability
	15° - <30°	8	High risk of erosion following disturbance
	10° - <15°	6	Moderate risk of erosion following disturbance
	5° - <10°	2	Low sensitivity
	0° - <5°	0	No special topographical sensitivity

Outputs

See Figure 4

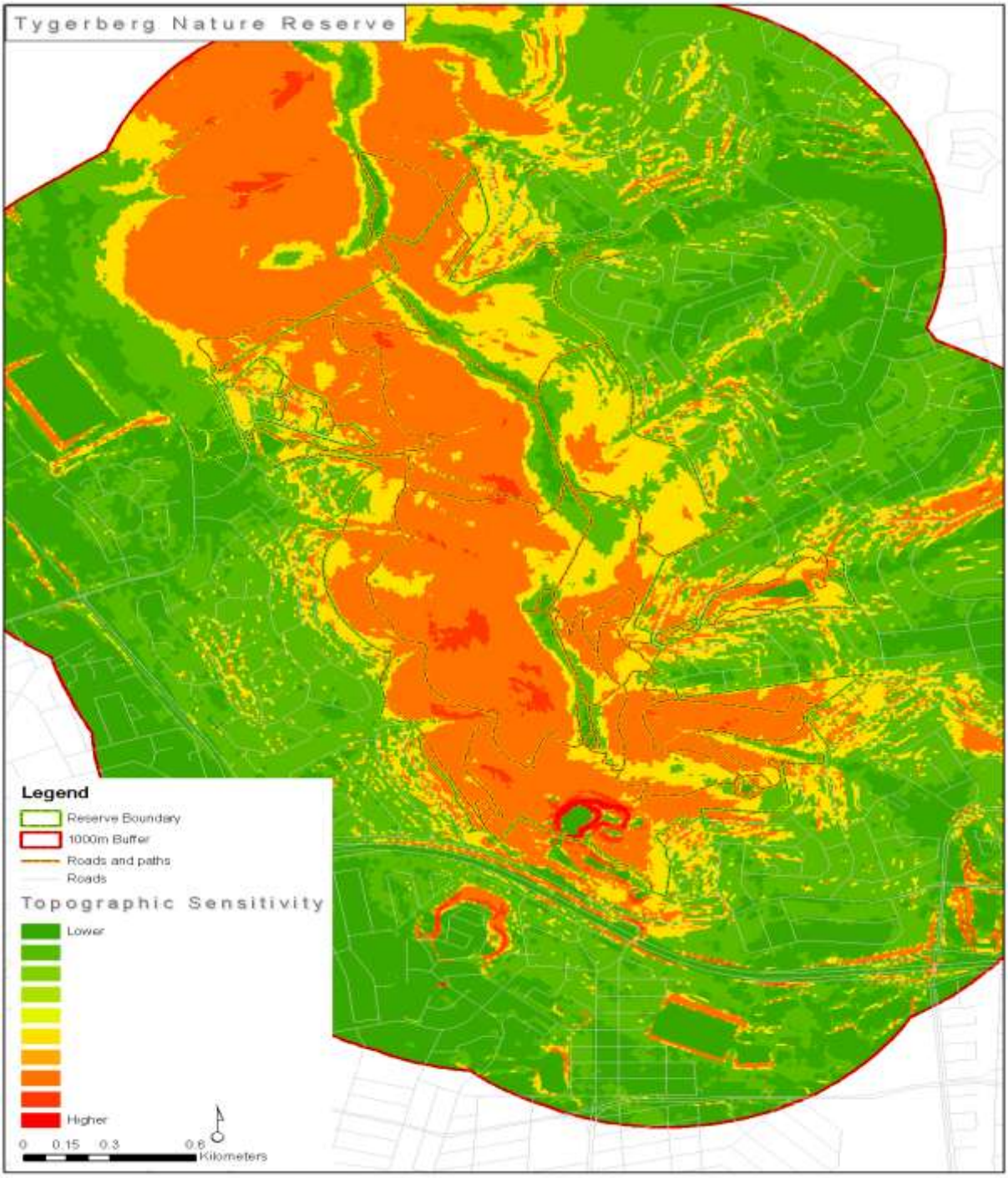

Figure 4: Tygerberg Nature Reserve Topographic Sensitivity

Showstoppers/fatal flaws and Special Management Area Informants

Structures or development on steeps slopes should be avoided.

Existing roads and paths on steep slopes must be a management priority for drainage management and erosion.

6 3.1.3 HYDROLOGICAL SENSITIVITY

The hydrological sensitivity layer has two purposes: to identify areas important for maintaining hydrological processes and to identify areas where infrastructure could be damaged by flooding.

Data inputs (GIS methods and sources)

The footprint within which the hydrological sensitivity is determined is defined by buffering river and wetlands by pre-determined distances.

River data was extracted from the City's rivers layer.

Wetlands data was extracted from the City's wetland layer.

Scoring, logic and rationale

These layers were reclassified as artificial or natural wetlands. Both the rivers and wetlands were buffered and scored as detailed in Table 5.

Procedure

- Clip the rivers and wetlands layer to the buffered boundary layer
- Create separate shapefiles for Natural/Semi-natural wetlands and Artificial/Modified wetlands
- Buffer natural and semi-natural wetlands by 50m (ensure use dissolve all)
- Buffer natural and semi-natural wetlands by 100m (ensure use dissolve all)
- Union the three wetlands shapefiles, create a new field "BUFFER", populate with the buffer distance value
- On the output shapefile create a field "WETNAT_VAL" and populate according to the value in Table 4.
- Delete all unnecessary fields.
- Repeat these steps for the artificial/modified wetlands and rivers, using the values and buffer distances specified in Table 4.
- Merge the new wetlands and rivers shapefiles and dissolve adjacent features with the same value.
- Clip the shapefile to the reserve boundary
- Create and export map
- Final Hydrological sensitivity layer: Tygerberg_hydro_sensitivity.shp

Table 5: Hydrological sensitivity

Source	Category	Value	Note
City Wetlands layer	Natural wetlands, seeps and pans - Actual Area plus 25m	10 8	Actual wetland area - potential for direct disturbance
	Wetlands, seeps and pans - 50m buffer	6	High sensitivity to disruption of hydrological and sediment transfer processes
	Artificial water bodies - actual area Buffer 20m	5 4	Buffer to accommodate spatial extent of potential water level fluctuations.
	Artificial water bodies - 50m buffer	3	As above, lower sensitivity as further away.
City Rivers layer	Perennial rivers - Actual area plus 20m buffer (40m total)	10	Includes areas with potential flood risk.
	Perennial rivers - 60m buffer (120m total)	6	Areas where disruptions could impact on hydrological processes.

Outputs

See Figure 5

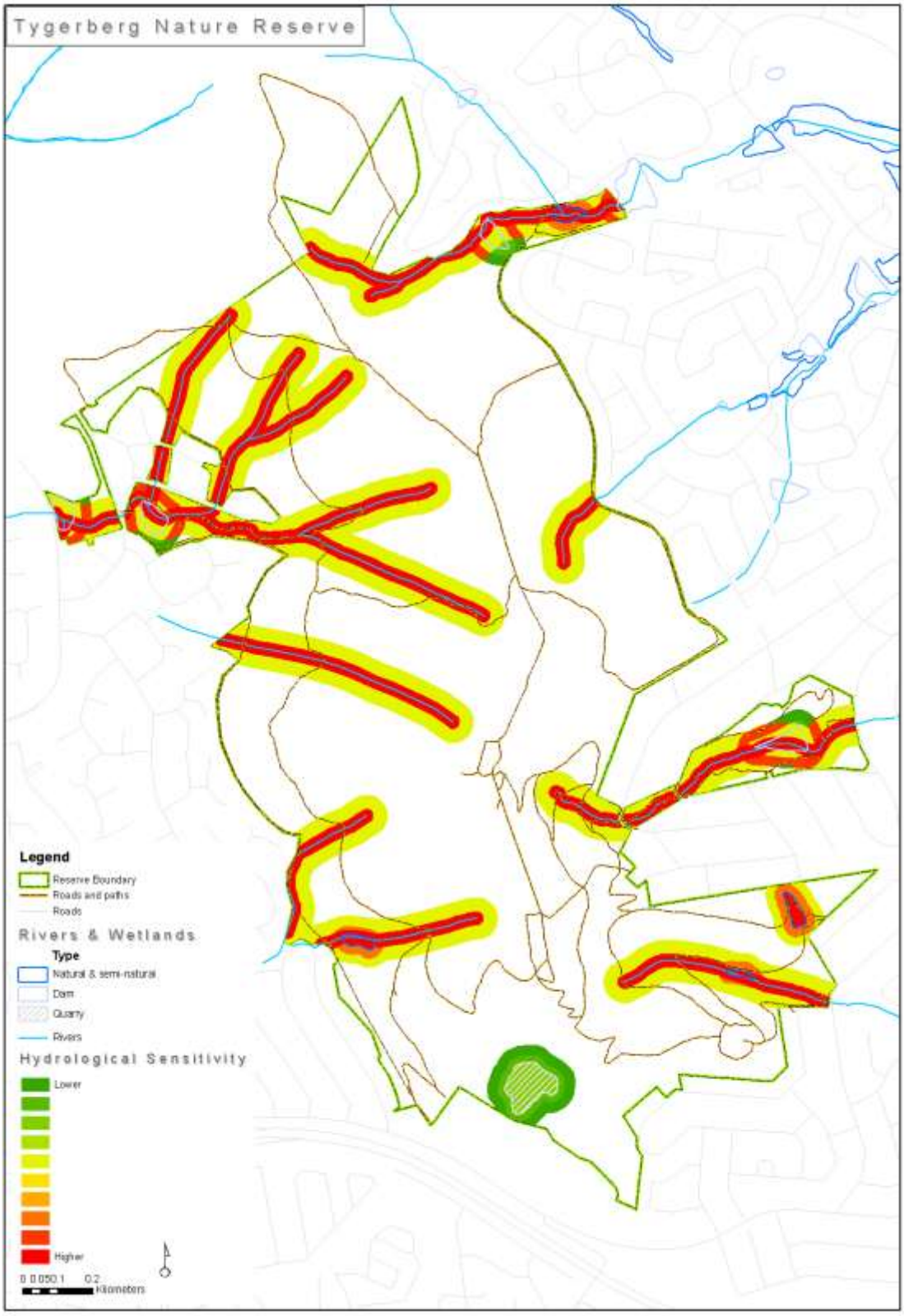

Figure 5: Tygerberg Nature Reserve Hydrological Sensitivity

Interpretation in local context

The buffers applied in the analysis are generous and should be refined at a local, site level if required.

7 3.1.4 VISUAL SENSITIVITY

This layer examines the value of the study area from a visually aesthetic perspective. Visually intrusive development should not occur in areas with a high visual aesthetic value.

The visual sensitivity layer examines how visually intrusive a development will be in a landscape.

Data inputs (GIS methods and sources)

A viewshed analysis was run on the TIN created for the study area, using ArcMap 9.3.1 and the 3D Analyst extension.

Scoring, logic and rationale

The visual analysis examined how visually intrusive a development or structure would be at a particular point. Three separate variables were calculated (see Table 6).

- Slope steepness was calculated based on the TIN for the study area. Slope angles were divided into 10 equal width categories (the range was 0°- 40°). These were scored in the range 1-10.
- An analysis of the visibility of each site from every other site in the reserve was undertaken. A 200m grid of points within the reserve was used to define 572 viewpoints with a Z value of 1.5m (the grid was created using the “Special Raster Tools” in Hawth’s Tools extension for ArcMap 9.3). The viewshed examines (on a proportional basis) which sites are most visible. Similar to slope steepness, these values were divided into 10 equal width categories and scored on a 0-10 basis.
- A viewshed analysis from all roads, paths and trails was undertaken. The analysis parameters used were the same as above except for the viewpoints used.
- These 3 values were added together and reclassified into the range 0-10 equal width categories to ensure compatibility with other layers.

Table 6: Visual Sensitivity Procedure

Source	Category	Value	Note
1. Slope Steepness			
❑ Slopes modeled in ArcGIS using Spatial Analyst		0-10	Slope angles calculated TIN created from 2m Contours
❑ Slopes reclassified	10 equal width categories		
	Scored 1 to 10		Values converted into ten integer based classes, with the maximum value equivalent to slopes of over 45°
2. Grid visibility			
❑ 200m grid of reserve area used as viewpoints 572 Viewpoints		0-10	Analysis based on the TIN
❑ Reclassified	10 equal width categories		Values converted into ten integer based classes, with the maximum value equivalent to visibility from 2.5% of park viewpoints.
3. Tourist viewpoint and public road visibility			
❑ All tourist roads, paths and trails used as viewpoints		0-10	Analysis based on the TIN
❑ Reclassified	10 equal width categories		Values converted into ten integer based classes, with the maximum value equivalent to visibility from 5% of park viewpoints.

Procedure:

Visual Sensitivity

- Create a 200m point grid covering the buffered reserve boundary layer. Hawths tools have an easy tool for this.
- Create a point shapefile using the roads and paths shapefile. Using the “feature vertices to points” tool.
- Run the viewshed analysis using the two shapefiles above as the view points. Use a Z factor of 1.5m.
- Reclassify into 10 equal width categories and export the raster to feature class.
- Clip to the reserve boundary
- Intersect the 3 shapefiles and delete all unnecessary fields. Add field “VISUAL_VAL” .Add up the 3 “VALUE” fields using the field calculator and populate the “VISUAL_VAL” field
- Reclassify into 10 equal class categories
- Create and export map
- Final Visual Sensitivity layer: Tygerberg_visual_sensitivity.shp

Outputs

See Figure 6

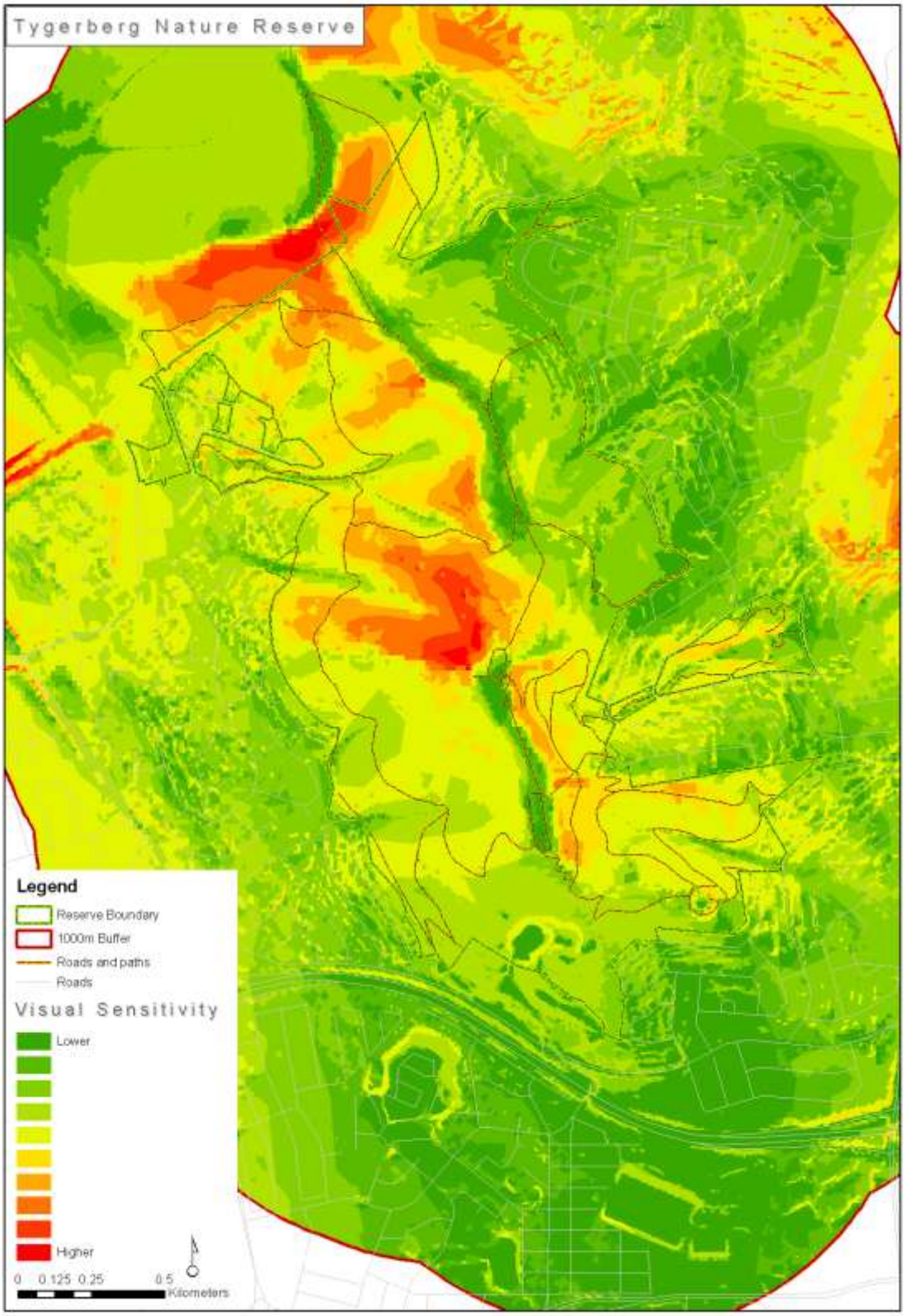

Figure 6: Tygerberg Nature Reserve Visual Sensitivity

Interpretation in local context

Visually intrusive structures or development should be avoided. The positioning of the aerials and masts on the summit plateau of Tygerberg is unavoidable, but care should be taken to restrict the footprint to its current extent.

Showstoppers/Fatal flaws and Special Management Area Informants

The viewshed analysis determines the visibility of areas from predefined observation points. However, the visibility of a development is only one of the components that determine its visual impact. Other factors, such as the development's design, construction and layout also contribute to the overall impact on the aesthetic character of its environment. Special consideration should be given to developments that are proposed in highly visible areas.

8 3.1.5 HERITAGE SENSITIVITY

This layer summarises the value or significance of a heritage site. The significance of a site will to a large extent determine the level of protection and management measures required for a site, and hence should be taken into account when undertaking spatial planning.

There was not data available for Tygerberg and this may need to be re-assessed in future.

9 4. SENSITIVITY-VALUE ANALYSIS PROCESS (INCLUDING WEIGHTINGS) AND SUMMARY LAYERS

The sensitivity-value analysis process has two key parts:

- The preparation of the input layers in a consistent and easy to analyze format (as outlined in the previous sections)
- The preparation of a summary layer which allows all the input layers to be easily accessed, interrogated, combined in a range of weightings (if necessary), and then used as a decision support tool in a workshop situation.

Data inputs (GIS methods and sources)

The GIS process is geared to keeping the dataset flexible enough for use in a workshop situation. All input and summary data need to be available within a single vector shapefile. The GIS method is as follows:

- Clip all input summary datasets to the spatial footprint of the smallest layer. This should correspond to the extent of the study area boundary. It is critical that all the clipped layers have the spatial extent, even though not all the area within the layer may be included within a polygon. Areas outside the polygons receive a 0 value in the union process so it is critical that these represent true 0 values and not gaps in the dataset.

- Union all datasets. This produces a composite vector shapefile containing all the data from the underlying summary layers.
- Delete all unnecessary attribute fields from the union shapefile.
- Summary information is calculated for each of the fragmented polygons using simple field calculations. A new attribute field is added for each summary weighting. Values are calculated using the field calculator. Complex calculations can be saved as expressions.
- Details of the summary calculations are given in Table 7.
- Export final sensitivity layer as Tygerberg_sensitivity.shp

Table 7: Sensitivity-Value Weightings

Name	Field Name	Composition	Notes
Linear summary	LINEAR	Habitat Value + Special Habitat Value + Topographic Sensitivity + Hydrological Sensitivity + Visual sensitivity	Equal weighted summary of all layers
Biodiversity Value	BIODIV_VAL	Habitat Value + Special Habitat Value	Equal weighted summary of biodiversity value layers
Biodiversity sensitivity value	BIODIVSEN	2x(Habitat Value) + 2x(Special Habitat Value) + Hydrological Sensitivity + Visual sensitivity	Equal weighted summary of biodiversity value and sensitivity layers
Biodiversity Value driven summary	BIOVALHEAV	4x(Habitat Value) + 4x(Special Habitat Value) + Hydrological Sensitivity + Visual sensitivity	Layer which emphasizes the biodiversity value of a site, and hence is strongly influenced by the distribution of rare and threatened habitats and species, as well as by patterns of transformation across the landscape.
Balanced summary	BALANCED	2x(Habitat Value) + 2x(Special Habitat Value) + Topographic Sensitivity + Hydrological Sensitivity + Visual sensitivity +	This is the favoured layer which emphasizes biodiversity value and aesthetic considerations, and de-emphasizes biodiversity sensitivities

Outputs

See Figure 7

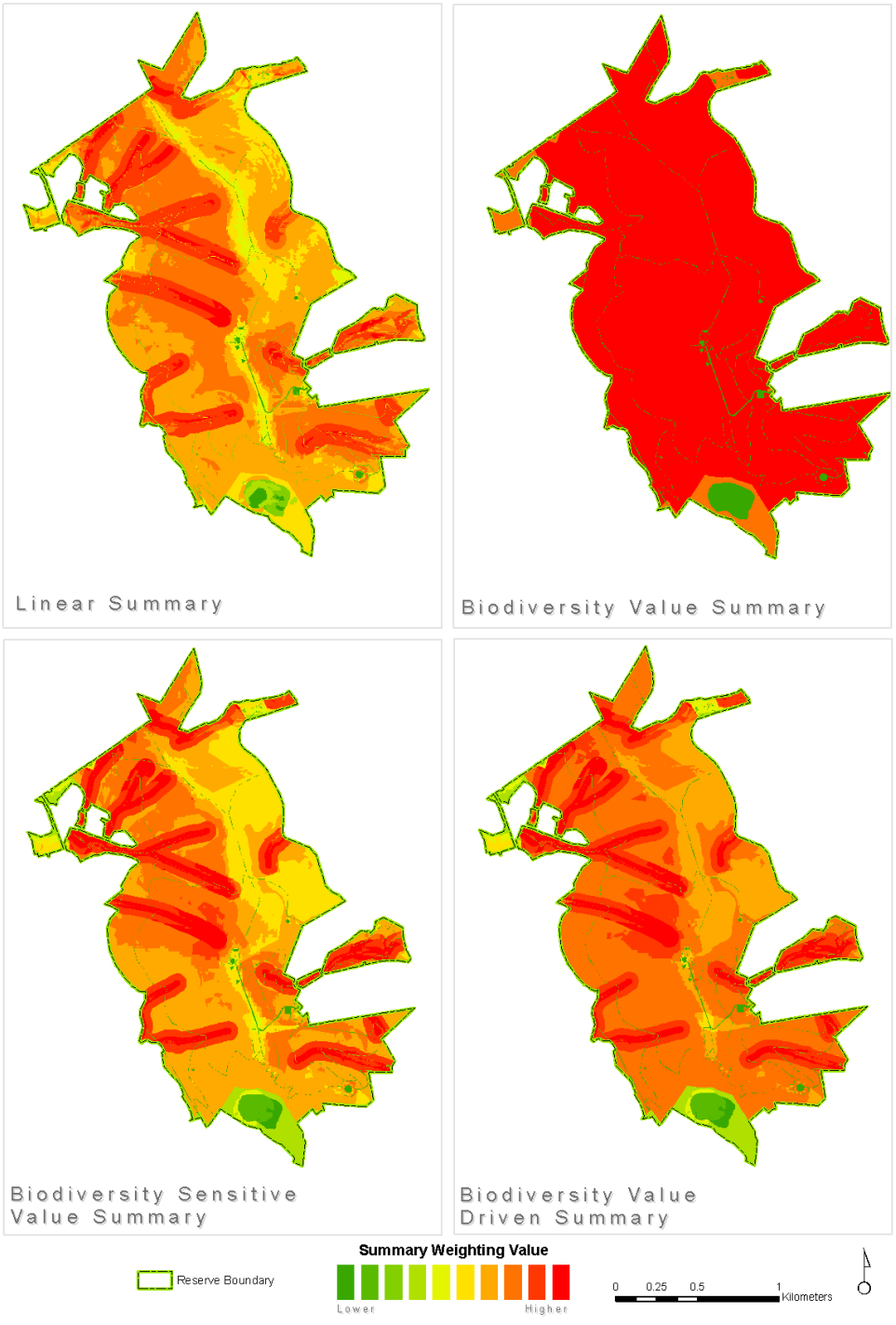

Figure 7: Examples from the outputs from the sensitivity–value analysis process using different weightings (See Table 6)

Interpretation in local context

The combined range of weightings presented in Table 7 and Figure 7 & 8 indicate no significant difference in outcome of the summary layers. This is a typical scenario of areas with levels of biodiversity sensitivity and large topographic variability (Holness 2008).

The Balanced Summary weighting (see Figure 8) was used as the sensitivity analysis input for the zonation process.

Figure 8: Tygerberg Nature Reserve Sensitivity Analysis: Balanced Summary

10 5. ZONING PROCESS

5.1 ZONING INFORMANTS

This section briefly outlines the values underlying the identification of broad tourism use zones. It is important to remember that the landscape/biodiversity analysis is just one of the informants in the zonation process. Although the biodiversity analysis is intrinsically a relatively objective scientific process, other informants to the zoning process are not. Although every attempt is made to place high sensitivity-value sites into more protected zones where possible, the zoning process is in its essence a compromise between environment and development. In particular, often the identified high value sites are the key biodiversity assets that need to be made available in an appropriate manner to the ecotourism market. Direct links between the biodiversity layers and the spatial management of the reserve are made during the identification of special management areas (Where applicable). Even within broad high tourist use zones, there are likely to be areas subject to very tight conservation controls (potentially including complete exclusion of human impacts from an area).

Underlying decision making rules used in the zonation process:

- The zonation process is aimed a striking a *balance* between environmental protection and the development required to meet the broader economic and social objectives of the reserve.
- The zoning process takes into account existing development footprints and tourism access routes.
- This is based on the underlying principle that all else being equal, an existing transformed site is preferable to a greenfields site from a biodiversity perspective.
- Infrastructure costs are dramatically increased when developments take place away from existing infrastructure.
- Existing tourism nodes and access routes are a reality of the economic landscape, and it is would not be possible to shut down existing tourism sites compromising the development objectives of the reserve.
- Where existing development nodes, tourist sites and access routes occur in areas with high sensitivity-value, then the broad use zoning aims to keep the development footprint as small as is realistically possible, preferably within the existing transformed site.
- Where possible, sites with high biodiversity sensitivity-value are put into stronger protection zones.
- Peripheral development is favoured and where possible should be located outside of the conservation area.

Two key points need to be emphasized:

- The designation of a broad use zone does not imply that all sites within that zone would be suitable for all the development types anticipated within that use zone. Detailed site level planning is still required, and many sites may prove to be unsuitable at a site/precinct/EIA level of planning.
- Special Management Areas/Overlays need to be formalized and the links made to the management plans. (Adapted from Holness 2008)

5.2 Zoning Definitions and Descriptions

The zonation definitions and descriptions were workshopped with reserve and area managers. Four categories were decided on, namely; Primary Conservation zone, Conservation zone, Low Intensity leisure zone and High Intensity leisure zone. Table 11 outlines the proposed zonation and zone descriptions. The link is still made to the Zonation used for the CapeNature Reserves (Holness 2008) as there should be general alignment of the broader use zones for ease of comparison and integration if required in Provincial documents.

5.3 Draft Zoning Outputs

A zonation workshop was held at the Tygerberg Nature Reserve on the 22nd October 2010. The zonation for the Tygerberg Nature Reserve was drawn up using the balanced sensitivity analysis as the sensitivity value input in applying the Zonation categories as defined in Table 11. Figure 9 shows the draft zonation map for the Tygerberg Nature Reserve. Table 8 shows the breakdown per zonation category and the % of the total area per category.

Table 8: Breakdown (in HAs and % of Area) of the 5 Zonation Categories in the reserve

Zonation category	Area Has	% of Area
Conservation	290.1112	92.81791147
Low Intensity Use	8.2680	2.645256343
High Intensity Use	13.5093	4.322153062
Utility	0.6710	0.214679125

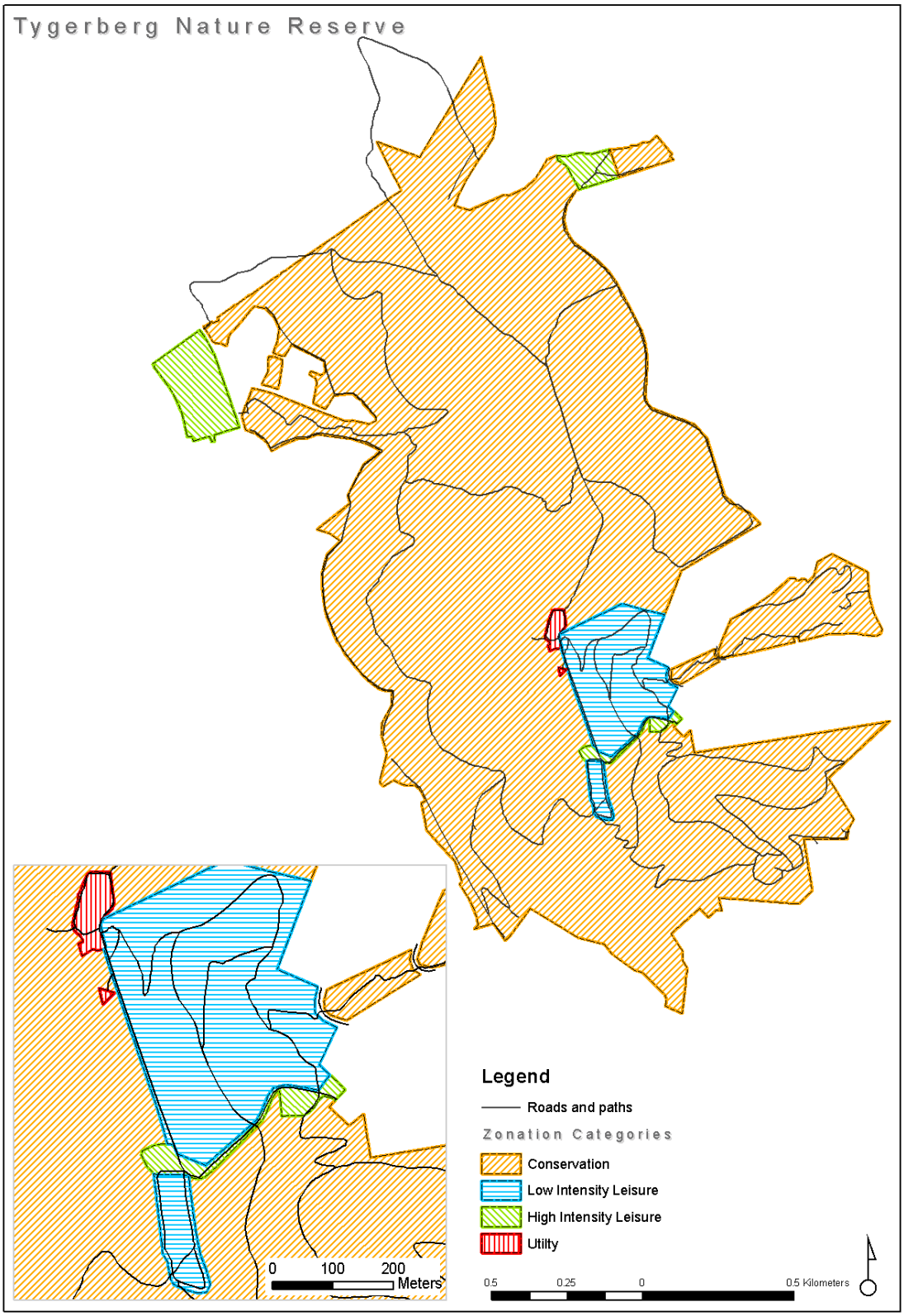

Figure 9: Draft Zonation for the Tygerberg Nature Reserve

5.4 SPECIAL MANAGEMENT OVERLAYS

Overlay zones are applied to different areas of the reserve requiring special management intervention. Overlay management zones are applied to areas of national, regional or reserve based importance for example: RAMSAR SITE or IBA (important Bird Areas), NB cultural sites or Natural resource consumptive use areas (Medicinal Plants).

The potential special management overlays are:

1. Heritage
2. Special Conservation
    a. This special management overlay defines areas around known locations of critically endangered species or species requiring specific management interventions.
3. Rehabilitation
    a. Areas identified for restoration and rehabilitation

5.4.1 Special Management Overlay

TBC

11 6. CONCLUSIONS AND RECOMMENDATIONS

- The current footprint of the utility zone should not be increased and where possible should be reduced to the absolute minimum.
- The removal of the pine plantations north of the designated picnic area should be prioritised.
- The rehabilitation of areas previously under pines should be a priority management action.

12 7. REFERENCES

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13 APPENDICES

Table 9: Base values: Ecosystem Status of National vegetation types occurring in the City

Vegetation Type	**NSBA Conservation Status**	**NSBA Conservation Status - Score**	**Criterion D Status**	**Criterion D score**	**SANBI Conservation Status (% target Conserved in City)**	**Conservation Status Score**
Atlantis Sand Fynbos	Vulnerable	6	Critically endangered	10	Not Protected	5
Boland Granite Fynbos	Endangered	8	Vulnerable	6	Poorly Protected	3
Cape Estuarine Salt Marshes	Least threatened	4			Well Protected	-1
Cape Flats Dune Strandveld: False bay	Endangered	8	Endangered	8	Poorly Protected	3
Cape Flats Dune Strandveld: West Coast	Least threatened	4	Endangered	8	Poorly Protected	3
Cape Flats Sand Fynbos	Critically endangered	10	Critically endangered	10	Hardly Protected	4
Cape Lowland Freshwater Wetlands	Least threatened	4			Well Protected	-1

Cape Winelands Shale Fynbos	Endangered	8			Poorly Protected	3
Elgin Shale Fynbos	Critically endangered	10			Hardly Protected	4
Hangklip Sand Fynbos	Vulnerable	6	Vulnerable	6	Well Protected	-1
Kogelberg Sandstone Fynbos	Least threatened	4	Critically endangered	10	Moderately Protected	2
Lourensford Alluvium Fynbos	Critically endangered	10	Critically endangered	10	Poorly Protected	3
North Peninsula Granite Fynbos	Least threatened	4			Well Protected	-1
Peninsula Sandstone Fynbos	Least threatened	4	Endangered	8	Well Protected	-1
Peninsula Shale Fynbos	Vulnerable	6			Well Protected	-1
Peninsula Shale Renosterveld	Critically endangered	10			Poorly Protected	3
South Peninsula Granite Fynbos	Endangered	8			Moderately Protected	2
Southern Afrotemperate Forest	Least threatened	4			Well Protected	-1
Swartland Alluvium Fynbos	Critically endangered	10			Not Protected	5
Swartland Granite Renosterveld	Critically endangered	10	Critically endangered	10	Hardly Protected	4
Swartland Shale Renosterveld	Critically endangered	10	Critically endangered	10	Hardly Protected	4
Swartland Silcrete Renosterveld	Critically endangered	10			Not Protected	-1
Western Shaleband Vegetation	Least threatened	4			Poorly Protected	3

Table 10: National vegetation types for the City of Cape Town showing historic extent, remaining extent, targets and targets achieved inside and outside Protected Areas

National Vegetation Type	Historic extent (ha)	Current extent (ha)	Selected in Bionet (ha)	Target %	Target (ha)	Extent in proclaimed Protected Areas	Target met in selected Bionet	% Target conserved	% Target met in proclaimed Protected Areas	% Selected in Bionet from current extent	% Remaining from historic extent	15% of historic extent	% that is not selected in Bionet	Conservation Status	SANBI Conservation Status
Atlantis Sand Fynbos	25234.63	15711.95	12695.95	30	7570.39	0.00	Yes	168	0	81	62	3785.19	19	VU	Not Protected
Boland Granite Fynbos	9575.31	6064.19	4807.17	30	2872.59	354.52	Yes	167	12	79	63	1436.30	21	EN	Poorly Protected
Cape Estuarine Salt Marshes	39.86	25.79	25.64	24	9.57	25.64	Yes	268	268	99	65	5.98	1	LT	Well Protected
Cape Flats Dune Strandveld: False Bay	27260.11	8467.86	7272.84	24	6542.43	1855.58	Yes	111	28	86	31	4089.02	14	EN	Poorly Protected
Cape Flats Dune Strandveld: West Coast	12700.27	10603.88	6892.82	24	3048.07	964.79	Yes	226	32	65	83	1905.04	35	LT	Poorly Protected
Cape Flats Sand Fynbos	54410.34	8466.70	8464.75	30	16323.10	464.07	No	52	3	100	16	8161.55	0	CE	Hardly Protected
Cape Lowland Freshwater Wetlands	1463.98	1095.47	1068.83	24	351.36	786.66	Yes	304	224	98	75	219.60	2	LT	Well Protected
Cape Winelands Shale Fynbos	2666.97	1706.19	1388.97	30	800.09	217.89	Yes	174	27	81	64	400.05	19	EN	Poorly Protected
Elgin Shale Fynbos	841.18	321.14	282.77	30	252.35	4.58	Yes	112	2	88	38	126.18	12	CE	Hardly Protected
Hangklip Sand Fynbos	3301.60	1910.25	1489.88	30	990.48	1363.63	Yes	150	138	78	58	495.24	22	VU	Well Protected

Kogelberg Sandstone Fynbos	9499.63	9260.73	8814.04	30	2849.89	1944.47	Yes	309	68	95	97	1424.94	VU	LT	Moderately Protected
Lourensford Alluvium Fynbos	4819.25	409.97	409.97	30	1445.77	190.30	No	28	13	100	9	722.89	0	CE	Poorly Protected
North Peninsula Granite Fynbos	1997.35	1439.12	1343.54	30	599.21	986.44	Yes	224	165	93	72	299.60	7	LT	Well Protected
Peninsula Sandstone Fynbos	21896.12	21348.95	20761.60	30	6568.83	17306.57	Yes	316	263	97	98	3284.42	3	LT	Well Protected
Peninsula Shale Fynbos	1262.79	690.37	688.96	30	378.84	686.97	Yes	182	181	100	55	189.42	0	VU	Well Protected
Peninsula Shale Renosterveld	2374.81	316.89	316.89	26	617.45	261.67	No	51	42	100	13	356.22	0	CE	Poorly Protected
South Peninsula Granite Fynbos	7148.66	2481.74	2290.70	30	2144.60	1770.19	Yes	107	83	92	35	1072.30	8	EN	Moderately Protected
Southern Afrotemperate Forest	347.52	346.79	346.79	34	118.16	276.80	Yes	294	234	100	100	52.13	0	LT	Well Protected
Swartland Alluvium Fynbos	1742.41	75.91	75.91	30	522.72	0.00	No	15	0	100	4	261.36	0	CE	Not Protected
Swartland Granite Renosterveld	8059.16	1951.89	1951.89	26	2095.38	35.64	No	93	2	100	24	1208.87	0	CE	Hardly Protected
Swartland Shale Renosterveld	46712.40	4019.33	4018.76	26	12145.22	408.13	No	33	3	100	9	7006.86	0	CE	Hardly Protected
Swartland Silcrete Renosterveld	1066.65	188.43	188.43	26	277.33	0.00	No	68	0	100	18	160.00	0	CE	Not Protected
Western Shaleband Vegetation	328.59	328.57	328.57	30	98.58	31.11	Yes	333	32	100	100	49.29	0	LT	Poorly Protected
	244749.59	97232.12	85925.67		68622.40	29935.65						36712.44			

Table 11: City of Cape Town Nature Reserves and Conservation Areas: Visitor Use Zoning - Desired State* & Experiential Qualities

Experience	Zone	Desired State*	Conservation objectives	Secondary objective	Experiential Qualities	Activities	Interaction between users	Frequency of use	Group size	Sophistication and type of facilities	Primary user movement within the zone	Roads & footpaths	Equivalent Provincial zone
Close To Nature Activities tend to be at landscape level	Primary conservation	Natural or near-natural areas (or areas that can be rehabilitated to this state) that are managed primarily for biodiversity conservation. The experience is one of relative solitude and wildness. The nature of the experience is dependant on the quality of the natural environment. The main accent of management is biodiversity conservation and "Pack it in Pack it out" principles are applied to all activities including management. There may be some signs of infrastructure mainly of a heritage nature. In the longer term, unused utility infrastructure (e.g. reservoirs) should be phased out and the site rehabilitated.	Natural areas should be kept intact in order to protect habitat required to meet biodiversity targets for various vegetation types and to provide undisturbed habitat for a range of species. Where possible degraded areas should be rehabilitated.	Managed to provide visitor experiences in a way that does not impact on the biodiversity objective. Where appropriate heritage values are managed as required	Relative sense of isolation	Controlled access** Research and monitoring. Accompanied small groups. The size and frequency of groups to be specified for each reserve.	None or very low	None -Very low	Small	No new facilities. Existing structures should be phased out where appropriate. Heritage assets are managed where appropriate	Pedestrian access in accompanied small groups Motorised for essential management only.	Absolutely essential management tracks and footpaths in accordance with the foot path and road management plan Ongoing restoration of old paths/roads to be prioritized and monitored.	Quiet
	Conservation	Natural or near-natural areas (or areas that can be rehabilitated to this state) that are managed for biodiversity conservation. This zone provides experiences of a relative sense of relaxation in an environment that is openly exposed to the sights and sounds of the city. Although it is a place of quietness and naturalness, there will be more interaction between users than in the Primary Conservation Zone. The quality of the experience is less dependant on the quality of the natural environment.	Natural areas should be kept intact in order to protect habitat required to meet biodiversity targets for various vegetation types and to provide undisturbed habitat for a range of species. Where possible degraded areas should be rehabilitated.	Managed to provide visitor experiences in a way that does not impact on the biodiversity objective.	Relaxation	Self guided hiking, non-motorised access ***: bird watching, etc. In reserves where access to water bodies is allowed, this area is limited to non-motorized vessels only in accordance with the Vlei By-Laws.	Moderate	Moderate	Small	Low impact, eco-friendly facilities that facilitate ecologically sustainable activities and visitor experiences may be permitted under certain circumstances. These are strictly for achieving the social and development objectives of the reserve where appropriate and are subject to a stringent internal approval process and must be inline with an approved reserve management plan.	Pedestrian Non motorised Motorised access for management only.	Management tracks/roads and footpaths. Minimal footpath construction to prevent ecological damage. Boardwalks may be permitted where appropriate to protect sensitive areas. The footpath system should be designed so as to control access into the Primary Conservation zone. Off road wheelchair access may be provided where appropriate.	
Outdoor Natural Experience Activities tend to be at precinct level	Low Intensity leisure	Natural, near-natural or managed landscapes which are primarily managed to promote recreational and educational objectives. The main accent is on recreational activities which are more reliant on the quality of the facilities provided than in a Conservation Zone. By their nature these zones are placed in more transformed landscapes. Interaction and socialisation are an integral part of the experience.	Although some areas will be impacted by a range of activities and limited infrastructure, most areas should be kept largely intact and ecological processes should remain functioning. Where possible degraded areas should be rehabilitated.	Recreation and education Managed to provide a largely natural outdoor area to support the recreational and education objectives of the reserve.	Socialisation	Walking, non-motorised access, bird watching. In reserves where access to water bodies is allowed, motorized vessels are only allowed under strict control (e.g. no waterskiing, low speed limits and wake-free zones) in accordance with the Vlei By-Laws.	Frequent	Moderate -high	Small-moderate	Low-Medium impact, eco-friendly facilities that facilitate ecologically sustainable activities and visitor experiences. E.g. Benches, bird hides, informative signage, lookouts. Parking for access to this and other zones.	Pedestrian Non motorised Motorised access for management only	Appropriate foot paths with directional signage Boardwalks should facilitate access and protect sensitive areas. Normal wheelchair access where appropriate Parking with no facilities for access to this and other zones	Low intensity leisure
	High Intensity Use	High use landscapes, which are often largely transformed, which are managed largely to support visitor activities more dependent on facilities, education and administrative functions of reserves. High intensity visitor facilities with modern commercialised amenities with very concentrated, activities. The quality of the visitor experience is heavily dependant of the quality of the facilities which enable the visitor to experience the environment with a minimum of effort. Due to the high impacts these are concentrated at specific nodes. These nodes are generally situated at existing facilities including historic buildings and precincts. The main focus of management is to ensure a high quality visitor experience whilst ensuring that the activities have a minimal impact on the surrounding environment and that heritage resources are respected and celebrated.	The activities and infrastructure in these areas should be managed to minimize impacts on biodiversity and visitor experience in other zones. Where feasible, non-crucial infrastructure should over time be removed from the reserve and the sites rehabilitated.	Facilities are managed to facilitate and promote appropriate visitor activities and educational use of the reserve. Administration; provides appropriate management infrastructure to facilitate other objectives of the reserve.	Entertainment	Events, self guided walks, wheelchair accessible trails, parking, picnicking. In reserves where access to water bodies is allowed, this area is appropriate for high intensity uses such as power boating and waterskiing in accordance with the Vlei By-Laws.	Very frequent	Very high	Small - Large	Picnic areas, parking areas, restaurants, information centers, ablutions, environmental education facilities, nurseries etc. Provides parking from which pedestrian access is gained to other zones.	Motorised Access People movers & Pedestrian access	Access roads and associated parking. Footpaths constructed to a higher standard for the comfort of the user. Design standards to be set in the footpath and road management plan Wheelchair access encouraged in this zone.	High intensity Leisure
Site Specific Level	Utility zone	Area used for utility functions such as bulk water provision, landfill sites within the protected /conservation areas etc.	The activities and infrastructure in these areas should be managed to minimize impacts on biodiversity and visitor experience in other zones. Where feasible, non-crucial infrastructure should over time be removed from the reserve and the sites rehabilitated.	Administration Conservation where appropriate	Utility	Determined at site	Determined at site	Determined at site	Determined at site	Determined at site	Determined at site level	Access roads and associated parking as required by the Utility Function	

* Note. The "Desired State" is the long term objective of the zone and these desired conditions may not actually exist at the time of zoning. Achieving the" Desired State" will be informed by many factors and may only be reached after many years.
** Accompanied access refers to controlled access. The level and type of control is determined at reserve level.
*** Non-motorised access refers to mountain bikes, horses, paragliding etc. These activities are reserve specific and reference must be made to the reserve management plan for a list of acceptable activities per reserve.

CITY OF CAPE TOWN

BIODIVERSITY MANAGEMENT BRANCH

Executive Brief

Comprehensive Security Audit of the Biodiversity Management Branch of the City of Cape Town

MARCH 2010

Project Order No.: **4501377564**

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14 INTRODUCTION

The City of Cape Town' Biodiversity Management Branch, in wishing to ensure the safety of visitors and staff, requested assistance on conducting a security audit of all (25) its managed (and envisaged) Nature Reserves.

The need was based on the following assumptions:

- That the areas are poorly managed
- Security Agencies are inefficient in their operations
- The lack of tools to measure management effectiveness
- Safety and security of visitors as well as that of personnel are threatened.

Plan-It, in collaboration with Thorn-Ex and Titan Security, agreed to undertake the project. Owing to the budgetary constraints, it was agreed that the audit would encompass 12 priority Reserves, as selected by the Biodiversity Management Branch.

The following outcomes were proposed and accepted:

- A desktop exercise to evaluate existing information and identify gaps
- A physical Audit of the listed facilities
- Consultation with public user groups
- Recommendations in respect of security technology and infrastructure
- A comprehensive report on all findings
- A basic entry level conservation security training session for staff

The project was to be completed by the end of April 2010.

15 APPROACH

The focus was to be on the safety and security of staff working in the different reserves, of visitors to theses reserves and of the biodiversity within the reserves.

The audit was to involve the reserve managers, site managers and any other staff the Biodiversity Management Branch deemed necessary to provide information for the audit.

The Project commenced with the Branch being approached to supply maps of each reserve with as much information as possible on all types of infrastructure, bio-physiographic information etc e.g. boundaries of reserves and kind of fence along these, access points, roads, tracks, paths, power lines, telephone lines, buildings, cell phone towers, masts,

aerials, bridges, streams, rivers, contours, vegetation, adjacent land use, habitation or settlements in close proximity.

Questionnaires were then drawn up and sent to all the Reserve Managers as well as separate questionnaires which were sent to the various public interest groups, via the Reserve Managers.

Upon receipt of the above the project team drafted a preliminary working document to guide and focus the audit.

The audit commenced on the 15th of February 2010 with a workshop with the various Managers and a presentation of the findings from the questionnaires to the Biodiversity Branch.

The audits commenced on the 16th of February 2010 with a visit to each Reserve..

During each audit the manager and staff were interviewed and a physical inspection of infrastructure was conducted. The audits focused on existing security systems, security infrastructure, activities, incidents, job descriptions, training and manpower

In addition to the audits workshops were scheduled, via the Reserve Manager with relevant external safety and security institutions and public interest groups. The workshops were then held with various District and Reserve-specific public interest groups.

On conclusion of the audit phase, the security technology specialist visited the Reserves to inspect the systems and infrastructure in place at each reserve. Based on and with reference to the initial draft Audit Report, the specialist undertook an assessment of technology short-comings in order to arrive at feasible recommendations for practicable improvements.

The completed report was then circulated to all the Reserve Managers as a Draft Report for comment, prior to the Final Comprehensive Report incorporating such comment being presented to the Branch.

The Project was then concluded with a basic entry level security training session for nominated staff covering aspects such as:

- Information gathering and reporting
- Patrol structuring, planing and safety
- Preparedness and response

- Handling of transgressors (armed or un-armed)
- Incident handling
- Charge office procedures
- Evidence and Statements
- Record keeping and dossier development

16 EXECUTIVE SUMMARY

A safety and security audit was carried out on twelve Reserves under the jurisdiction of the Biodiversity Branch of the Directorate Environmental Resource Management.

The Audit was aimed at doing a rapid and verifiable analysis of the current security situation, security services, infrastructure, staffing, and social contexts. The information allowed for a "threat" level to be determined for each reserve.

Information acquired through a questionnaire survey with the Reserve Mangers, and information provided by the Branch was used as a baseline to guide and provide focus for the individual Reserve audits.

The Audits very quickly revealed that the location of the various reserves with their own unique social contexts primarily dictated the level of threat of each Reserve.

Some Reserves perceived as being "dangerous" were found to be "safe" with very low key incidents actually occurring. Although social ills do tend to spill over into Reserves the occurrence thereof is very localised and relate to prostitution, substance abuse, theft and illegal plant harvesting for the muti trade.

General security observations revealed that any metal infrastructure or equipment and solar panels are at greatest risk and are stolen on a regular basis. Trespassing, vagrants traversing the reserves and the harvesting of plants for the commercial flower industry and commercially driven herbal medicine /"muthi" industry are linked to an associated threat to staff and visitors. However incidents of visitors and staff being accosted by vagrants are rare.

Security activities were generally viewed as an add-on function when incidents are reported, with some Reserve Managers and Field staff trying to fit security patrols and activities into their management work schedule. The Visitor Controller Officers, on the other hand are essentially Access Control Officers who may be called on to perform some Law Enforcement

function if their training enables them to do so. However staff does carry out combined operations with Law Enforcement bodies like Marine and Coastal Management, SAPS or City Law Enforcement when activities in the vicinity of the reserves warrant this in the interests of conservation.

One of the most evident security shortcomings found was that Reserves were “abandoned”, for all practical purposes, after hours, on weekends and on public holidays.

The investigation also found that very few Reserves actively patrol the Reserve and fences on a regular basis.

The Findings of each audit, including the responses received form the public interest groups were used to determine the threat level of each Reserve. The threat levels are based on a combination of factors which may affect security to the reserve, its staff and visitors as well as these threats in relation to other reserves.

The threat levels low, medium, and high reflects the safety threat to visitors, staff, and infrastructure. Further to which the threat level provides an indication in respect of intervention priority (staffing, infrastructure, equipment).

The results were as follow:

Reserve	Threat Level	Threat	Primary Cause
Witzands ACA	Medium	Illegal Access / Trespassing	Lack of fencing
Blaauwberg CA	Medium	Illegal Access / Trespassing	Lack of coverage
Rietvlei WR	Low	Illegal Access / Trespassing	Lack of coverage
Durbanville NR	Low	Theft	Lack of presence
Bracken NR	Low	Trespassing	Lack of coverage
Tygerberg NR	High	Trespassing / poaching	Lack coverage
Zandvlei NR	Low	Illegal Access / Trespassing	State of infrastructure
Falls Bay EP	High	Violent crime	Lack of fencing /coverage
Edith Stephens WP	Low	Theft	Lack of fencing
Wolfgat & Macassar NR	Severe	Violent crime	Location & Social
Kogelberg NR	Medium	Illegal Access / Trespassing	Extent / coverage
Helderberg NR	Low	Illegal Access / Trespassing	Lack coverage

Understaffing and poor or non-existent boundaries were found to be the primary cause of compromised Reserve security. The provision of “feet on the ground” or a management presence is therefore viewed as the first step towards improving the current situation.

The Investigation did conclude that technology solution options entailed fairly low key equipment such as Day-Night or Peak Inversion monitoring cameras, basic building alarm systems, external building detection beams, lighting, etc.

Infrastructure requirements were predominantly in respect of fencing.

Fencing is not always the preferred solution for safeguarding and demarcating an urban Reserve. However, it is suggested that failure to demarcate the boundaries of a Reserve compromises the authority’s ability to manage a designated area and severely limits the authority’s ability to prosecute transgressors. Simple in-expensive measures such as signage and markers will greatly aid in addressing these matters.

The relative “newness” of the Branch was found create various generic management challenges which negatively affect the efficiency and effective of Reserve management.

The aforesaid institutional matters included:

- Lack in consistency of staff designations
- Lack of consistency in functional content (job descriptions)
- Lack of career pathing and skills development program
- Lack of measurable performance standards
- Lack of training and capacity building
- Lack of uniform operational procedures and protocols
- Un-clear performance objectives of Advisory Boards
- Jurisdictional uncertainties in respect of cooperation with other environmental law enforcement agencies
- Lack of memorandums of Understanding with Utility Service Branches active in Reserves

The apparent absence of a clear and definitive Branch Policy on Reserve Safety and Security was viewed as a contributing shortcoming. Further to which, no consistency was found in respect of operational procedures or protocols. Some stations had a Management Plan whilst others were still going to develop such plans. Some stations had developed their own safety procedures.

In respect of Procedures and Protocols it is suggested that the Biodiversity branch consider the developing the following procedures and protocols;

- Incident response (poaching, trespassing, theft, fire, attack, medical emergency, land invasion, pollution, un-wanted pets)
- Reserve patrols
- Fence and gate security
- Visitor control

It is suggested that the above procedures and protocols be developed in conjunction with an auditable reserve management system which is linked to the personnel and finance performance requirements. It is also recommended that the Branch conduct an Institutional "Governance Audit" to guide the above protocols, relationships with other government institutions and law enforcement bodies as well as the Branch's legal obligations.

Consultation with public interest groups and reserve managers highlighted the benefits of "friend" groups. Some stations financial ability and conservation maintenance activities were greatly enhanced by such "friends" groups. Further to which, the social role that urban reserves play as "safe areas" for people to walk their pets, have picnics or conduct social functions was highlighted at several public meetings. It was also mentioned that in some areas where "gang turf" issues were dominant the reserves were viewed as "neutral" territories.

Advisory Boards are a requirement in terms of reserves proclaimed under the Protected Areas Act although no clarity could be defined with respect to the extent, role and responsibilities of the various Reserves Advisory Boards. Some Reserves indicated that they played an active role whilst others were not aware of their existence. The development of clear responsibilities and objectives for each Board is viewed as imperative to contributing to the achievement of the Reserve objectives whilst providing a formal link to neighbouring communities and local government.

Most Reserves have other City Utility Departments executing functions within the Reserve, share boundaries with them, or manage large tracts of land under their jurisdiction. None of the Reserves were aware of any Memorandums of Understanding which clarify joint management matters. This was viewed as institutional shortcoming requiring attention at higher level.

A variety of Security Service providers render various levels of security to Reserves. These services vary from private security firms providing uniformed guards to provide a static or gate control service to services where such guards are used as Bushrangers. It was the investigation's conclusion that each District or Reserve negotiates their own contract conditions with such service providers, a situation which does not contribute to clear and measurable security service provisioning.

The City Law Enforcement Services and structures were generally viewed as not being able to respond to conservation related incidents. Only a few Reserves reported adequate responses to call-outs or incidents with most Reserves saying they rely on the local SAPS for assistance.

Reserves which have installed alarm systems linked to the City Law Enforcement Control Rooms, reported that in the event of alarm activation the Reserve manager is phoned to investigate. No direct service benefit could be found in respect City Law Enforcement.

What was most evident during the investigation was the risk posed by staff acting outside their areas of jurisdiction. These transgressions are not through ill intent and staff is not necessarily aware that they are exceeding their authority. Urgent attention should be paid to the authority necessary for the role staff plays in enforcing provincial conservation laws, fisheries laws, and National laws. This should be done in cognisance of the criminal Procedures Act. It is further suggested that cooperation agreements and execution delegations be formalised with other environmental and conservation agencies.

Due to several reserves having a coastal boundary and the ever present activities of highly organised and dangerous Abalone poaching gangs the involvement of staff in curbing these activities need to clearly defined and coordinated. It is suggested that this should be the preserve of a highly trained and well equipped District based Law Enforcement Component conducting their duties in collaboration with other authorities and with the necessary jurisdiction.

It is the opinion of this investigation team that the establishment of a District based Law Enforcement Component will greatly contribute in addressing some of the security shortcomings highlighted. In addition, such a component will also alleviate some of the external enforcement requirements placed on Reserve staff thus allowing them to focus on reserve management and security.

17 CONCLUSION AND GENERIC RECOMENDATIONS

The audit results correlated closely with the location and management capacity of each Reserve. High concentrations of un-employed people living in dense informal settlements adjacent to reserves do pose a greater risk to the Reserves. Staff was found to be more exposed to violent crimes in such circumstances than those located in rural or medium to high income areas.

Although social ills do tend to spill over into Reserves the occurrence thereof is very localised and relates to prostitution, substance abuse, theft and illegal plant harvesting for the muti trade.

The Findings of each audit, including the responses received form the public interest groups were used to determine the threat level of each Reserve.

The threat levels low, medium, and high reflects the safety threat to visitors, staff, and infrastructure. Further to which the threat level provides an indication in respect intervention priority (staffing, infrastructure, equipment).

The results were as follow:

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Understaffing and poor or non-existent boundaries were found to be the primary cause of compromised Reserve security. The provision of “feet on the ground” or a management presence is therefore viewed as the first step towards improving the current situation.

The Investigation did conclude that technology solutions entail fairly low key equipment such as Day-Night or Peak Inversion monitoring cameras, basic building alarm systems, external building detection beams, lighting, etc.

Infrastructure requirements were predominantly in respect of fencing.

Fencing is not always the preferred solution for safeguarding and demarcating an urban Reserve. However, it is suggested that failure to demarcate the boundaries of a Reserve compromises the authority’s ability to manage a designated area and severely limits the authority’s ability to prosecute transgressors. Simple in-expensive measures such as signage and markers will greatly aid in addressing these matters.

In areas where fencing is vandalised on a regular basis the use of electric fencing (long distances, or Diamond Razor Mesh (short distances) is recommended. However it is recommended that spring-steel barb wire be used in all other instances.

The relative “newness” of the Branch was found to create various generic management challenges which negatively affect the efficiency and effective of Reserve management.

The apparent absence of a clear and definitive Branch Policy on Reserve Safety and Security was viewed as a contributing shortcoming.

A great inconsistency was found in staff designations, with some staff fulfilling similar conservation functions being called Conservation Officers whilst other were called Site Managers or Assistant Managers. The same problem was evident within the junior staff ranks. On some stations “labourers” conducted similar duties to those of Bushrangers.

The appointment and use of Contract staff was found to be a management challenge to most Reserves. Contract staff are generally employed by an external service provider whilst The Branch is responsible for the day to day management of said staff including the provision of uniforms and training. The opinion is held that the cost of these services could very well be such that the Branch could employ these contract staff directly to a greater benefit.

Several instances were found of junior staff being employed for several years as “Small Plant operators” or “Foreman” and having developed a keen interest and expertise in various conservation matters. The provision of career pathing opportunities to staff will not only contribute to the goals of the Branch but also provide an incentive to junior staff.

No evidence was found of a clear skills development program for officers and the impression was created that each officer arranges and sees to his or her own training. This was especially evident with some officers having been trained as Peace officers and appointed whilst others had been trained but not appointed and some still needed to be trained. Some Officers were also expressing the need to be appointed as Fisheries Officers whilst other believed they should be trained and appointed as Environmental Inspectors.

Most reserves had Conservation Students and Interns fulfilling a variety of roles and responsibilities, in some instances un-paid. The rotation of Students and interns was thought to be a good means of exposing them to various experiences and opportunities.

The investigation also found that most staff lacked basic equipment such as binoculars, handcuffs, batons or mace thereby limiting their ability to execute their duties.

The apparent lack of a dress code was viewed as a factor which contributed to the public’s sense of security or respect when coming into contact with officers. The wearing of T-shirts, overalls, or golf shirts should not be promoted whilst on duty in the public eye.

No consistency was found in respect of operational procedures or protocols. Some stations had a Management Plan whilst others were still going to develop such plans. Some stations had developed their own safety procedures.

One of the most evident security shortcomings found was that Reserves were “abandoned”, for all practical purposes, after hours, on weekends and on public holidays. It is understood that staff work standard working hours. However, the provision of accommodation, which most Reserves have, to either Site managers or Bushrangers are seen as a simple cost effective measure. Where there are operational staff resident on the Reserves (mostly students) it acts as a definite deterrent to illegal activities. Staff stationed on Reserves can then work on a “conservation standard” shift schedule of 20 days on 5 days off.

The investigation also found that very few Reserves actively patrol the Reserve and fences on a regular basis. Although staff shortage is a contributing factor, careful planning and allocation of available resources will ensure that Reserves are patrolled on a regular basis. It is further suggested that the sharing of resources between Reserves will allow for more frequent patrols.

With regard to Procedures and Protocols it is suggested that the Biodiversity branch consider developing the following;

- Incident response (poaching, trespassing, theft, fire, attack, medical emergency, land invasion, pollution, un-wanted pets)
- Reserve patrols
- Fence and gate security
- Visitor control

It is suggested that the above procedures and protocols be developed in conjunction with an auditable Reserve management system which includes a personnel and finance performance aspect.

Consultation with public interest groups and reserve managers highlighted the benefits of “friend” groups. Some stations’ financial ability and conservation maintenance activities were greatly enhanced by such “friends” groups. It is accepted that not all Reserves have the opportunity to have well capacitated “friends”. However, the neighbouring community’s sense of ownership was found to be a primary contributor to a Reserves state of security.

Further to which the social role that urban reserves play as “safe areas” for people to walk their pets, have picnics or conduct social functions was highlighted at several public meetings. It was also mentioned that in some areas where “gang turf” issues was dominant the reserves were viewed as “neutral” territories.

Advisory Boards are a requirement in terms of reserves proclaimed under the Protected Areas Act. The aim of which is to allow participation by interested parties and to ensure their continual engagement. With regard to reserves not yet proclaimed under the Protected Areas Act but which have Advisory Boards their role is much the same with the possible addition of raising and allocation of funds. This investigation could not clearly define the extent, role and responsibilities of the various Reserves Advisory Boards. Some Reserves indicated that they played an active role whilst others were not aware of their existence. The development of a clear responsibilities and objectives for each Board is viewed as

imperative to contributing to the achievement of the Reserve objectives whilst providing a formal link to neighbouring communities and local government.

The removal of Spare tyres from Reserve vehicles by the Transport Sections should be halted as it poses a significant risk to staff operating in remote areas or providing law enforcement services.

Most Reserves have other City Utility Departments executing functions within the Reserve, share boundaries with them, or manage large tracts of land under their jurisdiction. None of the Reserves were aware of any Memorandums of Understanding which clarify joint management matters. This was viewed as institutional shortcoming requiring attention at higher level.

A variety of Security Service providers render various levels of security to Reserves. These services vary from private security firms providing uniformed guards to providing a static or gate control service to services where such guards are used as Bushrangers. It was the investigations conclusion that each District or Reserve negotiates their own contract conditions with such service providers, a situation which does not contribute to clear and measurable security service provisioning.

The City Law Enforcement Services and structures were generally viewed as not being able to respond to conservation related incidents. Only a few Reserves reported adequate responses to call-outs or incidents with moth Reserves saying they rely on the local SAPS for assistance.

Reserves which have installed alarm systems linked to the City Law Enforcement Control Rooms, reported that in the event of an alarm activation, the Reserve manager is phoned to investigate. No direct service benefit could be found in respect of City Law Enforcement.

What was most evident during the investigation was the risk posed by staff acting outside their areas of jurisdiction. These transgressions are not through ill intent and staff are not necessarily aware that they are exceeding their authority. Urgent attention should be paid to necessary authority and the role staff play in enforcing provincial conservation laws, fisheries laws, and National laws. This should be done in cognisance of the criminal Procedures Act. It is further suggested that cooperation agreements and execution delegations be formalised with other environmental and conservation agencies.

Due to several reserves having a coastal boundary and the ever present activities of highly organised and dangerous Abalone poaching gangs, the involvement of staff in curbing these activities need to be clearly defined and coordinated. It is the opinion of this team that this should be the preserve of a highly trained and well equipped District based Law Enforcement Component conducting their duties in collaboration with other authorities and with the necessary jurisdiction.

It is the opinion of this investigation team that the establishment of a District based Law Enforcement Component will greatly contribute in addressing some of the security shortcomings highlighted. In addition, such a component will also alleviate some of the external enforcement requirements placed on Reserve staff thus allowing them to focus on reserve management and security. The current practice of Law enforcement staff working a daily night shift is questioned as no evidence could be found on its effectiveness. It is suggested that through information gathering, coordination with other authorities and planning, such nightly activities could take place on a sporadic basis with much greater successes.

The investigation team was also of opinion that the management requirements of the various Reserves need to be included in the Municipal Spatial Development Framework so as to ensure that the Reserve - Neighbourhood interface receive adequate attention.

18 SUMMARY OF RECOMMENDATIONS

INSTITUTIONAL		
Aspect	**Issue**	**Recommendation**
Governance	1. Relationship with other National & Provincial Conservation/Environmental institutions 2. Relationship with other City Institutions 3. Obligations in respect of By-laws, Municipal Systems Act (2000) and the Municipal Finance Management Act (2003) 4. Working agreements with other Utility Services	1. Conduct Institutional Governance Audit 2. Draft MOU's
Policy & Procedures	1. Management Policies, Goals, Objectives 2. Operational Procedures &Protocols	1. Develop management Policies Goals & Objectives 2. Develop Procedures and Protocols
Management	1. Consistency in personnel designations 2. Consistency in personnel functional content 3. Career pathing 4. Skills development 5. Reserve Management Standards	1. Develop consistent Job Descriptions 2. Develop Skills Development and career pathing Protocol 3. Develop Auditable Reserve Management System linked to Personnel & Financial Performance Management System

Reserve	Additional Staffing	Security and Equipment	Infrastructure
NORTH			
Witzands	1. 3x Bushrangers 2. Small labor team 3. Staff must be trained in 4 wheel driving 4. Officers appointed as Peace Officers	1. Establish a MOU with Bulk Water 2. Replace damaged fences 3. Monitor Wood cutter activities 4. Permits must contain more information 5. Reserve map required 6. Curb illegal access 7. Regular perimeter patrols.	1. 4x4 vehicle in good 2. condition 3. Office Trellidor and 4. burglar bars 5. Demarcation of 6. boundaries 7. Erect signage 8. Electric fence along north and north-eastern boundary 9. Basic staff equipment
Blaauwberg	1. 6x Bushrangers (2 x3-member teams) 2. 2 x Permanent Visitor Controller Off's 3. Officers appointed as Peace Officers 4. Station District Law Enforcement Component	1. Staff be appointed as Peace Officers 2. Law Enforcement Component duties expanded to cover "hot spots" in district. 3. Daily night shifts limited to conduct patrols across district and do ad hoc night time	1. Link present alarm system to security service provider. 2. Mount Day-Night camera to cover main resort area. 3. Active Monitor to monitor activities during peak periods. 4. Erect signage 5. 5. Basic staff equipment
Rietvlei	1. 2 x Bushrangers 2. Officers appointed as Peace Officers	1. Regular perimeter patrols 2. Co-ordinate with MCM	1. Fence along R27 road. 2. Alarm systems at new facilities 3. Peak Inversion camera with recording facility for main gate 4. Fence open residential property boundaries

			5. Patrol boat 6. Basic staff equipment
CENTRAL			
Bracken	1. 1x EE Officer/Community Officer. 2. 1x Labourer	1. Visible patrols 2. Liaison with Everite Hostel.	1. Ablutions at gate 2. Day-night camera for main access area. 3. Removal of derelict buildings 4. Guard monitoring 5. Clear alien vegetation along fences 6. Basic staff equipment
Durbanville	1. 2x Visitor Controller Officers 2. Officers appointed as Peace Officers	1. Boundary fence cleared of vegetation 2. Erect signage iro handling of unwanted pets	1. Steel gate at offices to be kept locked, and fitted with buzzer and solenoid access control 2. Video monitor for door 3. Service counter inside front door 4. Alarm system to include response 5. Long-range mobile panic buttons 6. Lighting at offices and main gate 7. Peak Inversion camera for main gate 8. Guard Monitoring system 9. Basic staff equipment
Tygerberg	1. Employ current 3 Contract Bushrangers 2. 2x Bushrangers 3. 1x Site Manager 4. 1x Foreman 5. 5x Llabourers 6. 1x Additional EE Officer/Community	1. Attend Community Police Forum and Crime Watch meetings. 2. Bushrangers obtain drivers licenses 3. Staff presence over week-ends and after hours 4. All gate remotes currently issued be recovered immediately and re-issued under a new access signal code	1. Replace existing camera at main entrance gate with a Peak Inversion camera with recording facility 2. Present cameras be replaced with Day-Night cameras. 3. Plattekloof and Quarry area be re-fenced with electric fence 4. Perimeter road should be constructed where feasible

	Liaison 7. 2x Visitor Controller Officers 8. Officers appointed as Peace Officers 9. Station District Law Enforcement Component	5. Keys handed out should be retrieved and locks changed. 6. Kanonberg be afforded controlled access in the event of a fire.	5. Flatrap razer coils installed on top of all fences and along bottom of select fences 6. Accommodation for Bushranger teams 7. Installation of trigger operated floodlight in darker area of parking 8. Additional mountain bike 9. Basic staff equipment
SOUTH			
Zandvlei	1. 3x Visitor Controller Officers 2. 3x Bushrangers 3. 4x Labourers 4. Officers appointed as Peace Officers	1. Cease involvement in public amenity facilities on eastern side 2. Formal gate control required during open hours 3. Formalise relationship with Mountain Men Security Services 4. Evening security at offices by private security service provider 5. Introduce ad hoc evening patrols 6. Formalise co-operation with Marine and Coastal Management regarding control at the estuary.	1. Northern access well designated and controlled access point 2. Signage at the entrance, parking areas & along the water 3. Re-fence office area with Diamond Razor Mesh 4. Provide appropriate security lighting 5. Replaced northern and western fence with Diamond Razor Mesh fence 6. New offices need to be completed & fitted with monitored alarm system and BX Outdoor Beams 7. Guard Monitoring system 8. Motorized boat 9. Basic staff equipment
False Bay	1. 9x Bushrangers 2. 4x Static Guards 3. Officers appointed as Peace Officers 4. Station District Law Enforcement Component	1. Regular patrols supported 2. Bushrangers and Visitor Control officers should be circulated & deployed to cover peak periods of public use within the Park. 3. Change permanent night shift to a planned basis during periods of specific risk or in	1. Establish two or three Bushranger bases 2. Re-fence southern and eastern boundary electric fence 3. Motorised patrol 4. 2x Quad 5. Install Guard Patrol Monitoring system

		response to specific incidents 4. Co-ordinate night activities with other law enforcement bodies 5. Visitor Controller Officers patrol Zeekoevlei picnic area during peak periods.	6. Fence Rondevlei offices and EE Centre with Diamond Razor Mesh Install additional trigger 7. Install flood lights at all facilities 8. Day-Night camera to Rondevlei Viewing Tower for office and entrance area 9. Upgrade all existing cameras to Day-Night cameras with recording 10. Additional cameras for Zeekoevlei entrance gate and new office complex 11. Buildings should be alarmed with a siren and linked to a security service provider 12. Buildings which do not have security staff at night should be fitted with BX80 13. Erect signage 14. Basic staff equipment
Edith Stephens	1. Replace "small plant operator" with a fence maintenance post.	1. The reserve fence needs to be patrolled daily or at least twice a week 2. Walk-in access should be controlled and documented at the gate 3. Office gate should remain locked	1. Northern and southern fences must be replaced with Razor Diamond Mesh be considered or electric fence using spring steel wire 2. Management track should be created along the fence 3. Basic staff equipment
EAST			
Wolfgat & Macassar	1. 8 x Bushrangers. 2. 3x District Law Enforcement Officers 3. 2 x Community Liaison Officers	1. Weltevreeden office security system should include a response system 2. City employed private security with mobile support to patrol coastal road esp. parking areas	1. Demarcate reserve using cement poles 2. Erect signage 3. Move Macassar Gate 4. Basic staff equipment

	5. Officers appointed as Peace Officers 6. Station District Law Enforcement Component	3. Investigate sand mining permits	
Kogelberg	1. 1x Visitor Controller Officer 2. 3x Bushrangers 3. Officers appointed as Peace Officers	1. Improve communication services	1. Construct Bushranger camp 2. Erect signage 3. Fence Erf 19 and north-west boundary using electric fence 4. Install alarm at all buildings 5. Install trigger lighting 6. Install depot fence at rear 7. Install Reed Switches for solar panels 8. Peak Inversion Camera for entrance gate to depot 9. Basic staff equipment
Helderberg	1. 6 existing Labourers trained to level of Bushrangers 2. Officers appointed as Peace Officers	1. Develop system for evening monies 2. Regular perimeter patrols	1. Erect signage 2. Electric fence be retained 3. Peak Inversion camera at main gate 4. Day –Night camera to cover parking area 5. Basic staff equipment

19 COSTING

The equipment costing listed below are based on actual quotes provided.

Fencing:

Diamond Razor mesh fencing installed per 100m	R 440,00/meter
1,8m, 12 strand electric fencing installed at 100m (Au Alloy wire)	R 55,00/meter
12 Joule Nemtek energizer with built in fence monitor	R 3400,00 excl

Alarm Equipment:

To supply and install an 8-zone alarm Paradox alarm system complete with battery back-up, keypad, 15 watt siren, four internal infra red passives, two fixed panic buttons and two reed switches. Alarm system can be zone doubled to a 16 zone system.

R 3600,00 excl.

To supply and install one outdoor BX80 beam	R 1500,00 excl.

GSM 4 channel radio, programmed to four cellular phone numbers and linked to fence energizers, Alarm systems, Solar panels and standalone panic systems R 1800,00 excl

Long Range remote panic – one long range remote	R 250,00 excl.
Long Range receiver – installed	R 1100,00 excl.

Cameras:

To supply and install one gate camera – Peak inversion camera, auto-iris lens, 40m co-axial cable, power supply, 4-channel embedded digital recorder (250 G) hard drive and one 17 inch monitor. Price includes camera housing and installation R 11 900,00 excl.

To supply and install one day/night camera – Day/Night camera, auto-iris lens, 40m co-axial cable, power supply, 4-channel embedded digital recorder (250 G) hard drive and one 17 inch colour monitor. Price includes housing and installation R 12 900,00 excl.

REPORTING PROGRESS IN URBAN PROTECTED AREAS

A Site-level rapid assessment tool based on the World Bank & WWF's "Management Effectiveness Tracking Tool"

Tygerberg Nature Reserve

Prepared for the

City of CapeTown

by
Howard Langley & Paul Britton

22 May 2007

REPORTING PROGRESS AT PROTECTED AREA SITES: DATA SHEET

Name of protected area	Tygerberg Nature Reserve		
Location of protected area (country and if possible, map reference)	South Africa, Western Cape, Cape Town, Bellville		
Date of establishment (distinguish between agreed and gazetted	*Agreed*	*Gazetted* 1974	
Ownership details (i.e. owner, tenure rights etc.)	City of Cape Town		
Management Authority	City of Cape Town, Strategy and Planning Directorate, Envir		
Protected area size (ha)	300 ha		
Staff numbers	*Permanent* 10	*Temporary* 2	
Budget			
Designation (ICUN category), World Heritage, Ramsar etc	Local Authority Nature Reserve		
Reason for designation	Biodiversity Conservation		
Brief detail of World Bank funded project or projects in PA	Not applicable		
Brief detail of WWF funded project or projects in PA	Not applicable		
Brief detail of other relevant projects in PA	Nothing to report		
List two of the primary protected area objectives			
Objective 1	Biodiversity Conservation		
Objective 2	Environmental Education		
List the top two most important threat to the PA (and indicate reasons why they are selected)			
Threat 1	Invasive alien vegetation		
Threat 2	Impact of the urban edge on biodiversity		
List top two critical management activities			
Activity 1	Biodiversity Conservation		
Activity 2	Environmental Education		
Date assessement carried out:	**22-May-07**		
Name of assessor:	**Ettienne Jacques Kuyler**		

Howard Langley Paul Britton 22 May 2007

MANAGEMENT EFFECTIVENESS TRACKING TOOL

1: Context : Where are we now?	Criteria	Value	Score	Comments	Next steps
1.1 Legal status **Does the PA have secure permanent conservation legal status?**	The PA's permanent legal conservation status is not secured by its	0		PA proclaimed as Local Authority Nature Reserve in 1974	Extension of boundaries of PA with proclamation of open space and corridors
	There is a formal agreement that the PA should be afforded the highest possible legal protection, but the process has not yet begun.	1			
	The PA is in the process of being afforded the highest possible legal protection.	2			
	The PA has Local Authority Nature Reserve status, or a higher level	3	3		
1.2. Protected Area regulations	There are no legal mechanisms for controlling inappropriate land use and activities in the PA	0		Improvement in inter-departmental communications of the City	Establishment of good working relations with other departments eg. Planning
	Legal mechanisms for controlling inappropriate land use activities in the PA exist but are not being implemented.	1			
	Legal mechanisms for controlling inappropriate land use and activities in the PA exist but there are some problems in effectively implementing them	2	2		
	Legal mechanisms for controlling inappropriate land use and activities in the PA exist and are being effectively implemented	3			
1.3. Law enforcement PA has capacity/resources to enforce regulations & bylaws well enough?	PA has no effective capacity/resources to enforce regulations & bylaws	0		Awaiting approval from City Manager to be appointed as Peace / Law Enforcement Officers	Awaiting approval from City Manager to be appointed as Peace / Law Enforcement Officers
	There are major deficiencies in capacity/resources to enforce regulations & bylaws (e.g. lack of skills, no patrol budget)	1			
	PA has acceptable capacity/resources to enforce regulations & bylaws but some deficiencies remain	2	2		
	PA has excellent capacity/resources to enforce regulations & bylaws	3			
1.4. Protected Area boundary demarcation **Is the boundary known and demarcated?**	The boundary of the PA is not known by the management authority or local residents/neighbouring land users	0		Boundary is fenced and clearly demarcated with signage. PA has Certificate of Adequate Enclosure from CapeNature. Need exists for standardized fencing of PA. Currently consists of welded mesh, diamond mesh, veldspan and palissade	PA fence to be standartzed with welded mesh as Capital Budget becomes available
	The boundary of the PA is known by the management authority but is not known by local residents/neighbouring land users	1			
	The boundary of the PA is known by both the management authority and local residents but is not appropriately demarcated	2			
	The boundary of the PA is known by the management authority and local residents and is appropriately demarcated	3	3		
1.5. Resource Inventory Do you have enough information to manage the area?	There is little or no information available on critical habitats, species and cultural values of the PA	0		Very little information available on Renosterveld habitats and management thereof. Surveys conducted ad hoc by reserve management, Friends Groups, SANBI, CREW, Universities and Technikons. Need for key areas research.	Management orientated research on key habitat components
	Information on critical habitats, species and cultural values of the PA is not sufficient to support planning and decision making	1	1		
	Information on critical habitats, species and cultural values of the PA is sufficient for key areas of planning/decision making but the necessary survey work is not being maintained	2			
	Information concerning critical habitats, species and cultural values of the PA is sufficient to support planning and decision making and is being maintained	3			
Subtotal: Context		15	11		

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MANAGEMENT EFFECTIVENESS TRACKING TOOL

2: Planning: Where do we want to be?	Criteria	Value	Score	Comments	Next steps
2.1. Protected area design Does the protected area need enlarging, corridors etc to meet its objectives?	Inadequacies in design mean achieving the PA's major management objectives is impossible	0		*For long term ecological activities to be sustainable the PA should be enlarged and linked via corridors to other PA's*	Extension of boundaries of PA
	Inadequacies in design mean that achievement of major objectives are constrained to some extent	1			
	Design is not significantly constraining achievement of major objectives, but could be improved	2	2		
	Reserve design features are particularly aiding achievement of major objectives of the PA	3			
2.2 Management plan Is there a management plan (compliant with Protected Areas Act) and is it being implemented?	There is no standard Management Plan for the PA	0		Draft Management Plan not yet approved by Council since 2005. Not standardized format	Draft Management Plan needs to be revised and updated and circulated for public participation
	A standard Management Plan is being prepared or has been prepared, but is not yet approved.	1	1		
	An approved Management Plan exists and is being implemented, but has not been updated/reviewed during the past five years.	2			
	An approved Management Plan exists, is being implemented and has been updated/reviewed during the past three years	3			
2.3. Conservation Development Framework (CDF) Is there a visitor use zoning system indicating position and nature of operation & visitor infrastructure?	There is no CDF for the PA	0	0	*No approved plan for trails, road, visitors, facilities etc.*	CDF to be drafted with input from various specialists and approved
	A CDF is being prepared or has been prepared but is not being implemented	1			
	An approved CDF exists but it is only being partially implemented because of funding constraints or other problems	2			
	An approved CDF exists and is being implemented	3			
Supplementary items	The planning process allows adequate opportunity for key stakeholders to influence the management plan	1	1	City of Cape Town, De-Grendel Sub-Council, Advisory Board, Friends Group, Bird Club, CREW	
	There is an established schedule and process for periodic review and updating of the management plan	1			
	The results of monitoring, research and evaluation are routinely incorporated into planning	1			
Subtotal Score: Planning		12	4		

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MANAGEMENT EFFECTIVENESS TRACKING TOOL

3: Inputs: What do we need?	Criteria	Value	Score	Comments	Next steps
3.1. Research Is there a programme of management-orientated research work?	Research needs have not been identified nor is any research work taking place in the PA	0		Research mainly by conservation students, Universities and Technikons	Management orientated research needs to be identified and communicated with for example University Masters students
	Research needs have been identified, but other than for ad hoc research, no management orientated research is being done.	1			
	There is considerable research work but only limited "management" orientated research is being done.	2	2		
	There is considerable research work being undertaken, which is relevant to management needs	3			
3.2. Human Resource capacity Does the PA have sufficient HR capacity to manage the protected area?	The PA has no HR capacity	0		Vacancies in Visitor Access Control and Law Enforcement	Placements to be finalised
	HR capacity is inadequate for critical management activities	1			
	HR capacity is sufficient, but there are deficiencies in necessary skills for critical management activities	2	2		
	HR capacity and expertise is adequate for management needs	3			
3.3. Current budget Is the current budget sufficient?	There is no dedicated budget for the PA	0		PA's budget pooled in Central Area Budget supporting three PA's and three satellite sites constraining capacity to manage effectively	PA budget to be removed from pooled amount and dedicated to PA only
	The available budget is inadequate for basic management needs and presents a serious constraint to the capacity to manage	1			
	The available budget is acceptable, but could be further improved to fully achieve effective management	2	2		
	The available budget is sufficient and meets the full management needs of the PA	3			
Supplementary items	The budget is secure/guaranteed for the PA on an annual cycle	1	1	PA's budget pooled in Central Area Budget supporting three PA's and three satellite sites constraining capacity to manage	PA budget to be removed from pooled amount and dedicated to PA only
	The budget is secure/guaranteed on a three year cycle	2			
	The PA is not reliant on external funding	2			
Subtotal		14	7		

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MANAGEMENT EFFECTIVENESS TRACKING TOOL

4: Process : How do we go about it?	Criteria	Value	Score	Comments	Next steps
4.1. Annual Plan of Operation (APO) Is there an annual work plan/APO that is approved by the organisation?	No approved/standardised APO exists	0		Standard Branch APO approved by reserve management. Many activities not completed due to staff and budget shortage	Placements to be completed and budget to be secured
	An approved APO exists but activities are not monitored against the plan's targets	1			
	An approved APO exists and actions are monitored against the plan's targets, but many activities are not completed	2	2		
	Actions are monitored against the approved APO's targets and most or all prescribed activities are completed	3			
4.2. Resource management Is the protected area adequately managed (e.g. for fire, invasive species, poaching)?	Requirements for active management of critical ecosystems, species and cultural values have not been assessed	0		Management restrained by staff not adequately trained and budget shortage	Placements to be completed and budget to be secured
	Requirements for active management of critical ecosystems, species and cultural values are known but are not being addressed	1			
	Requirements for active management of critical ecosystems, species and cultural values are only being partially addressed	2	2		
	Requirements for active management of critical ecosystems, species and cultural values are substantially or fully addressed.	3			
4.3. Staff training Is there enough training for staff?	Staff are untrained	0		Staff training could be improved for critical procedures and tasks	Training needs has been identified. Awaiting implementation
	Staff training and skills are low relative to the needs of the PA	1	1		
	Staff training and skills are adequate, but could be further improved to fully achieve the objectives of management	2			
	Staff training and skills are in tune with the management needs of the PA, and with anticipated future needs	3			
4.4. Budget management Is the budget managed to meet critical management needs?	Budget management is poor and significantly undermines effectiveness	0		PA budget is pooled in Central Area Budget	Dedicated PA budget needed
	Budget management is poor and constrains effectiveness	1	1		
	Budget management is adequate but could be improved	2			
	Budget management is excellent and aids effectiveness	3			
4.5. Operational equipment & Infrastruoture (as required for operational management purposes, but excluding tourism/visitor facilities)	There is little or no operational equipment & infrastructure	0		Equipment and infrastructure constrains with regards to vehicles, small plant, office equipment, storage space	Needs has been identified to be placed on Capital Budget. Awaiting implementation
	There is some equipment & infrastructure but these are wholly inadequate	1			
	There is equipment and infrastructure, but still some major gaps that constrain management	2	2		
	There is adequate operational equipment and infrastructure	3			
4.6 Maintenance of equipment & Infrastruoture Is equipment & infrastructure (including tourism/visitor facilities) adequately maintained?	There is no approved Maintenance Plan and no maintenance is taking place	0		Regular maintenance of equipment and infrastructure. Repairs and replacement done filed for future reference. But need for long term maintenance	
	There is no Maintenance Plan and maintenance is taking place to an unsatisfactory standard.	1			
	There is no Maintenance Plan, but maintenance is taking place to a satisfactory standard.	2			
	There is an approved Maintenance Plan that is being fully implemented to a high standard.	3	3		

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MANAGEMENT EFFECTIVENESS TRACKING TOOL

5: Outputs/Outcomes: What were the results/achievements?	Criteria	Value	Score	Comments	Next steps
5.1. Visitor facilities Are visitor/tourism facilities good enough and sufficient to prevent damage to the PA?	There are no visitor facilities and services	0		Minor trampling and impact in certain areas	Improvement of hiking trails, visitor facilities and visitor access control
	Visitor facilities and services are inappropriate for current levels of visitation or are under construction	1			
	Visitor facilities and services are adequate for current levels of visitation but could be improved	2	2		
	Visitor facilities and services are excellent for current levels of visitation	3			
Additional points	There are active programmes for restoration of degraded areas within the PA and/or in associated buffer zone	1			
5.2. Ecological & Cultural condition assessment Is the protected area being managed consistent to its objectives?	Important biodiversity, ecological and cultural values are being severely degraded in the PA	0		Fire Management, Grazing / Browsing component partially degraded	Identified areas to be addressed
	Some biodiversity, ecological and cultural values are being severely degraded	1			
	Some biodiversity, ecological and cultural values are being partially degraded but the most important values have not been significantly impacted	2	2		
	Biodiversity, ecological and cultural values are predominantly intact	3			
5.3. Access assessment Are the available management mechanisms working to control access or use?	Protection systems (patrols, permits etc) are ineffective in controlling access or use of the PA in accordance with designated objectives	0		Weekends, Public Holidays and after hour access control problems	To be improved with resolving of Placement issues
	Protection systems are only partially effective in controlling access or use of the PA in accordance with designated objectives	1			
	Protection systems are moderately effective in controlling access or use of the PA in accordance with designated objectives	2	2		
	Protection systems are largely or wholly effective in controlling access or use of the PA in accordance with designated objectives	3			
5.4. Economic benefit assessment Is the Protected Area providing economic benefits to local communities?	The existence of the PA has reduced the options for economic development of the local communities	0		Insignificant economic benefits to local Friends Groups. Increased property values of neighbouring communities. Direct benefits (City employed staff) and indirect benefits (Educational programmes, public transport system to reserve etc)	
	The existence of the PA has neither damaged nor benefited the economy of the local economy	1			
	There is some flow of economic benefits to local communities from the existence of the PA but this is of minor significance to the regional economy	2	2		
	There is a significant or major flow of economic benefits to local communities from activities in and around the PA (e.g. employment of locals, locally operated commercial tours etc)	3			
5.5. Community benefit assessment (other than economic) e.g. recreation & education facilities, community hall, sport facilities etc.	The existence of the PA has not delivered any direct or indirect community benefits	0		Recreational benefits to local communities	
	The existence of the PA has delivered some minor short term community benefits	1			
	The PA delivers some quantifiable long term community benefits that make a difference to the lives of local communities	2	2		
	The PA delivers considerable quantifiable long term community benefits that make a real difference to the lives of local communities	3			
Subtotal Score: Outcomes		18	10		

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1: CONTEXT	VALUE	SCORE	
1.1. Legal status	3	3	
1.2. Protected Area regulations	3	2	
1.3. Law enforcement	3	2	
1.4. Protected area demarcation	3	3	
1.5. Resource Inventory	3	1	
Subtotal	**15**	**11**	
2: PLANNING			
2.1. Protected area design	3	2	
2.2. Management plan	3	1	
2.3. Conservation Development Framework	3	0	
Additional Points	3	1	
Subtotal	**12**	**4**	
3: INPUTS			
3.1. Research	3	2	
3.2. Staff numbers	3	2	
3.3. Current budget	3	2	
Supplementary items	5	1	
Subtotal	**14**	**7**	
4: PROCESS			
4.1. Annual Plan of Operation	3	2	
4.2. Resource management	3	2	
4.3. Staff training	3	1	
4.4. Budget management	3	1	
4.5. Operational equipment & infrastructure	3	2	
4.6. Maintenance of equipment & infrastructure	3	3	
4.7. Education & awareness	3	2	
4.8. Government & commercial neighbours	3	2	
4.9. Advisory committee	3	2	
4.10. Community partners	3	2	
4.11. Commercial Tourism	3	1	
4.12. Monitoring & Evaluation	3	1	
Supplementary items	1	1	
Subtotal	**37**	**22**	
5: OUTPUTS/OUTCOMES			
5.1. Visitor facilities	3	2	
5.2. Condition assessment	3	2	
5.3. Access assessment	3	2	
5.4. Economic benefit assessment	3	2	
5.5. Community benefit assessment	3	2	
Supplementary items	1	0	
Subtotal	**16**	**10**	
TOTAL SCORE	**94**	**54**	**57%**

Summary and comment on score. This is an established nature reserve. Attention should be given to compiling a management plan and particular a CDF which needs to address inter alia the destination at the summit and the lack of an operation area.

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