Specialist Study 5

Terrestrial Ecological Assessment

TRANSNET RAILWAY LINE EIA

TERRESTRIAL ECOLOGICAL ASSESSMENT

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GLOSSARY OF ACRONYMS, TERMS AND UNITS

AoC	Areas of Concern
ALARP	As low as reasonably practicable
BIT	Biogeographically important taxon
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Areas
CR	Critically Endangered
DCA	Detrended Correspondence Analysis
DD	Data Deficient
DEAT	Department of Environmental Affairs and Tourism
DWAF	Department of Water Affairs and Forestry
ECBCP	Eastern Cape Biodiversity Conservation Plan
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EN	Endangered
ERM	Environmental Resource Management Southern Africa (Pty) Ltd
ECBCP	Eastern Cape Biodiversity Conservation Plan
EX	Extinct
IEMP	Integrated Environmental Management Programmes
IDP	Integrated Development Plan
IUCN	World Conservation Union
LC	Least Concern
LT	Least Threatened
Med	Valued medicinal plant
NE	Near Endangered
NEPAD	New Partnership for Africa's Development
NSBA	National Spatial Biodiversity Assessment
NBSAP	National Biodiversity Strategy Action Plan
NSS	Natural Scientific Services
NEMA	National Environmental Management Act
NEPAD	New Partnership for Africa's Development
NT	Near Threatened
PP	Protected Plant
PS	Protected Species
QDS	Quarter Degree Squares
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
STBA	Still To Be Assessed
STEP	Subtropical Thicket Ecosystem Planning initiative
TSP	Threatened Species Programme
VU	Vulnerable

1 INTRODUCTION

Environmental Resource Management Southern Africa (Pty) Ltd (ERM) appointed Natural Scientific Services (NSS) to undertake an Ecological Assessment for the proposed upgrade of the Transnet Railway between Hotazel and the Port of Ngqura in the Eastern and Northern Cape Provinces.

The Ecological Assessment is split into two phases:

- **Baseline Assessment** - an initial overview and brief description of the ecological environment at each of the sites, which was submitted to ERM for comment on the 8 September 2008; and
- **Terrestrial Ecological Assessment (Detailed Assessment) –** Focusing on specific sites requiring detailed investigations (excluding trapping) and identifying and assessing impacts associated with the railway development. This phase also identifies mitigation and management measures for the proposed development.

1.1 AIM OF THE TERRESTRIAL ECOLOGICAL ASSESSMENT

The aim of this study is to provide a detailed assessment of the current terrestrial fauna and floral status of the different sites within the study area (***Figure 1.1***), by:

- Gathering information on the ecological status of the project area through a review of existing and available information;
- Identifying and describing, through selected field investigations, potential sensitive species, habitats or ecological processes that may be impacted by the construction and operational activities (Areas of Concern);
- Assessing potential impacts on fauna, flora and ecological processes from the construction and operation activities;
- Describing mitigation/management measures that may be implemented to avoid or reduce any negative impacts and enhance benefits of the development that can be incorporated into the project design; and
- Outlining any further studies that may be required during.

This report therefore includes:

- A description of the potential ecological sensitivities in and around the loop sites (including sites of associated infrastructure), at the borrow pit sites (new and existing), at the Emil Substation site and along the section of line to be refurbished and electrified between Kimberley and De Aar;
- An assessment of existing impacts and potential ecological impacts at each site (assessed according to significance criteria and methodology provided by ERM);
- A description of relevant and implementable mitigation measures to reduce, avoid, or minimise negative impacts and enhance positive impacts;

- Identification of information gaps, uncertainties, study limitations and underlying assumptions;
- Recommendations, including possible monitoring requirements during the construction phase;
- Glossary and list of definitions; and
- Reference of all information sources.

1.2 STUDY AREA

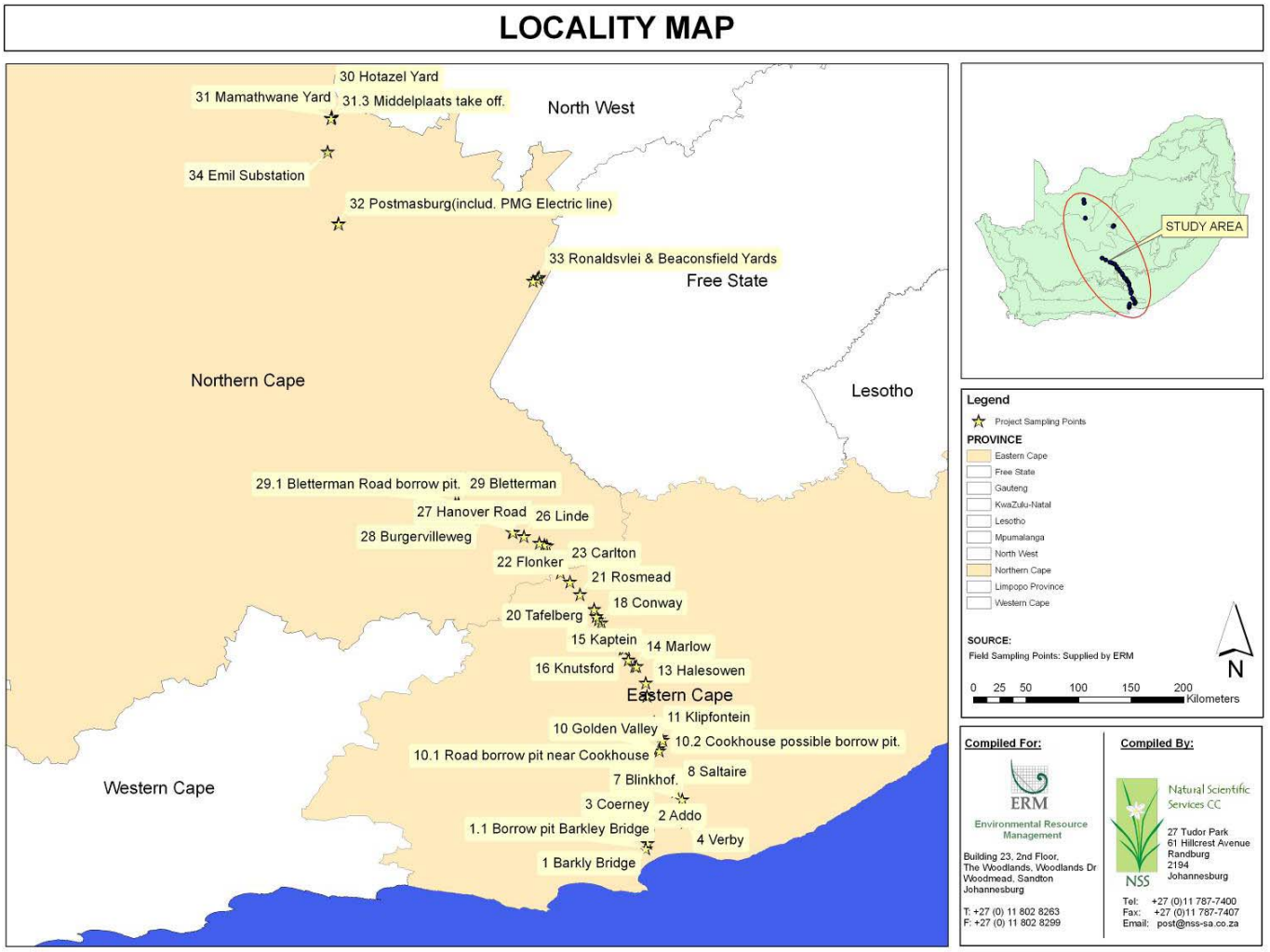
The study area is located in the Northern and Eastern Cape Provinces (*Figure 1.1*) with the sites for the railway loops, borrow pits, yards and substation falling within the following Municipalities:

- Northern Cape
    - Gamagora (District DC45)
    - Moshaweng (District DC45)
    - Tsantsabane (District DC8)
    - Sol Plaatjie (District DC9)
    - Emthanjeni (District DC7)
    - Umsobomvu (District DC7)
- Eastern Cape
    - Inxuba Yethemba (DC13)
    - Blue Crane Route (DC10)
    - Makona (DC10)
    - Sundays River Valley (DC10)
    - Nelson Mandela (NMA)

The sites under investigation are as follows:

Description	Latitude	Longitude
1 Barkly Bridge	-33.62208	25.69616
1.1 Borrow pit Barkley Bridge	-33.66946	25.68153
2 Addo	-33.55512	25.69053
3 Coerney	-33.45914	25.72143
4 Verby	-33.44308	26.01851
5 Eagle's Crag	-33.38400	26.05689
6 Tootabi	-33.35001	26.06897
7 Blinkhoff	-33.24877	25.9928
8 Saltaire	-33.17947	25.93965
9 Kommadagga	-33.11853	25.89966
10 Golden Valley	-32.81031	25.78934
10.1 Road borrow pit near Cookhouse	-32.71248	25.81221
10.2 Cookhouse possible borrow pit.	-32.73841	25.82719
10.3 Golden Valley possible borrow pit.	-32.82803	25.79735
11 Klipfontein	-32.60304	25.76213
11.1 Klipfontein cutting as borrow pit	-32.58495	25.75405
12 Mortimer	-32.36226	25.69168
13 Halesowen	-32.24848	25.68088
14 Marlow	-32.10521	25.58687
14.1 Marlow borrow pit	-32.10451	25.60175
15 Kaptein	-32.04856	25.53296
16 Knutsford	-31.95536	25.50667
16.1 Knutsford borrow pit	-31.95762	25.48624
16.2 Knutsford borrow material	-31.95889	25.51189
17 Visrivier	-31.90487	25.40917
17.1 Visrivier Collett se quarry	-31.92611	25.43351
17.2 Visrivier possible borrow pit (existing)	-31.91552	25.41996
18 Conway	-31.73242	25.30152
18.1 Conway possible borrow Pit	-31.70389	25.27851
19 Glenheath	-31.67899	25.25894
20 Tafelberg	-31.61538	25.24052
21 Rosmead	-31.49010	25.11904
22 Flonker	-31.38297	25.03316
23 Carlton	-31.30505	24.95056
24 Barredeel	-31.22002	24.94696
25 Wildfontein	-31.07201	24.83622
25.1 Borrow pit near Wildfontein	-31.06341	24.81386
25.2 Borrow pit near Wildfontein	-31.04704	24.77151
26 Linde	-30.99132	24.64041
27 Hanover Road	-30.95363	24.54012
27.2 Hanover Road existing borrow pit	-30.95588	24.54479
28 Burgervilleweg	-30.82397	24.29203
29 Bletterman	-30.70928	24.08014
29.1 Bletterman road borrow pit	-30.71311	24.05424
30 Hotazel Yard	-27.21981	22.9663
30.2 HZL Tie in of triangle.	-27.21423	22.96415
31 Mamathwane Yard	-27.39366	22.99488
31.3 Middelplaats take off.	-27.40530	22.99017
32 Postmasburg Yard (including PMG Electrifying line)	-28.30719	23.05147
33 Ronaldsvlei & Beaconsfield Yards	-28.77973	24.75643
34 Emil Substation	-27.69978	22.96696

Figure 1.1 *Study Area*



Source: Field Points: ERM

2 APPROACH AND METHODOLOGY

2.1 APPROACH

This Terrestrial Ecological Assessment was undertaken using existing sources of information and primary data collect during the initial field investigation (August 2008), the Eastern Cape detailed field investigation (October 2008), and the Northern Cape detailed field investigation (November 2008).

The NSS Team for the ecological component of the study were as follows:

Specialist	Aspect Investigated	Qualifications
Ian Bredin (NSS)	Fauna	MSc (Veterinary Science) *Pr.Sci.Nat* Registered - Zoology
Lukas Niemand (Pachnoda)	Flora	M.Sc. (Restoration Ecology/Zoology) *Pr.Sci.Nat* Registered – Ecological Science & Zoology
Susan Abell (NSS)	Flora & GIS Mapping	MSc (Resource Conservation Biology) *Pr.Sci.Nat* Registered – Ecological Science & Environmental Science
Carien van Dam	Background & GIS Mapping	MSc (Environmental Science) – thesis still to be finalized.

The NSS team has over 25 years combined experience in project management and fieldwork for numerous ecological studies (fauna & flora) and wetland assessments. A number of the team members are registered Professional Natural Scientists in the ecological, environmental and zoological fields.

2.2 METHODOLOGY

The methodology for the terrestrial ecological assessment entailed a two phased approach: a scoping assessment in the winter season and a detailed field investigation in the summer season.

2.2.1 *Scoping Assessment*

The scoping assessment mainly focused on a desktop assessment with a brief visit to most of the sites (access to a few sites was restricted) to undertake an initial broad level scan. The desktop assessment included:

- A review of applicable legislation; and
- A literature review of existing reports and studies, including:
  - the Eastern Cape State of the Environment Report, (2004);
  - the Northern Cape State of the Environment Report, (2004);
  - National Spatial Biodiversity Assessment (2005);
  - Floristic Regions of Endemism (2001);
  - Published data for Red Data faunal species (Friedman and Daly, 2004; Minter *et al.*, 2004; South African Bird Atlas Data Extraction, 2007);
  - Mucina & Rutherford (2006) – the vegetation map of South Africa, Lesotho and Swaziland;

- Pierce & Mader (2006) – the STEP programme;
- Van Wyk & Smith (2001) – regions of floristic endemism;
- Threatened Species Programme (2007)– IUCN listing for plant taxa as provided by SANBI;

The initial scan included:

- An initial broad site visit (*drive through*) to obtain a visual perspective of the vegetation/habitat types at the different sites, and a broad overview of faunal species throughout the study sites. This was undertaken in August 2008.

2.2.2 *Detailed Field Investigations*

This phase included two weeks of field investigations within identified habitats within and along the different proposed loops (including associated infrastructure), borrow pit areas, yards and the new substation. The field investigations were undertaken in late October 2008 between the Port of Ngqura and the town of De Aar, and in mid November 2008 to evaluate the sites from the town of De Aar to the town of Hotazel.

The terrestrial flora assessment included:

- A regional overview of the affected study area. In addition to the Scoping Phase the following published literature was also consulted:
  - Mesemb (Mesembryanthemaceae) taxa (gratuitously) determined by Me Priscilla Burgoyne at the Pretoria National Herbarium (PRE), SANBI;
  - Esler, Milton & Dean (2006) – the general ecology specific to the Karoo;
  - Various monographs such as Bayer (1999) – Haworthia and Bruyns (2005) – Stapeliads; and
  - Various field guides with particular reference to Shearing (1994), Manning (2001), Van Rooyen (2001) and Palgrave (2002).

- A site visit to obtain a visual perspective of the vegetation/habitat types at the different sites. This included random transect walks at each loop (or proposed loop), yard and the substation area to ensure sampling of less abundant or localised species, and to assist with the compilation of a species inventory.
- All borrow pits (existing and new) were quantitatively sampled by means of plot-based data collection. Four (4) plots were established at 10 m, 20 m, 50 m and 100 m intervals from the perimeter of exiting pits or from the central point indicating a new pit. The sampling plot size was standardised at 100 m^2. A sample entailed the compilation of a list of plant taxa, where each taxon was assigned an estimate (usually a cover-abundance estimate). A vegetation sample can be seen as a simplified model of the vegetation stand. Therefore, the species composition, as well as the mean percentage cover of each species per sampling plot was measured. Percentage cover was not measured precisely, but was placed

in one of seven categories by a visual estimate as described by Braun-Blanquet (in Mueller-Dombois & Ellenberg, 1974; see **Table 2.2.2**).

Table 2.2.2 ***Adapted Braun-Blanquet Cover classes (Mueller-Dombois & Ellenberg, 1974.) used during the project***

Class	Range of Cover (%)	Mean
5	75-100	87.5
4	50-75	62.5
3	25-50	37.5
2b	12.5-25	18.75
2a	5-12.5	8.75
1	1-5	2.5
+	Occasional, less than 5	
r	One or few individuals	

- A TWINSPAN analysis (Hill, 1979) and Detrended Correspondence Analysis (DCA) of cover estimates for the different plant species were used to classify vegetation assemblages. The TWINSPAN analysis is used to assign associations between samples with the aim to objectively delineate groups or assemblages. Therefore, sampling entities that group together (being more similar) are believed to have similar compositions. Data was left untransformed to allow for only common or dominant species to participate in the analysis. The software package JUICE ver. 6.5.2 (Tichý L., Inst of Botany and Zoology, Masaryk Univ., Brno, Czech Rep, 1999-2007) was used during the analysis; and
- The percentage contribution (%) of each plant taxon within each vegetation grouping was calculated according to Clarke & Warwick (1994). Those species with high consistencies and percentage contributions were considered to be typical (or representative) for the given assemblage.

In addition, the following parameters were also documented to aid the vegetation survey:

- All plant taxa were identified to species level. Scientific names follow Germishuizen & Meyer (2003);
- The growth form of each plant species (a measure of structural diversity) and an indication of its perenniality;
- A survey of Red Data and endemic plant taxa;
- The identification of plant species protected by provincial and national legislation;
- A survey of plant species with medicinal or cultural value; and
- The identification of declared weeds and invader species as promulgated under the amended regulations (Regulation 15) of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).

The terrestrial faunal assessment included:

- Walking the sites and noting habitat types and the visual presence of animals or evidence of animals in the form of faeces, pellets, spoor, nests, burrows, feathers etc;
- A description of fauna linked to each habitat and possible occurrence of endemic, Red Data / protected species;
- Identifying Areas of Concern through ranking of each site based on species diversity, species richness and the presence of Red Data / protected species; and
- Identification and assessment of potential impacts and recommendations on management and mitigation measures (discussed in *Section 2.4* and *2.5*).

A broad site visit (*drive through*) was undertaken for the assessment of fauna and flora along the 230km section between De Aar and Kimberley.

2.3 ECOLOGICAL IMPORTANCE

The ecological sensitivity of any piece of land is based on its inherent ecosystem service (e.g. ridge systems) and overall preservation of biodiversity. It therefore relates to:

- Species diversity, endemism (unique species or unique processes) and the high occurrence of threatened and protected species or ecosystems protected by legislation –*conservation importance*.; and
- The degree of ecological connectivity between systems within a landscape matrix. Thus, systems with a high degree of landscape connectivity amongst one another are perceived to be more sensitive – *ecological function*.

2.3.1 Sensitivity Scale

- *High* – Sensitive ecosystems with either low inherent resistance or low resilience towards disturbance factors or highly dynamic systems considered being important for the maintenance of ecosystem integrity. Most of these systems represent ecosystems with high connectivity with other important ecological systems OR with high species diversity and usually provide suitable habitat for a number of threatened or rare species. These areas should be protected;
- *Medium* – These are slightly modified systems which occur along gradients of disturbances of low-medium intensity with some degree of connectivity with other ecological systems OR ecosystems with intermediate levels of species diversity but may include potential ephemeral habitat for threatened species; and
- *Low* – Degraded and highly disturbed/transformed systems with little ecological function and are generally very poor in species diversity (most species are usually exotic or weeds).

2.4 IMPACT ASSESSMENT METHODOLOGY (PROVIDED BY ERM)

The assessment of impacts includes the determination of the following:

- The nature of the impact – **Table 2.4a**;
- The magnitude (or severity) of the impact – **Table 2..4b**; and
- The likelihood of the impact occurring - **Table 2..4b**

The degree of confidence in the assessment will also be reflected.

Table 2.4.a Impact assessment terminology

Term	Definition
Impact nature	
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
Indirect impact	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (e.g. in-migration for employment placing a demand on resources).
Cumulative impact	Impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the Project.

2.4.1 Assessing significance

There is no statutory definition of '*significance*' and its determination is, therefore, somewhat subjective. However, it is generally accepted that significance is a function of the magnitude of the impact and the likelihood of the impact occurring. The criteria used to determine significance are summarised in **Table 2.4b**.

Table 2.4b Significance criteria

Impact magnitude	
Extent	*On-site* – impacts that are limited to the boundaries of the rail reserve, yard or substation site. *Local* – impacts that affect an area in a radius of 20km around the development site. *Regional* – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem. *National* – impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.
Duration	*Temporary* – impacts are predicted to be of short duration and intermittent/occasional. *Short-term* – impacts that are predicted to last only for the duration of the

	construction period. *Long-term* – impacts that will continue for the life of the Project, but ceases when the Project stops operating. *Permanent* – impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.
Intensity	BIOPHYSICAL ENVIRONMENT: *Intensity can be considered in terms of the sensitivity of the biodiversity receptor (ie. habitats, species or communities).* **Negligible –** the impact on the environment is not detectable. **Low –** the impact affects the environment in such a way that natural functions and processes are not affected. **Medium –** where the affected environment is altered but natural functions and processes continue, albeit in a modified way. **High –** where natural functions or processes are altered to the extent that it will temporarily or permanently cease. ***Where appropriate, national and/or international standards are to be used as a measure of the impact.*** *Specialist studies should attempt to quantify the magnitude of impacts and outline the rationale used.* SOCIO-ECONOMIC ENVIRONMENT: *Intensity can be considered in terms of the ability of project affected people/communities to adapt to changes brought about by the Project.* **Negligible –** there is no perceptible change to people's livelihood **Low** - People/communities are able to adapt with relative ease and maintain pre-impact livelihoods. **Medium** - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support. **High** - Those affected will not be able to adapt to changes and continue to maintain-pre impact livelihoods.
Impact likelihood (Probability)	
Negligible	The impact does not occur.
Low	The impact may possibly occur.
Medium	Impact is likely to occur under most conditions.
High	Impact will definitely occur.

Once a rating is determined for magnitude and likelihood, the following matrix can be used to determine the impact significance (**Table 2.4c**).

Table 2.4c ***Example of significance rating matrix***

SIGNIFICANCE RATING					
	LIKELIHOOD	**Negligible**	**Low**	**Medium**	**High**
MAGNITUDE	**Negligible**	**Negligible**	**Negligible**	**Low**	**Low**
	Low	**Negligible**	**Negligible**	**Low**	**Low**
	Medium	**Negligible**	**Low**	**Medium**	**Medium**
	High	**Low**	**Medium**	**High**	**High**

In **Table 2.3d**, the various definitions for significance of an impact are given.

Table2.4d Significance definitions

Significance definitions	
Negligible significance	An impact of negligible significance (or an insignificant impact) is where a resource or receptor (including people) will not be affected in any way by a particular activity, or the predicted effect is deemed to be 'negligible' or 'imperceptible' or is indistinguishable from natural background variations.
Minor significance	An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small (with and without mitigation) and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate significance	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that 'moderate' impacts have to be reduced to 'minor' impacts, but that moderate impacts are being managed effectively and efficiently.
Major significance	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors such as employment, in coming to a decision on the Project.

Once the significance of the impact has been determined, it is important to qualify the **degree of confidence** in the assessment. Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact. Degree of confidence can be expressed as low, medium or high.

2.5 MITIGATION AND RESIDUAL IMPACTS

Suitable and practical mitigation measures will be recommended for identified significant impacts. If required a workshop could be held to discuss mitigating measures with ERM and the client.

Residual impacts are those impacts which remain once the mitigation measures have been designed and applied. Once the mitigation is applied, each impact is re-evaluated (assuming that the mitigation measure is effectively applied) and any remaining impact is rated once again using the process outlined above. The result is a significance rating for the residual impact.

2.6 LIMITATIONS OF THE STUDY

Biodiversity/ecological studies are usually constrained by resources such as surveying time and duration, financing and support, which are all interrelated. A complete census of an area is only feasible if:

- the target population is small;
- measurement is not destructive;
- the study area is small and well delineated; and
- you have unlimited resources.

Data Limitations

There were limitations in the data available for each site as most information i.e. the Conservation and Environmental Plans were at a National, Provincial or Municipal level. It must be mentioned that very little data was available for the Northern Cape Province. (i.e. no C-Plan data was available).

Field Limitations

The study area (all 51 sites throughout the Eastern and Northern Cape) was considerable in extent and therefore the detailed investigations included field assessments at each site that ranged from 30 minutes to 2 hours in duration. Time spent at each site was restricted due to the number of sites to survey and the required distance to travel between them.

No trapping was undertaking at any of the sites, therefore the assessment of small mammals (i.e. rodents) and herpetofauna was limited to a broad assessment (desktop analysis and field observations where possible). In addition, the number of species recorded was restricted by the amount of time spent at each site.

In order to obtain a comprehensive understanding of the dynamics of the floristic communities on the study site, as well as the status of endemic, rare or threatened species in any area, vegetation assessments should always consider investigations at different time scales (across seasons/years) and through replication. However, due to time constraints such long-term studies were not feasible. It should also be mentioned that one of the proposed borrow pits were not accessible (e.g. site 10.3 – Golden Valley) during the survey due to biosecurity reasons. The borrow pit could be seen from a distance (approximately 200m) and vegetation in the general vicinity was assessed.

3 IDENTIFICATION OF APPLICABLE POLICIES, LEGISLATION, STANDARDS AND GUIDELINES

3.1 INTERNATIONAL LEVEL

3.1.1 *Convention on Biological Diversity.*

The Convention is the first global, comprehensive agreement to address all aspects of biological diversity: genetic resources, species, and ecosystems. It recognizes - for the first time - that the conservation of biological diversity is "a common concern of humankind" and an integral part of the development process.

3.1.2 *The Ramsar Convention.*

Over the years the Convention has broadened its scope of implementation to cover all aspects of wetland conservation and wise use, recognizing all wetlands as ecosystems that are extremely important for biodiversity conservation and for the well-being of human communities. South Africa is a contracting party to the Ramsar Convention with 19 internationally recognized Ramsar sites.

3.1.3 *The Bonn Convention (on conservation of migratory species of wild animals)*

This convention aims to conserve terrestrial, marine and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. South Africa is a party to this convention.

3.1.4 *The World Heritage Convention.*

The most significant feature of the 1972 World Heritage Convention is that it links together the concepts of nature conservation and the preservation of cultural properties. The Convention recognizes the way in which people interact with nature, and the fundamental need to preserve the balance between the two.

3.1.5 *The IUCN (World Conservation Union).*

The Union's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

3.2 REGIONAL LEVEL

3.2.1 The Action Plan of the Environmental Initiative of NEPAD (the New Partnership for Africa's Development), 2003.

This initiative encourages sustainable development and associated conservation and wise use of biodiversity.

3.3 NATIONAL LEVEL

3.3.1 National Environmental Management Act (No. 107 of 1998) (NEMA)

NEMA can be regarded as the most important piece of general environmental legislation covering three main areas namely: Land, planning and development; Natural and cultural resources use and conservation; Pollution control and waste management. The objective of NEMA is to provide for co-operative environmental governance through a series of principles. Principles relevant to this chapter include:

- Sustainable development requires the consideration of all relevant factors including:
    - that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
    - that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource; and
    - that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised.
- Sensitive, vulnerable, highly dynamic or stressed ecosystems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

3.3.2 National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

Although South Africa became a signatory to the Convention of Biological Diversity in 1998, the enactment of recent national legislation has affirmed our countries commitment to biodiversity and conservation. The National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004) has been assented by the South African President and was published in the Government Gazette in June 2004 (Vol. 467; No. 26426). One of the objectives of this Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and to ensure the sustainable use of indigenous biological resources.

3.3.3 *National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations*

Chapter 4, Part 2 of NEMA Biodiversity Act, 2004 (Act No. 10, 2004) provides for listing of species that are threatened or in need of protection to ensure their survival in the wild, while regulating the activities, including trade, which may involve such listed threatened or protected species and activities which may have a potential impact on their long-term survival. In February 2007, this was achieved as the Minister of Environmental Affairs and Tourism published a list of CR, EN, VU and Protected Species (PS), according to Section 56(1) of the Act.

3.3.4 *Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)*

In 1984, regulations were passed in terms of the Conservation of Agricultural Resources Act (CARA) regulations declaring about 50 species "weeds" or "invader plants". On 30 March 2001 the Minister of Agriculture promulgated an amendment to these regulations. This amendment now contains a comprehensive list of species that are declared weeds and invader plants dividing them into three categories. These categories are as follows:

- Category 1: Declared weeds that are prohibited on any land or water surface in South Africa. These species must be controlled, or eradicated where possible.
- Category 2: Declared invader species that are only allowed in demarcated areas under controlled conditions and prohibited within 30m of the 1:50 year floodline of any watercourse or wetland.
- Category 3: Declared invader species that may remain, but must be prevented from spreading. No further planting of these species are allowed.

In terms of the amendments to the regulations under the Conservation of Agriculture Resources Act, 1983 (Act No. 43 of 1983), landowners are legally responsible for the control of alien species on their properties. Various Acts administered by the Departments of Agriculture, Environmental Affairs and Tourism (DEAT), and DWAF, as well as other laws (including local by-laws), spell out the fines, terms of imprisonment and other penalties for contravening the law. Although no fines have yet been placed against landowners who do not remove invasive species, the authorities may clear their land of invasive alien plants and other alien species entirely at the landowners cost and risk.

3.3.5 *National Forests Act, 1998 (Act No. 84 Of 1998)*

One of the objectives of this Act is to provide special measures for the protection of certain forests and tree species and to promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes. In terms of section 15(1) of the National Forests

Act, 1998 ,forest trees or protected tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by the Department of Water Affairs and Forestry (or a delegated authority).

Therefore a Government Notice was issued in 2005 listing the protected trees within the borders of South Africa [Notice No. 767 Notice of List of Protected Tree Species under the National Forests Act, 1998 (Act No. 84 Of 1998) 5 August 2005]. The criteria used to select tree species for inclusion in the protected tree list were:

- Red List Status (rare or threatened species);
- Keystone Species Value (whether species play a dominant role in an ecosystem's functioning);
- Sustainability of Use (whether a species is threatened by heavy use of its products such as timber, bark etc);
- Cultural or Spiritual Importance (outstanding landscape value or spiritual meaning attached to certain tree species); and
- Other Legislation (whether a species is already adequately protected by other legislation).

3.3.6 National Spatial Biodiversity Assessment (NSBA)

The National Spatial Biodiversity Assessment (NSBA) was completed in 2004 and its main focus was on mainstreaming biodiversity priorities throughout the economy, and making links between biodiversity and socio – economic development. It is the first ever comprehensive spatial assessment of biodiversity throughout the country and has four components, dealing with the terrestrial, freshwater, estuarine and marine environments.
There are several possible approaches to biodiversity planning. The approach used most often in South Africa, including in the NSBA, is systematic biodiversity planning. It is based on three key principles:

- The need to conserve a representative sample of biodiversity pattern, such as species and habitats (the principle of representation).
- The need to conserve the ecological and evolutionary processes that allow biodiversity to persist over time (the principle of persistence).
- The need to set quantitative biodiversity targets that tell us how much of each biodiversity feature should be conserved in order to maintain functioning landscapes and seascapes.

3.3.7 National Biodiversity Strategy Action Plan (NBSAP) (DEAT 2005)

Five main strategic objectives have been identified in the NBSAP, namely:

- **Strategic Objective 1**: An enabling policy and legislative framework integrates biodiversity management objectives into the economy.
- **Strategic Objective 2:** Enhanced institutional effectiveness and efficiency ensures good governance in the biodiversity sector.

- **Strategic Objective 3**: Integrated terrestrial and aquatic management across the country minimizes the impacts of threatening processes on biodiversity, enhances ecosystem services and improves social and economic security.
- **Strategic Objective 4**: Human development and well-being is enhanced through sustainable use of biological resources and equitable sharing of the benefits.
- **Strategic Objective 5**: A network of protected areas conserves a representative sample of biodiversity and maintains key ecological processes across the landscape and seascape.

3.4 PROVINCIAL AND MUNICIPAL LEVEL

3.4.1 Subtropical Thicket Ecosystem Planning (STEP) initiative

The STEP Project encompasses the south-eastern Cape region, extending from the Kei River to Riversdale. The project's aim was to assess the region's biodiversity in terms of the diversity of indigenous plants and animals and the processes that sustain them with special emphasis on the unique, indigenous vegetation type known as Thicket. The main objectives from the initiate were to

- Ensure the persistence of biodiversity by developing a co-operative strategy for conserving corridors of land along major river valleys and the coast (the Mega-conservancy Network) which were identified as needing special safeguarding.
- Ensure the retention of biodiversity by categorizing those areas not contained within the Network into areas of conservation status with guidelines for appropriate land use.

3.4.2 Eastern Cape Biodiversity Conservation Plan (ECBCP)

The ECBCP is a broad-scale biodiversity plan. It integrates other existing broad-scale biodiversity plans in the Province, and fills in the gaps using mainly national data. This plan identifies Critical Biodiversity Areas (CBAs). These are terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning.

3.4.3 Eastern Cape: Cacadu Integrated Development Plan

The role of an Integrated Development Plan (IDP) is to facilitate local governments' planning and municipal management. A number of opportunities to integrate biodiversity management and conservation with sustainable development have been identified within the Cacadu IDP. These include:

- Consolidation and expansion of protected areas through links with communities and land owners
- Opportunities to engage with production sectors to develop ecologically sustainable land use management practices

- Carbon sequestration - i.e. Restoration of degraded areas by planting spekboom (*Portulacia afra*), which is a characteristic of the Cacadu district
- Alien vegetation clearing programmes linked to improved catchment management

3.4.4 Eastern Cape: Cacadu Spatial Development Framework

The Spatial Development Framework (SDF) for the Cacadu District is guided by the Subtropical Thicket Ecosystem Planning (STEP) initiative / project. Details provided above. The environmental guidelines as recommended by the STEP project have been included into the District wide SDF from a regional perspective.

3.4.5 Eastern Cape: Chris Hani District Municipal IDP

The Chris Hani District Municipal IDP contains developmental focus areas that are as follows:

- Sustainable Economic development;
- Integrated infrastructure development; and
- Social sustainability.

These objectives will be realized by the strategies such as

- Environmental sustainability through careful planning and protection by managing grazing land; planning woodlots and conserving sensitive areas.

3.4.6 Northern Cape Nature & Environmental Conservation Ordinance 19 of 1974

The Nature & Conservation Ordinance was developed to consolidate and amend the laws relating to nature and environmental conservation, and to provide for matters incidental thereto (DTEC, 2004). This Ordinance established the Department of Nature as well as an Environmental Conservation and Advisory Committee. It is also divided to cover nature reserves, miscellaneous conservation measures, protection of wild animals other than fish, protection of rhinoceroses, protection of fish in inland waters, protection of flora and professional hunters and hunting contractors. Under section 82 of the Ordinance, the Administrator has the power to effect provincial regulations.

3.4.7 Northern Cape: Frances Baard District Municipality 2006-2007

Council of Frances Baard District municipality adopted Key Performance Areas for their 2006-2007 IDP which included- ensuring a healthy and safe environment as well as environmentally aware community.

3.4.8 Northern Cape: Kgalagadi District Municipality IDP

The IDP for the Kgalagadi District Municipal Area indicated certain shortfalls including the lack of Integrated Environmental Management Programmes for the four municipalities

3.4.9 Northern Cape: Kgalagadi District Municipality SEA and IEMP

The District Municipality conducted a Strategic Environmental Assessment and Integrated Environmental Management Programmes in June 2005. These programmes are intended to contribute to a sustainable environment by ensuring that environmental issues are adequately addressed and the impacts of envisaged development projects on the environment are limited.

3.4.10 Northern Cape: Kgalagadi District Municipality SDF

The Spatial Development Framework (SDF) for the Kgalagadi District is guided by the District Municipality's Strategic Environmental Assessment and Integrated Environmental Management Programmes.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT – BIOPHYSICAL ENVIRONMENT

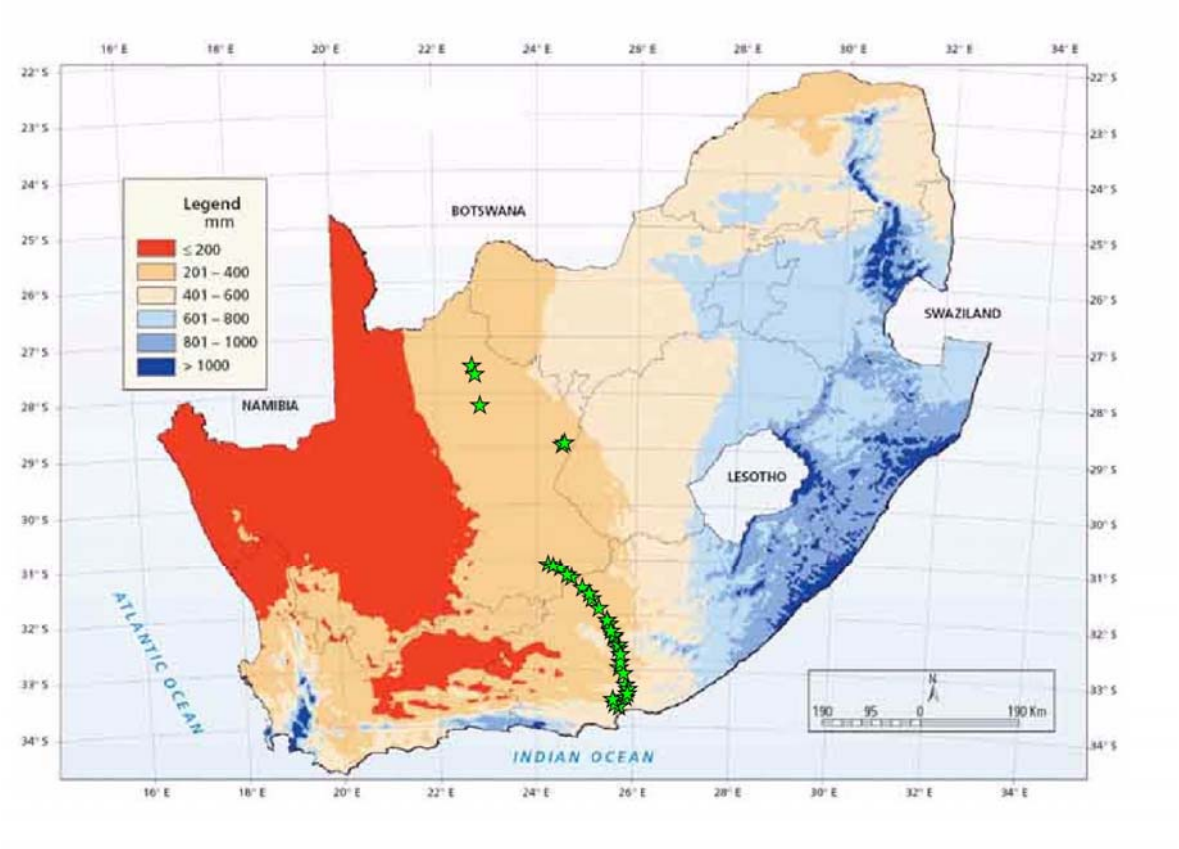
4.1 CLIMATE

The existing railway line runs from the Hotazel, which lies inland near the greater Karoo, south towards the coast near Port Elisabeth. The climate across the length of the existing railway line varies from the dry and arid Northern Cape to the wetter coastal region of the Eastern Cape.

4.1.1 Rainfall

Rainfall levels tend to be much lower in the western regions of South Africa where as the eastern and coastal regions have a higher annual rainfall (*Figure 4.1.1*).

Figure 4.1.1 Regional annual rainfall variations across South Africa (Google images)



(Source: Food and Agricultural Organisation of the United Nations, 2008)

The upper sections of the railway line lie in the eastern regions of the Northern Cape Province The eastern regions of the Northern Cape have a summer rainfall and commonly experience afternoon thunderstorms. This area can receive up to 400mm of rainfall annually, however rainfall varies greatly between years with some years receiving as little as 200mm. Cold winter evenings often result in the formation of dew and frost in the early

mornings which helps supplement the low rainfall. The detailed field investigation for the terrestrial ecological assessment was undertaken in mid November 2008. Although the study was conducted at the beginning of the summer rain season limited rain had already fallen in the region. The study was conducted over a considerable area at relatively small sites and therefore the effect of the limited rainfall was minimal.

The Eastern Cape has a winter rainfall along the coast and a summer rainfall inland. Along the coast rainfall is approximately 600mm per annum but as the altitude changes inland the rainfall drops to approximately 400mm per annum. The limited rainfall and infrequent frost provides ideal conditions for the development of fynbos and thicket. The detailed field investigations were conducted in late October, 2008. This was after the winter rain season for the Eastern Cape and was seen as an optimum time to conduct the study.

4.1.2 Temperature

The Northern Cape is a semi-desert region with fluctuating temperatures. In summer temperatures have been known to exceed 40°C but most summer maximum temperatures are closer to 30°C. In winter the daily average temperature is approximately 15°C and in the evenings temperatures can drop below 0°C resulting in frost and dew in the early mornings (South African Weather Service, 2008). The variety in climate from hot summers to cold winters, where temperatures can drop to below zero, limits vegetation grow to Karoo and thornveld vegetation.

The southern areas of the Eastern Cape have a mild, temperate, coastal climate with an average of 7 to 8 sunshine hours a day. The summer temperatures vary between 18°C and 25°C while the winter temperatures vary between 9°C and 20°C (South African Weather Service, 2008). These conditions encourage the growth of riverine thicket along the coastal regions and thornveld occurs in the wider flood plains (Mucina & Rutherford, 2006). The climate becomes more extreme as you move inland away from the Indian Ocean. The increase in altitude results in temperature ranges from 5°C to 35°C. Topological differences cause great climate differences from the coastal regions inland to the great Karoo (South African Weather Service, 2008). Grasslands and veld are encountered and then Karoo vegetation develops as you move further inland. The changes in vegetation types provides for different habitats.

4.2 GEOLOGY & SOIL

The geology has been roughly divided into regions with similar characteristics along the length of the line. These are listed below (Council for Geosciences, 1986; De Jong, *et al,* 2008):

- The section of line between Hotazel and Sishen is located entirely on geology of the Kalahari Group which is comprised of Aeolian sands and limestone. The sands lead to the development of parallel sand dues which results in the very sparse vegetation comprising of mainly grasses and

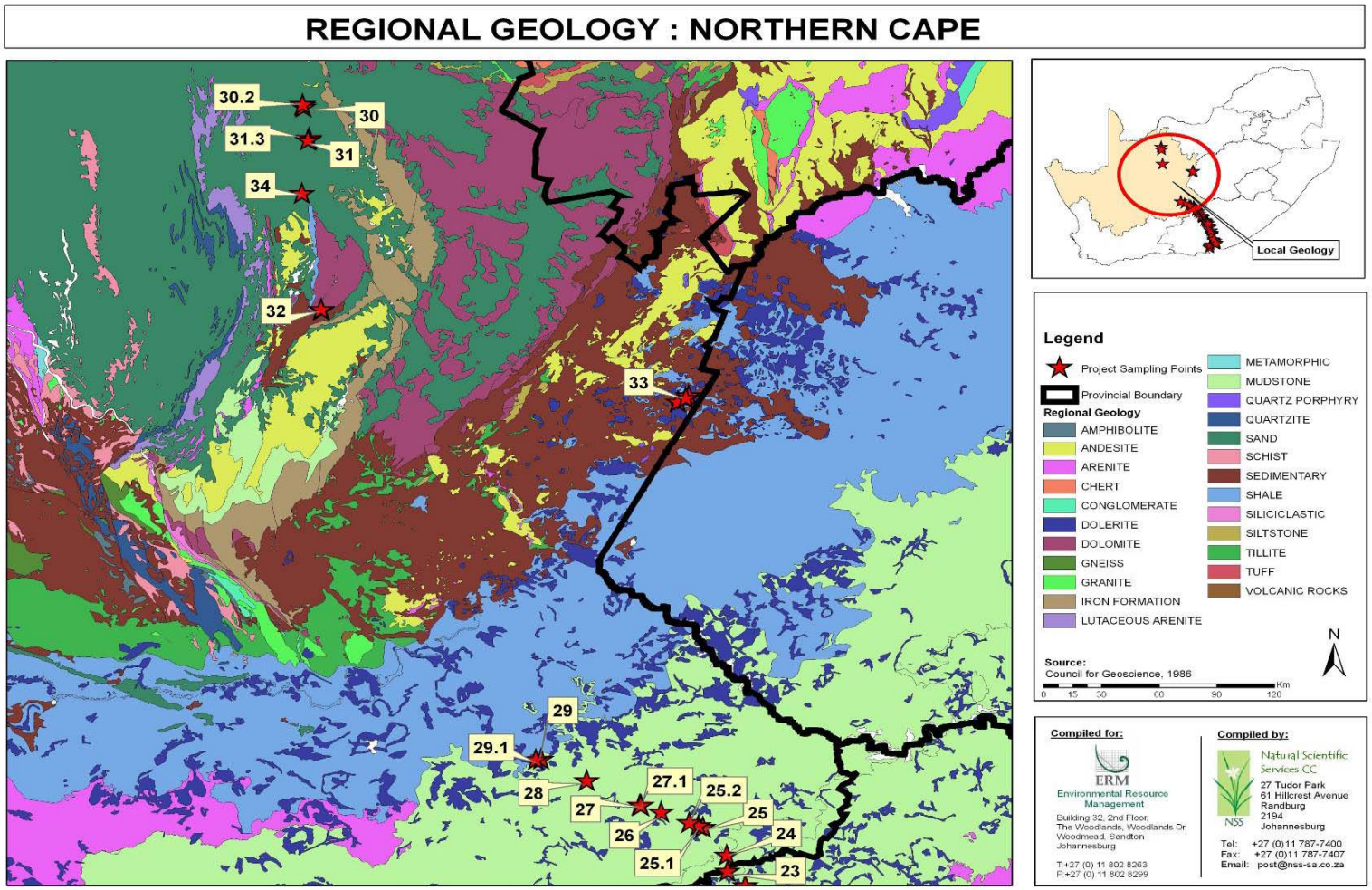
open shrubland. Aeolian sands can be as deep as1.2m and are able to support larger vegetation such as the Kathu Bushveld;

- From the Sishen to Harts River the railway line is primarily underlain by geology of the Transvaal Supergroup, although there is a small section of Quaternary geology of the Kalahari Group immediately east of Postmasberg. The Transvaal Supergroup rocks are comprised of dolomite, limestone, cherts, jaspilite and andesites, whilst the Kalahari Group geology is comprised of Aeolian sands and limestone (*Figure 4.2a*);
- The portion of the line from Harts River to Barkly West is underlain by geology of the Ventersdorp Supergroup, which is comprised of basalts and andesites;
- From Barkly West to De Aar the geology is made up of the Ecca Group Shales which were developed during the Paleozoic period;
- From De Aar to Kommadagga the line is primarily underlain by geology of the Beaufort Group with doleritic intrusions. This geology is comprised of mudstones, sandstones and arenite;
- Between Kommadagga and Paterson , where the line crosses the Suurberg mountain range, the project area is underlain by sedimentary rocks (quartzite and shales) from the Cape Supergroup. Soils are either sandy (developed from quartzite) or acidic clay-loam (developed from shales); and finally
- Between Paterson and Port Elizabeth, the geology is comprised mainly of mudstones and limestones of the Algoa, Uitenhage and Witteberg groups which developed during the Paleozoic period (*Figure 4.2b*). Mudstones result in the development of heavy soils due to the high clay content. These soils are able to support dense vegetation such as the Sundays and Kowie Thicket. As the line moves closer to the coast more shale and sand occurs supporting less dense vegetation such as riverine thicket, thornveld and fynbos.

4.3 TOPOGRAPHY

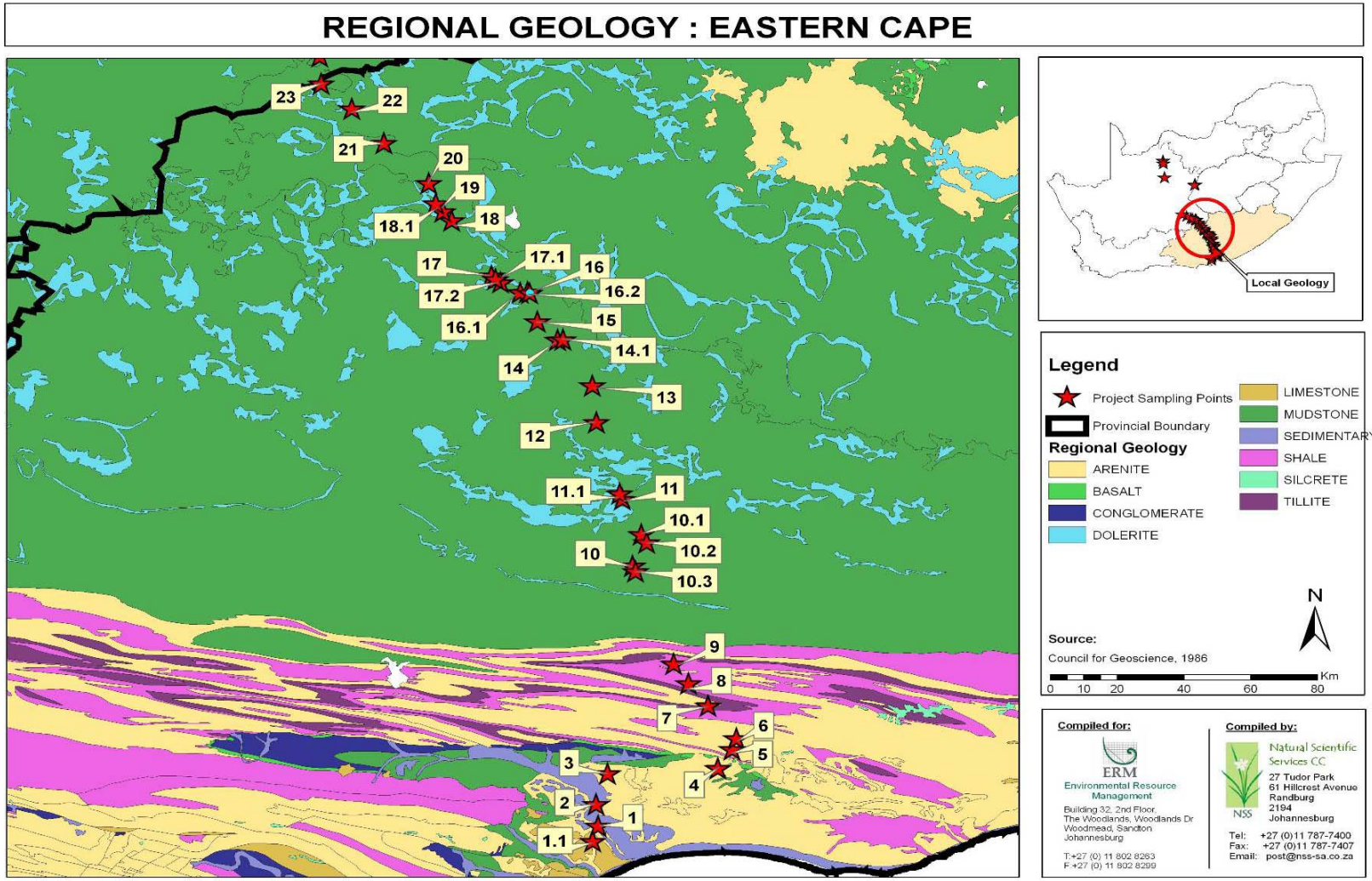
The topography of the project area is largely dominated by the semi arid Karoo basin in the Northern Cape and much of the Eastern Cape, as well as the sub-escarpment and coastal areas of the Eastern Cape. The terrain through which the existing railway line runs is, therefore, predominantly quite flat, with exception of those sections of the line that traverse the Cape Fold mountains and the escarpment north of Patterson and south of Cradock (De Jong, *et al,* 2008).

Figure 4.2a Regional geology of the Northern Cape



Source: Council of Geosciences, 1986

Figure 4.2.2 Regional geology of the Eastern Cape



Source: Council of Geosciences, 1986

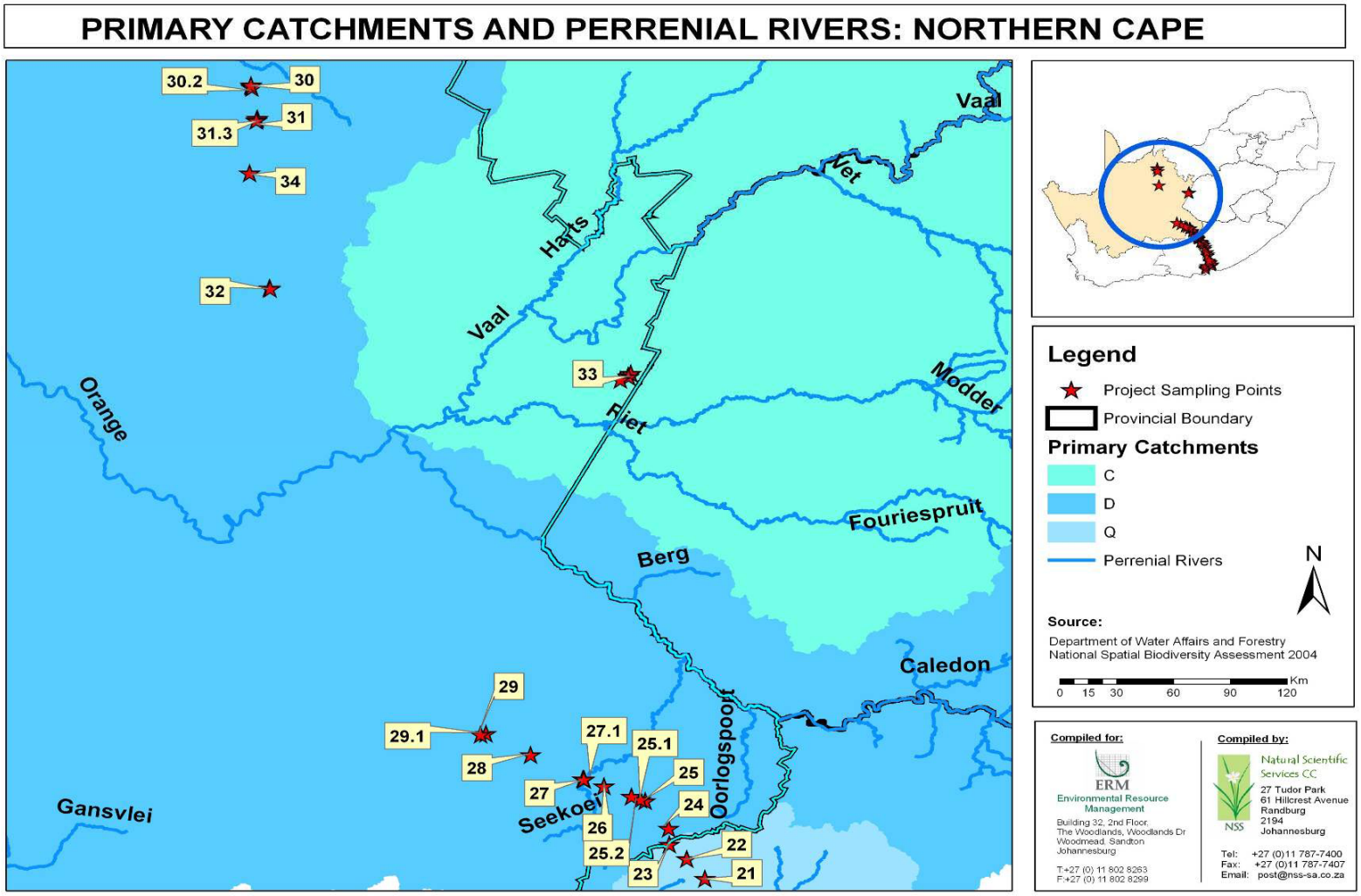
4.4 HYDROLOGY

The existing railway line, along which the proposed upgrades, refurbishments and developments will occur, runs in a southerly direction from Hotazel towards Postmasburg, crossing a number of tributaries of the Ga-mogara River before heading in an easterly direction, crossing the Klein Riet, Steenbok, Harts and Vaal Rivers, before arriving in Kimberley (*Figure 4.4a*). From Kimberley, the railway line runs south south west, crossing the Riet River, the Orange River and the Hondeblafspruit, en-route to De Aar, before crossing the provincial border between the Northern and Eastern Cape near Carlton. From there, the line runs in a south easterly direction towards Cradock before following the Noupoortspruit, the Groot and Klein Brak, Great Fish, Boesmans and Sundays Rivers in a generally southerly direction to the Port of Nqgura and Port Elizabeth (*Figure 4.4b*; De Jong, *et al,* 2008).

Rivers in the Northern Cape exist in a range of impacted conditions from largely natural with few negative impacts, to largely modified with extensive negative impacts (NSBA, 2004). The Orange River and the Vaal River in the Northern Cape are both largely modified and exist in a Critically Endangered condition. Rivers in Eastern Cape are classified as being either moderately modified or largely modified. The conservation status of rivers in the Eastern Cape varies from Endangered to Critically Endangered (NSBA, 2004).

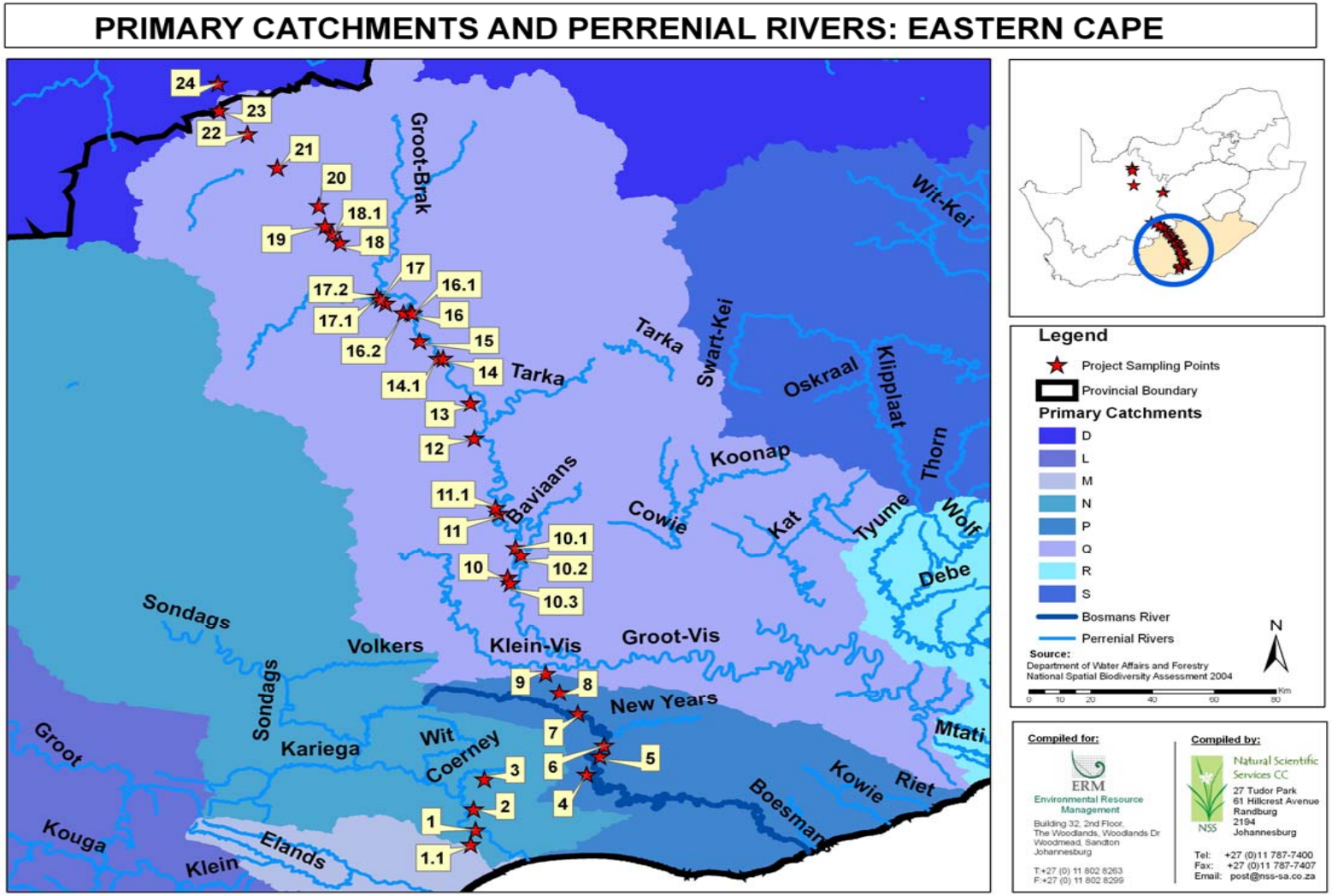
One particular river of concern is the Boesmans River. It is a perennial river which starts in the Cape Fold Mountains and flows into the Southern Eastern Coastal Hinterland (*Figure 4.4b*). This river exists in a largely modified condition and is identified as being critically endangered. According to the National Spatial Biodiversity Assessment (2004) ''*Critically Endangered ecosystems have lost so much of their original natural habitat that ecosystem functioning has broken down and species associated with the ecosystem have been lost or are likely to be lost.*'' Therefore, any remaining natural habitat must be protected and conserved to ensure that species associated with this system are not threatened further. An existing railway line currently runs along the riparian zone of the Boesmans River. It is intended that a new railway loop (Site 6 Tootabi) will run along the existing track. The construction of the proposed new railway loop should be restricted to the current railway reserves to minimize the potential future impact. Precautions will need to be taken to prevent any additional degradation to the already fragile river ecosystem (De Jong, *et al,* 2008).

Figure 4.4a Primary catchments and perennial rivers which occur in the Northern Cape near the railway line.



Source: DWAF 2004

Figure 4.4b Primary catchments and perennial rivers which occur in the Eastern Cape near the railway line



Source: DWAF 2004.

4.5 REGIONAL VEGETATION

As part of the NSBA, a terrestrial assessment was conducted nationally utilising the SANBI vegetation map for South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2004) as the main habitat layer. The main products of this terrestrial component included the status of as well as the protection levels of terrestrial ecosystems (*Figure 4.5g*).

Utilizing the SANBI vegetation map (Mucina & Rutherford, 2006), the study area falls within 13 different vegetation types (*Figure 4.5a - Figure 4.5f*). These are as follows:

4.5.1 Coega Bonteveld

This vegetation type is found on moderately undulating plains, where a mosaic of low thicket (2-3 m) occurs. Furthermore, secondary open grassland occurs over wide stretches. This unit is often restricted to 'islands' in a matrix of typical valley thicket. The species present are a mixture of Fynbos, Grassland and Succulent Karoo elements. Key species within this vegetation type are listed in **Table 4.5.1**. According to the STEP programme, the vegetation type is considered as the Grass Ridge Bonteveld.

Table 4.5.1 Important flora species of the Coega Bonteveld vegetation types

Growth Form	*Coega Bontveld*
Succulent Trees:	**Aloe africana, Aloe ferox.**
Small Trees:	**Schotia afra *var.* afra, Sideroxylon inerme.**
Tall Shrubs:	**Euclea undulata, Carissa bispinosa *subsp.* bispinosa, Dovyalis caffra, Ehretia rigida, Euclea crispa, Gymnosporia capitata.**
Low Shrubs:	**Helichrysum anomala, Jamesbrittenia microphylla, Tephrosia capensis *var.* acutifolia, Acmadenia obtusata, Agathosma capensis, Asparagus falcatus, Asparagus multiflorus, Asparagus striatus, Blepharis capensis.**
Succulent Shrubs:	**Crassula expansa, Ruschia hamata, Aloe arborescens, Carpobrotus edulis, Crassula capitella subsp. capitella, Crassula ericoides, Crassula perforata.**
Semiparasitic Shrub:	**Osyris compressa.**
Woody Succulent Climbers:	**Pelargonium peltatum, Sarcostemma viminale.**
Woody Climbers:	**Asparagus racemosus, Jasminium angulare, Rhoiacarpos capensis, Rhoicissus digitata.**
Herbaceous Climber:	**Kedrostis capensis.**
Graminoids:	**Aristida diffusa, Cynodon dactylon, Cynodon incompletus, Eustachys paspaloides, Heteropogon contortus, Merxmuellera disticha, Panicum maximum, Setaria sphacelata, Stipa dregeana, Themeda triandra.**
Succulent Herbs:	**Mesembryanthemum aitonis.**
Geophytic Herbs:	**Sansevieria hyacinthoides, Bulbine favosa, Bulbine inamarxiae, Moraea pallida, Oxalis smithiana.**
Herbs:	**Aizoon rigidum, Gazania krebsiana, Hypoestes aristata, Indigastrum costatum *subsp.* macrum, Senecio burchelli, Sutera campanulata.**

Source: Mucina & Rutherford (2006)

The following sites within the study area that are found in this vegetation type are (***Figure 4.5a***)*:*

- Site 1.1 Borrow pit Barkley Bridge

4.5.2 Sundays Thicket

This vegetation type is located on undulating plains and low mountains and foothills covered with tall, dense thicket, where trees, shrubs and succulents are common, with many spinescent species. The local dominance of *Portulacaria afra* increases and the relative abundance of woody species present decreases with increasing aridity. According to Mucina & Rutherford (2006) there is considerable structural heterogeneity within this vegetation unit. Key species within this vegetation type are listed in **Table 4.5.2**.

According to the STEP programme, this vegetation type is considered as the Sundays Spekboom Thicket.

Table 4.5.2 Important flora species of the Sundays Thicket vegetation type

Vegetation Type	*Sundays Thicket*
Succulent Trees:	**Aloe africana.**
Small Trees:	**Pappea capensis, Schotia afra *var.* afra.**
Tall Shrubs:	**Euclea undulata, Olea europaea *subsp.* africana.**
Low Shrubs:	**Pentzia globosa.**
Succulent Shrubs:	**Crassula ovata, Euphorbia caerulens, Euphorbia ledienii, Portulacaria afra.**
Woody Succulent Climbers:	**Pelargonium peltatum.**
Graminoids:	**Aristida adscensionis, Aristida congesta, Cynodon dactylon, Cynodon incompletus, Eragrostis obtusa, Panicum maximum, Tragus berteronianus.**
Succulent Herbs:	**Senecio radicans.**
Geophytic Herbs:	**Bulbine frutescens, Drimia intricata, Sanseviera hyacinthoides.**
Source: Mucina & Rutherford (2006)	

The following sites within the study area that are found in this vegetation type are (***Figure 4.5a)**:*

- Site 1 Barkley Bridge
- Site 3 Coerney

4.5.3 Kowie Thicket

This vegetation type is found. Key species within this vegetation type are listed in **Table 4.5.**.

According to the STEP programme, there are two municipal level vegetation types within the Kowie Thicket. These are the Shamwari Grass Thicket and the Salem Karroid Thicket.

Table 4.5.3 Important flora species of the Kowie Thicket vegetation type

Vegetation Type	**Kowie Thicket**
Succulent Trees:	*Euphorbia grandidens, E. Tetragona, E. Triangularis.*
Small Trees:	*Schotia afra* var. *afra.*
Tall Shrubs:	*Azima tetracantha, Croton rivularis, Gymnosporia polyacantha, Scutia myrtina.*
Low Shrubs:	*Asparagus striatus, Chrysocoma ciliata, Galenia secunda.*
Succulent Shrubs:	*Aloe arborascens, Crassula cultrata, Portulacaria afra.*
Woody Succulent Climbers:	*Pelargonium peltatum, Sarcostemma viminal.e*
Woody Climbers	*Capparis sepiaria var. citrifolia, Plumbago auriculata.*
Herbaceous Climbers	*Acharia tragodes, Cynanchum ellipticum.*
Graminoids:	*Cynodon dactylon, C. incompletus, Cyperus albostriatus, Ehrharta erecta, Eragrostis curvula, Karroochloa curva, Panicum deustum, Setaria sphacelata, Sporobolus fimbriatus, Themeda triandra.*
Herbs	*Achyranthes aspera, Commelina benghalensis, Hypoestes*

Vegetation Type	Kowie Thicket
	aristata, Leidesia procumbens.
Succulent Herbs:	*Plectranthus grandidentatus.*
Geophytic Herbs:	*Sansevieria aethiopicus, S. Hyacinthoides.*
Source: Mucina & Rutherford (2006)	

The following sites within the study area that are found in this vegetation type are (***Figure 4.5a)**:*

- Site 4 Verby
- Site 5 Eagle's Crag
- Site 6 Tootabi

4.5.4 Albany Broken Veld

This vegetation type consists of low mountain ridges and hills with an open grassy karroid dwarf shrubland with scattered low trees (*Boscia oleoides, Euclea undulata, Pappea capensis, Schotia afra* var. *afra*) with a matrix of dwarf shrubs (*Becium burchellianum, Chrysocoma ciliata*) and grasses (*Eragrostis obtusa*). Key species within this vegetation type are listed in **Table 4.5.4**.

According to the STEP programme, there are two municipal level vegetation types within the Kowie Thicket. These are the Saltaire Karroid Thicket and the Eastern Lower Karoo.

Table 4.5.4 Important flora species of the Albany Broken Veld vegetation type

Vegetation Type	*Albany Broken Veld*
Small Trees:	**Acacia natalitia, Euclea undulata, Pappea capensis, Schotia afra *var.* afra.**
Low Shrubs:	**Asparagus striatus, Asparagus suaveolens, Becium burchellianum, Chrysocoma ciliata, Selago fruticosa.**
Graminoids:	**Aristida congesta, Eragrostis obtusa, Sporobolus fimbriatus, Tragus berteronianus.**

The following sites within the study area that are found in this vegetation type are (***Figure 4.5a*** and ***Figure 4.5b)**:*

- Site 7 Blinkhof.
- Site 8 Saltaire
- Site 9 Kommadagga
- Site 10 Golden Valley
- Site 10.3 Golden Valley possible borrow pit

4.5.5 Albany Alluvial Vegetation

Two major types of vegetation pattern are observed in these zones, namely riverine thicket and thornveld (*Acacia natalitia*). The riverine thicket tends to occur in the narrow floodplain zones in regions close to the coast or further inland, whereas the thornveld occurs on the wide floodplains further inland. Key species within this vegetation type are listed in **Table 4.5.5**.

According to the STEP programme, this is known as the Sundays Doring Veld.

Table 4.5.5 Important flora species of the Albany Alluvial vegetation type

Vegetation Type	*Albany Alluvial Vegetation*
Riparian thickets *Small Trees:*	**Acacia natalitia, Salix mucronata *subsp.* mucronata, Schotia afra *var.* afra.**
Riparian Thickets *Low Shrub:*	**Pentzia incana.**
Riparian Thickets *Graminoids:*	**Sporobolus nitens.**
Reed beds *Megagraminoids:*	**Cyperus papyrus, Phragmites australis.**
Flooded grasslands & herblands *Graminoid:*	**Cynodon dactylon**

The following sites within the study area that are found in this vegetation type are (***Figure 4.5a***)*:*

- Site 2: Addo.

4.5.6 Great Fish Thicket

Steep slopes of deeply dissected rivers supporting short, medium and tall thicket types where both the woody trees and shrubs and the succulent component are well developed, with many spinescent shrubs. *Portulacaria afra* is locally dominant, decreasing in relative abundance and is replaced by *Euphorbia bothae* with increasing aridity.

The closed canopy of the *Portulacaria afra* – dominated thicket is another distinctive feature of parts of the Great Fish Thicket. Key species within this vegetation type are listed in **Table 4.5.6**.

According to the STEP programme, this is known as the Fish Spekboom Thicket.

Table 4.5.6 Important flora species of the Great Fish Thicket vegetation type

Vegetation Type	*Great Fish Thicket*
Succulent Tree:	**Euphorbia triangularis.**
Small Tree:	**Pappea capensis.**
Tall Shrub:	**Euclea undulata.**
Low Shrubs:	**Asparagus striatus, Chaetacanthus setiger, Chrysocoma ciliata.**
Succulent Shrubs:	**Crassula cordata, Crassula ovata, Portulacaria afra.**
Graminoids:	**Aristida congesta, Cynodon incompletus, Digitaria eriantha, Ehrharta erecta, Eragrostis obtusa, Panicum deustum, Panicum maximum, Panicum stapfianum, Setaria sphacelata, Sporobolus fimbriatus, Sporobolus nitens, Themeda triandra, Tragus berteronianus, Tragus koelerioides.**
Herbs:	**Cyanotis speciosa, Hypoestes aristata, Salvia scabra.**
Succulent Herb:	**Crassula expansa.**
Geophytic Herb:	**Sansevieria hyacinthoides.**

The following sites within the study area that are found in this vegetation type are (***Figure 4.5b)**:*

- Site 10.1 Road borrow pit near Cookhouse
- Site 10.2 Cookhouse possible borrow pit.

4.5.7 Southern Karoo River

This vegetation type contains narrow riverine flats supporting a complex of *Acacia karroo* or *Tamarix usneoides* thickets (up to 5 m tall), and fringed by tall *Salsola* – dominated shrubland (up to 1.5 m high). In sandy drainage lines *Stipagrostis namaquensis* may occasionally also dominate. Key species within this vegetation type are listed in **Table 4.5.7.**

According to the STEP programme, this is known as the Southern Karoo Alluvia.

Table 4.5.7 Important flora species of the Southern Karoo River vegetation type

Vegetation Type	*Southern Karoo Riviere*
***Riparian Thickets** Small Trees:*	**Acacia karroo, Rhus lancea.**
***Riparian Thickets** Tall Shrubs:*	**Diospyros lycioides, Tamarix usneoides.**
***Riparian Thickets** Succulent Shrub:*	**Lycium cinereum.**
Rocky slopes of river canals *Graminoids:*	**Stipagrostis namaquensis.**
Alluvial shrublands & herblands *Succulent Shrubs:*	**Malephora uitenhagensis, Salsola aphylla, Salsola arborea.**
Alluvial shrublands & herblands *Graminoid:*	**Cynodon incompletus.**
***Reed beds** Megagraminoid:*	**Phragmites australis**

The following sites within the study area that are found in this vegetation type are (***Figure 4.5b)**:*

- Site 11 Klipfontein
- Site 11.1 Cutting as borrow pit

- Site 12 Mortimer.
- Site 14 Marlow New Borrow Pit

4.5.8 Eastern Upper Karoo

This vegetation type consists mainly of gently sloping plains (interspersed with hills and rocky areas of Upper Karoo Hardeveld in the west, besemkaree Koppies Shrubland in the northeast and Tarkastad Montane Shrubland in the southeast). It is dominated by dwarf microphyllous shrubs, with 'white' grasses of the genera *Aristida* and *Eragrostis*. The grass cover increases along a gradient from southwest to northeast. Key species within this vegetation type are listed in **Table 4.5.8**.

Table 4.5.8 Important flora species of the Eastern Upper Karoo vegetation type

Vegetation Type	*Eastern Upper Karoo*
Tall Shrub:	**Lycium cinereum.**
Low Shrubs:	**Chrysocoma ciliata, Eriocephalus ericoides *subsp.* ericoides, Eriocephalus spinescens, Pentzia globosa, Pentzia incana, Phymaspermum parvifolium, Salsola calluna.**
Geophytic Herb:	**Moraea pallida.**
Graminoids:	**Aristida congesta, Aristida diffusa, Cynodon incompletus, Eragrostis bergiana, Eragrostis bicolor, Eragrostis lehmanniana, Eragrostis obtusa, Sporobolus fimbriatus, Stipagrostis ciliata, Tragus koelerioides.**

The following sites within the study area that are found in this vegetation type are (***Figure 4.5b*** ; ***Figure 4.5c*** and ***Figure 4.5d)***:

- Site 13 Halesowen
- Site 15 Kaptein
- Site 16 Knutsford
- Site 16.1 Borrow pit
- Site 16.2 Knutsford Borrow material.
- Site 17 Visrivier
- Site 17.1 Visrivier Collett se quarry
- Site 17.2 Visrivier possible borrow pit (existing)
- Site 18 Conway
- Site 18.1 Conway possible burrow pit
- Site 19 Glenheath
- Site 20 Tafelberg
- Site 21 Rosmead
- Site 23 Carlton
- Site 24 Barredeel.
- 25 Wildfontein
- Site 25.1 Borrow pit near Wildfontein
- Site 26 Linde
- Site 27 Hanover Road
- Site 27.2 Existing borrow pit

4.5.9 Tarkastad Montane Shrubland

This vegetation type consists mainly of ridges, hills and isolated mountain slopes, characterized by high surface rock cover, this often consisting of large, round boulders. The vegetation is low, semi – open mixed shrubland with 'white' grasses and dwarf shrubs forming a prominent component of the vegetation (Mucina & Rutherford 2006). Key species within this vegetation type are listed in **Table 4.5.9**.

According to the STEP programme, this is known as the Drakensberg Montane Shrubland.

Table 4.5.9 Important flora species of the Tarkastad Montane Shrubland vegetation type

Vegetation Type	*Tarkastad Montane Shrubland*
Succulent Tree:	**Aloe ferox.**
Tall Shrub:	**Diospyros austro – africana.**
Low Shrub:	**Euryops annae.**
Graminoids:	**Aristida adscensionis, Aristida congesta, Aristida diffusa, Cynodon incompletus, Enneapogon scoparius, Eragrostis chloromelas, Eragrostis lehmanniana, Eragrostis obtusa, Heteropogon contortus, Tragus berteronianus, Tragus koelerioides.**

The following sites within the study area that are found in this vegetation type are (***Figure 4.5b*** and ***Figure 4.5c)***:

- Site 14 Marlow
- Site 16.1 Borrow Pit
- Site 22 Flonker

4.5.10 Northern Upper Karoo

This vegetation type consists of shrubland dominated by dwarf karoo shrubs, grasses, and *Acacia mellifera* subsp. *detinens*. It is flat to gently sloping, with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the northeast . Furthermore it is interspersed with a number of pans. Key species within this vegetation type are listed in **Table 4.5.10**.

Table 4.5.10 Important flora species of the Northern Upper Karoo vegetation type

Vegetation Type	*Northern Upper Karoo*
Tall Shrub:	**Lycium cinereum.**
Low Shrub:	**Chrysocoma ciliata, Gnidia polycephala, Pentzia calcarea, Pentzia globosa, Pentzia incana, Pentzia spinescens, Rosenia humilis.**
Semiparasitic Shrub:	**Thesium hystrix.**
Graminoids:	**Aristida adscensionis, Aristida congesta, Aristida diffusa, Enneapogon desvauxii, Eragrostis lehmanniana, Eragrostis obtusa, Eragrostis truncata, Sporobolus fimbriatus, Stipagrostis obtusa.**

The following sites within the study area that are found in this vegetation type are (***Figure 4.5d)***:

- Site 28 Burgervilleweg
- Site 29 Bletterman
- Site 29.1 Road borrow pit.

4.5.11 Kimberley Thornveld

This vegetation type consists of often slightly irregular plains with a well – developed tree layer consisting of A*cacia erioloba, Acacia tortilis, Acacia karroo,* and *Boscia albitrunca* . It also has a well – developed shrub layer with occasional dense stands of *Tarchonanthus camphorates* and *Acacia mellifera*. Key species within this vegetation type are listed in **Table 4.5.1**.

Table 4.5.1 Important flora species of the Kimberley Thornveld vegetation type

Vegetation Type	*Kimberley Thornveld*
Tall Tree:	**Acacia erioloba.**
Small Trees:	**Acacia karroo, Acacia mellifera *subsp.* detinens, Acacia tortilis *subsp.* heteracantha.**
Tall Shrub:	**Tarchonanthus camphoratus.**
Low Shrub:	**Acacia hebeclada *subsp.* hebeclada.**
Graminoid:	**Eragrostis lehmanniana.**

The following sites within the study area that are found in this vegetation type are (***Figure 4.5e)***:

- Site 33 Ronaldsvlei & Beaconsfield

4.5.12 Kuruman Thornveld

This vegetation type is flat rocky plains with some sloping hills with a very well – developed, closed shrub layer and well – developed open tree stratum consisting of *Acacia erioloba*. Key species within this vegetation type are listed in **Table 4.5.2**.

Table 4.5.2 Important flora species of the Kuruman Thornveld vegetation type

Vegetation Type	*Kuruman Thornveld*
Tall Tree:	**Acacia erioloba.**
Small Trees:	**Acacia mellifera *subsp.* detinens, Boscia albitrunca.**
Tall Shrubs:	**Grewia flava, Lycium hirsutum, Tarchonanthus camphoratus.**
Low Shrubs:	**Acacia hebeclada *subsp.* hebeclada, Monechma divaricatum.**
Graminoids:	**Aristida meridionalis, Aristida stipitata *subsp.* stipitata, Eragrostis lehmanniana.**

The following sites within the study area that are found in this vegetation type are (*Error! Reference source not found.**5f**)*:

- Site 32 Postmasburg yard (including PMG Electrifying line)

4.5.13 Kathu Bushveld

According to Mucina & Rutherford (2006), this vegetation type consists of a medium – tall tree layer with *Acacia erioloba* in places but mostly open and

including *Boscia albitrunca* as the prominent trees. The shrub layer consists of species such as *Acacia mellifera*, *Diospyros lycioides* and *Lycium hirsutum*.

Key species within this vegetation type are listed in **Table 4.5.3.**

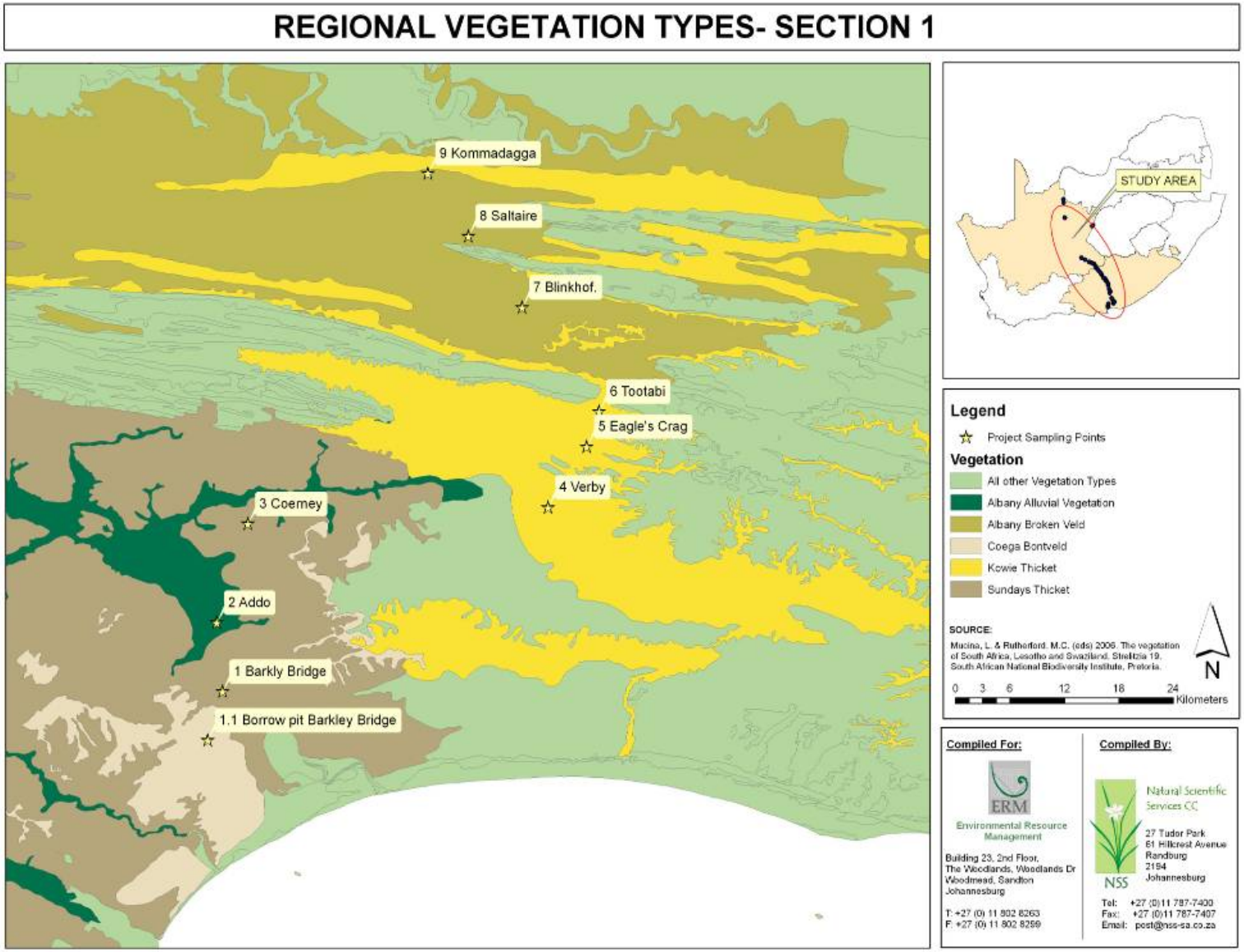
Table 4.5.3 Important flora species of the Kathu Bushveld vegetation type

Vegetation Type	*Kathu Thornveld*
Tall Tree:	**Acacia erioloba.**
Small Trees:	**Acacia mellifera *subsp.* detinens, Boscia albitrunca.**
Tall Shrubs:	**Diospyros lycioides *subsp.* lycioides**
Graminoids:	**Aristida meridionalis, Brachiaria nigropedata, Centropodia glauca, Eragrostis lehmanniana, Schmidtia pappoophoroides, Stipagrostis ciliata.**

The following sites within the study area that are found in this vegetation type are (*Error! Reference source not found.**5f**):*

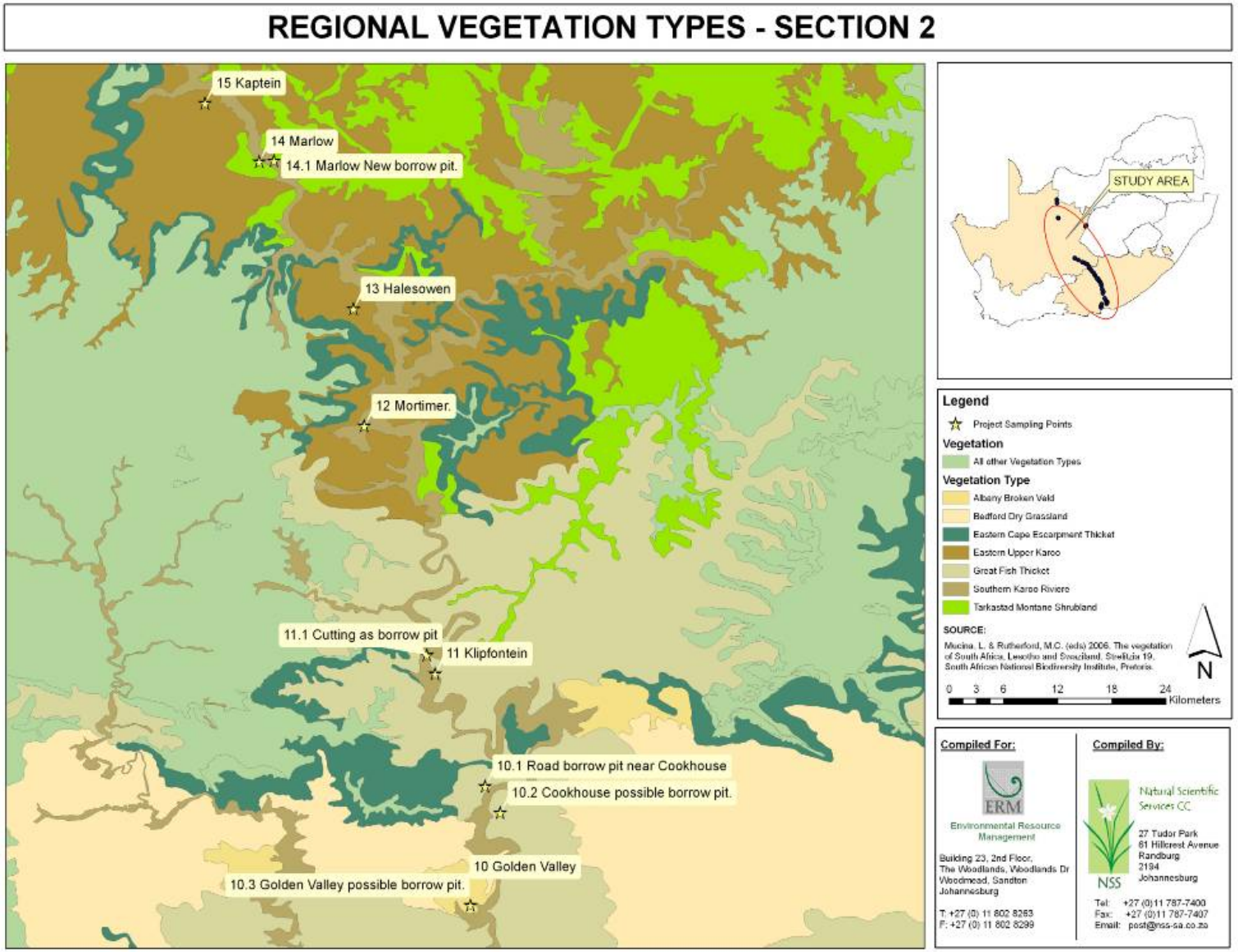
- Site 30 Hotazel
- Site 30.2 HZL Tie in of triangle.
- Site 31 Mamathwane yard
- Site 31.3 Middelplaats take off
- Site 34 Emil Substation

Figure 4.5a Regional Vegetation within and Surrounding the Study Area – Section 1



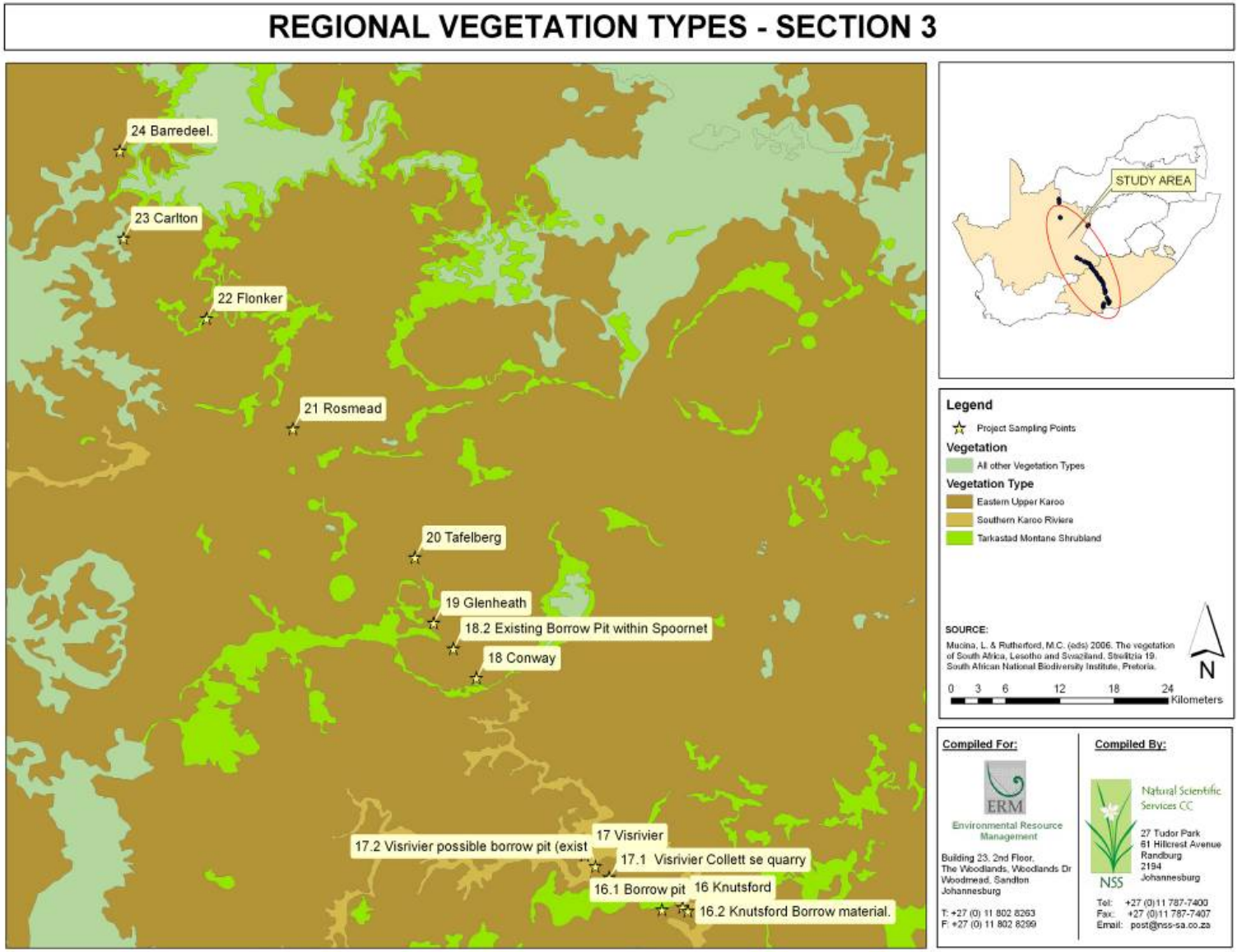
Source: Mucina & Rutherford (2006)

Figure 4.5b Regional Vegetation within and Surrounding the Study Area – Section 2



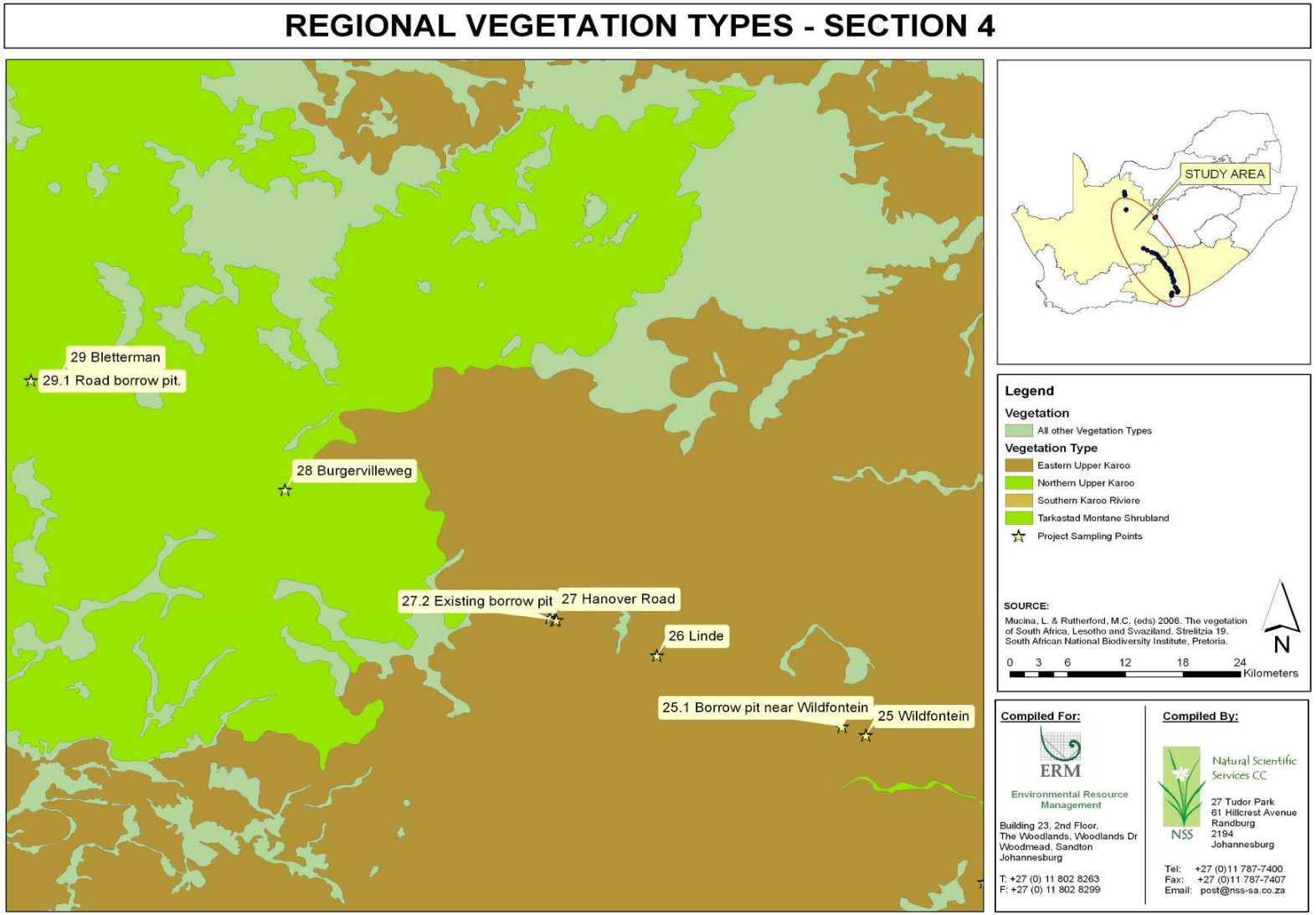
Source: Mucina & Rutherford (2006)

Figure 4.5c *Regional Vegetation within and Surrounding the Study Area – Section 3*



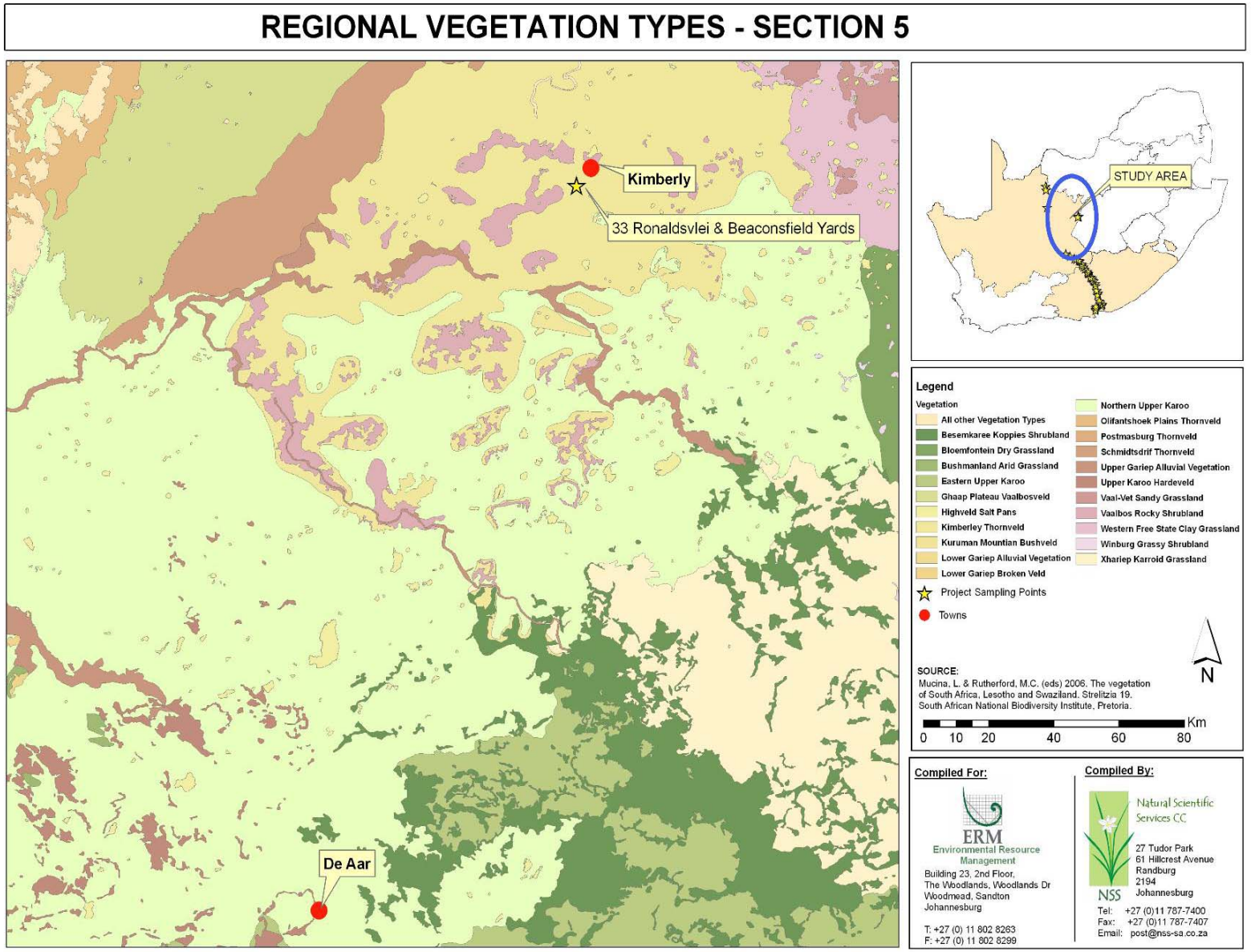
Source: Mucina & Rutherford (2006)

Figure 4.5d *Regional Vegetation within and Surrounding the Study Area – Section 4*



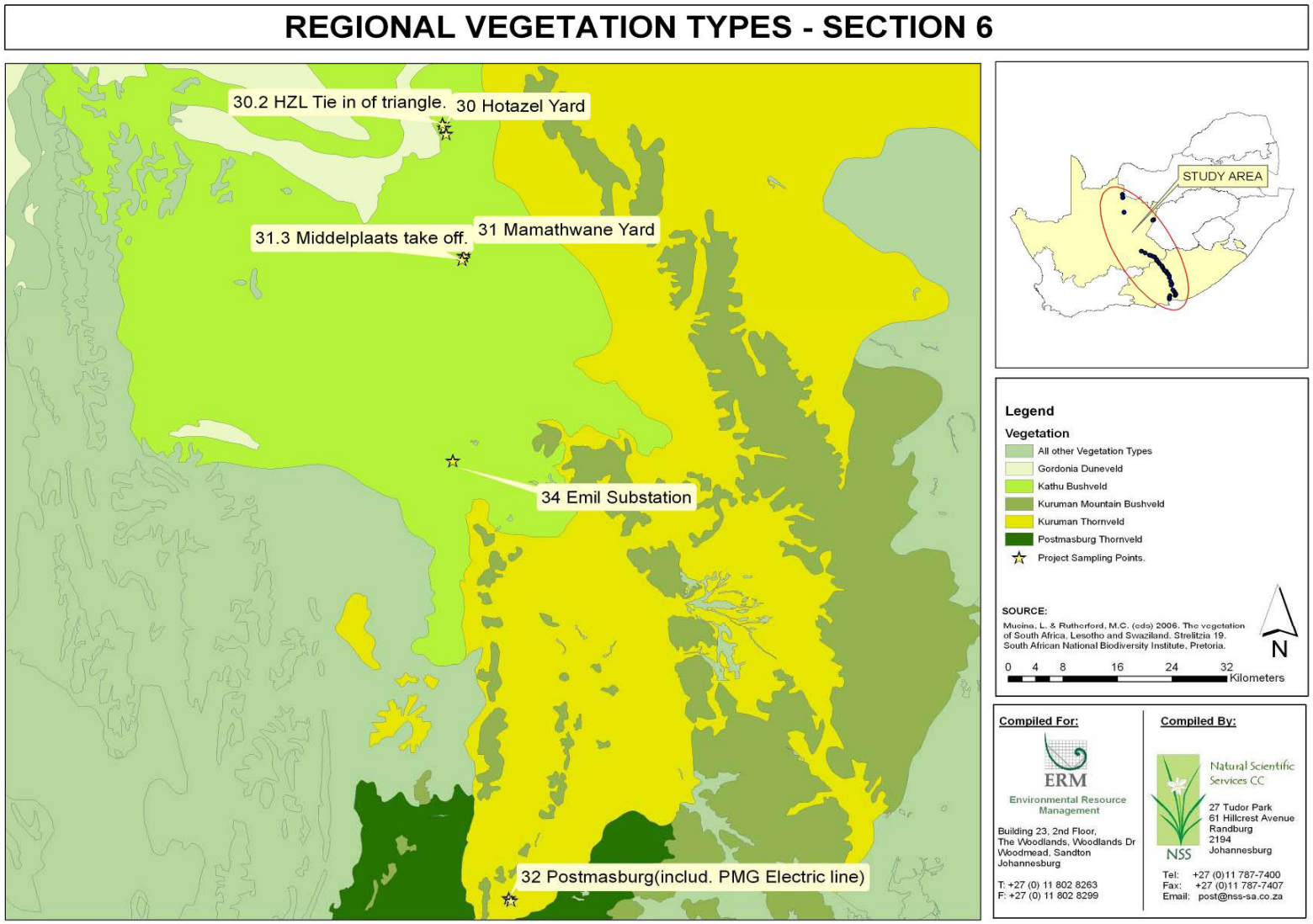
Source: Mucina & Rutherford (2006)

Figure 4.5e *Regional Vegetation within and Surrounding the Study Area – Section 5*



Source: Mucina & Rutherford (2006)

Figure 4.5f *Regional Vegetation within and Surrounding the Study Area – Section 6*



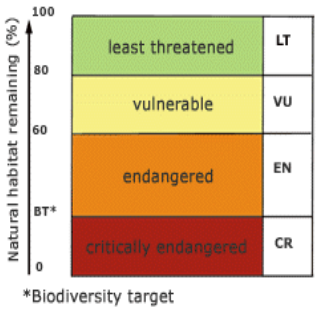
Source: Mucina & Rutherford (2006)

4.6 VEGETATION CONSERVATION STATUS

4.6.1 National Level

Ecosystem status is based on how much of an ecosystem's original area remains intact, relative to three different thresholds based on best available science (***Figure 4.6.1***) (Driver *et al*, 2005). Note that the threshold beyond which an ecosystem becomes critically endangered varies from 16% to 36%, depending on the ecosystem. The more species-rich the ecosystem, the higher the threshold. This threshold is also known as the biodiversity target. It represents the proportion of each ecosystem one would ideally like to see included in a formal protected area.

Figure 4.6.1 NSBA Terrestrial Ecosystem Status



Source: Driver *et al* (2005)

According to Mucina and Rutherford (2006) and the terrestrial component of the NSBA (Driver *et al*, 2005), the ecosystem status at a national level for each of the vegetation sites relevant to the study area are listed in **Table 4.** below.

Table 4.6.1 Vegetation Types, their Ecosystem Status and Potential Threats

Vegetation Type	Ecosystem Status	Conservation Target	Threats
Coega Bushveld	***LT***	***19%***	***Cultivation and urbanization.***
Sundays Thicket	***LT***	***19%***	***Cultivation , urbanization and grazing by livestock***
Kowie Thicket	***LT***	***19%***	***Mainly Cultivation***
Albany Broken Veld	***LT***	***16%***	***Mainly Cultivation***
Albany Alluvial Vegetation	***EN***	***31%***	***Cultivation, urban development, road building and plantations***
Great Fish Thicket	***LT***	***19%***	***Cultivation and urbanization.***
Southern Karoo River	***LT***	***24%***	***Cultivation and building of dams, Frequent disturbance (floods, concentrated grazing pressure), and associated input of nutrients, increase vulnerability to invasion of alien woody species***
Eastern Upper Karoo	***LT***	***21%***	***Cultivation and building of dams***
Tarkastad Montane Shrubland	***LT***	***28%***	***Cultivation and building of dams***
Northern Upper Karoo	***LT***	***21%***	***Cultivation, building of dams, human settlements and Alien invasion***
Kimberley Thornveld	***LT***	***16%***	***Cultivation***
Kuruman Thornveld	***LT***	***16%***	***Grazing***
Kathu Bushveld	***LT***	***16%***	***Grazing, Mining***

Source: Mucina & Rutherford (2006)

- LT = Least Threatened; EN= Endangered

The Albany Alluvial Vegetation is the only vegetation type on a national level that is considered threatened and has an Ecosystem Status of Endangered (***Figure 4.6.1a***). The Addo passing loop (Site 2) falls within this vegetation type. The target for conservation is 31%. According to Mucina and Rutherford (2004) about 6% is statutorily conserved in the Greater Addo Elephant National Park, Baviaanskloof Wilderness Area, Loerie Dam, Springs, Swartkops Valley and Yellowwoods Nature Reserves and the Double Drift Reserve Complex. About 2% is protected in eight private conservation areas.

Furthermore according to the NSBA (Driver *et al,* 2005) nine of the sites towards the south fall within the Priority Area[1]: *Albany Thicket and Wild Coast* (***Figure 4.6.1b***). Out of the 9 national Priority Areas, the Albany Thicket is ranked 6th in terms of future pressures on biodiversity.

(1) [1] The **NSBA derived 9 priority areas within South Africa based on the systematic analysis of species, ecosystem and ecological processes. Areas with high scores were groups according to topography, and biome boundaries**

4.6.2 Provincial/Municipal Level

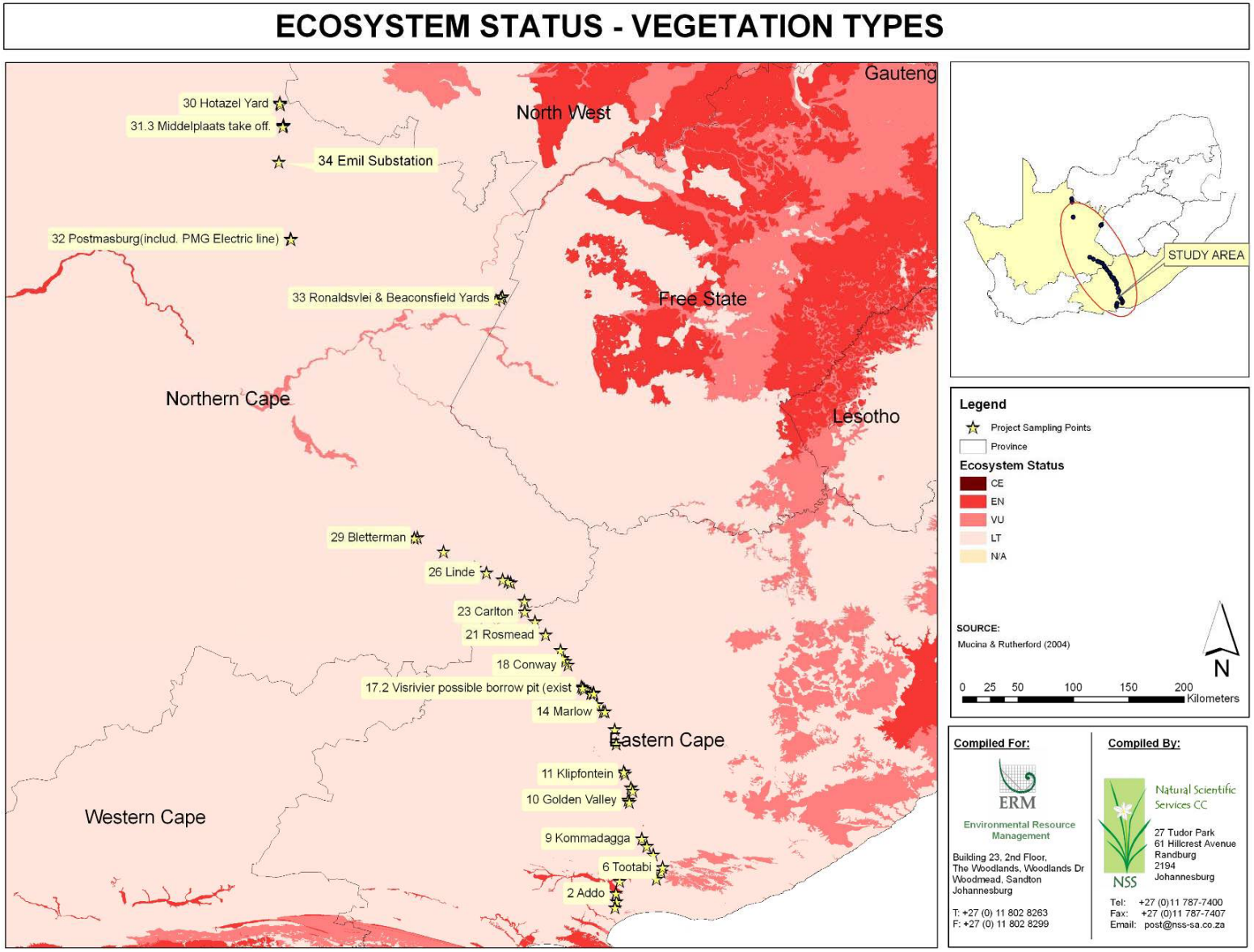
At a Provincial / Municipal level, there is only one programme that has highlighted the conservation status of vegetation or habitats types. This programme is based in the Eastern Cape and is known as the STEP programme. According to Pierce & Mader (2006), it identifies a number of threatened habitats. These include:

- *Sundays Spekboom Thicket*
    - Sites 1: Barkly Bridge
    - Site 3: Coerney
- *Sundays Doring Veld*
    - Site 2: Addo
- *Fish Spekboom Thicket*
    - Site 10.1: Road borrow pit near Cookhouse
    - Site 10.2: Cookhouse possible borrow pit

These habitats above are recognised as Vulnerable (***Figure 4.6.2***). They are ecosystems that cover much of their original extent but where further disturbance or destruction could harm their health or functioning. These ecosystems can withstand only limited loss of natural area through disturbance or development.

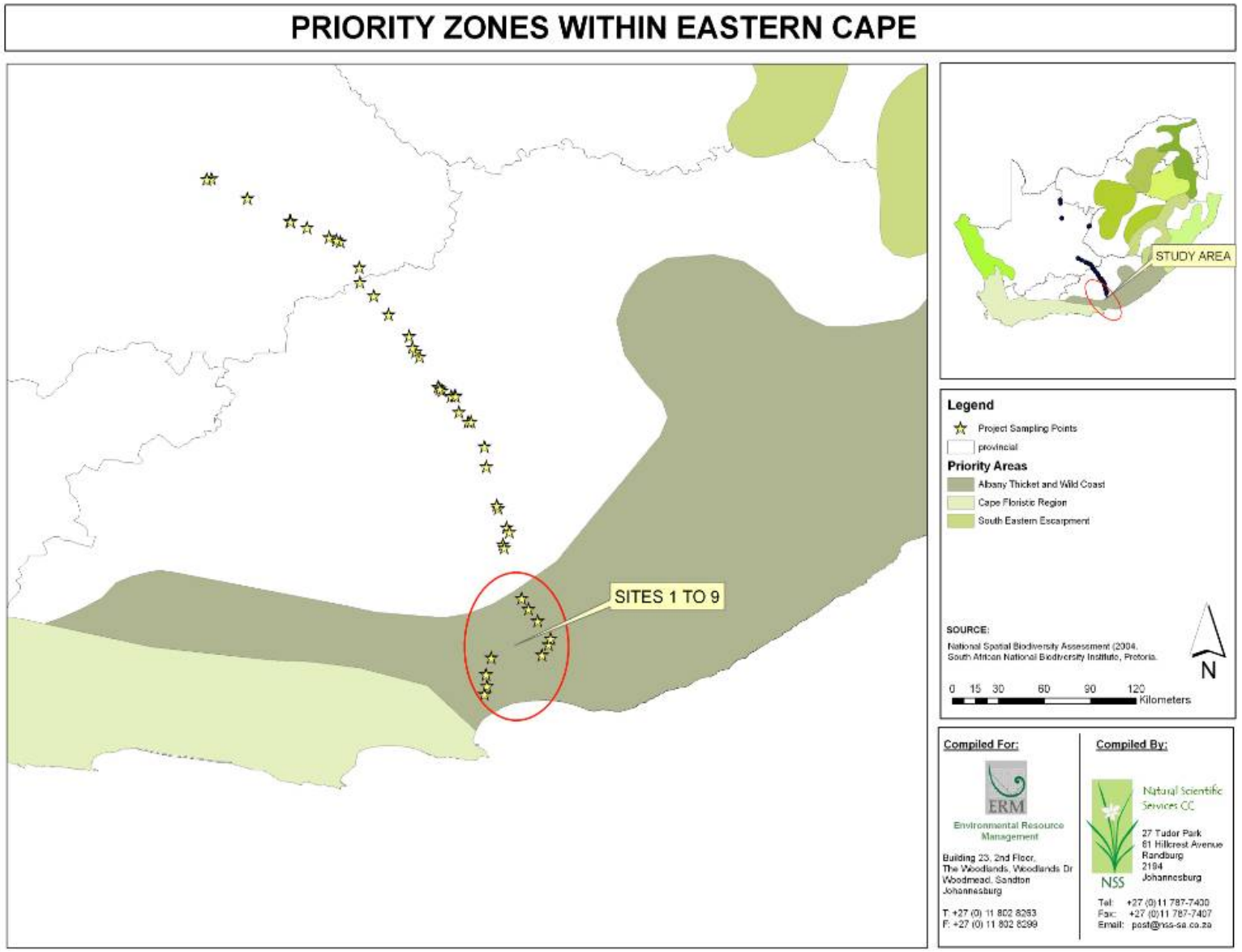
At the time of the compilation of this report no programmes for the Northern Cape section of the study area were available.

Figure 4.6.1a Ecosystem Status within and Surrounding the Study Area



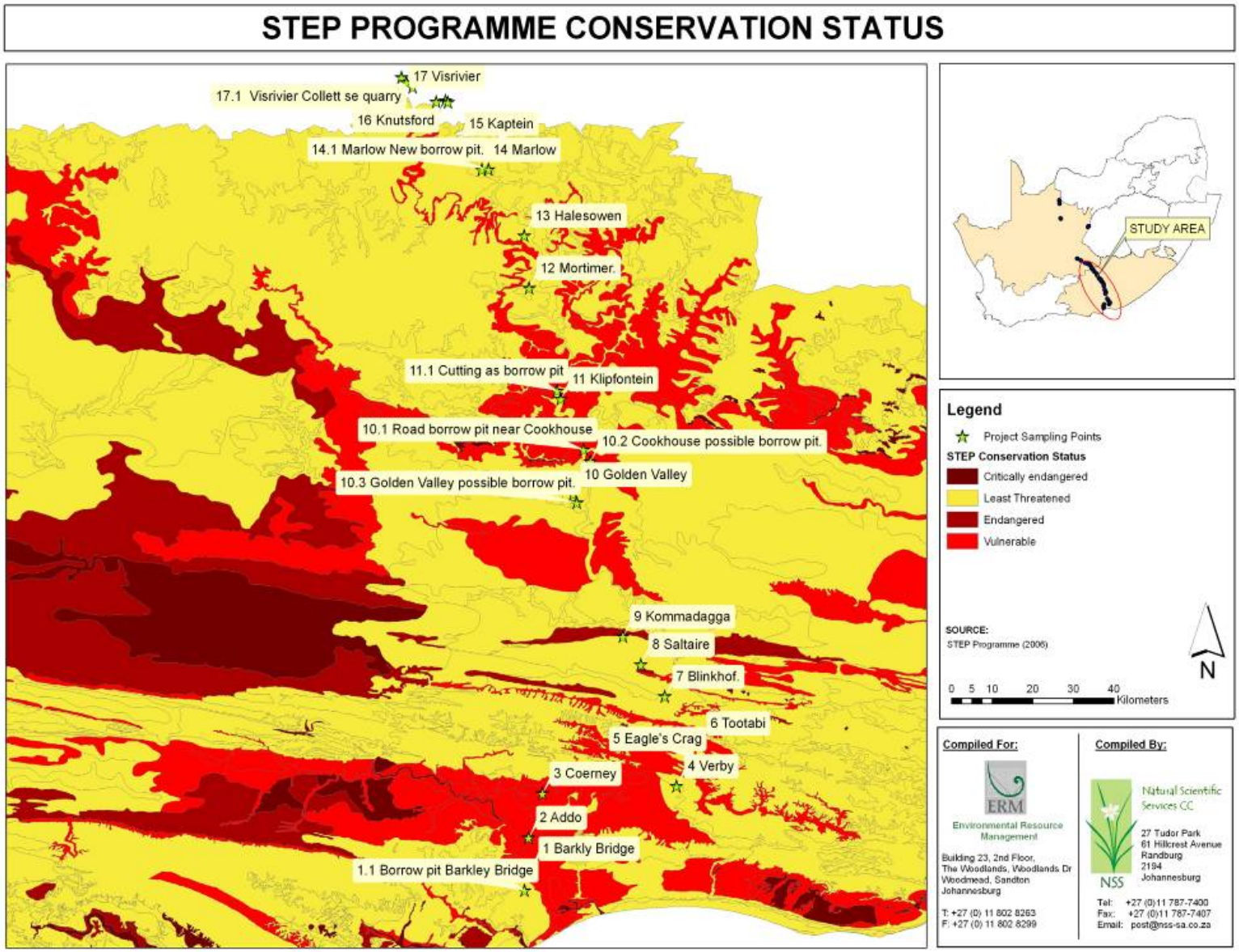
Source: Mucina & Rutherford (2006)

Figure 4.6.1b Priority Zones within and Surrounding the Study Area



Source: Driver *et al* (2005)

Figure 4.6.2 Ecosystem Status for a number of the Eastern Cape Sites at a Provincial/ Municipal Level



Source: Pierce & Mader (2006)

5 DESCRIPTION OF THE AFFECTED ENVIRONMENT – SITE SPECIFIC INFORMATION

5.1 1. BARKLY BRIDGE

5.1.1 Flora

The site was confined to the Sondagsrivier Valley and corresponded to soils that were derived from alluvial (Quaternary) deposits such as sand and limestone. Structurally, the vegetation was reminiscent of disturbed thicket comprising of decumbent, sprawling forbs and Asteraceous shrub with a well-developed graminoid layer. However, the grassy layer was poor in species richness, and was dominated by *Panicum schinzii*. The woody layer was represented by short, spinescent shrubby taxa. Exotics were represented by localised groves of tall *Eucalyptus camaldulensis* (Invader: Category 2). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Portulacaria afra (d), *Lycium cinereum* (d), *Acacia natalitia, Cynanchum ellipticum*	*Lampranthus productus* (d), *Albuca cf. setosa*, *Asparagus capensis, Malephora sp., Drosanthemum hispidum, Senecio linifolius, Pseudognaphalium undulatum*	*Panicum schinzii* (d), *Cynodon dactylon, Melinis repens, Stipa dregeana*
Taxa of Conservation interest:	Mesembryanthemaceae (*Delosperma sp., Drosanthemum hispidum, Malephora sp.*) - PP	
Ecological importance:	Low – disturbed with early-successional composition * Although the site has a Low Ecological Importance it does fall within the Sundays Spekboom Thicket, which is a threatened habitat.	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.1.2 Fauna

Within the vicinity of the proposed loop expansion site there were citrus plantations, dwellings and open disturbed fields. These existing disturbances in the area are likely factors contributing to the limited faunal activity. Nineteen bird species, including Burchell's Coucal (*Centropus burchellii*), Karoo Prinia (*Prinia maculosa*) and Red-headed Finch (*Amadina erythrocephala*), were

observed at the site. For a complete list of bird species refer to Appendix A. Evidence of the presence of Small Grey Mongoose (*Galerella pulverolenta*) was also observed adjacent to the railway reserve. No Red Data species were observed on site. The construction of the loop extension at Barkly Bridge is unlikely to cause any major disturbance to fauna in the area when taking into account the existing disturbances.

5.2 1.1 BARKLY BRIDGE BORROW PIT

5.2.1 Flora

The site corresponded to an existing borrow pit colonised by many pioneer and secondary plant taxa. However, the vegetation of the immediate surroundings was particularly rich and can be described as a mosaic of low thicket and bush clumps interspersed by short, open grassland on lime-rich clayey soils (Alexandria Formation). It represents a fine example of Albany Thicket (more precisely Coega Bontveld) with a high propensity towards succulence as exhibited by the families Apocynaceae (*Pachypodium*), Asphodelaceae (*Aloe, Bulbine, Haworthia*), Crassulaceae (*Crassula, Cotyledon*), Mesembryanthemaceae (*Rhombophyllum, Ruschia, Delosperma*) and lastly Asteraceae (*Senecio*). Floristic endemism is believed to be high since many of the residing taxa have Fynbos, Grassland and Succulent Karoo links, all of them reaching their eastern and southern biogeographical limits here. Exotics include the highly invasive *Opuntia ficus-indica* (Weed: Category 1). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Euclea undulata (d), *Gymnosporia capitata* (d), *Olea europaea subsp. africana, Carissa bispinosa subsp. bispinosa, Diospyros pallens, Grewia robusta, Hippobromus pauciflorus, Rhus incisa, Schotia afra var. afra, Aloe*	*Becium burchellianum* (d), *Disparago cf. ericoides, Asparagus striatus, Asparagus cf. capensis, Cotyledon orbiculata, Crassula mucosa, Pachypodium bispinosum, Senecio radicans*	*Cynodon dactylon* (d), *Digitaria argyrograpta, Stipa dregeana, Heteropogon contortus*

	ferox, Mystroxylon aethiopica
Taxa of Conservation interest:	*Sideroxylon inerme* – DWAF protected[2] *Ficinia truncata* - BIT *Rhombophyllum rhomboideum* – En, NT (TSP, 2007), PP *Euphorbia meloformis* subsp. *valida* – Rare (TSP, 2007), NT (Victor & Dold, 2003), PP Mesembryanthemaceae (*Carpobrotus edulis, Delosperma rogersii, Mesembryanthemum aitonis, Ruschia hamata, Ruschia sp. Trichodiadema bulbosum, Drosanthemum sp.*) – PP *Haworthia attenuata* – PP *Aloe humilis* – PP *Pachypodium bispinosum* – PP *Carpobrotus edulis* - Med
Ecological importance:	High – high species richness with endemic taxa and range-restricted taxa

(d) – dominant taxa
BIT - Biogeographically important taxon reaching the eastern limit of its distribution (Mucina & Rutherford, 2006)
En – Endemic to Coega Bontveld
NT – Near-threatened (according to IUCN listing criteria)
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974
Med – Valued medicinal plant (Van Wyk *et al*., 1997)

5.2.2 Fauna

Barkly Bridge borrow pit is an existing borrow pit, however, faunal activity adjacent to the existing pit is relatively high. Evidence of fauna includes:

Figure 5.2.2 Faunal evidence

Possible Grysbok (*Raphicerus melanotis*) midden.

Angulate Tortoise (*Chersina angulata*)

During the field investigations 21 bird species, four mammal species and two reptile species were observed or evidence of their presence was observed in the vicinity of the existing borrow pit. Examples of theses species include: Brimstone Canary (*Serinus arrogularis*), Cape Bunting (*Emberiza capensis*),

(1) [2] This species is listed on the national list of declared protected tree species as promulgated by the National Forests Act, 1998 (No 84 of 1998). In terms of the National Forests Act of 1998, these tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the Department of Water Affairs and Forestry.

Steenbok (*Raphicerus campestris*), Grey Duiker (*Sylvicapra grimmia*), and Spotted Harlequin Snake (*Homoroselaps lacteus*). For a completed list of species refer to Appendix A. No Red Data species were observed on site. The use of the existing borrow pit at Barkly Bridge will result in further loss of habitat, within the immediate surroundings, which supports an abundance of faunal species.

5.3 2. ADDO

5.3.1 Flora

The site was confined to the Sondagsrivier Valley and corresponded to soils that were derived from alluvial (Quaternary) deposits such as sand and limestone. Structurally, the vegetation was reminiscent of low thicket comprising of many spinescent shrub dominated by *Acacia natalitia* and *Asparagus africanus* and succulent shrub such as *Potulacaria afra*. Many of the taller woody species were pre-disturbance Albany Thicket relicts, and were dominated by members of the Fabaceae (*Acacia*), Anacardiaceae (*Rhus longispina*), Celastraceae (*Gymnosporia*), Salvadoraceae (*Azima tetracantha*) and Solanaceae (*Lycium*). Exotics were represented by localised groves of tall *Eucalyptus camaldulensis* (Invader: Category 2). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia natalitia (d), *Lycium cinereum* (d), *Portulacaria afra* (d), *Azima tetracantha, Gymnosporia capitata, Rhus longispina, Schotia afra var. afra*	*Albuca cf. setosa* (d), *Asparagus africanus* (d), *Gasteria bicolor, Justicia cf. petiolaris, Bulbine frutescens*	*Cynodon dactylon, Sporobolus ioclados*
Taxa of Conservation interest:	*Malephora sp.* - PP	
Ecological importance:	Medium – high anticipation of vegetation destruction within the railway reserve. * The site also falls within the Sundays Doring Veld, which is a threatened habitat.	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.3.2 *Fauna*

The proposed loop expansion site is in the vicinity of the town of Addo, which is the likely factor causing limited faunal activity. During the field investigations only 13 bird species were recorded on site. Some of these species included Cape Weaver (*Ploceus capensis*), Malachite Sunbird (*Nectarinia famosa*) and Red-fronted Tinkerbird (*Pogoniulus pusillus*). For a complete species list refer to Appendix A. No Red Data species were observed on site. The construction of the loop extension at Addo is unlikely to cause any major disturbance to fauna in the area when taking into account the existing disturbances.

5.4 3. COERNEY

5.4.1 *Flora*

The proposed study area falls within the ambit of the railway servitude and was floristically ascribed to be a pertubated system dominated by pioneer and secondary graminoid taxa. The study area formed part of an ecological type known as the Sundays Thicket, which in a natural state, was covered by tall, dense thickets comprising of aspect dominants such as *Euphorbia grandidens*, *Aloe africana* and *A. ferox*. This was clearly illustrated within the Addo National Park, which formed the eastern boundary of the railway reserve. The relictual floristic composition comprised of short spinescent shrub on mudstone-derived soils (of the Sundays Formation). Exotics were represented by localised groves of tall *Eucalyptus camaldulensis* (Invader: Category 2) and *Argemone ochroleuca* (Weed: Category 1). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Portulacaria afra (d), *Gymnosporia capitata* (d), *Azima tetracantha*, *Lycium cinereum, Plumbago auriculata, Capparis sepiaria, Schotia afra var. afra, Rhoicissus digitata, Grewia robusta, Ehretia rigida*	*Albuca cf. setosa* (d), *Bulbine frutescens* (d) *Asparagus cf. capensis, Emex australis, Sansevieria aethiopica, Euphorbia mauritanica, Scutia myrtina*	*Cynodon dactylon* (d), *Panicum schinzii*, *Eragrostis curvula*
Taxa of Conservation interest:	*Drosanthemum hispidum, Malephora sp*, *Lampranthus productus* - PP	

Ecological importance:	Low * Although the site has a Low Ecological Importance it does fall within the Sundays Spekboom Thicket, which is a threatened habitat.

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.4.2 Fauna

Although the Addo Elephant National Park forms the eastern boundary to the railway reserve limited faunal activity was observed at the site, which was likely due to the high level of disturbance to the vegetation. Species recorded in the vicinity of the site included Cape Turtle Doves (*Streptopelia capicola*), Bokmakierie (*Telophorus zeylonus*) and Vervet Monkeys (*Cercopithecus aethiops*). No Red Data species were observed on site. The construction of the loop extension at Coerney is unlikely to cause any major disturbance to fauna in the area provided construction activities remain within the railway reserve and existing disturbed areas.

5.5 4. VERBY

5.5.1 Flora

The proposed study area was surrounded by orchards and antropo-maintained secondary grassland that was primarily utilised for grazing purposes. However, the study area comprised of secondary graminoid taxa applied to counter the possible erosion of the existing railway cuttings. The remainder of the study area comprised of secondary herbs and woody lianas that were relicts of the regional vegetation type, namely Kowie Thicket. Exotics were represented by localised groves of tall *Eucalyptus camaldulensis* (Invader: Category 2). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
	Helichrysum dregeanum, *Jasminum anglulare*, *Cynanchum ellipticum*, *Cotyledon orbiculata*	*Panicum schinzii* (d), *Bromus pectinatus*, *Hordeum murinum*
Taxa of Conservation interest:	None	
Ecological importance:	Low - disturbed	

(d) – dominant taxa

PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.5.2 Fauna

Open fields used predominantly for grazing of livestock formed the majority of the landscape surrounding the proposed loop expansion site, which limited the availability of natural habitat for faunal species. During the field investigations 17 bird species where observed in the vicinity of the site, these included African Firefinch (*Lagonosticta rubricata*), Black-headed Heron (*Ardea melanocephala*) and Black-headed Oriole (*Oriolus larvatus*). For a complete list of species refer to Appendix A. Vervet Monkeys (*Cercopithecus aethiops*) were also observed in close proximity to the site. The construction of the loop extension at Verby is unlikely to cause any major disturbance to fauna in the area when taking into account the existing disturbances.

5.6 5. EAGLES CRAG

5.6.1 Flora

The proposed study area coincided with the Bushman's River Valley that was bordered by dense Kowie Thicket and agricultural land. The Kowie Thicket comprised of low shrub with a thick understorey of succulent forbs and geophytes, while the existing railway loop comprised of post-disturbed grassland. The floristic composition of this area was more diverse in comparison to the previous sites, with *Aloe speciosa* replacing *A. africana*. Exotics were represented by localised groves of tall *Eucalyptus camaldulensis* (Invader: Category 2) and *Opuntia ficus-indica* (Weed: Category 1). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia natalitia (d), *Ehretia rigida* (d), *Azima tetracantha* (d), *Plumbago auriculata* (d), *Aloe speciosa*, *Diospyros pallens, Lycium cinereum, Pappea capensis, Cadaba aphylla*	*Becium burchellianum* (d), *Euphorbia mauritanica*, *Blepharis capensis, Chrysocoma ciliata, Felicia muricata, Nemesia fruticans, Asparagus striatus, Gazania krebsiana, Senecio radicans, Chrysanthemoides incana, Pteronia incana, Cotyledon campanulata, Galenia sarcophylla*	*Panicum schinzii* (d), *Melinis repens*

Taxa of Conservation interest:	*Aloe speciosa, A. tenuior* – PP Mesembryanthemaceae (*Delosperma echinatum, Ruschia putterillii, R. uncinata, Lampranthus productus*) – PP Amaryllidaceae (*Brunsvigia nr. striata, Nerine cf. flexuosa*) – PP *Pachypodium succulentum* – PP *Hypoxis cf. iridifolia* - Med
Ecological importance:	Medium – high species richness with many protected taxa. Adjacent to outcrop with high species richness

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974
Med – Valued medicinal plant (Van Wyk *et al.,* 1997)

5.6.2 Fauna

The proposed loop expansion site at Eagle's Crag lies predominately between agricultural lands and rocky ridges. Evidence of faunal activity within the railway reserve includes:

Figure 5.6.2 Faunal evidence

Trapdoor Spider burrow – likely Family = Ctenizidae

During the field investigations 21 bird species were recorded at the site, including African Red-eyed Bulbul (*Pycnonotus nigricans*), Egyptian Geese (*Allopochen aegyptiaca*) and Fork-tailed Drongo (*Dicrurus adsimilis*). For a complete species list refer to Appendix A. Two mammal species, Baboons (*Papio hamadryas ursinus*) and Scrub Hare (*Lepus saxatilis*), were also recorded in the vicinity of the proposed site. No Red Data species were observed on site. The construction of the loop extension at Eagle's Crag will almost certainly destroy the Trapdoor Spiders (likely Family Ctenizidae) burrowing in the substrate within the railway reserve. Although evidence of only one spider burrow is provided, generally more than one will utilize an area that is suitable for burrowing. In addition, it is likely that portions of the ridges will be disturbed during construction and although no scorpions were observed at the site the ridges are potential habitats for certain protected species (*Opistophthalmus spp.*)[3].

(2) [3] National listings of CR, EN, VU and Protected Species (PS), according to Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act no. 10, 2004)

5.7 6. TOOTABI

5.7.1 Flora

The study site was located along the Bushman's River Valley and comprised of relictual Kowie Thicket that was partly disturbed by former agricultural activities. The Kowie Thicket elements comprised of tall woody succulents (mainly the genera *Euphorbia* and *Aloe*) and dense, spinescent shrub dominated by *Acacia natalitia* and *Plumbago auriculata*. The invasive tendency of *A. natalitia* was probably a function of past agricultural disturbances that took place in the immediate vicinity. The railway servitude was elevated along this part of the loop, causing dense proliferation of *Acacia* shrub along the side. Exotics were represented by localised groves of *Agave americana* (Invader: Category 2) and *Nicotiana glauca* (Weed: Category 1). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Plumbago auriculata (d), *Acacia natalitia* (d), *Azima tetracantha* (d), *Cynanchum ellipticum* (d), *Lycium cinereum, Euphorbia tetragona, Diospyros pallens, Gymnosporia capitata, Ehretia rigida, Portulacaria afra, Capparis sepiaria, Hippbromus pauciflorus, Maerua cafra, Aloe ferox, Cussonia spicata, Cadaba aphylla, Aloe speciosa*	*Euphorbia mauritanica* (d), *Bulbine frutescens* (d), *Nemesia fruticans* (d), *Albuca setosa, Asparagus africanus, Sarcostemma viminale, Crassula mucosa, Senecio radicans, Cotyledon orbiculata, Pelargonium carnosum, Gazania krebsiana, Trachyandra cf. affinis*	*Panicum schinzii* (d), *Eragrostis curvula*
Taxa of Conservation interest:	*Aloe tenuior, A. speciosa* – PP	
Ecological importance:	Low	

(d) – dominant taxa

PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.7.2 Fauna

The proposed site for the construction of a new loop at Tootabi was located adjacent to the Boesmans River. During the field investigations 10 bird species and three mammal species were observed, or evidence of their presence was observed. Species included Black-headed Oriole (*Oriolus larvatus*), Common Moorhen (*Gallinula chloropus*), Porcupine (*Hystrix africaeaustralis*) and Grey

Duiker (*Sylvicapra grimmia*). For a complete list of species refer to Appendix A. In addition, rodent activity (burrows, droppings, etc) was evident within the railway reserve, however, species identification could not be confirmed without trapping. No Red Data species were observed on site. The construction of the new loop extension at Tootabi is unlikely to cause any major disturbance to fauna in the area provided construction activities remain within the railway reserve and do not encroach into the riparian vegetation along the river.

5.8 7. BLINKHOF

5.8.1 Flora

The study site was located on slightly undulating plains surrounded by mountain ridges that formed part of the Albany Broken Veld. Floristically, the vegetation composition recalled the transition between elements of the Albany Thicket and the dry, karroid shrub of the Nama-Karoo Biome. The vegetation could be described as low, open karroid shrub on rocky soils derived from Witteberg Group shale and arenite. The graminoid layer was sparse, consisting of short tufted grasses. However, the forb composition, although poor in richness, showed strong affinities with the Fynbos Biome (the presence of *Elytropappus rhinocerotis*). Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Grewia robusta, Carissa bispinosa, Rhus lucida, Aloe ferox, Acacia karroo	*Felicia filifolia* (d), *Becium burchellianum* (d), *Elytropappus rhinocerotis* (d), *Asparagus africanus, Pentzia globosa, Ledebouria sp., Asparagus striatus, Felicia muricata, Asparagus capensis, Gasteria bicolor*	*Eragrostis curvula* (d), *E. obtusa* (d), *Aristida diffusa*
Taxa of Conservation interest:	None	
Ecological importance:	Medium – high erosion potential due to sparse vegetation cover	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.8.2 Fauna

The proposed loop expansion site was located adjacent to what appeared to be a private game farm and evidence of Kudu (*Tragelaphus strepsiceros*) activity

along the railway reserve was evident. Evidence of other faunal activity included:

Figure 5.8.2 Faunal evidence

Aardvark (*Orycteropus afer*) digging

Wall Crab Spider (Family - Selenopidae)

During the field investigations nine bird species and five mammal species were observed, or evidence of their presence was observed. Some of these species included Fiscal Flycatcher (*Sigelus silens*), Mocking Cliff-chat (*Myrmecocichla cinnamomeiventris*), Common Kestrel (*Falco tinnunculus*), Grey Duiker (*Sylvicapra grimmia*) and Steenbok (*Raphicerus campestris*). For a complete list of species refer to Appendix A. No Red Data species were recorded, however, possible scorpion burrows of the *Opistophthalmus* genus, all species in this genus are protected, were observed in the vicinity of the site. Although faunal activity was relatively high, particularly mammal activity, the construction of the loop extension at Blinkhof is unlikely to cause any major disturbance to fauna in the area provided activities remain within the railway reserve.

5.9 8. SALTAIRE

5.9.1 Flora

The study site was in many respects similar to Blinkhof. It was located on undulating plains that formed part of the Albany Broken Veld. The vegetation could be described as low, open karroid shrub on rocky soils derived from Witteberg Group shale and arenite. The graminoid layer was sparse, consisting of short tufted grasses. However, forb species diversity was poor, especially in comparison to the mesic Thicket vegetation recorded further south. Exotics were represented by localised groves of *Agave americana* (Invader: Category 2) and *Pinus* sp. (Invader: Category 2). Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lyceum cinereum (d), *Rhigozum trichotomum, Schotia afra var. afra, Grewia robusta, Rhus lucida, Pappea capensis, Boscia oleoides, Azima tetracantha, Carissa bispinosa*	*Aloe striata* (d), *Asparagus striata, Sansevieria aethiopicus, Asparagus africanus, Pentzia globosa, Albuca setosa, Crassula mucosa, Cyphostemma cf. quinatum*	*Eragrostis curvula* (d), *Digitaria eriantha* (d), *Aristida congesta, Enneapogon scoparius*
Taxa of Conservation interest:	*Aloe striata* – PP *Mestoklema sp.* & *Phyllobolus splendens* - PP	
Ecological importance:	Low	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.9.2 Fauna

The proposed loop expansion site was located adjacent to a rocky ridge. Evidence of faunal activity included:

Figure 5.9.2 Faunal evidence


Baboon (*Papio hamadryas ursinus*) droppings


Rock Hyrax (*Procavia capensis*) midden

During the field investigations 12 bird species and nine mammal species were observed, or evidence of their presence was observed. Some of these species included Acacia Pied Barbet (*Tricholaema leucomelas*), Eastern Long-billed Lark (*Certhilauda semitorquata*), Hadeda Ibis (*Bostrychia hagedash*), Scrub Hare (*Lepus saxatilis*) and Porcupine (*Hystrix africaeaustralis*). For a complete list of species refer to Appendix A. No Red Data species were recorded, however, possible

scorpion burrows of the *Opistophthalmus* genus (all protected species in this genus) were observed in the vicinity of the site. Although faunal activity was relatively high, particularly mammal activity, the construction of the loop extension at Saltaire is unlikely to cause any major disturbance to fauna in the area provided activities remain within the railway reserve. If the railway reserve is required to be widened possible disturbance to the rocky ridges could result in minor habitat loss for some burrowing scorpion species (*Opistophthalmus spp*.).

5.10 9. KOMMADAGGA

5.10.1 Flora

The study site was structurally and compositionally similar to the Saltaire area, and corresponded to undulating plains of the Albany Broken Veld. Floristically, the vegetation composition recalled the transition between elements of the Albany Thicket and the dry, karroid shrub of the Nama-Karoo Biome. The vegetation can be described as secondary karroid shrub on rocky soils derived from Witteberg Group shale and arenite. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lycium cinereum, Azima tetracantha, Pappea capensis, Rhus lucida, Grewia robusta, Euclea undulatum, Acacia karroo, Boscia oleoides, Schotia afra var. afra, Cadaba aphylla	*Asparagus africanus* (d), *A. striatus* (d), *Felicia muricata* (d), *Becium burchellianum, Pentzia globosa, Pelargonium peltatum, Eriocephalus ericoides, Rhigozum trichotomum, Aloe striata, Cineraria lobata*	*Eragrostis curvula* (d), *E. obtusa* (d), *Melinis repens, Aristida congesta, Pennesetum setaceum, Digitaria eriantha, Bromus pectinatus*
Taxa of Conservation interest:	*Ruschia sp.* – PP *Aloe striata* - PP	
Ecological importance:	Low	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.10.2 Fauna

The proposed loop expansion site was located within an undulating landscape, which required the use of extensive borrow material to level portions of the existing track. Evidence of faunal activity included:

Figure 5.10.2 Faunal evidence

Baboon Spider (possible Family - Theraphosidae) burrows within unused borrow material on the edge of the railway reserve.

During the field investigations only four bird species and four mammal species were observed, or evidence of their presence was observed. Some of these species included African Paradise-flycatcher (*Terpsiphone viridis*), Bokmakierie (*Telophorus zeylonus*), Small Grey Mongoose (*Galerella pulverolenta*) and Steenbok (*Raphicerus campestris*). For a complete list of species refer to Appendix A. No Red Data species were recorded, however, there were approximately 10 Baboon Spider (possible Family - Theraphosidae) burrows located within the site (all species are listed as protected[4]). While construction is unlikely to result in any significant disturbance to the general fauna in the area the Baboon Spiders will almost certainly be destroyed during the construction of the loop extension at Kommadagga.

5.11 10. GOLDEN VALLEY

5.11.1 Flora

The study site was located due south of Cookhouse and was surrounded by cultivated land. The vegetation on the site was severely pertubated, comprising mainly of pioneer taxa and annual weed species. Exotics were represented by *Argemone ochroleuca* (Weed: Category 1). Floral site characteristics include:

(3) [4] National listings of CR, EN, VU and Protected Species (PS), according to Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act no. 10, 2004)


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
	Solanum tomentosum, Emex australis	*Eragrostis curvula* (d), *Digitaria eriantha*
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.11.2 Fauna

The proposed loop expansion site was surrounded by disturbed vegetation and cultivated fields, which was the likely factor for limited faunal activity in the area. During the field investigations only seven bird species were observed at the site, these include Cape Sparrows (*Passer melanurus*), Cape Turtle Doves (*Streptopelia capicola*) and Red-billed Quelea (*Quelea quelea*). For a complete list of species refer to Appendix A. No Red Data species were recorded on site. The construction of the loop extension at Golden Valley is unlikely to cause any major disturbance to fauna in the area.

5.12 10.1 COOKHOUSE BORROW PIT 1

5.12.1 Flora

The study site was located to the north of Cookhouse *en route* towards the Farm Craig Gowan. The study site corresponded to an open *Acacia* woodland utilised for livestock grazing. Structurally, it was composed of a well-developed grassy layer dominated by genera such as *Aristida* and *Eragrostis* interspersed by an open *Acacia karroo* woodland. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)

Acacia karroo (d), *Aloe ferox*	*Felicia muricata* (d), *Pentzia globosa, Cyrtanthus smithiae, Asparagus striatus, Bulbine abyssinica*	*Eragrostis racemosa (d), Aristida congesta*
Taxa of Conservation interest:	*Cyrtanthus smithiae* – PP, NT (Victor & Dold, 2003)	
Ecological importance:	Medium – high density of a protected geophyte and the site is located in a threatened habitat – Fish SpekboomThicket	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974
NT – Near-threatened (according to IUCN listing criteria)

5.12.2 Fauna

The proposed borrow pit north of Cookhouse is an existing borrow it and the veld around the old borrow pit is used for grazing of livestock. Faunal activity at the site was limited. During the field investigations eight bird species and five mammal species were observed, or evidence of their presence was observed. Species included Black-shoulder Kite (*Milvus caeruleus*), Common Fiscal (*Lanius collaris*), Jackal Buzzard (*Buteo rufofuscus*), Scrub Hare (*Lepus saxatilis*) and Grey Duiker (*Sylvicapra grimmia*). For a complete list of species refer to Appendix A. No Red Data species were recorded, however a likely Baboon Spider (possible Family - Theraphosidae) burrow was located on site (all species are considered protected). While the use of this borrow pit is unlikely to cause significant disturbance to the general fauna in the area the Baboon Spider is likely to be destroyed, and although only one burrow was located there are probably more within the immediate vicinity.

5.13 10.2 COOKHOUSE BORROW PIT 2

5.13.1 Flora

The study site was located east of Cookhouse along the N10 highway. It corresponded to an open grassy plain that was utilised for livestock grazing. Structurally, the vegetation was composed of a well-developed grassy layer dominated by genera such as *Digitaria* and *Themeda,* while the forb and woody layer was almost absent (comprising of scattered *Acacia* shrub). The absence of a well-defined woody element could be explained through past bush-clearing activities to enhance the gazing capacity of the area. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia karroo, Aloe ferox	*Felicia muricata* (d), *Asparagus striatus*	*Eragrostis lehmanniana* (d), *E. obtusa*
Taxa of Conservation interest:	*Cyrtanthus smithiae* – PP, NT (Victor & Dold, 2003) *Aloe tenuior* – PP *Stapelia grandiflora var. grandiflora* - PP	
Ecological importance:	Medium – presence of protected plant taxa and the site is located in a threatened habitat – Fish SpekboomThicket	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974
NT – Near-threatened (according to IUCN listing criteria)

5.13.2 Fauna

The proposed borrow pit is an existing pit and the veld surrounding it has been used for grazing livestock. Faunal activity at the site was limited. During the field investigations eight bird species and three mammal species were observed, or evidence of their presence was observed. Some of these species included Cape Longclaw (*Macronyx capensis*), Cattle Egret (*Bubulcus ibis*), Steenbok (*Raphicerus campestris*) and Scrub Hare (*Lepus saxatilis*). For a complete list of species refer to Appendix A. No Red Data species were recorded, however a likely Baboon Spider (possible Family - Theraphosidae) burrow was located on site (all species are considered protected). While the use of this borrow pit is unlikely to cause significant disturbance to the general fauna in the area the Baboon Spider is likely to be destroyed, and although only one burrow was located there are probably more within the immediate vicinity.

5.14 10.3 GOLDEN VALLEY BORROW PIT

5.14.1 Flora

The study site was structurally and compositionally similar to the Saltaire area and corresponded to Albany Broken Veld consisting of a well-developed graminoid layer. Floristically, the vegetation composition recalled the transition between elements of the Albany Thicket and dry, karroid shrub of the Nama-Karoo Biome. The area was utilised for livestock grazing. Access to this proposed borrow pit was restricted and could subsequently not be assessed in detail. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia karroo, Lycium cinereum	*Felicia muricata, Hermannia cuneifolia*	*Eragrostis lehmanniana, E. obtusa, Digitaria eriantha*
Taxa of Conservation interest:	None – possible occurrence of *Cyrtanthus smithiae* – PP, NT (Victor & Dold, 2003)	
Ecological importance:	Medium	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974
NT – Near-threatened (according to IUCN listing criteria)

5.14.2 Fauna

Access to the proposed borrow pit, which was an existing borrow pit, was restricted because it was located on an Ostrich farm, which had biosecurity measures in place. The existing borrow pit could be view from the road (N10) and in the general area faunal activity was limited. Only four bird species were observed in the vicinity of the borrow pit, these included Cape Turtle Doves (*Streptopelia capicola*), Hadeda Ibis (*Bostrychia hagedash*), Egyptian Geese (*Alopochen aegyptiaca*) and Red-billed Quelea (*Quelea quelea*). Although the site was not assessed in detail it is unlikely that there will be any significant disturbance to fauna within the general area if the existing borrow pit is utilized.

5.15 11. KLIPFONTEIN

5.15.1 Flora

The study site coincided with the Groot Fish River Valley and was surrounded by agricultural land. The vegetation comprised of dense secondary grassland that was probably artificially cultivated along the railway cuttings to counteract possible erosion. However, the remainder of the composition comprised of a woody layer dominated by taxa pertaining to the genera *Acacia* and *Lycium*. The forb layer was well-developed and comprised of many succulent genera such as *Aloe* and *Cotyledon*. Exotics were represented by *Agave americana* (Invader: Category 2), *Pinus* sp. (Invader: category 2) and *Opuntia imbricata* (Weed: Category 1). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)

Aloe ferox, Rhus burchellii, Acacia karroo, Grewia robusta	*Euphorbia mauritanica* (d), *Felicia muricata* (d), *Asparagus stristus, A. aethiopicus, Pelargonium carnosum, Pentzia globosa, Sansseviera aethiopica, Aloe tenuior, A. striata, Cotyledon campanulata*	*Enneapogon scoparius* (d), *Aristida congesta, Panicum shinzii*
Taxa of Conservation interest:	*Aloe tenuior, A. striata* - PP	
Ecological importance:	Low	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.15.2 Fauna

The proposed site for the new loop was surrounded by disturbed vegetation and cultivated fields, which was the likely factor for limited faunal activity in the area. During the field investigations only 10 bird species were observed at the site, these include African Hoopoe (*Upupa africana*), Black-headed Heron (*Ardea melanocephala*) and Booted Eagle (*Aquila pennata*). For a complete list of species refer to Appendix A. No Red Data species were recorded on site. The construction of the new loop at Klipfontein is unlikely to cause any major disturbance to fauna in the area.

5.16 11.1 KLIPFONTEIN CUTTING AS BORROW PIT

5.16.1 Flora

The study site coincided with the Groot Fish River Valley and was surrounded by agricultural land. The structure and composition of the vegetation was similar to the Klipfontein area.

5.16.2 Fauna

The borrow material was located in close proximity to the proposed loop expansion site at Klipfontein. Faunal activity at the site was limited. During the field investigations 13 bird species were observed, these included Cape Glossy Starling (*Lamprotornis nitens*), Common Fiscal (*Lanius collaris*) and Namaqua Dove (*Oena capensis*). For a complete list of species refer to Appendix A. No Red Data species were recorded on site. The use of the borrow material is unlikely to cause significant disturbance to fauna in the area.

5.17 12. MORTIMER

5.17.1 Flora

The study site coincided with the Groot Fish River Valley and was surrounded by agricultural land. The area was previously disturbed, probably during the installation of the existing railway line, and consisted of a dry, open karroid shrub dominated by secondary grass species. The woody layer

was poorly defined and lacked in species richness, while the forb layer comprised of many pioneer taxa that were of little economic or conservation value. However, a drainage line was present along the railway and dominated by the mega-graminoid *Phragmites australis*. Exotics were represented by *Argemone ochroleuca* (Weed: Category 1), *Agave americana* (Invader: Category 2), *Prosopis gladulosa* (Invader: Category 2) and *Schinus molle* (proposed invader). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lycium cinereum (d), *Rhus lancea, Gymnosporia buxifolia, Diospyros lycioides*	*Chrysanthemoides incana* (d), *Asparagus aethiopicus, Typha capensis, Rumex crispus, Nemesia fruticans, Bulbine frutescens, Tragopogon dubius, Atriplex semibaccata*	*Panicum schinzii* (d), *P. maximum* (d), *Digitaria eriantha, Enneapogon scoparius, Eragrostis curvula, Sporobolus fimbriatus, Setaria verticillata, Phragmites australis*
Taxa of Conservation interest:	None	
Ecological importance:	Medium – presence of a wetland-associated plant composition	

(d) – dominant taxa

5.17.2 Fauna

The proposed loop expansion site was surrounded by cultivated fields, which was the likely factor for limited faunal activity in the area. During the field investigations only seven bird species and four mammal species were observed at the site, these include Southern Red Bishop (*Euplectes orix*), Southern Boubou (*Laniarius vaillantii*), Vervet Monkeys (*Cercopithecus aethiops*) and Yellow Mongoose (*Cynictis penicillata*). For a complete list of species refer to Appendix A. No Red Data species were recorded on site. The construction of the loop extension at Mortimer is unlikely to cause any major disturbance to fauna in the area.

5.18 13. HALESOWEN

5.18.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of prominent, open grassy plains dominated by the mid-successional graminoid *Eragrostis lehmanniana*. The composition consisted of a forb layer that was dominated by dwarf, decumbent succulents and microphyllous shrubs, and a sparse, thorny woody layer composed of *Acacia* and *Lycium*. The vegetation

corresponds with the Eastern Upper Karoo floristic region, although many of the taxa were secondary and indicative of past disturbances. Exotics were represented by *Argemone ochroleuca* (Weed: Category 1). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia karroo, Lycium cinereum, Lycium oxycarpum	*Pentzia incana* (d), *Eriocephalus ericoides, Pentzia globosa, Nemesia fruticans, Atriplex semibaccata*	*Eragrostis lehmanniana* (d), *E. bicolor, Aristida congesta*
Taxa of Conservation interest:	Mesembryanthemaceae (*Drosanthemum hispidum, Phyllobolus splendens, Psilocaulon coriarium, P. articulatum, Malephora sp.*) - PP	
Ecological importance:	Low	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.18.2 Fauna

The proposed loop expansion site was surrounded mostly by disturbed vegetation. In general the faunal activity in the area was low, an example reptile activity included:

Figure 5.18.2 Faunal evidence

Parrot-beaked Padloper (*Homopus areolatus*)

During the field investigations only three bird species and one mammal species were observed at the site, these include Hadeda Ibis (*Bostrychia hagedash*), Lesser Grey Shrike (*Lanius minor*), Neddicky (*Cisticola fulvicapillus*) and South African Ground Squirrel (*Xerus inauris*). No Red Data species were

recorded on site. The construction of the loop extension at Halesowen is unlikely to cause any major disturbance to fauna in the area.

5.19 14. MARLOW

5.19.1 Flora

The study site was impacted by severe anthropogenic activities and intensive agricultural practices. The transformed state of the environment was mirrored by a floristic composition comprising of ruderal weeds and redundant taxa not considered to be of any conservation value. Exotics were represented by *Argemone ochroleuca* (Weed: Category 1). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lycium cinereum, Acacia karroo	*Plantago lanceolata, Nemesia fruticans, Forsskaolea candida, Rumex cripus, Psilocaulon articulatum*	*Cynodon dactylon* (d), *Bromus pectinatus* (d)
Taxa of Conservation interest:	*Psilocaulon articulatum* - PP	
Ecological importance:	Low	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.19.2 Fauna

The proposed loop expansion site was surrounded by anthropogenic disturbances (farming community), which was the likely factor for limited faunal activity in the area. During the field investigations only 10 bird species were observed at the site, these include Acacia Pied Barbet (*Tricholaema leucomelas*), African Hoopoe (*Upupa africana*) and Common Fiscal (*Lanius collaris*). For a complete list of species refer to Appendix A. No Red Data species were recorded on site. The construction of the loop extension at Marlow is unlikely to cause any major disturbance to fauna in the area.

5.20 14.1 MARLOW BORROW PIT

5.20.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of gentle, sloping plains dominated by mid-successional graminoid taxa of the genera *Aristida* and *Enneapogon*. A diverse assemblage of dwarf, microphyllous shrubs and thorny taxa of the genera *Acacia, Grewia, Gymnosporia* and *Rhus* dominated the woody composition. However, the occurrence of an arenite-derived ridge and stone-littered slopes has elevated the species richness tremendously in comparison to the previously discussed sites. The vegetation comprehends the Eastern Upper Karoo floristic region and intergrades with Tarkastad Montane Shrubland, thereby increasing the potential plant diversity likely to be present. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia karroo, Grewia robusta, Rhus burchellii, Gymnosporia buxifolia, Diospyros dichrophylla	*Becium burchellianum* (d), *Eriocephalus ericoides* (d), *Felicia filifolia, Euphorbia enopla, Asplenium cordatum, Aptosimum procumbens, Sansevieria aethiopicus*	*Aristida diffusa* (d), *Enneapogon scoparius, Tragus koelerioides*
Taxa of Conservation interest:	Amaryllidaceae (*Haemanthus humilis, Cyrtanthus contractus*) – PP *Haworthia bolusii var. blackbeardiana* – PP *Trichodiadema pomeridianum* & *Ruschia spinosa* - PP	
Ecological importance:	High – high species richness and the occurrence of many protected taxa	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.20.2 Fauna

The proposed borrow pit north of Cradock is an existing borrow pit at the base of a rocky ridge. Faunal activity at the site was relatively high. During the field investigations 18 bird species and six mammal species were observed, or evidence of their presence was observed, in the vicinity of the borrow pit. Species included African Fish Eagle (*Haliaeetus vocifer*), Brown-hooded Kingfisher (*Halcyon albiventris*), Kalahari Scrub Robin (*Erythropygia paena*), Aardvark (*Orycteropus afer*) and South African Ground Squirrel (*Xerus inauris*). For a complete list of species refer to Appendix A. Although not on site, Blue Cranes (*Anthropoides paradiseus*), which are listed as a vulnerable species, were

observed foraging in the cultivated fields adjacent to the borrow pit. In addition, the rocky substrate surrounding the existing borrow pit is suitable habitat for protected scorpion species (*Opistophthalmus spp.*). The use of borrow material from the Marlow borrow pit is likely to have a significant disturbance on fauna in the area.

5.21 15. KAPTEIN

5.21.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of flat plains dominated by mid-successional graminoid taxa pertaining to the genus *Enneapogon*. The area showed signs of past disturbance events (as evidenced by the occurrence of *Tagetes minuta* and *Argemone ochroleuca*) and was subsequently poor in floristic richness. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia karroo, Lycium cinereum	*Felicia muricata* (d), *Emex australis, Atriplex semibaccata, Sesamum triphyllum, Psilocaulon coriarium*	*Enneapogon scoparius* (d)
Taxa of Conservation interest:	*Psilocaulon coriarium* – PP *Drosanthemum hispidum* - PP	
Ecological importance:	Low	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.21.2 Fauna

The proposed loop expansion site was surrounded by disturbed vegetation, which was the likely factor for limited faunal activity in the area. During the field investigations only five bird species and four mammal species were observed, or evidence of their presence was observed, these include Anteating Chat (*Myrmecocichla formicivora*), Cape Longclaw (*Macronyx capensis*), Aardvark (*Orycteropus afer*) and Yellow Mongoose (*Cynictis penicillata*).For a complete list of species refer to Appendix A. No Red Data species were recorded on site. The construction of the loop extension at Kaptein is unlikely to cause any major disturbance to fauna in the area.

5.22 16. KNUTSFORD

5.22.1 Flora

The study site showed signs of past disturbances to the extent that any phytosociological study was deemed unnecessary.

5.22.2 Fauna

The proposed loop expansion site was surrounded by disturbed vegetation, which was the likely factor for limited faunal activity in the area. During the field investigations only eight bird species and one mammal species were observed, or evidence of their presence was observed, these include Black-shouldered Kite (*Milvus caeruleus*), Eastern Clapper Lark (*Mirafra fasciolata*) and Small grey Mongoose (*Galerella pulverolenta*). For a complete list of species refer to Appendix A. No Red Data species were recorded on site. The construction of the loop extension at Knutsford is unlikely to cause any major disturbance to fauna in the area.

5.23 16.1 KNUTSFORD BORROW PIT

5.23.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of gentle, sloping plains dominated by many mid- to late-successional graminoid taxa of the genera *Aristida, Eragrostis, Enneapogon, Themeda* and *Cymbopogon*. A diverse assemblage of dwarf, microphyllous shrubs and spinescent woody taxa of the genera *Acacia, Grewia* and *Carissa* dominated the plant composition. However, the occurrence of a shale-derived ridge and stone-littered slopes has elevated the species richness tremendously in comparison to the surrounding landscape. The composition comprehends the Eastern Upper Karoo floristic region and intergrades with Tarkastad Montane Shrubland, thereby increasing the potential plant diversity likely to be present. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia karroo, Diospyros lycioides, Grewia robusta, Carissa bispinosa	*Eriocephalus ericoides* (d), *Ruschia spinosa, Felicia muricata, Asparagus striatus, Rosenia humilis, Rosenia glomerata*	*Eragrostis bergiana* (d), *Aristida diffusa* (d), *Cymbopogon pospischilii, Enneapogon scoparius, Themeda triandra*

Taxa of Conservation interest:	Mesembryanthemaceae (*Ruschia spinosa, Delosperma multiflora, Drosanthemum hispidum, Malephora sp., Ruschia cradockensis subsp. cradockensis, Trichodiadema sp.*)– PP *Pachypodium succulentum* - PP
Ecological importance:	Medium – apparent high richness of forb species & protected taxa

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.23.2 Fauna

The proposed borrow pit is an existing borrow pit at the base of a rocky ridge. Faunal activity at the site was relatively high even though there were only eight bird species and six mammal species identified during the field investigations. Species included Karoo Korhaan (*Eupodotis vigorsii*), Wattled Starling (*Creatophora cinerea*), Aardvark (*Orycteropus afer*) and Steenbok (*Raphicerus campestris*). For a complete list of species refer to Appendix A. Although no Red Data species were recorded and there were only a limited number of birds and mammals observed, or evidence of their presence observed, there would still be a significant disturbance to fauna in the area if the borrow pit was utilized, as the species richness particularly on the ridge above the borrow pit was high.

5.24 16.2 KNUTSFORD BORROW MATERIAL

5.24.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of gentle, undulating plains dominated by graminoid taxa pertaining to the genera *Aristida* and *Eragrostis*. However, the structure of the vegetation comprised of an open graminoid layer with scattered tall *Acacia* shrub. The soils were rocky and shale-derived. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia karroo	*Felicia muricata* (d), *Ruschia spinosa, Eriocephalus ericoides, Thesium lineatum*	*Eragrostis bergiana* (d), *Aristida diffusa* (d), *Heteropogon contortus*
Taxa of Conservation interest:	*Ruschia spinosa* – PP *Boophone disticha* - Med	
Ecological importance:	Low	

(d) – dominant taxa

PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974
Med – Valued medicinal plant (Van Wyk *et al*., 1997)

5.24.2 Fauna

The proposed borrow pit was located in a rocky veld adjacent to the railway reserve, with an irrigation channel in close proximity. Faunal activity at the site was low. During the field investigations seven bird species and four mammal species were observed, or evidence of the presence was observed. Species included Black-shouldered Kite (*Milvus caeruleus*), Cape Wagtail (*Motacilla capensis*), Aardvark (*Orycteropus afer*) and Water Mongoose (*Atilax paludinosus*). For a complete list of species refer to Appendix A. No Red Data species were recorded on site. The use of borrow material form the site is unlikely to cause any major disturbance to fauna in the area.

5.25 17. VISRIVIER

5.25.1 Flora

The study site showed signs of past disturbance regimes to the extent that any phytosociological study was deemed unnecessary. The floristic composition comprised of many secondary grass taxa and ruderal forb species. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia karroo	*Galenia sarcophylla, Salsola kali*	*Eragrostis curvula* (d), *E. obtusa* (d), *Aristida adscensionis, Enneapogon scoparius*
Taxa of Conservation interest:	*Psilocaulon cf. coriarium* - PP	
Ecological importance:	Low	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.25.2 Fauna

The proposed loop expansion site was surrounded by disturbed vegetation, which was the likely factor for limited faunal activity in the area. During the field investigations only eight bird species and three mammal species were observed, or evidence of the presence was observed. Some of the species included African Hoopoe (*Upupa africana*), Cattle Egret (*Bubulcus ibis*), Aardvark (*Orycteropus afer*) and Steenbok (*Raphicerus campestris*). For a complete list of species refer to Appendix A. No Red Data species were recorded on site. The construction of the loop extension at Visrivier is unlikely to cause any major disturbance to fauna in the area.

5.26 17.1 VISRIVIER: COLLETT SE QUARRY

5.26.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of flat, stony plains dominated by many mid-successional graminoid taxa of the genera *Aristida* and *Eragrostis*. The forb layer was poorly defined consisting of many dwarf, microphyllous shrubs dominated by members of the Asteraceae. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
	Felicia muricata (d), *Eriocephalus ericoides, Thesium lineatum*	*Aristida adscensionis* (d), *Eragrostis lehmanniana*
Taxa of Conservation interest:	*Ruschia spinosa* - PP	
Ecological importance:	Low	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.26.2 Fauna

The borrow pit was located in a flat rocky landscape. Faunal activity at the site was limited. During the field investigations seven bird species and three mammal species were observed, or evidence of their presence was observed. Species included African Stonechat (*Saxicola torquata*), Anteating Chat (*Myrmecocichla formicivora*), Eastern Clapper Lark (*Mirafra fasciolata*) and Aardvark (*Orycteropus afer*). For a complete list of species refer to Appendix A. No Red Data species were recorded on site. The use of the borrow material at the Visrivier quarry is unlikely to cause significant disturbance to fauna in the area.

5.27 17.2 VISRIVIER POSSIBLE BORROW PIT

5.27.1 Flora

The study site comprised of a derelict borrow pit that was subsequently invaded by *Eucalyptus camaldulensis* and *Acacia karroo* shrub. Exotics were represented by localised groves of *Eucalyptus camaldulensis* (Invader: Category 2). Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia karroo (d), *Eucalyptus camaldulensis* (d)	*Aptosimum procumbens*	*Enneapogon scoparius, Eragrostis curvula*
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.27.2 Fauna

The proposed borrow pit, which was an existing pit, was located approximately 100m south of the Great Fish River. Due to disturbances such as dwellings in the vicinity, poor vegetation cover and exotic vegetation faunal activity in the area was very low. During the field investigations only four bird species were observed on site. These species included African Hoopoe (*Upupa africana*), Barn Swallow (*Hirundo rustica*), Cape Sparrow (*Passer melanurus*) and Common Fiscal (*Lanius collaris*). The use of the borrow material at the Visrivier quarry is unlikely to cause significant disturbance to fauna in the area.

5.28 18. CONWAY

5.28.1 Flora

The study site showed signs of past disturbance regimes to the extent that any phytosociological study was deemed unnecessary. The floristic composition comprised of secondary grass species, particularly stoloniferous taxa and ruderal forb species. Exotics were represented by localised groves of tall *Pinus* spp. (Invader: Category 2). Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lycium cinereum	*Felicia muricata* (d), *Salsola kali, Asparagus aethiopicus*	*Sporobolus fimbriatus, Eragrostis lehmanniana*
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.28.2 Fauna

The proposed loop expansion site was surrounded by disturbed vegetation, which was the likely factor for limited faunal activity in the area. During the field investigations only three bird species were observed at the site, these include African Red-eyed Bulbul (*Pycnonotus nigricans*), African Stonechat (*Saxicola torquata*) and Pied Crow (*Corvus albus*). The construction of the loop extension at Conway is unlikely to cause any major disturbance to fauna in the area.

5.29 18.1 CONWAY POSSIBLE BORROW PIT

5.29.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of flat to slightly undulating plains dominated by mid-successional graminoid taxa of the genera *Aristida* and *Eragrostis*. The floristic composition consisted of a diverse assemblage of dwarf, microphyllous shrubs and included succulent taxa of the genera *Aloe* and *Ruschia*. However, a dolerite outcrop (Karoo Hardeveld) bordered the study area, thereby increasing the potential floristic species richness for the area. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lycium cinereum, Rhus erosa	*Asplenium cordatum* (d), *Eriocephalus ericoides* (d), *Ruschia spinisa, Aloe broomii, Thesium lineatum,*	*Digitaria argyrograpta* (d), *Aristida diffusa* (d), *Eragrostis lehmanniana* (d), *E. bergiana*
Taxa of Conservation interest:	*Ruschia spinosa* – PP *Aloe broomii* – PP *Stomatium* (?) sp. - PP	
Ecological importance:	High – high species richness and spatial heterogeneity	

(d) – dominant taxa

PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.29.2 Fauna

The proposed borrow pit was located in karoo veld between the existing railway line and a dolerite outcrop. There was no existing disturbance, i.e. existing borrow pit, other than livestock grazing. Evidence of faunal activity included:

Figure 5.29.2 Faunal evidence

	
Southern Africa's most venomous scorpion - *Parabuthus granulatus*	Aardvark (*Orycteropus afer*) activity

During the field investigations five bird species, six mammal species and two scorpion species were observe, or evidence of their presence was observed. Species included African Red-eyed Bulbul (*Pycnonotus nigricans*), African Stonechat (*Saxicola torquata*), Mountain Reedbuck (*Redunca fulvorufula*) and Steenbok (*Raphicerus campestris*). For a complete species list refer to Appendix A. Although no Red Data species were recorded and species abundance was relatively low, there was relatively high species activity. The dolerite outcrop provided a suitable habitat for protected scorpion species (*Opistophthalmus spp.*). The use of borrow material form the proposed Conway borrow pit will have significant affect on fauna on site and in the immediate vicinity.

5.30 19. GLENHEATH

5.30.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of open, flat plains dominated by a diverse basal cover of mid-successional graminoid taxa pertaining to the genera *Aristida, Eragrostis, Digitaria* and *Hyparrhenia*. The floristic composition consisted of dwarf, microphyllous forbs and scattered spinescent shrub. Although of poor species richness, the composition provides a fine example of near-pristine Eastern Upper Karoo veld. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lycium cinereum (d), *Rhus burchellii*	*Felicia muricata, Salsola calluna, Salsola kali, Eriocephalus ericoides, Gomphocarpus fruticosus, Delosperma sp., Rosenia humilis, Pentzia incana*	*Eragrostis lehmanniana* (d), *Fingerhuthia africana, Digitaria eriantha, Eragrostis obtusa, Aristida adscensionis, Hyparrhenia hirta, Enneapogon scoparius*
Taxa of Conservation interest:	*Delosperma sp.* - PP	
Ecological importance:	Low	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.30.2 Fauna

The proposed site for the new loop was located on open flat karoo veld. Faunal activity in the area was low. During the field investigations only three bird species and three mammal species were observed, or evidence of there presence was observed. These species included African Stonechat (*Saxicola torquata*), Cape Turtle Dove (*Streptopelia capicola*), Pied Crow (*Corvus albus*), Aardvark (*Orycteropus afer*), Baboons (*Papio hamadryas ursinus*) in the adjacent hills, and Steenbok (*Raphicerus campestris*). The construction of the new loop at Glenheath is unlikely to cause any major disturbance to fauna in the area.

5.31 20. TAFELBERG

5.31.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of open, flat plains dominated by a diverse basal cover of mid-successional graminoid taxa. The floristic composition consisted of dwarf, microphyllous forbs and scattered spinescent shrub, which was very similar to the composition found at Glenheath. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lycium cinereum	*Eriocephalus ericoides* (d), *Pentzia globosa, Helichrysum zeyheri, Ruschia spinosa, Aptosimum procumbens*	*Fingerhuthia africana* (d), *Eragrostis lehmanniana, Aristida adscensionis, Enneapogon scoparius*
Taxa of Conservation interest:	*Ruschia spinosa* - PP	
Ecological importance:	Low	

(d) – dominant taxa
PP – Protected plant as promulgated by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance, No. 19 of 1974

5.31.2 Fauna

The proposed loop expansion site was located on flat open karoo veld. Faunal activity in the area was low. During the field investigations only two bird species and two mammal species were observed, or evidence of there presence was observed. These species included Cape Turtle Dove (*Streptopelia capicola*), Lanner Falcon (*Falco biarmicus*), Aardvark (*Orycteropus afer*) and Steenbok (*Raphicerus campestris*). The Lanner Falcon, which is a Red Data species (Near Threatened), was observed foraging in the general vicinity of the study area. The construction of the loop extension at Tafelberg is unlikely to cause any major disturbance to fauna in the area.

5.32 21. ROSMEAD

5.32.1 Flora

The study site showed signs of frequent anthropogenic disturbances to the extent that a phytosociological study was deemed unnecessary. The floristic composition comprised mainly of secondary grass taxa and ruderal forb species. Exotics were represented by localised groves of tall *Pinus* spp. and *Eucalyptus camaldulensis* (Invader: Category 2). Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Eucalyptus camaldulensis (d), *Pinus spp.*	*Felicia muricata* (d)	*Eragrostis lehmanniana* (d)
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.32.2 Fauna

The proposed loop expansion at Rosemead was located in an already disturbed site. Faunal activity was low. The construction of the loop extension is unlikely to cause any major disturbance to fauna in the area.

5.33 22. FLONKER

5.33.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of grassy slopes dominated by a basal cover of mid-successional graminoid taxa of the genera *Aristida, Eragrostis* and *Hyparrhenia*. The floristic composition comprised of dwarf, microphyllous forbs and scattered spinescent shrub reminiscent of past disturbance regimes. Please note that the study site was bordered by "climax" Tarkastad Montane Shrubland (a ridge), which was rich in floristic elements. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lycium cinereum	*Eriocephalus ericoides* (d), *Felicia filifolia, Pentzia incana*	*Eragrostis curvula* (d), *E. lehmanniana, Themeda triandra, Aristida adscensionis, Hyparrhenia hirta, Digitaria*

	eriantha, Cymbopogon pospischilii
Taxa of Conservation interest:	None
Ecological importance:	Medium due to close proximity to "climax" Tarkastad Montane Shrubland

(d) – dominant taxa

5.33.2 Fauna

The proposed loop expansion site was located in open karoo veld adjacent to a ridge system. Faunal activity in the area was low. During the field investigations only four bird species and two mammal species were observed, or evidence of there presence was observed. These species included African Pied Starling (*Spreo bicolor*), Cape Wagtail (*Motacilla capensis*), Eastern Clapper Lark (*Mirafra fasciolata*), Pied Crow (*Corvus albus*), Aardvark (*Orycteropus afer*) and Scrub Hare (*Lepus saxatilis*). The construction of the loop extension at Flonker is unlikely to cause any major disturbance to fauna in the area.

5.34 23. CARLTON

5.34.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of grassy slopes dominated by a basal cover of mid-successional graminoid taxa of the genera *Aristida, Eragrostis* and *Hyparrhenia*. The floristic composition comprised of dwarf, microphyllous forbs and scattered spinescent shrub reflecting past disturbance regimes. Please note that the study site was located in close proximity to "climax" Besemkaree Koppies Shrubland (a ridge), which was rich in floristic elements. Exotics were represented by localised groves of tall *Eucalyptus camaldulensis* (Invader: Category 2). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lycium cinereum, Rhus erosa, R. burchellii	*Eriocephalus ericoides* (d), *Felicia muricata, Gomphocarpus fruticosus, Sutherlandia microphylla, Felicia filifolia, Nemesia fruticans, Pentzia incana, Elytropappus rhinocerotis*	*Eragrostis curvula* (d), *E. lehmanniana, Themeda triandra, Aristida adscensionis, Hyparrhenia hirta*
Taxa of Conservation interest:	None	

Ecological importance:	Medium due to close proximity to "climax" Besemkaree Koppies Shrubland

(d) – dominant taxa

5.34.2 Fauna

The proposed loop expansion site was located in open eroded karoo veld adjacent to a ridge system. Faunal activity in the area was low. During the field investigations only five bird species and one mammal species were observed, or evidence of there presence was observed. These species included African Pied Starling (*Spreo bicolor*), Cape wagtail (*Motacilla capensis*), Eastern Clapper Lark (*Mirafra fasciolata*), Pied Crow (*Corvus albus*), Rufous-eared Warbler (*Malcorus pectoralis*) and Baboons (*Papio hamadryas ursinus*) (The Baboons were on the ridge adjacent to the site). The construction of the loop extension at Carlton is unlikely to cause any major disturbance to fauna in the area.

5.35 24. BARREDEEL

5.35.1 Flora

The study site showed signs of frequent anthropogenic disturbance regimes to the extent that a phytosociological study was deemed unnecessary. The floristic composition comprised mainly of secondary grass taxa and ruderal forb species. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lycium cinereum	*Eriocephalus ericoides* (d), *Pentzia incana* (d), *Felicia muricata, Tagetes minuta, Gazania krebsiana, Arctotis sp.*	*Eragrostis lehmanniana* (d), *E. curvula, Chloris virgata, Ehrharta calycina*
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.35.2 Fauna

The proposed loop expansion site was located in open disturbed karoo veld. Faunal activity in the area was low. During the field investigations only 10 bird species and one mammal species were observed on site. Species included

African Stonechat (*Saxicola torquata*), Anteating Chat (*Myrmecocichla formicivora*), Grey-backed Sparrowlark (*Eremopterix verticalis*) and South African Ground Squirrel (*Xerus inauris*). For a complete species list refer to Appendix A. No Red Data species were recorded on site. The construction of the loop extension at Barredeel is unlikely to cause any major disturbance to fauna in the area.

5.36 25. WILDFONTEIN

5.36.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of open secondary grassland dominated by mid-successional taxa of the genera *Eragrostis*. The forb composition was poor in richness and reminiscent of past disturbance regimes. Exotics were represented by localised groves of tall *Eucalyptus camaldulensis* (Invader: Category 2) and *Argemone ochroleuca* (Weed: Category 1). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Lycium hirsutum	*Salvia repens, Pentzia incana, Eriocephalus ericoides*	*Eragrostis lehmanniana* (d)
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.36.2 Fauna

The proposed loop expansion site was located in open disturbed karoo veld. Faunal activity in the area was low. During the field investigations 14 bird species and one mammal species were observed on site. Species included Anteating Chat (*Myrmecocichla formicivora*), Chat Flycatcher (*Bradornis infuscatus*), Grey-backed Cisticola (*Cisticola subruficapillus*) and Scrub Hare (*Lepus saxatilis*). For a complete species list refer to Appendix A. Blue Cranes (*Anthropoides paradiseus*), which are listed as Vulnerable species, were observed foraging in close proximity to the study area. However, the construction of the loop extension at Wildfontein is unlikely to cause any major disturbance to fauna in the area.

5.37 25.1 BORROW PIT NEAR WILDFONTEIN

5.37.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of open grassy plains dominated by a basal cover of secondary graminoid taxa pertaining to the genera *Sporobolus, Aristida* and *Eragrostis*. The floristic composition comprised of dwarf, microphyllous forbs. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
	Rosenia humilis (d), *Eriocephalus spinescens* (d), *Pentzia incana, Rosenia glomerata*	*Sporobolus ludwigii* (d), *Aristida adscensionis, Eragrostis lehmanniana, Stipagrostis obtusa*
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.37.2 Fauna

The proposed borrow pit, which was an existing pit, was located closest to Wildfontein loop extension site in comparison to the second proposed borrow pit in the area. Faunal activity on site, particularly mammal activity, was high. During the field investigations nine bird species and five mammal species were observed, or evidence of their presence was observed. Species included Anteating Chat (*Myrmecocichla formicivora*), Eastern Clapper Lark (*Mirafra fasciolata*), Kalahari Scrub Robin (*Erythropygia paena*), Porcupine (*Hystrix africaeaustralis*) and Aardvark (*Orycteropus afer*). Blue Cranes (*Anthropoides paradiseus*), which are listed as Vulnerable species, were observed foraging in close proximity to the study area, as shown below:

Figure 5.37.2 Faunal evidence adjacent to site

Blue Cranes (*Anthropoides paradiseus*) foraging in close proximity to the study areas

However, the use of the borrow material from the proposed borrow pit is unlikely to cause significant disturbance to fauna in the area provided activities remain localised.

5.38 25.2 BORROW PIT NEAR WILDFONTEIN

5.38.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of open grassy plains dominated by a basal cover of secondary graminoid taxa pertaining to the genera *Sporobolus* and *Eragrostis*. The floristic composition comprised of dwarf, microphyllous forbs. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
	Eriocephalus ericoides (d), *Felicia muricata* (d), *Melolobium candicans, Pentzia incana, Rosenia humilis, Rosenia glomerata*	*Sporobolus ludwigii* (d), *Eragrostis lehmanniana, E. obtusa*
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.38.2 Fauna

The proposed borrow pit, which was an existing pit, was located in open karoo veld, further from the Wildfontein loop in comparison to the previous borrow pit. Faunal activity on site, particularly mammal activity, was high. Evidence of faunal activity included:

Figure 5.38.2 Faunal evidence

Porcupine (*Hystrix africaeaustralis*) droppings

Scrub Hare (*Lepus saxatilis*) droppings

During the field investigations nine bird species and five mammal species were observed, or evidence of their presence was observed. Species included Anteating Chat (*Myrmecocichla formicivora*), Eastern Clapper Lark (*Mirafra fasciolata*), Kalahari Scrub Robin (*Erythropygia paena*), Porcupine (*Hystrix africaeaustralis*) and Aardvark (*Orycteropus afer*). Blue Cranes (*Anthropoides paradiseus*), which are listed as Vulnerable species, were observed foraging in close proximity to the study area. However, the use of the borrow material from the proposed borrow pit is unlikely to cause significant disturbance to fauna in the area provided activities remain localised.

5.39 26. LINDE

5.39.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of open grassy plains dominated by a basal cover of secondary graminoid taxa pertaining to the genera *Aristida* and *Eragrostis*. The floristic composition comprised of dwarf, microphyllous forbs reflecting past disturbance regimes. Floral site characteristics include:

		
Woody (Trees & shrubs)	**Herbaceous (forbs)**	**Graminoid (Grass & Sedge)**
	Pentzia incana (d), Pteronia glauca, Salvia repens, Schkuhria pinnata, Gazania krebsiana	*Bromus pectinatus* (d), *Eragrostis curvula* (d), *E. bicolor* (d), *E. lehmanniana, Aristida diffusa*
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.39.2 Fauna

The proposed loop expansion site was located in open disturbed karoo veld. Faunal activity in the area was low. During the field investigations 10 bird species and four mammal species were observed, or evidence of there presence was observed. Species included African Pipit (*Anthus cinnamomeus*), Cape Longclaw (*Macronyx capensis*), Eastern Clapper Lark (*Mirafra fasciolata*), South African Ground Squirrel (*Xerus inauris*) and Steenbok (*Raphicerus campestris*). For a complete species list refer to Appendix A. A Lanner Falcon (*Falco biarmicus*), which is listed as a Near Threatened species, was observed foraging in the vicinity of the site. However, the construction of the loop extension at Linde is unlikely to cause any major disturbance to fauna in the area.

5.40 27. HANOVER ROAD

5.40.1 Flora

The study site showed signs of frequent anthropogenic disturbances to the extent that a phytosociological study was deemed unnecessary. The floristic composition comprised mainly of secondary grass taxa and ruderal forb species. Exotics were represented by localised groves of tall *Pinus* spp. and *Eucalyptus camaldulensis* (Invader: Category 2).

5.40.2 Fauna

The proposed new loop site was surrounded by disturbed vegetation, which was the likely factor for limited faunal activity in the area. During the field investigations only seven bird species were observed at the site, these include Hadeda Ibis (*Bostrychia hagedash*), Pied Crow (*Corvus albus*) and Black-shouldered Kite (*Milvus caeruleus*). For a complete species list refer to

Appendix A. No Red Data species were recorded on site. The construction of the new loop at Hanover Road is unlikely to cause any major disturbance to fauna in the area.

5.41 27.1 HANOVER ROAD BORROW PIT

5.41.1 Flora

The study site coincided with the Nama-Karoo Biome and comprised of open grassy plains dominated by a basal cover of secondary graminoid taxa pertaining to the genus *Eragrostis*. The floristic composition consisted of a diverse layer of dwarf, microphyllous forbs. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
	Rosenia humilis (d), *Pentzia incana* (d), *Ruschia spinosa*	*Eragrostis bergiana* (d)
Taxa of Conservation interest:	*Ruschia spinosa, Titanopsis sp.*	
Ecological importance:	Medium	

(d) – dominant taxa

5.41.2 Fauna

The proposed borrow pit, which was an existing pit, was located in open karoo veld. Faunal activity on site, particularly mammal activity, was high. During the field investigations eight bird species and six mammal species were observed, or evidence of their presence was observed. Species included African Pied Starling (*Spreo bicolor*), European Bee-eater (*Merops apiaster*), Pale-winged Starling (*Onychognathus nabouroup*), Springhare (*Pedetes capensis*) and Suricate (*Suricata suricatta*). For a complete species list refer to Appendix A. No Red Data species were recorded on site, however, possible evidence of Cape Fox (*Vulpes chama*), a protected species, was recorded. However, the use of the borrow material from the proposed borrow pit is unlikely to cause significant disturbance to fauna in the area provided activities remain localised.

5.42 28. BURGERVILLEWEG

5.42.1 Flora

The study site showed signs of frequent anthropogenic disturbances to the extent that a phytosociological study was deemed unnecessary. The floristic composition comprised primarily of secondary grass taxa and ruderal forb species. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
	Nemesia fruticans (d), *Pentzia incana, Felicia muricata*	*Fingerhuthia africana* (d), *Eragrostis lehmanniana, E. bicolor*
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.42.2 Fauna

The proposed loop expansion site was located in open disturbed karoo veld. Faunal activity at the site was low, however, in the general vicinity of the study area faunal activity was relatively high. During the field investigations seven bird species and five mammal species were observed, or evidence of their presence was observed. Species included Rock Martin (*Hirundo fuligula*), Southern Pale Chanting Goshawk (*Melierax canorus*), Scrub Hare (*Lepus saxatilis*) and Black-backed Jackal (*Canis mesomelas*). For a complete species list refer to Appendix A. Blue Cranes (*Anthropoides paradiseus*) and Ludwig's Bustard (*Neotis ludwigii*), which are listed as Vulnerable species, were recorded foraging in the general vicinity of the study area. However, even with the Red Data species foraging nearby the construction of the loop extension at Burgervilleweg is unlikely to cause any major disturbance to fauna in the area provided construction activities remain within the railway reserve and disturbed areas adjacent to the reserve.

5.43 29. BLETTERMAN

5.43.1 Flora

The study site showed signs of frequent anthropogenic disturbances to the extent that a phytosociological study was deemed unnecessary. The floristic composition comprised of secondary grass taxa and ruderal forb species. Exotics were represented by *Argemone ochroleuca* (Weed: Category 1). Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
	Pentzia incana (d)	*Eragrostis lehmanniana* (d), *Cynodon dactylon, E. bicolor*
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.43.2 Fauna

The proposed loop expansion site was located in open disturbed karoo veld. Faunal activity at the site was low. During the field investigations seven bird species and two mammal species were observed, or evidence of their presence was observed. Species included Southern Pale Chanting Goshawk (*Melierax canorus*), Cape Sparrow (*Passer melanurus*), Black-backed Jackal (*Canis mesomelas*) and South African Ground Squirrel (*Xerus inauris*). For a complete species list refer to Appendix A. No Red Data species were recorded on site, however, Ludwig's Bustards (*Neotis ludwigii*), which are listed as Vulnerable species, were recorded foraging in the general vicinity of the study area. However, even with the Red Data species foraging nearby the construction of the loop extension at Bletterman is unlikely to cause any major disturbance to fauna in the area provided construction activities remain within the railway reserve and disturbed areas adjacent to the reserve.

5.44 29.1 BLETTERMAN ROAD BORROW PIT

5.44.1 Flora

The study site coincided with the Nama-Karoo Biome (more particularly the Northern Upper Karoo) and comprised of open grassy plains dominated by a basal cover of secondary graminoid taxa of the genera *Aristida* and *Eragrostis*. The floristic composition consisted of a diverse layer of dwarf, microphyllous forbs. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
	Pentzia incana (d), *Ruschia spinosa, Rosenia humilis, Salsola calluna, Plinthus karooicus*	*Enneapogon desvauxii* (d), *Eragrostis lehmanniana, E. bicolor, E. bergiana*
Taxa of Conservation interest:	*Ruschia spinosa*	
Ecological importance:	Low	

(d) – dominant taxa

5.44.2 Fauna

The proposed borrow pit, which was an existing pit, was located in open karoo veld approximately 10km south of De Aar, adjacent to the N10. Faunal activity on site was low. During the field investigations five bird species and

two mammal species were observed, or evidence of their presence was observed. Species included Common Kestrel (*Falco tinnunculus*), Southern Pale Chanting Goshawk (*Melierax canorus*) and Eastern Clapper Lark (*Mirafra fasciolata*). For a complete species list refer to Appendix A. The use of the borrow material from the proposed borrow pit is unlikely to cause significant disturbance to fauna in the area.

5.45 30. HOTAZEL YARD (INCLUDING HOTAZEL TIE IN OF TRIANGLE)

5.45.1 Flora – Hotazel Yard

The study site coincided with the Eastern Kalahari Savanna of which the surrounding vegetation comprised of short, mixed *Acacia* thornveld on deep Cenozoic sand (Kalahari Group). A basal cover of secondary taxa pertaining to the genus *Stipagrostis* dominated the grassy layer. The forb composition was poorly defined as reflected by past disturbance regimes. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia tortilis	*Chrysocoma ciliata, Helichrysum argyrosphaerum, Nemesia cf. fruticans*	*Stipagrostis uniplumis, Enneapogon scoparius, Schmidtia pappophoroides*
Taxa of Conservation interest:	*Acacia erioloba* – DWAF protected *Acacia haematoxylon* – DWAF protected, BIT	
Ecological importance:	Low	

(d) – dominant taxa
BIT - Biogeographically important taxon endemic to the Kalahari (Mucina & Rutherford, 2006)

5.45.2 Flora - Hotazel Tie in of Triangle

The study site coincided with the Eastern Kalahari Savanna and comprised of short, dense *Acacia* thornveld dominated by *Acacia mellifera* shrub. The encroachment of *A. mellifera* illustrated how habitat transformation (by means of anthropogenic activities) has benefited the formation of near-impenetrable stands of this woody shrub. The forb composition was poorly defined as reflected past disturbance regimes. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia mellifera (d), *Acacia tortilis, Acacia haematoxylon*	*Senecio consanguineus* (d), *Chrysocoma ciliata, Felicia muricata, Helichrysum argyrosphaerum*	*Enneapogon scoparius, Schmidtia pappophoroides, Stipagrostis uniplumis*
Taxa of Conservation interest:	*Acacia haematoxylon* – DWAF protected, BIT	
Ecological importance:	Low	

(d) – dominant taxa
BIT - Biogeographically important taxon endemic to the Kalahari (Mucina & Rutherford, 2006)

5.45.3 Fauna

The railway yard (including the tie in triangle) is located approximately 3km south of the town of Hotazel, where majority of the habitat has been transformed. The faunal activity, particularly mammal activity, adjacent to the study area was high. However, within the study area there was very little fauna activity. During the field investigations nine bird species, seven mammal species and one reptile species were observed, or evidence of their presence was observed adjacent to the study area. Species included European Bee-eater (*Merops apiaster*), Red-breasted Swallow (*Hirundo semirufa*), Common Mole-rat (*Cryptomys hottentotus*), Springhare (*Pedetes capensis*) and Southern Rock Agama (*Agama atra*). For a complete species list refer to Appendix A. No Red Data species were recorded on site, however, South African Hedgehog (*Atelerix frontalis*), which is listed as Near Threatened, was recorded in the general vicinity of the study area. The proposed upgrades to the Hotazel yard (including the tie in triangle) are unlikely to cause a significant disturbance to fauna in the area.

5.46 31. MAMATHWANE YARD

5.46.1 Flora – Mamathwane Loops

The study site coincided with the Eastern Kalahari Savanna and comprised of short, open *Acacia* thornveld on deep Cenozoic sand (Kalahari Group). A basal cover of secondary taxa pertaining to the genus *Stipagrostis* dominated the grassy layer. The forb composition was poorly defined as reflected by past disturbance regimes. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia mellifera, Acacia hebeclada	*Chrysocoma ciliata, Lagerra decurrens, Sesamum triphyllum, Hermannia tomentosa, Talinum cf. tenuissimum, Hirpicium gazanioides, Elephantorrhiza elephantina*	*Stipagrostis uniplumis, Schmidtia pappophoroides* (d) *Cynodon dactylon*
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.46.2 Flora - Middelplaats Take-off

The study site coincided with the Eastern Kalahari Savanna and comprised of short, open *Acacia* thornveld on deep Cenozoic sand (Kalahari Group). A basal cover of secondary taxa pertaining to the genus *Stipagrostis* dominated the grassy layer. The forb composition was poorly defined. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia mellifera, Acacia haematoxylon	*Felicia muricata, Gnidia polycephala, Senecio inaequidens, Sesamum triphyllum*	*Enneapogon scoparius, Eragrostis lehmanniana*
Taxa of Conservation interest:	*Acacia haematoxylon* – DWAF protected, BIT	
Ecological importance:	Low	

(d) – dominant taxa
BIT - Biogeographically important taxon endemic to the Kalahari (Mucina & Rutherford, 2006)

5.46.3 Fauna

The railway yard (loops and middelplaats take-off) is located approximately 22km south of the town of Hotazel, where majority of the habitat has been transformed. The faunal activity within the study area was low. During the field investigations four bird species and three mammal species were observed, or evidence of their presence was observed adjacent to the study area. Species included Pied Crow (*Corvus albus*), Laughing Dove (*Streptopelia senegalensis*) and Slender Mongoose (Galerella sanguinea). For a complete species list refer to Appendix A. No Red Data species were recorded on site, however, South African Hedgehog (*Atelerix frontalis*), which is listed as Near Threatened, was recorded on route to the study area. The proposed upgrades to the Mamathwane yard (loops and middelplaats take-off) are unlikely to cause a significant disturbance to fauna in the area.

5.47 32. POSTMASBURG YARD (INCLUDING PMG ELECTRIFYING LINE)

5.47.1 Flora

The study site coincided with Kuruman Thornveld and comprised of short, open *Acacia* thornveld with a basal cover of mid-successional graminoid taxa pertaining to the genus *Enneapogon*. The forb composition reflected past disturbance regimes. Floral site characteristics include:


Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia mellifera (d), *Lycium cinereum, Tarchonanthus camphoratus*	*Felicia muricata, Gnidia polycephala, Aloe grandidentata, Eriocephalus ericoides, Hirpicium gazanioides*	*Enneapogon scoparius* (d)
Taxa of Conservation interest:	None	
Ecological importance:	Low	

(d) – dominant taxa

5.47.2 Fauna

The railway yard is located approximately 3km north of the town of Postmasburg, where majority of the vegetation is disturbed. The faunal activity within the study area was low. During the field investigations two bird species and two reptile species were observed on site. These included Cape Sparrow (*Passer melanurus*), Cape Turtle Dove (*Streptopelia capicola*), Puff

Adder (*Bitis arietans*) and Ground Agama (*Agama aculeata*). The proposed upgrades to the Postmasburg yard (including PMG Electrifying line) are unlikely to cause a significant disturbance to fauna in the area.

5.48 33. ROANALDSVLEI & BEACONSFIELD YARDS

5.48.1 Flora

Both sites corresponded to an industrial area. The botanical importance of these areas was insignificant.

5.48.2 Fauna

The Ronaldsvlei change-over yard and the Beaconsfield electric locomotive running shed are located approximately 5km south of Kimberley. Faunal activity within the study area was low. During the field investigations 16 bird species were observed on site. These included Bokmakierie (*Telophorus zeylonus*), Cape Longclaw (*Macronyx capensis*), Crimson-breasted Shrike (*Laniarius atrococcineus*) and Fiscal Flycatcher (*Sigelus silens*). For a complete species list refer to Appendix…. No Red Data species were recorded on site. The proposed upgrades to the Ronaldsvlei change-over yard and the Beaconsfield electric locomotive running shed are unlikely to cause a significant disturbance to fauna in the area.

5.49 34 EMIL

5.49.1 Flora

The study site coincided with the Eastern Kalahari Savanna and comprised of short, open *Acacia* thornveld that was dominated by secondary graminoid taxa pertaining to the genera *Eragrostis, Stipagrostis* and *Cenchrus*. The forb composition comprised of dwarf species, mainly members of the Asteraceae. Floral site characteristics include:

Woody (Trees & shrubs)	Herbaceous (forbs)	Graminoid (Grass & Sedge)
Acacia mellifera (d), *Tarchonanthus camphorates, Lycium cinereum, Diospyros lycioides*	*Felicia muricata (d), Pentzia incana (d), Zygophyllum pubescens, Lagerra decurrens, Chrysocoma ciliata, Geigeria ornativa, Hermannia tomentosa*	*Stipagrostis uniplumis, Cenchrus ciliaris, Eragrostis echinochloidea*

Taxa of Conservation interest:	None
Ecological importance:	Low

(d) – dominant taxa

5.49.2 Fauna

The proposed new Transnet Freight Rail traction substation at Emil is located approximately 35km south of Mamathwane. Faunal activity within the study was low. During the field investigations nine bird species and four mammal species were observed, or evidence of their presence was observed on site. Species included African Red-eyed Bulbul (*Pycnonotus nigricans*), Greater Kestrel (*Falco rupicoloides*), Lesser Grey Shrike (*Lanius minor*), Porcupine (*Hystrix africaeaustralis*) and Scrub Hare (*Lepus saxatilis*). For a complete species list refer to Appendix A. No Red Data species were recorded on site, however, possible scorpion burrows (*Opistophthalmus spp.* – protected species) were located in the vicinity of the study area. The construction of a new substation at Emil is unlikely to cause significant disturbance to fauna in the area.

5.50 REFURBISHMENT OF THE KIMBERLEY – DE AAR SECTION

5.50.1 Flora

The rail section between Kimberley and De Aar comprises mainly of low shrub dominated by *Rhus burchellii, Rhigozum trichotomum, Lycium cinereum* and the spinescent shrub *Asparagus cf. aethiopicus*. However, large sections along the servitude were previously disturbed, mainly due to overstocking of livestock as evidenced by the near-homogenous stands of *Rhigozum trichotomum.*

A number of alien invader and weed species were observed along the rail servitude and noteworthy species include *Eucalyptus camaldulensis* (Invader; Category 2), *Pinus* spp. (Invader: Category 2), *Agave americana* (Invader: Category 2), *Opuntia ficus-indica* (Weed: Category 1), *O. imbricata* (Weed: Category 1) and *Nicotiana glauca* (Weed: Category 1).

5.50.2 Fauna

The proposed refurbishment of the De Aar to Kimberley section of the railway line was assessed by driving the route. Fauna observed are listed in **Table 5.50.2**.

Table 5.50.2 Faunal species observed or evidence of their presence observed along the De Aar to Kimberley section.

COMMON NAME	SCIENTIFIC NAME	STATUS
BIRDS		
African Hoopoe	*Upupa africana*	LC
African Pied Starling	*Spreo bicolor*	LC
Anteating Chat	*Myrmecocichla formicivora*	LC

COMMON NAME	SCIENTIFIC NAME	STATUS
Barn Swallow	*Hirundo rustica*	LC
Black - shouldered Kite	*Milvus caeruleus*	LC
Cape Longclaw	*Macronyx capensis*	LC
Cape Turtle Dove	*Streptopelia capicola*	LC
Cape Weaver	*Ploceus capensis*	LC
Chestnut - backed Sparrowlark	*Eremopterix leucotis*	LC
Common Fiscal	*Lanius collaris*	LC
Eastern Clapper Lark	*Mirafra fasciolata*	LC
Greater Striped Swallow	*Hirundo cucullata*	LC
Helmeted Guineafowl	*Numida meleagris*	LC
Jackal Buzzard	*Buteo rufofuscus*	LC
Kalahari Scrub Robin	*Erythropygia paena*	LC
Karoo Scrub Robin	*Erythropygia coryphaeus*	LC
Laughing Dove	*Streptopelia senegalensis*	LC
Lesser Kestrel	***Falco naumanni***	**VU**
Namaqua Dove	*Oena capensis*	LC
Ostrich	*Struthio camelus*	LC
Pale - winged Starling	*Onychognathus nabouroup*	LC
Pied Crow	*Corvus albus*	LC
Red - breasted Swallow	*Hirundo semirufa*	LC
Sociable Weaver	*Philetairus socius*	LC
Southern Black Korhaan	*Afrotis afra*	LC
Southern Masked Weaver	*Ploceus velatus*	LC
Southern Pale - chanting Goshawk	*Melierax canorus*	LC
Southern Red Bishop	*Euplectes orix*	LC
MAMMALS		
Aardvark	*Orycteropus afer*	LC
Aardwolf	*Proteles cristatus*	LC
Cape Porcupine	*Hystrix africaeaustralis*	LC
Common Duiker	*Sylvicapra grimmia*	LC
Scrub Hare (check black tip on ears)	*Lepus saxatilis*	LC
South African Ground Squirrel	*Xerus inauris*	LC
Springbok	*Antidorcas marsupialis*	LC
Steenbok	*Raphicerus campestris*	LC
Yellow Mongoose	*Cynictis penicillata*	LC
REPTILES		
Ground Agama	*Agama aculeata*	LC

The refurbishment of the route from De Aar to Kimberley is unlikely to cause significant disturbance to fauna.

5.51 BROAD OVERVIEW OF THE VEGETATION ASSEMBLAGES/UNITS

5.51.1 Rationale

A number of proposed borrow pits were sampled and phytosociologically analysed to provide a better description of contemporary vegetation assemblages likely to occur along the freight line servitude. The outcome of such an exercise will provide more detail with regards to the floristic structure and compositional relationship among plant taxa than referring to the Vegetation Map of Mucina & Rutherford (2006) alone. However, the results merely allow for broad descriptions and should not be interpreted in the localised context.

The borrow pit localities were chosen since these were surrounded by natural vegetation.

5.51.2 Vegetation Units/Assemblages

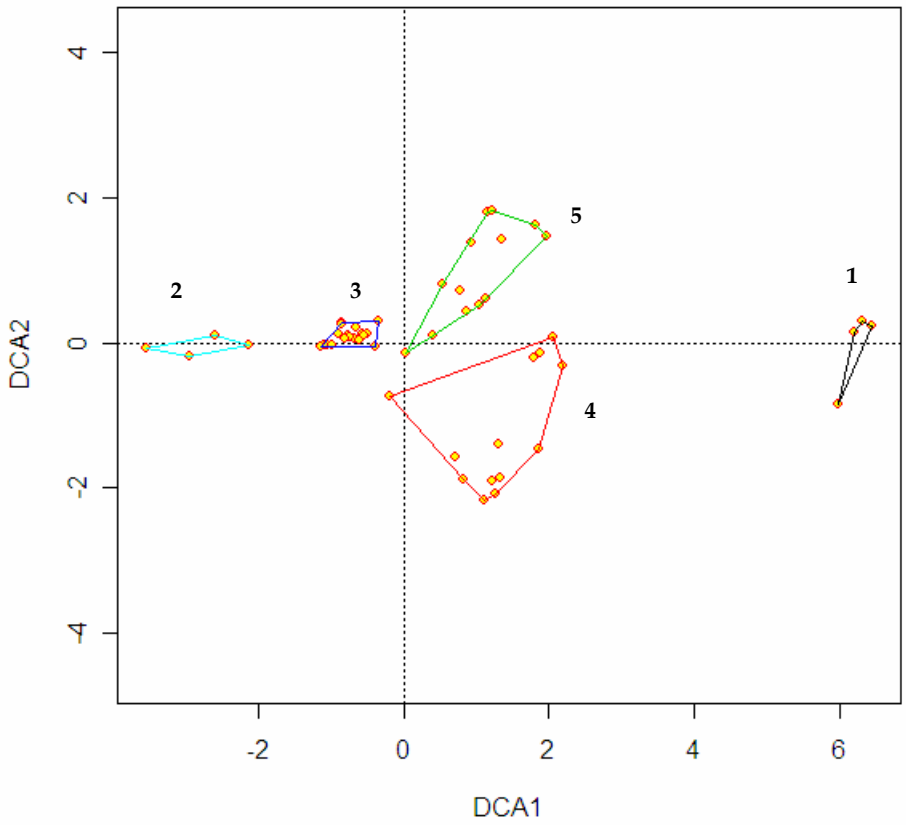
Based on the results of the ordination analysis, five distinct vegetation units were discernable (*Figure 5.51*). All of these tend to correlate well with current phytogeographical patterns such as those derived from the deep sands of the Mega-Kalahari basin, the arid Nama-Karoo basin and the Albany phytochorion.

These include:

1. *Acacia haematoxylon - Acanthosicyos naudinianus - Schmidtia pappophoroides* open woodland;
2. *Euclea undulata – Cynodon cf. dactylon* thicket;
3. *Felicia muricata – Aristida diffusa* transitional scrubland;
4. *Pentzia incana – Rosenia humilis* karroid bossieveld; and
5. *Eriocephalus ericoides – Aristida adscensionis* open bossieveld.

Appendix B provides an inventory of all plant taxa recorded during the survey period.

Figure 5.51 ***A Detrended Correspondence Analysis (DCA) of 52 sampling plots showing 5 distinct floral assemblages pertaining to natural vegetation along selected borrow pits***



1. *Acacia haematoxylon - Acanthosicyos naudinianus - Schmidtia pappophoroides open woodland*

This assemblage occurred on deep aeolian sand of the Kalahari basin and was particularly dominant near the town of Hotazel and Mamathwane. Structurally it was composed of a short, open woodland with a sparse field layer (depending on the amount of rainfall) of hardy, drought-tolerant taxa. Many of these contain underground storage mechanisms to restrict the loss of water. This unit could be described as a mixed microphyllous woodland dominated by the genus *Acacia*, in particular *A. heamatoxylon*, *A. erioloba*, *A. tortilis* and *A. hebeclada*, with a sparse to dense graminoid cover, depending on the preceding rainfall. The graminoid composition was biased towards arid-adapted grass species such as *Schmidtia pappophoroides*. Other noteworthy graminoid taxa include *Stipagrostis uniplumis, Anthephora pubescens* and *Eragrostis lehmanniana*. Forb richness was poor and comprised mainly of *Acanthosicyos naudinianus* (a common creeper in the Kalahari), *Hermannia tomentosum* and *Gnidia polycephala*. Typical floristic characteristics include:

Typical Species	% Contribution	Average abundance (based on mean cover/plot
Schmidtia pappophoroides	86.45	69.25
Acanthosicyos naudinianus	12.56	14.06
Stratum	**Average cover (%)**	**Height (m)**
Tree	25.25	4
Shrub	17.25	1.5
Field	26.5	-
Herb	15	0.3
Grass	85	0.75
Total cover:	±70%	
Borrow Pit #	30.1 Hotazel	

2. *Euclea undulata – Cynodon cf. dactylon thicket*

This assemblage occurred on shallow soils, mainly calcrete and limestone, along the southern extremity of the study area. It was located within the Albany Centre of floristic Endemism as illustrated by the high richness and endemism of forb taxa (e.g. *Rhombophyllum rhomboideum*). Structurally it was composed of short, dense bush clumps (e.g. *Euclea undulata, Gymnosporia capitata, Schotia afra, Sideroxylon inerme* and *Grewia robusta*) interspersed by a dry graminoid cover dominated by stoloniferous species such as *Cynodon cf. dactylon*. The composition showed a high prevalence of succulent and spinescent floras that were especially evident within the families Crassulaceae, Euphorbiaceae, Asphodelaceae (*Aloe*) and Mesembryanthemaceae.

Other noteworthy species include *Asparagus striatus, Stipa dregeana, Ruschia hamata, Rhus incisa* and *Aloe ferox*.

Typical floristic characteristics include:

Typical Species	% Contribution	Average abundance (based on mean cover/plot
Cynodon cf. dactylon	68.98	33.19
Euclea undulata	13.53	11.59
Gymnosporia capitata	5.84	7.50
Becium burchellianum	3.31	5.96
Stratum	**Average cover (%)**	**Height (m)**
Tree	18.75	3.5
Shrub	37.00	1.88
Field	11.25	-
Herb	45	0.3
Grass	55	0.23
Total cover:	±66.5%	
Borrow Pit #	1.1 Barkley Bridge	

3. Felicia muricata – Aristida diffusa transitional scrubland

This assemblage was typical of slightly undulating plains and broken terrain (or topography) with the exception being the Cookhouse borrow pits which were located on flat plains. It was found primarily on medium to shallow gravelly soils. Interestingly, this assemblage showed both floristic affinities to the Albany Thicket Biome and the Nama-Karoo Biome. It thus represents a transitional scrub with a floristic composition shared among thicket (*Euclea undulata – Cynodon cf. dactylon* thicket) and karroid vegetation types (*Pentzia incana – Rosenia humilis* karroid bossieveld and *Eriocephalus ericoides – Aristida adscensionis* open bossieveld) (therefore very similar in composition to the Albany Broken Veld). It was mainly centred in the Eastern Cape Province south of the Great Escarpment. The main drivers differentiating the observed composition from the upper Karoo floras are believed to be a combination of varied topography (aspect) and rainfall patterns (increased precipitation to the south) as dictated by the surrounding landscape.

The woody layer was poorly defined consisting of the genera *Rhus*, *Acacia Gymnosporia* and *Grewia*. Typical herbaceous taxa include *Felicia muricata*, *Asparagus striatus* and *Eriocephalus ericoides*. Typical graminoid taxa include *Aristida diffusa*, *Eragrostis obtusa*, *E. racemosa, E. bergiana* and the occurrence of *Cymbopogon pospischilii* and *Themeda triandra* on areas with steeper gradients.

Typical floristic characteristics include:

Typical Species	**% Contribution**	**Average abundance (based on mean cover/plot**
Felicia muricata	35.35	16.72
Becium burchellianum	15.52	8.93
Eragrostis bergiana	15.37	12.76
Aristida diffusa	12.72	7.97
Eriocephalus ericoides	11.95	8.64
Stratum	**Average cover (%)**	**Height (m)**
Tree	3.1	1.87
Shrub	2.6	0.62
Field	49.5	
Herb	45.0	0.35
Grass	51.1	0.80
Total cover:	±55.2%	
Borrow Pit #	10.1 Cookhouse, 10.2 Cookhouse, 14.1 Marlow, 16.1 Knutsford (in part), 16.2 Knutsford	

4. Pentzia incana – Rosenia humilis karroid bossieveld

This assemblage corresponded to a large area of flat plains between the towns of Middleburg and De Aar. It represents a floristic composition typical of the Upper Karoo (mainly Nama-Karoo Biome) and was structurally very similar to the *Eriocephalus ericoides – Aristida adscensionis* open bossieveld. However,

the observed slight reduction in the graminoid layer was best explained by a combination of below-average rainfall, and the trampling and indiscriminate stocking practices of livestock leading to the excessive proliferation of bossieveld (*Pentzia incana* and *Rosenia humilis*). The woody layer was absent while the majority of the graminoid composition consisted of annual or mid-successional taxa such as the genera *Aristida* and *Eragrostis*.

Typical graminoid taxa include *Eragrostis lehmanniana, E. bergiana, Sporobolus ludwigii, Enneapogon desvauxii* and *Aristida adscensionis*. Noteworthy forb species include *Eriocephalus ericoides, E. spinescens, Ruschia spinosa* and *Plinthus karooicus*.

Typical floristic characteristics include:

Typical Species	**% Contribution**	**Average abundance (based on mean cover/plot**
Pentzia incana	57.06	29.17
Rosenia humilis	24.17	9.93
Eriospermum spinescens	5.43	5.72
Eragrostis bergiana	5.01	10.09
Stratum	**Average cover (%)**	**Height (m)**
Tree	0.08	2.0
Shrub	0.38	1.2
Field	48.77	-
Herb	52.3	0.25
Grass	47.7	0.25
Total cover:	±49.2%	
Borrow Pit #	25.1 Wildfontein, 27.2 Hanover Road, 29.1 Bletterman	

5. Eriocephalus ericoides – Aristida adscensionis open bossieveld

This assemblage was in many respects indifferent to the *Pentzia incana – Rosenia humilis* karroid bossieveld, although the graminiod layer was better preserved and floristically more species rich. However, the differences were subtle. This assemblage occurred between Cradock and Middelburg, but was also patchily distributed between De Aar and Middelburg, making the geographic delineation thereof problematic. It also represents a floristic composition typical of the Upper Karoo (mainly Nama-Karoo Biome).

Typical graminoid taxa include *Aristida adscensionis, Eragrostis obtusa, E. lehmanniana, E. bergiana* and *Sporobolus ludwigii*. Noteworthy forb species include *Eriocephalus ericoides, Felicia muricata* and *Rosenia humilis.*

Typical floristic characteristics include:

Typical Species	% Contribution	Average abundance (based on mean cover/plot
Eriocephalus ericoides	42.51	15.61
Aristida adscensionis	19.66	13.83
Felicia muricata	12.65	7.08
Sporobolus ludwigii	10.65	7.25
Eragrostis lehmanniana	4.03	4.68
Aristida diffusa	4.00	6.72
Stratum	**Average cover (%)**	**Height (m)**
Tree	1.0	2.6
Shrub	15.5	1.7
Field	29.7	-
Herb	38.6	0.3
Grass	60.7	0.4
Total cover:	±46.2%	
Borrow Pit #	17.1 Visrivier Collett se quarry, 18.2 Conway, 25.2 Wildfontein	

5.52 CONSERVATION IMPORTANT SPECIES (RED DATA, ENDEMICS, PROTECTED)

Within this section, species listed have been extracted from the various literature sources mentioned in *Section 2.2* and may, therefore, occur within the study region and potentially at the different sites.

5.52.1 Floristic Species

South Africa has been recognised globally as having a remarkable plant diversity with high levels of endemism. Almost ten percent of the earth's plants are found within South Africa approximating 23 420 species (Golding, 2002). Of the 948 taxa assessed, 414 species that are 'threatened with extinction, while 270 of these have populations with extremely localised geographic distributions (Golding, 2002).

In terms of conserving biodiversity, there has been a shift towards focussing on ecosystems and landscapes (habitats[5]) rather than efforts in conserving specific species. This is the case due to the variety of living organisms, which make up ecosystems relying on suitable habitats to which they have become adapted over long periods of time. Habitat degradation is one of the main reasons for species becoming extinct in a particular area. However, it can be viewed that threatened species are seen as indicators of the overall health of an ecosystem and serve, with varying degrees of success, as 'umbrellas' for the protection of other organisms as well as ecosystems (Hilton-Taylor, 1996; 2000). According to Hilton-Taylor (1996) threatened species can be seen as biodiversity attention grabbers. The Threatened Plant Species Programme (TSP) is currently revising all threatened plant species assessments made by Craig Hilton-Taylor (1996) using IUCN Red Listing Criteria modified from Davis *et al.* (1986).

Red Data Species

When looking at conservation important floristic species, there are two main listings within South Africa that are currently been utilized. Firstly there is the TSP on a national level for the conservation and protection of Red Data species. The TSP has identified the most up-to-date Red List status for each taxon (in October 2007) and it is advised by the National Biodiversity Institute that this be used until the new Red Data List is produced. It aims to facilitate the conservation of South Africa's rare and endangered species. Secondly there are the Protected Plant listings for each province. For the Eastern Cape, the combination of the legislation of the former Cape Province, Transkei and Ciskei was used to determine the protection status of plants in the Eastern Cape.

Eastern Cape

In terms of the TSP listing there are 36 Critically Endangered species within the Eastern Cape Province (9% of the National listings), 46 Endangered (7.92% of the National Listings) and 118 Vulnerable species (10.48% of the National Listings) (**Table 5.52.1a**).

Northern Cape

Over 16% of the Nationally listed species are considered Vulnerable within the Northern Cape, 18 species are Critically Endangered and 31 species are Endangered (**Table 5.52.1a**).

(4) [5] Habitats normally comprise several biotopes or areas of uniformity (Davies & Day, 1998).

Table 5.52.1a The Number of Red Data Species found within the Eastern and Northern Cape provinces.

Status**	No. of Species in Eastern Cape	No. of Species in Northern Cape	Total (Nationally)	% of National (Eastern Cape)	% of National (Northern Cape)
CR	36	18	397	9.07	4.53
DD	95	97	655	14.5	14.81
Declining	-	8	37	0	21.62
EN	46	31	581	7.92	5.34
EX	6	1	36	16.67	2.78
NT	55	42	335	16.42	12.54
NT*	1	-	7	14.29	0
Rare	155	255	1288	12.03	19.8
STBA	10	9	210	4.76	4.29
VU	118	185	1126	10.48	16.43

** See Appendix C for a full description of each category

Near-threatened Taxa

The species *Rhombophyllum rhomboideum*, *Euphorbia meloformis* subsp. *valida* and *Cyrtanthus smithiae* are currently listed as "Near-threatened" based on an assessment conducted by the Threatened Species Programme (TSP, 2007) and Victor and Dold (2003). Both *R. rhomboideum* and *E. meloformis* were only observed from site 1.1 Barkley Bridge Borrow Pit and were part of the *Euclea undulata – Cynodon cf. dactylon* thicket. It is worth mentioning that the *valida* subspecies of *E. meloformis* was recently listed as "Rare" by the Threatened Species Programme (TSP, 2007).

C. smithiae, a geophyte, was observed from open arid grassland (part of the *Felicia muricata – Aristida diffusa* transitional scrubland) near the town of Cookhouse. This species was only recorded from sites 10.1 Cookhouse Borrow Pit and 10.2 Cookhouse Borrow Pit.

Protected Species

Table 5.52.1b provides a list of plant taxa protected by Schedule 4 of the Cape Nature and Environmental Conservation Ordinance (No. 19 of 1974). Please note that this ordinance, although old, is still applicable.

Table 5.52.1b A list of protected taxa observed from the study area.

Site	Protected Taxa
1. Barkley Bridge	All Mesembryanthemaceae*:*
1.1 Borrow pit Barkley Bridge	*Carpobrotus edulis*
2. Addo	*Delosperma echinatum*
3. Coerney	*Delosperma multiflora*
5. Eagles Crag	*Delosperma rogersii*
	Delosperma sp.

Site	Protected Taxa
8. Saltaire 9. Kommadagga 13. Haleshowen 14. Marlow 14.1 Marlow Borrow Pit 15. Kaptein 16.1 Knutsford Borrow Pit 16.2 Knutsford Borrow Pit 17. Visrivier 17.1 Visrivier: Collett se Quarry 18.1 Conway Borrow Pit 19. Glenheath 20. Tafelberg 27 Hanover Road 29. Bletterman Borrow Pit	*Drosanthemum hispidum* *Drosanthemum sp.* *Lampranthus productus* *Malephora sp.* *Mesembryanthemum aitonis* *Mestoklema sp.* *Phyllobolus splendens* *Psilocaulon coriarium* *Psilocaulon articulatum* *Rhombophyllum rhomboideum* *Ruschia cradockensis subsp. cradockensis* *Ruschia hamata* *Ruschia putterillii* *Ruschia spinosa* *Ruschia uncinata* *Ruschia sp.* *Stomatium sp.* *Titanopsis sp.* *Trichodiadema bulbosum* *Trichodiadema pomeridianum* *Trichodiadema sp.*
1.1 Borrow pit Barkley Bridge	*Euphorbia meloformis* subsp. *valida*
1.1 Borrow pit Barkley Bridge 5. Eagles Crag 6 Tootabi 8. Saltaire 9. Kommadagga 10.2 Cookhouse Borrow Pit 11. Klipfontein 18.1 Conway Borrow Pit	All Aloes except *Aloe ferox*: *Aloe broomii* *Aloe humilis* *Aloe speciosa* *Aloe striata* *Aloe tenuior*
1.1 Borrow pit Barkley Bridge 14.1 Marlow Borrow Pit	All members of the genus *Haworthia*: *Haworthia attenuata* *Haworthia bolusii var. blackbeardiana*
1.1 Borrow pit Barkley Bridge 5. Eagles Crag 16.1 Knutsford Borrow Pit	All members of the genus *Pachypodium*: *Pachypodium bispinosum* *Pachypodium succulentum*
5. Eagles Crag	All Amaryllidaceae: *Brunsvigia nr. striata* *Nerine cf. flexuosa*
10.1 Cookhouse Borrow Pit 10.2 Cookhouse Borrow Pit	All Amaryllidaceae: *Cyrtanthus smithiae*
14.1 Marlow Borrow Pit	All Amaryllidaceae: *Haemanthus humilis* *Cyrtanthus contractus*
10.2 Cookhouse Borrow Pit	*Stapelia grandiflora var. grandiflora*

A permit is required to remove or disturb a protected plant. It is recommended that protected plants in danger of becoming destroyed during the construction phase be removed prior to the commencement of construction activities and translocated to suitable habitat, or used during the rehabilitation phase (refer to the impact assessment).

Three recorded species of tree (**Table 5.52.1c**) appear on the national list of declared protected tree species as promulgated by the National Forests Act, 1998 (No 84 of 1998). The main reasons for this list are to provide strict

protection to certain species while others require control over harvesting and utilisation.

In terms of the National Forests Act of 1998, these tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the Department of Water Affairs and Forestry (or a delegated authority). Therefore, such activities (as mentioned above) should be directed to the responsible Forestry official in each province or area (please contact: Northern Cape: Ms Jackie Mans at Private Bag X5912, Upington, 8800 or (054) 334 0201 or e-mail her at MansJ@dwaf.gov.za and Eastern Cape: Ms Gwen Sgwabe at Private Bag X7485, King Williams Town, 5600 or (043) 604 5400 or e-mail her at sgwabeG@dwaf.gov.za).

Table 5.52.1c A list of protected tree taxa observed from the study area.

Site	Protected Taxa
1.1 Barkley Bridge Borrow Pit	*Sideroxylon inerme*
30. Hotazel	*Acacia erioloba*
30. Hotazel 30.2 Hotazel Tie in of Triangle 13.3 Middelplaats Take-off	*Acacia haematoxylon*

Endemics / Biogeographically Important Taxa

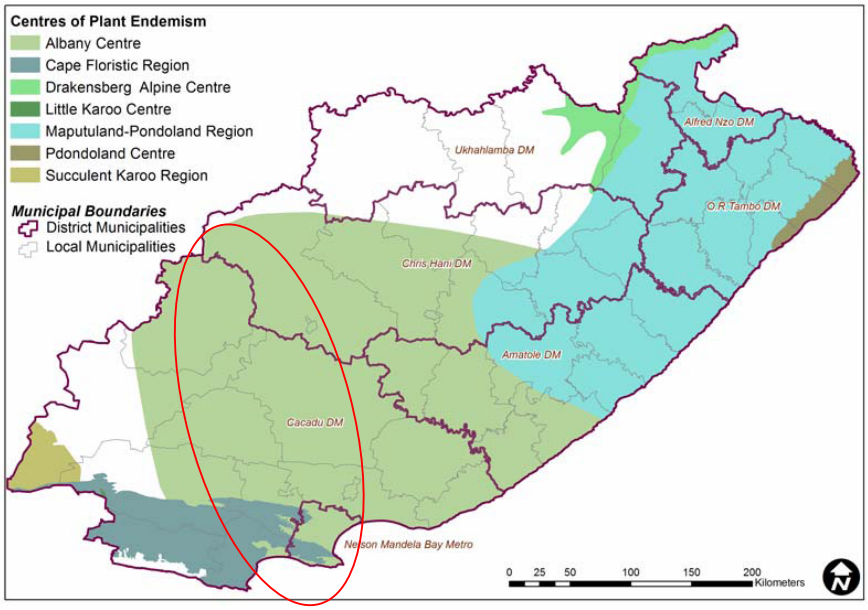
Whereas the classification and mapping of southern Africa's vegetation types have been the subject of numerous publications, the classification and mapping of the distribution patterns of the region's plant species have been neglected. This prompted the study by Van Wyk & Smith (2001) on identifying regions of floristic endemism in Southern Africa. The study area currently falls within two of these regions: The Albany Centre (*Figure 5.52.1a*) and the Griqualand West Centre (*Figure 5.52.1b*).

- *The Albany Centre*
  According to Cowling and Hilton-Taylor (1994) the country's protected areas are not well situated to conserve plant diversity and endemism as only 6.5% of the surface area of the Albany Centre falls into formally protected areas. In total, 126 taxa are threatened with extinction in the Albany Centre, and 6 are now extinct. A further 22 are listed as Data Deficient (DD). In the past, agriculture has been a severe threat to the survival of rare species in this part of the Eastern Cape; the main threats to the continuing existence of threatened plants in this area are illegal collecting, residential development and urban growth (Victor & Dold, 2003).

  The study sites which fall within the Albany Centre include Sites 1 – 23 (including subsites).

- *The Griqualand West Centre*
  The centre represents approximately 1800 taxa (species and subspecies) of which more than 40 (2.2%) are considered endemic. There are 13 species listed as being endemic or near-endemic succulents (van Wyk & Smith 2001). A number of non-succulent species are also endemic / near-endemic to the Griqualand West Centre of Endemism (van Wyk & Smith 2001) including *Digitaria polyphylla*. The main threats to this region include bush encroachment and overgrazing by domestic livestock.

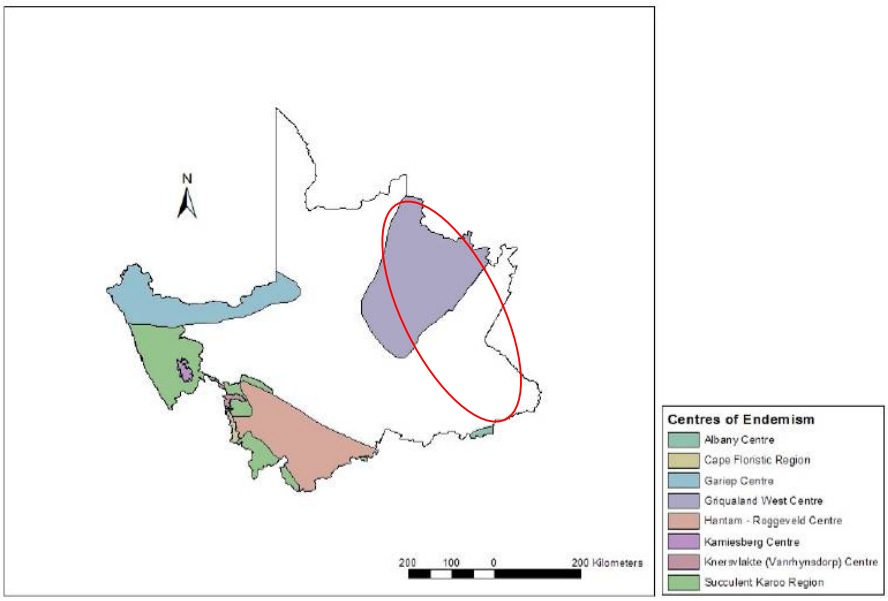
Figure 5.52.1a Centres and region of plant endemism occurring within the Eastern Cape



Source: Van Wyk & Smith, 2001

The study sites which fall within the Griqualand West Centre include Sites 30, 30.1, 30.2, 31, 31.3, 32, 32.1 and Site 34,.

Figure 5.52.1b Centres and region of plant endemism occurring within the Northern Cape



Source: Van Wyk & Smith, 2001

According to Mucina & Rutherford (2006) endemic and biogeographically important taxa that could potentially be found at the specific sites are presented in **Table 5.52.1d**.

Table 5.52.1d The Different Sites within the Study Area and the Potential Biogeographically Important or Endemic Species that could occur.

Site	Biogeographically important / Endemic taxa
1.1 Borrow pit Barkley Bridge	Biogeographically important taxa include *Ficinia truncata, Tribolium uniolae* and *Gibbaria scabra*. Endemic taxa include the succulent shrubs *Euphorbia globosa* and *Rhombophyllum rhomboideum,* the low shrub *Anginon rugosum* and the geophytic *Ledebouria* sp. nov.
1 Barley Bridge; 3 Coerney	Biographically important taxa: include the climbers *Ceropegia ampliata* var. *ampliata* and *Fockea sinuata*, the epiphytic parasite *Cuscuta bifurcata* and the geophyte *Pelargonium campestre*
4 Verby; 5 Eagle's Crag; 6 Tootabi	The endemic species *Faucaria nemorosa, Albuca crudenii* and *Walhenbergia kowiensis*.
7 Blinkhof; 8 Saltaire; 9 Kommadagga; 10 Golden Valley; 10.3 Golden Valley possible borrow pit.	Biogeographically important species includes the succulent *Sarcocaulon vanderietiae*. Endemic taxa include *Brachystelma huttonii, Ornithogalum britteniae, Ornithogalum perdurans*, *Haworthia cymbiformis* var. *obtusa*, *Ceropegia fimbriata* subsp. *fimbriata*, *Euphorbia inermis* var. *huttoniae*, *Rhombophyllum albanense* and *Rhombophyllum dyeri*.
10.1 Road borrow pit near Cookhouse; 10.2 Cookhouse possible borrow	Endemic taxa which could occur within these sites include *Euphorbia cumulata, Euryops gracillipes, Haworthia angustifolia* var. *paucifolia, Haworthia cummingii,*

Site	Biogeographically important / Endemic taxa
pit.	*Haworthia cymbiformis* var. *incurvula, Haworthia cymbiformis* var. *ramose* and *Zaluzianskya vallispiscis.*
11 Klipfontein; 11.1 Cutting as borrow pit; 12 Mortimer; 14.1 Marlow New borrow pit.	Endemic taxa which could occur within these sites include the species *Isolepis expallescens.*
13 Halesowen; 15 Kaptein; 16 Knutsford; 16.1 Borrow pit; 16.2 Knutsford Borrow material; 17 Visrivier; 17.1 Visrivier Collett se quarry; 17.2 Visrivier possible borrow pit; 18 Conway; 18.2 Borrow Pit; 19 Glenheath; 20 Tafelberg; 21 Rosmead; 23 Carlton; 24 Barredeel; 25 Wildfontein; 25.1 Borrow pit near Wildfontein; 26 Linde; 27 Hanover Road; 27.1 Level crossing to be moved; 27.2 Existing borrow pit	Endemic species such as *Chasmatophyllum rouxii, Hertia cluytiifolia, Rabiea albinota, Sasola tetrandra, Phymaspermum scoparium, Aspalathus acicularis* subsp. *planifolia, Selago persimilis, Selago walpersii*.
14 Marlow; 22 Flonker	Biographically Important Taxa: *Encephalartos friderici – guiliemi, Eriocephalus africanus, Senecio acutifolius.*
28 Burgervilleweg 29 Bletterman; 29.1 Road borrow pit.	Biographically Important Taxa: *Convolvulus boedeckerianus, Gymnosporia szyszylowiczii* subsp. *namibiensis*. Endemic Taxa: *Lithops hookeri, Stomatium pluridens, Atriplex spongiosa, Galenia exigua, Manulea deserticola*.
33.4 BEC ERS staging; 33.5 Beaconsfield x-over; 34.6 BEC Electrify line for loco x-over; Add 1 ERS staging; Add 1.1 Ronaldsvlei possible borrow pit; Add 1.2 Ronaldsvlei possible borrow pit 2.	Biographically Important Taxa: *Blepharis marginata, Euphorbia bergii, Panicum kalaharense, Helichrysum arenicola, Neuradopsis bechuanensis, Lithops aucampiae* subsp. *aucampiae, Tridentea marientalensis* subsp. *marientalensis.*
32 Postmasburg yard; 32.1 PMG Electrify this line	Biographically Important Taxa: *Acacia luederitzii* var. *luederitzii, Terminalia sericea, Acacia haematoxylon, Blepharis marginata, Digitaria polyphylla, Corchorus pinnatipartitus.* Endemic Taxon: *Gnaphalium englerianum*.
30 Hotazel; 30.1Borrow pits; 30.2 HZL Tie in of triangle; 31 Mamathwane loops; 31.1 MHV; 31.3 Middelplaats take off.	Biographically Important Taxa: *Acacia luederitzii* var. *luederitzii, Anthephora argentea, Megaloprotachne albescens, Panicum kalaharense, Neuradopsis bechuanensis*.
Source: Mucina & Rutherford (2006)	

Biogeographically important and endemic taxa identified during the survey included:

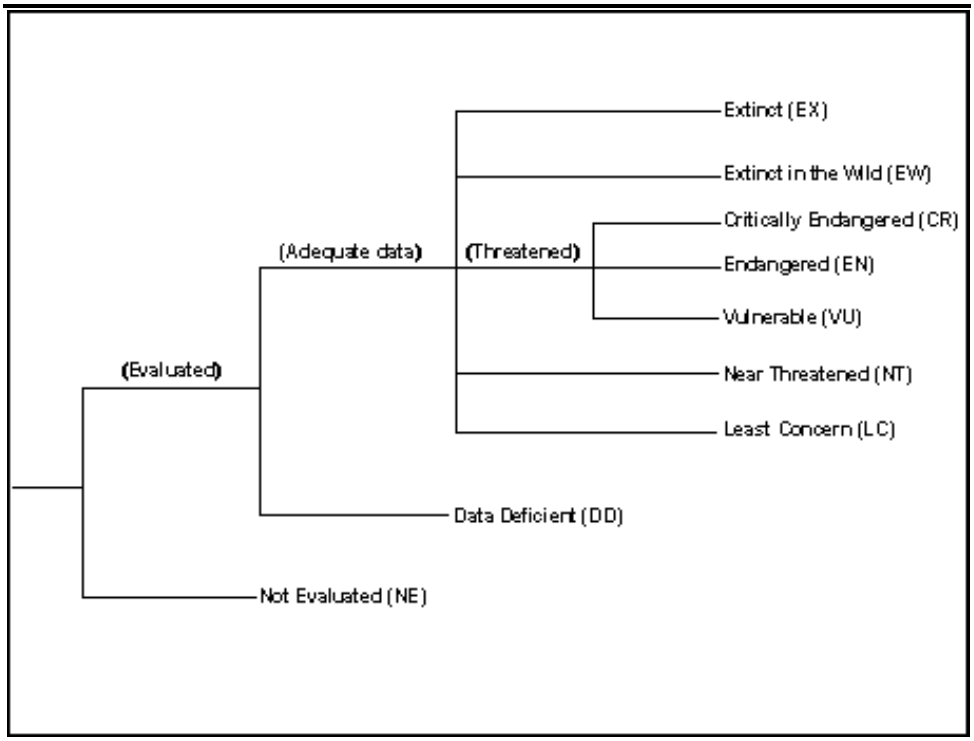
Site 1.1 Barkley Bridge Borrow Pit- *Rhombophyllum rhomboideum*
Ficinia truncata
Site 30 Hotazel- *Acacia haematoxylon*
Site 32.2 Hotazel Tie in of Triangle-*Acacia haematoxylon*

5.52.2 Faunal Species

The animals discussed in this section are prioritised because they are either threatened or are of conservation concern.

The best-known criteria for categorizing the level of threats facing species, is the IUCN's Red List criteria. According to Friedman and Daly (2004), the IUCN Red List Categories are intended to be an easily and widely understood system for classifying species at high risk of global extinction. The general aim of the system is to provide an explicit, objective framework for the classification of the broadest range of species according to their extinction risk. The IUCN categories are depicted below in *Figure 5.52.2a*, overleaf.

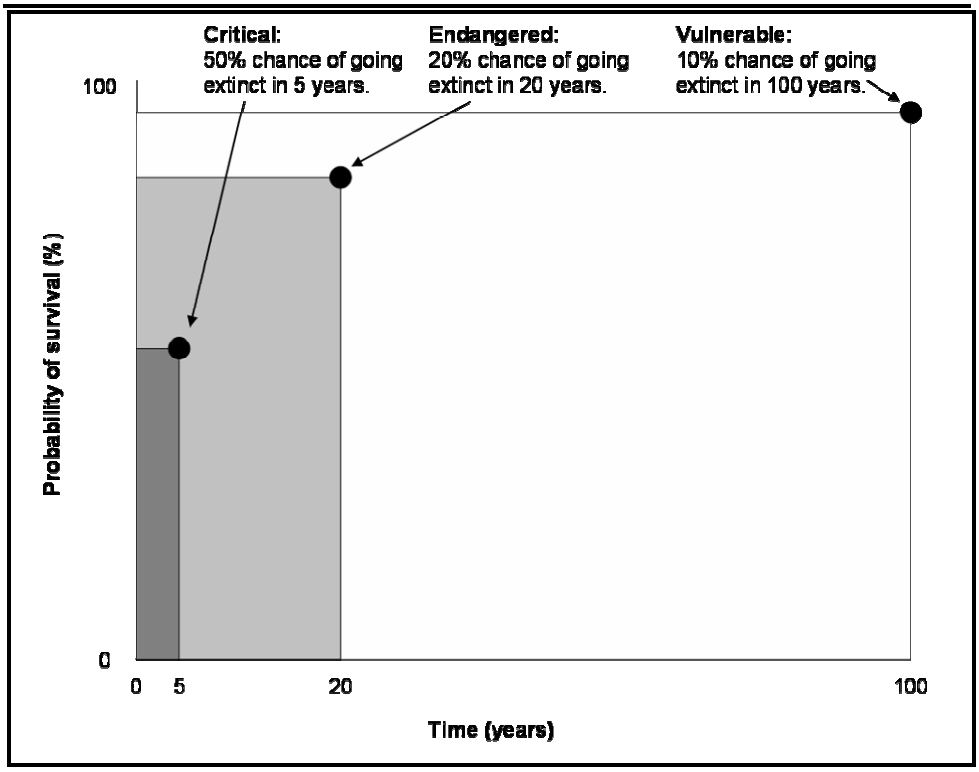
Figure 5.52.2a IUCN Red Data List Categories



Source: Friedman and Daly (2004)

The severity of the "Threatened" categories (i.e. Critically Endangered (CR), Endangered (EN) and Vulnerable (VU)) should not be taken lightly. One criterion for determining the threatened category of a taxon is quantitative analysis, which is any form of analysis that estimates the extinction probability of a taxon based on known life history, habitat requirements, threats and any specified management options (illustrated in *Figure 5.52.2b*, overleaf).

Figure 5.52.2b Quantitative Analysis Showing the Probability of Survival in the Wild for CR, EN and VU species



Source: Barnes (2000)

On a National level, Atlases and Red Data Books for mammals, birds and frogs have been updated (Friedman & Daly, 2004; Barnes, 2000; Minter *et al.*, 2004), and the reptile Atlas is in the progress of being updated. These National listings follow the IUCN system for categorizing the conservation status of species. In addition to these National listings, in February 2007, the Minister of Environmental Affairs and Tourism published a list of CR, EN, VU and Protected Species (PS), according to Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act no. 10, 2004). A PS is classified as an indigenous species of high conservation value or national importance that requires national protection.

Working with Quarter Degree Squares

Quarter Degree Squares (QDS) correspond to the area shown on a 1:50 000 map and are approximately 27 km long (north-south) and 23 km wide (east-west) (Avian Demography Unit 2008).

Avifauna & Mammals

A broad avifauna and mammal assessment for QDS was achieved by using published data for species and using databases available on the internet. **Table 5.52.2a** identifies the Threatened (CR, EN & VU), Near Threatened (NT), PS and Data Deficient (DD) avifaunal and mammal species within the relevant QDS.

Table 5.52.2a The number of threatened (CR, EN & VU), NT and DD avifauna and mammal species that have been recorded throughout the 29 QDS, within which the various sites (loops, borrow pits, yards, etc.) are located.

QDS	SITES	AVIFAUNA		MAMMALS					
		VU	NT	CR	EN	VU	PS	NT	DD
2722 BB	30 Hotazel; 30.2 HZL tie in of triangle.	2	1	1		1	5	3	3
2722 BD	31 Mamathwane loops; 31.3 Middelplaats take off.	2	1	1			4	3	3
2722 DB	Emil substation	2	1	1			4	3	3
2723 AC	31 Mamathwane loops; 31.3 Middelplaats take off.	1		1		1	5	3	3
2823 AC	32 Postmasburg yard; 32.1 PMG electrify this line.		1	1			4	5	3
2824 DD	33 Ronaldsvlei & Beconsfield	7	6	1			8	3	4
3024 CA	29 Bletterman; 29.1 Road borrow pit.	5	4	1			4	1	3
3024 CD	28 Burgervilleweg	4	6	1			4	1	4
3024 DC	26 Linde; 27 Hanover Road; 27.2 Existing borrow pit	5	6	1			4	1	4
3124 BA	25.2 Borrow pit near Wildfontein.	4	4	1	1		4	1	5
3124 BB	24 Barredeel; 25 Wildfontein; 25.1 Borrow pit near Wildfontein.	3	2	1	1		4	1	5
3124 BD	23 Carlton	1	4	1	1		4	1	6
3125 AC	21 Rosmead; 22 Flonker	3	4	1	1		6	1	7
3125 CA	20 Tafelberg	5	3	1	1		6	1	6
3125 CB	18 Conway; 18.2 Conway possible borrow pit; 19 Glenheath.	5	5	1	1		6	1	6
3125 CD	16.1 Borrow pit; 17 Visrivier	8	9	1	1	1	6	1	6
3125 DC	16 Knutsford; 16.2 Knutsford borrow material.	7	5	1	1	1	6	1	6
3225 BA	13 Halesowen; 14 Marlow; 14.1 Marlow new borrow pit; 15 Kaptein.	7	5	1	2	2	7	3	6
3225 BC	12 Mortimer; 13 Halesowen.	3	2	1	1		7	3	6
3225 DA	11.1 Cutting as borrow pit	5	7	1	2	1	8	3	6
3225 DB	10.1 Road borrow pit near Cookhouse, 10.2 Cookhouse possible borrow pit; 11 Klipfontein, 11.1 Cutting as borrow pit	6	8	1	2	1	8	3	6
3225 DD	10 Golden Valley; 10.3 Golden Valley possible borrow pit.	2	3	1	2	1	7	3	7
3325 BB	7 Blinkhof; 8 Saltaire; 9 Kommadagga.	1	3	1	1	1	6	5	7
3325 BC	3 Coerney	2	8	1	2	1	6	5	8
3325 BD	7 Blinkhof.	5	8	1	2	2	6	5	8
3325 DA	1 Barkly Bridge; 1.1 Borrow pit Barkley Bridge; 2 Addo	4	9	1	2	1	6	5	8
3326 AA	7 Blinkhof	5	6	1	1	2	6	5	7

QDS	SITES	AVIFAUNA		MAMMALS					
		VU	NT	CR	EN	VU	PS	NT	DD
3326 AC	4 Verby; 5 Eagle's Crag; 6 Tootabi.	3	3	1	2	2	6	5	8
Source: Friedmann & Daly, 2004; South African Bird Atlas Project, 2007									

Thirty four Red Data listed bird species have been recorded within the 28 QDS, which incorporate all the relevant sites (South African Bird Atlas Project, 2007). Of the 34 species recorded, 19 are NT and 15 are VU. During the field investigations the following Red Data birds were recorded: Blue Crane (*Anthropoides paradiseus*) (VU), Lanner Falcon (*Falco biarmicus*) (NT), Ludwig's Bustard (*Neotis ludwigii*) (VU), Lesser Kestrel (*Falco naumanni*) (VU). However, all of these birds were only observed foraging in the vicinity and not within the actual sites. In addition, the proposed construction activities (loop extensions, new loops, borrow pit usage, etc) are unlikely to cause any significant disturbance to these threatened and near threatened species.

Thirty four Red Data listed mammal species have been recorded within the relevant QDS (Friedmann & Daly, 2004). Of the 34 species recorded, 13 are DD, 7 are NT, 9 are PS, 3 are VU, and 2 are EN. During the field investigations Cape Fox (*Vulpes chama*) (PS) was recorded in the vicinity of the borrow pit close to Wildfontein and Hanover Road borrow pit, and South African Hedgehog (*Atelerix frontalis*) (NT) recorded in the vicinity of Hotazel and Mamathwane. The loss of habitat due to construction activities is unlikely to cause significant disturbance to these species or any other Red Data mammal species possibly occurring in the vicinity of the various sites.

For a complete list of Red Data avifaunal and mammal species recorded in the relevant QDS refer to Appendix D.

Herpetofauna

Red Data /Rare / Endemic / Restricted Species were identified to occur in the northern section (De Aar to Hotazel) and the southern section (De Aar to the Port of Ngqura) according to Prof. G. Alexander's (Herpetologist) expert opinion on datasets of Jacobsen (1989) and Minter *et al*. (2004). For a complete list of reptiles likely to occur throughout the study area refer to Appendix E.

Table 5.52.2b Red Data /Rare / Endemic / Restricted Herpetofaunal Species Previously Recorded within some of the Study Sites

Common Name	Scientific Name	De Aar to Hotazel	De Aar to the Port of Ngqura	Conservation
Plain Mountain Adder	*Bitis inornata*	Does not occur	Occurs in southern parts	Restricted and rare
Albany Adder	*Bitis albanica*	Does not occur	Occurs in southern extremes	Restricted and rare

Common Name	Scientific Name	De Aar to Hotazel	De Aar to the Port of Ngqura	Conservation
Cape Mountain Lizard	*Tropidosaurus gularis*	Does not occur	Occurs in southern extremes	Endimic to South Africa; restricted, patchy and rare
Common Mountain Lizard	*Tropidosaurus montana*	Does not occur	Occurs in southern extremes	Endimic to South Africa; restricted, patchy and rare
Namaqua Plated Lizard	*Gerrhosaurus typicus*	Does not occur	Occurs in southern parts	South African endemic, restricted and rare
FitzSimons' Long-tailed Seps	*Tetrachactylus africanus*	Does not occur	Occurs in southern parts	South African endemic, restricted and rare
Short-legged Seps	*Tetrachactylus seps*	Does not occur	Occurs in southern extremes	South African endemic, restricted and rare
Common Long-tailed Seps	*Tetrachactylus tetradactylus*	Does not occur	Occurs in southern parts	South African endemic, restricted and rare
Cape Grass Lizard	*Chamaesaura anguina*	Does not occur	Occurs in southern parts	Restricted and patchy, but may be locally common
Elandsberg Dwarf Chameleon	*Bradypodium taeniabronchum*	Does not occur	Occurs in southern parts	South African Endemic; restricted distribution; IUCN listed
Peringuey's Coastal Leaf-toed Gecko	*Cryptactities peringueyi*	Does not occur	Occursfrom Chelsea Point to Kromme estuary	South African endemic; very restricted range; very rare
Essex's Dwarf Leaf-toed Gecko	*Goggia essexi*	Does not occur	Occurs in the southern extremes	South African endemic; restricted range
Giant Bullfrog	*Pyxicephalus adspersus*	Occurs in limited QDS's	Occurs in limited QDS's	Near Threatened

No Red Data/Rare / Endemic / Restricted herpetofaunal species were recorded at any of the sites. However, Barkly Bridge, Marlow and Conway borrow pits all had suitable habitat for a few of the reptiles listed in **Table 5.52.2b**.

Macro Invertebrates

At a National level, the National Environmental Management: Biodiversity Act, 2004 (Act no. 10, 2004). **Table 5.51c** lists protected invertebrate species that have the potential to occur within some of the relevant study sites.

Table 5.51.2c Protected Invertebrate Species Likely to Occur within some of the Study Sites

Common Name	*Scientific Name*	*Status*	*Occurrence within Study Area (Reference)*
Creeping Scorpions	**Opistacanthus asper / validus**	***PS***	***Likely (Leeming, 2003)***
Burrowing Scorpions	**Opistophthalmus glabrifrons**	***PS***	***Likely (Leeming, 2003)***
Horned Baboon Spiders	**Ceratogyrus spp.**	***PS***	***Likely (Filmer, 1995)***
Common Baboon Spiders	**Harpactira spp.**	***PS***	***Likely (Filmer, 1995)***
Golden Baboon Spiders	***Previously* Pterinochilus spp.**	***PS***	***Likely (Filmer, 1995)***
Coega Coppper Butterfly	**Aloeides clarki**	***PS***	***Likely Woodhall (2005)***
Wineland Blue	**Lepidochrysops bacchus**	***Rare (PS)***	***Likely Woodhall (2005)***

None of the species listed in **Table 5.52.2c** were recorded at any of the sites. However, there was possible evidence (scorpion and spider burrows) indicating the presence of Burrowing Scorpions and Baboon Spiders at nine of the sites. Scorpion burrows and suitable habitat were located at Blinkhof, Eagle's Crag, Saltaire, Marlow Borrow Pit, the possible borrow pit at Conway, and Emil. Potential Baboon Spider burrows were located at Kommadagga, and Cookhouse borrow pit 1 and 2.

5.53 MEDICINAL PLANT SPECIES

It is estimated that the Southern African subcontinent holds approximately 24 300 plant taxa (Arnold & De Wet, 1993), an estimated 10 % of the world's flora. In addition, South Africa is home to a diversity of cultural groups all of which utilises plant species for some purpose.

A number of these species are highly prized for their traditional healing properties, especially for "muthi" (they have ethnomedicinal value). It is estimated that more than 28 million people in South Africa consume about 19 500 tonnes of plant material per annum (Mander, 1998). Although most of these plant species are regionally widespread and abundant, some of the more sought-after plant resources are currently declining and should be envisaged as priority conservation entities. **Table 5.53** lists those species considered to be of economical or cultural value (according to Van Wyk *et al.,* 2002).

*Table 5.53 **A list of important medicinal taxa observed from the study area based on Van Wyk et al. (1997).***

Site	Medicinal Taxa
Widespread, observed from many sites	*Acacia karroo*
Widespread, observed from many sites	*Aloe ferox*
16.2 Knutsford Borrow Material	*Boophone disticha*
1.1 Barkley Bridge Borrow Pit	*Carpobrotus edulis*
Widespread, observed from many sites (primarily from Eastern Cape localities)	*Cotyledon orbiculata*
31 Mamathwane loops	*Elephatorrhiza elephantina*
1.1 Barkley Bridge Borrow Pit 9. Kommadagga	*Euclea undulata*
5. Eagles Crag	*Hypoxis cf. iridifolia*

Site	Medicinal Taxa
1.1 Barkley Bridge Borrow Pit	*Olea europaea subsp. africana*
3. Coerney 5. Eagles Crag 6. Tootabi	*Plumbago auriculata*
32. Postmasburg 34. Emil	*Tarchonanthus camphoratus*

5.54 DECLARED WEEDS & INVADER PLANTS

Invaders and weed species are plants that invade natural or semi-natural habitats; especially areas disturbed by humans and are commonly known as environmental weeds. Weeds that invade severely disturbed areas are known as ruderal and agrestal weeds. Most of these weeds are annuals colonising waste sites and cultivated fields. These weeds only persist on recently disturbed areas and seldom invade established areas (Henderson, 2001).

Declared weeds and invaders have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems.

The amended Regulations (Regulation 15) of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) identify three categories of problem plants:

- Category 1 plants may not occur on any land other than a biological control reserve and must be controlled or eradicated. Therefore, no person shall establish, plant, maintain, propagate or sell/import any category 1 plant species.
- Category 2 plants are plants with commercial application and may only be cultivated in demarcated areas (such as biological control reserves) otherwise they must be controlled.
- Category 3 plants are ornamentally used plants and may no longer be planted, except those species already in existence at the time of the commencement of the regulations (30 March 2001), unless they occur within 30 m of a 1:50 year floodline and must be prevented from spreading.

Most of these species were recorded form past-pertubated systems showing localised, albeit patchy invasions along the railway servitude. **Table 5.54** provides a list of declared weed and invasive plant species recorded during the current study.

Table 5.54 A list of weed and invader taxa recorded from the railway servitude.

Species	Vernacular Name	Type	Control Measure	Category
Agave americana	American agave	Invader	Eradicate	2
Argemone ochroleuca	Mexican poppy	Weed	Difficult to eradicate	1
Atriplex lindleyi	Australian saltbush	Invader	Control	3
Cirsium vulgare	Scotch thistle	Weed	Difficult to eradicate	1
Eucalyptus camaldulensis	Red river gum	Invader	Control	2
Nicotiana glauca	Wild tobacco	Weed	Eradicate	1
Opuntia ficus-indica	Sweet Prickly-pear	Weed	Eradicate	1
Opuntia humifusa	Creeping prickly pear	Weed	Eradicate	1
Opuntia imbricata	Imbricate prickly pear	Weed	Eradicate	1
Pennisetum setaceum	Fountain grass	Weed	Eradicate	1
Pinus spp.	Pines	Invader	Control	2
Prosopis glandulosa	Mesquite	Invader	Eradicate	2

6.1 EXISTING IMPACTS

The majority of the areas where proposed construction activities will take place have already been disturbed, due to the existing railway line stretching the entire length of the greater project area (all study sites between the Port of Ngqura and Hotazel). Areas where proposed construction activities will take place include the railway reserve, old and current railway stations, railway yards and associated infrastructure, and borrow pits. There were, however, a number of study sites that were located in areas where no disturbance from the existing railway line occurred. However, other disturbances (such as livestock grazing) occur throughout a large portion of these sites. General existing ecological issues, therefore include:

- Inadequate or no rehabilitation, which has resulted in exposed soil (bare ground) i.e. existing borrow pits;
- Stands of alien invader and weedy species within and adjacent to the majority of the proposed sites, therefore there is a loss in biodiversity in these areas;
- Introduced faunal species, i.e. feral and/or domesticated cats and domesticated dogs;
- Livestock grazing within and adjacent to the majority of the proposed sites;
- Habitat fragmentation due to the existing railway line and access roads for some of the proposed sites;
- Mismanagement, which has lead to erosion both onsite and within adjacent areas for some of the proposed sites (e.g. 23. Carlton); and
- A large portion of the proposed study areas have existing adjacent disturbances in the form of agricultural activities (cultivated lands, grazing livestock, etc.) and dwellings (both rural and urban).

The above existing threats to biodiversity are the result of anthropogenic disturbances (e.g. human settlement, poverty and land mismanagement). Secondary impacts that result from the above include:

- Loss of habitat;
- Loss and disturbance of species;
- Loss of species of conservation concern; and
- Increase in alien and invasive species, i.e. therefore a change in habitat structure.

However, with these existing threats to biodiversity natural ecosystems are still able to function, therefore, all future impacts need to be assessed to determine their significance. Future impacts are discussed and evaluated in the sections below.

6.2 LOSS OF VEGETATION COMMUNITIES

Summary	Construction	Operation
Project Aspect/ activity	The development, especially the laydown and construction camps, will result in the clearing of a proportion of vegetation to accommodate the necessary infrastructure.	Increase in erosion potential, alien invasive and weedy species flourishing, and an increase in railway traffic.
Impact Type	Negative / Direct	Negative / Direct & Indirect
Stakeholders/ Receptors Affected	Vegetation in the study sites: 1.1; 14.1; 18.1; 2; 5; 7; 10.1; 10.2; 12; 16.1; 22; 23; 27.1.	Vegetation at all the study sites.

Construction Phase Impacts

The development, especially the laydown and construction camps, will result in the clearing of a proportion of vegetation to accommodate the necessary infrastructure during the construction process. These will entail the establishment of temporary offices, stores, shelters, mess toilets and ablution facilities. Part of the construction phase will also include the relocation of fence structures and existing electrical and signalling equipment.

In addition, a number of new and existing borrow pits will be worked to gain access to fill material. Herewith it is anticipated that clearing of vegetation will take place to obtain underlying fill material.

The indirect effects of vegetation clearing will increase the erosion potential of the area and surface water runoff. During dry periods, increased dust will have a negative impact on the surrounding vegetation. Secondly, the contractors and their staff could remove some of the plant taxa (e.g. for medicinal use) or fell woody species for use of firewood, and potential contamination soils and groundwater with waste and hydrocarbons.

Some of the loop sites (22. Flonker and 23. Carlton), although classified with medium sensitivities, border on "climax" vegetation units (e.g. Tarkastad Montane Shrubland and Besemkaroo Koppies Shrubland) or areas with steep gradients. Therefore, an overspill of construction activities into these areas could increase possible impacts on the vegetation composition and function.

Box 6.2a Construction Impact: Loss of Vegetation Communities

A. Sites with *High Ecological Importance*: 1.1 Barkley Bridge Borrow Pit, 14.1 Marlow Borrow Pit, 18.1 Conway possible Borrow Pit

Nature: Construction activities would result in a **negative direct** impact on the vegetation of the study site

Impact Magnitude: High

- **Extent:** On-site
- **Duration:** Permanent
- **Intensity**: Medium

Likelihood - High
Impact significance (Pre-mitigation) - High
Degree of Confidence: High

B. Sites with *Medium Ecological Importance*: 2. Addo, 5. Eagles Crag, 7. Blinkhof, 10.1 Cookhouse Borrow Pit, 10.2 Cookhouse Borrow Pit, 12. Mortimer, 16.1 Knutsford Borrow Pit, 22. Flonker, 23. Carlton, 27.1 Hanover Road Borrow Pit

Nature: Construction activities would result in a **negative direct** impact on the vegetation of the study site
Impact Magnitude: Medium
- **Extent:** On-site
- **Duration:** Permanent
- **Intensity**: Medium

Likelihood - High
Impact significance (Pre-mitigation) - Medium
Degree of Confidence: High

Operation Phase Impacts

During the operational phase there is the potential for an increase in erosion if rehabilitation measures are not implemented correctly. Alien invasive and weedy species could also flourish if an alien invasive removal programme is not implemented. In addition, with the development of the loop extensions there will be an increase in railway traffic, which is likely to result in an increase in manganese/iron ore dust pollution.

Box 6.2b ***Operational Impacts: Loss of Vegetation Communities***

All sites

Nature: Operational activities would result in a **negative direct/indirect** impact on the vegetation of the study area
Impact Magnitude: Medium
- **Extent:** Local
- **Duration:** Permanent
- **Intensity**: Medium

Likelihood - High
Impact significance (Pre-mitigation) - Medium
Degree of Confidence: High

Mitigation

The objective of mitigation is to minimise the impacts on the vegetation communities and limit the amount of clearing required at each site.

Specific measures include:

- Footprint areas of the proposed laydown and construction camps should be located on existing disturbed areas as opposed to "greenfield" areas. However, all areas identified must be scanned for Red Listed, protected and important medicinal plant species prior to the construction phase. It is recommended that these plants be

identified and marked, and if threatened by destruction be removed (with the relevant permits) and temporarily placed within an onsite nursery for re-establishment after construction;
- Areas where new borrow pits are proposed, if they are to be used, then potentially a small nursery at each site to collect and store seeds would be an option;
- The extent of the construction site should be demarcated on the site layout plans, and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. Those areas surrounding the construction site that are not part of the demarcated development area should be considered as "no-go" areas for employees, machinery or even visitors;
- The extent of the construction camp should be fenced-off;
- Checks must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of the eroded areas, and where necessary, the relocation of the paths causing the erosion, are to be undertaken;
- Vehicles transporting materials to and from a designated offloading area must be covered with tarpaulins to reduce dust generation and must be restricted to designated roads;
- Harvesting of firewood should be prohibited. The immediate surrounding area should be regularly monitored for evidence of wood collection. Fines could be implemented to alleviate firewood collection;
- Stockpiles susceptible to wind erosion are to be covered during windy periods;
- Excavated and stockpiled soil material are to be stored and bermed on the higher lying areas of the footprint area and not in any storm-water run-off channels or any other areas where it is likely to cause erosion, or where water would naturally accumulate;
- Measures must be put in place to ensure that the energy of storm-water that is to be released into any watercourse is dissipated;
- A alien invasive and weedy species removal programme should be implemented during the construction and operational phase;
- A *rehabilitation programme* should be implemented once construction activities ceased, general rehabilitation measures are highlighted in Section 7; and
- Both labour and visitors should be educated on the regulations and good practice regarding general housekeeping and the ecological process, biodiversity value and function of the area (In the form of a pamphlet or induction process).

Residual Impact

The implementation of the above mitigation measures would reduce the construction impacts from high to moderate significance (for sites with a high ecological importance) and moderate to minor significance (for sites with a medium ecological importance). The proposed mitigation measures would alleviate the operational impacts from moderate to minor.

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction: Sites of high ecological importance	High	Moderate
Construction: Sites of medium ecological importance	Moderate	Minor
Operation	Moderate	Minor

6.3 *LOSS OF FAUNAL DIVERSITY & RICHNESS*

Summary	Construction	Operation
Project Aspect/ activity	The clearing of vegetation for construction activities will have an impact on faunal habitats.	During the operation of construction camps impacts could include hunting, destruction of burrows, littering or polluting
Impact Type	Negative / Direct & Indirect	Negative / Direct & Indirect
Stakeholders/ Receptors Affected	Faunal habitat at study sites: 1.1; 5; 7; 8; 14.1; 16.1; 18.1; 25.1; 25.2; 27.1	All sites

Construction Phase Impacts

The clearing of vegetation for construction activities (i.e. labour camps, laydown areas, new access roads, removal of fences, etc) will have an impact on faunal habitat at all sites. However, the loss of faunal habitat is likely to be significantly greater at sites with high faunal activity. Through the loss of faunal habitat there will likely to be an indirect loss in faunal diversity and species richness.

Additional activities that are likely to result in the loss of faunal diversity and species richness include:

- Hunting;
- Destruction of burrows and nesting sites;
- Littering or polluting;
- Driving at night, which can increase the likelihood of "road kills"
- Dust generation resulting from construction activities; and
- Noise disturbance.

Box 6.3a Construction Impact: Loss of Faunal Diversity & Richness

Sites with *High Faunal Activity*: 1.1 Barkley Bridge Borrow Pit, 5. Eagles Crag, 7. Blinkhof, 8. Saltaire, 14.1 Marlow Borrow Pit, 16.1 Knutsford Borrow Pit, 18.1 Conway possible Borrow Pit, 25.1 Borrow Pit near Wildfontein, 25.2 Borrow Pit near Wildfontein, 27.1 Hanover Road Borrow Pit.

Nature: Construction activities would result in a **negative direct/indirect** impact on faunal diversity and richness at the study sites

Impact Magnitude: Medium

- **Extent:** Local
- **Duration:** Permanent
- **Intensity**: Medium

Likelihood - High
Impact significance (Pre-mitigation) - Medium
Degree of Confidence: High

Operation Phase Impacts

Railway traffic is likely to increase during the operational phase, which could increase noise disturbance. An increase in manganese/ iron ore dust pollution could also potential impact on faunal activity.

Box 6.3b ***Operational Impacts: Loss of Faunal Diversity& Richness***

All sites but particularly sites with *High Faunal Activity*: 1.1 Barkley Bridge Borrow Pit, 5. Eagles Crag, 7. Blinkhof, 8. Saltaire, 14.1 Marlow Borrow Pit, 16.1 Knutsford Borrow Pit, 18.1 Conway possible Borrow Pit, 25.1 Borrow Pit near Wildfontein, 25.2 Borrow Pit near Wildfontein, 27.1 Hanover Road Borrow Pit.

Nature: Operational activities would result in a **negative direct/indirect** impact on faunal diversity and richness at the study sites
Impact Magnitude: Low

- **Extent:** Local
- **Duration:** Long-term
- **Intensity**: Low

Likelihood - Medium
Impact significance (Pre-mitigation) - Low
Degree of Confidence: High

Mitigation

The objective of mitigation is to minimise the impacts on faunal diversity and species richness within and adjacent to the study sites.

Specific measures include:

- The construction camps and laydown areas should be located on existing disturbed areas. These areas should be scanned for Red Data or Protected Species that are unlikely to move off the site during or prior to construction activities commencing. These species, likely invertebrate species (Burrowing Scorpions – *Opistophthalmus spp.* and Baboon Spiders - likely Family Theraphosidae), should be collected and placed in a museum;
- Burrowing species like the Trapdoor Spider (likely Family Ctenizidae) (burrow located at 5. Eagles Crag) should also be collected and placed in a museum as they will likely be destroyed during the construction phase;
- The extent of the construction site should be demarcated on the site layout plans, and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. Those areas surrounding the construction site that are not part of the demarcated development area should be considered as "no-go" areas for employees, machinery or even visitors;

- The extent of the construction camp should be fenced-off;
- Vehicles transporting materials to and from a designated offloading area must be covered with tarpaulins to reduce dust generation and must be restricted to designated roads;
- Construction vehicles should be restricted to driving during daylight hours only. This will reduce the likelihood of "road kills";
- Hunting or the unnecessary destruction of burrow systems or nesting sites should be prohibited. Littering or polluting onsite and within the adjacent areas should also be prohibited. Suitable facilities should be provided onsite to avoid littering or polluting.
- Stockpiles susceptible to wind erosion are to be covered during windy periods;
- A *rehabilitation programme* should be implemented once construction activities have ceased (refer to Section 7); and
- Both labour and visitors should be educated on the regulations and good practice regarding general housekeeping and the ecological process, biodiversity value and function of the area (In the form of a pamphlet or induction process).

Residual Impact

The implementation of the above mitigation measures would reduce the construction impacts from moderate to minor significance (for sites with high faunal activity). The proposed mitigation measures would alleviate the operational impacts from minor to negligible.

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction: Sites of high faunal activity	Moderate	Minor
Operation	Minor	Negligible

6.4 LOSS OF CONSERVATION IMPORTANT PLANT SPECIES

Summary	Construction	Operation
Project Aspect/ activity	A number of protected, endemic and "near-threatened" plant species were identified from various sites	Similar to construction phase impacts.
Impact Type	Negative / Direct	Negative / Direct
Stakeholders/ Receptors Affected	Vegetation in the study areas: 1.1; 10.1; 10.2; 5; 16.1; 18.1; 27.1.	Vegetation in the study areas: 1.1; 10.1; 10.2; 5; 16.1; 18.1; 27.1.

Construction & Operational Phase Impacts

A number of protected, endemic and "near-threatened" plant species were identified from sites along the freight line (especially from the Barkley Bridge Borrow Pit and the Cookhouse Borrow Pits). Some of the loop sites contain many succulent members of the family Mesembryanthemaceae. Although not "threatened" by any means, these taxa are all considered to be protected in the

Eastern and Northern Cape Province. It is therefore recommended that if likely to become lost, a representative sample should be rescued prior to the construction phase. In addition, many of these taxa show creeping or trailing habits, making them critical important items to be used during erosion control and rehabilitation.

During the construction phase, vegetation will be cleared and it is possible that sensitive species may become lost. In addition, the increased number of anthropogenic activities associated with the construction phase could lead to uncontrolled and unsustainable harvesting of sensitive/medicinal plant species (by both the labour force and residents).

Box 6.4 Construction/Operation Impact: Loss of conservation important plant species

A. Important sites containing Red Data and endemic taxa: 1.1 Barkley Bridge Borrow Pit, 10. 1 Cookhouse Borrow Pit, 10.2 Cookhouse Borrow Pit

Nature: Construction/Operational activities would result in a **negative direct** impact on the vegetation of the study area
Impact Magnitude: High
- **Extent:** On-site
- **Duration:** Short-term
- **Intensity**: High

Likelihood - High
Impact significance (Pre-mitigation) - High
Degree of Confidence: High

B. Sites with high densities of protected plant species: 5. Eagles Crag, 16.1 Knutsford Borrow Pit, 18.1 Conway possible Borrow Pit and 27.1 Hanover Road Borrow Pit

Nature: Construction/Operational activities would result in a **negative direct** impact on the vegetation of the study area
Impact Magnitude: Medium
- **Extent:** On-site
- **Duration:** Short-term
- **Intensity**: High

Likelihood - High
Impact significance (Pre-mitigation) - Medium
Degree of Confidence: High

Mitigation

The objective of mitigation is to minimise the impacts on the vegetation and the loss of conservation important species.

Specific measures include:

- For footprint areas containing Red Data plants (especially *Rhombophyllum rhomboideum, Euphorbia meloformis* and *Cyrtanthus smithiae*), protected plants and economic important medicinal plants, it is recommended that these plants be identified and marked prior to

any construction activity. These individuals should, where possible, be left *in situ*, but if threatened by destruction, be removed (with the relevant permits obtained through the provincial authorities) and temporarily placed within an onsite nursery for re-establishment after construction;

- Many of the geophyte taxa only flower during a short period of time, mainly in spring, when they appear to be conspicuous. It is therefore recommended that these individuals (e.g. *Cyrtanthus smithiae*) be searched (marked/removed) for during the optimal flowering period (preferably October) prior to any construction activity;
- A representative sample of members pertaining to the Mesembryanthemaceae should be rescued. These individuals should be stored at an onsite nursery for re-establishment after construction;
- A *management plan* must be compiled to ensure persistence of transferred/rescued individuals/populations. Such a management plan should entail the following:
    - To ensure the persistence of the individuals or populations;
    - To ensure proper establishment of *ex situ* individuals, which include a monitoring programme for at least two years after re-establishment; and
    - The implementation of the management plan is the sole responsibility of the applicant;
- Re-establishment of taxa should not exceed a 10 km radius from their original locality (the locality it was found growing prior to removal). This will prohibit unwanted mixing of genetic material;
- Both labour and visitors should be educated on the regulations and good practice regarding general housekeeping and the ecological process, biodiversity value and function of the area; and
- A qualified local botanist should be appointed to supervise the identification, marking and transferring of plant taxa.

Residual Impact

The implementation of the above mitigation measures would reduce the construction impacts from high to moderate significance (for sites with endemic and "near-threatened" taxa) and moderate to low significance for sites with protected taxa.

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction/Operation: Sites with endemic and "near-threatened" taxa	High	Moderate
Construction/Operation: Sites with high densities of protected taxa	Moderate	Minor

6.5 LOSS OF PROTECTED INVERTEBRATE SPECIES

Summary	Construction	Operation

Summary	Construction	Operation
Project Aspect/ activity	During the construction phase it is likely that protected invertebrate species could be destroyed.	N/A
Impact Type	Negative / Direct	
Stakeholders/ Receptors Affected	Protected Invertebrate species at the study areas: 5; 7; 8; 9; 10.1; 10.2; 14.1; 18.1; 34.	

Construction Phase Impacts

During the construction phase it is likely that protected invertebrate species (Burrowing Scorpions – *Opistophthalmus spp.* and Baboon Spiders likely Family - Theraphosidae) could be destroyed. Evidence of their presence or suitable habitat was identified at a number of the loop sites, borrow pit sites and the site for the new substation (Emil). It is therefore recommended that these sites (listed below) be surveyed prior to the commencement of the construction phase by an entomologist and specimens be donated to a local museum to further scientific research on these species.

Box 6.5 Construction Impact: Loss of Protected Invertebrate Species

Sites with evidence of Protected Invertebrate Species presence: 5. Eagles Crag, 7. Blinkhof, 8. Saltaire, 9. Kommadagga, 10.1 Cookhouse Borrow Pit, 10.2 Cookhouse Borrow Pit, 14.1 Marlow Borrow Pit, 18.1 Conway possible Borrow Pit, 34. Emil Substation.

Nature: Construction activities would result in a **negative direct** impact on protected invertebrate species in the study area
Impact Magnitude: Medium
- **Extent:** On-site
- **Duration:** Short-term
- **Intensity**: Low

Likelihood - High
Impact significance (Pre-mitigation) - Medium
Degree of Confidence: High

Operational Phase Impacts

Impacts are only expected during the construction phase.

Mitigation

The objective of mitigation is to minimise the impacts on protected invertebrate species.

Specific measures include:

- The extent of the construction sites should be demarcated on the site layout plans, and no construction personnel or vehicles should leave the demarcated area except those authorised to do so. Those areas surrounding the construction site that are not part of the demarcated

development area should be considered as "no-go" areas for employees, machinery or even visitors;
- The extent of the construction camps should be fenced-off;
- Sites with evidence of protect invertebrate species presence should be surveyed by an entomologist prior to the construction phase. Any protected invertebrate species located onsite should be donated to a museum as specimens for scientific research purposes.

Residual Impact

The implementation of the above mitigation measures would reduce the construction impacts from moderate to negligible significance.

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction: Sites with evidence of protected invertebrate species	Moderate	Negligible

6.6 *LOSS OF RIPARIAN VEGETATION AND DISTURBANCE TO THE BOESMANS RIVER*

Summary	Construction	Operation
Project Aspect/ activity	The proposed construction of a new passing loop at Tootabi lies adjacent to the riparian vegetation of the critically endangered Boesmans River.	Similar to construction phase.
Impact Type	Negative / Direct	Negative / Direct
Stakeholders/ Receptors Affected	6. Tootabi	6. Tootabi

Construction & Operational Phase Impacts

The proposed construction of a new passing loop at Tootabi lies adjacent to the riparian vegetation of the Critically Endangered Boesmans River. These habitats support a variety of flora and faunal species, but more importantly the functioning on this system is of major concern, considering it's current ecological status (Critically Endangered). Development encroaching on the riparian vegetation will have a direct negative impact (i.e. water pollution and an increase in siltation) on the ecology of the river system. In addition, any development within the riparian vegetation will require a Water Use License according to Section 21 of the National Water Act (Act No. 36 of 1998).

Box 6.6 Construction / Operational Impact: Loss of Riparian Vegetation and Disturbance to the Boesmans River

Site 6. Tootabi

Nature: Construction / Operational activities would result in a **negative direct** impact on riparian vegetation and the Boesmans River
Impact Magnitude: High
- **Extent:** On-site
- **Duration:** Short-term

- **Intensity**: High

Likelihood - High
Impact significance (Pre-mitigation) - High
Degree of Confidence: High

Mitigation

The objective of mitigation is to minimise the impacts on the riparian vegetation and prevent pollution/degradation of the Boesmans River.

Specific measures include:

- All construction and operational activities at the Tootabi site should be restricted to the railway reserve, more specifically to the western side of the railway reserve and vacant areas to the west of the reserve;
- The eastern side of the railway reserve (adjacent to the riparian vegetation) should be fenced;
- The extent of the construction camp should be fenced-off;
- The riparian vegetation and the Boesmans River should be considered as "no-go" areas;
- Both labour and visitors should be educated on the regulations and good practice regarding general housekeeping and the ecological process, biodiversity value and function of the area; and
- Should the development impact on the riparian vegetation or the Boesmans River then an application for a Water Use License according to Section 21 of the National Water Act (Act No. 36 of 1998) should be applied for.

Residual Impact

The implementation of the above mitigation measures would reduce the construction / operational impacts from high to moderate significance.

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction / Operational: Impact on the riparian vegetation and the Boesmans River	High	Moderate

6.7 LOSS OF DECLARED INVADER AND WEED SPECIES

Summary	Construction	Operation
Project Aspect/ activity	During the construction phase it is likely that the populations/stands of exotic invader and weed species would become lost during the clearing of vegetation.	A number of localised patches of invader and weed taxa occur along the railway line servitude.
Impact Type	Positive / Direct	Positive / Direct
Stakeholders/ Receptors Affected	All sites	All sites

Construction Phase Impacts

During the construction phase it is likely that the populations/stands of alien invader and weedy species would become lost during the clearing of vegetation. This impact is considered to be positive.

Box 6.7 Construction Impact: Loss of Declared Invader and Weed Species

Nature: Construction activities would result in a **positive direct** impact on the vegetation of the study area
Impact Magnitude: Low
- **Extent:** On-site
- **Duration:** Temporary
- **Intensity**: Low

Likelihood - Medium
Impact significance (Pre-mitigation) - Low
Degree of Confidence: High

No impacts during the operational phase.

Mitigation

The objective of mitigation is to increase floral/faunal diversity through the removal of alien vegetation.

Specific measures include:

- All declared invader and weed species should be eradicated as indicated in **Table 5.54**. The railway servitude should regularly (biannually) be inspected for re-established invader species and the follow-up removal thereof (Refer to Section 6.8); and
- Cleared areas should be succeeded by proper soil stabilisation procedures and rehabilitation to prevent soil erosion.

Residual Impact

The implementation of the above mitigation measures would reduce the construction impacts from minor to negligible significance. The proposed mitigation measures would alleviate the operational impacts from minor to negligible.

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction	Minor	Negligible

6.8 ESTABLISHMENT OF ALIEN INVADER AND WEED TAXA

Summary	Construction	Operation

Summary	Construction	Operation
Project Aspect/ activity	The clearing of vegetation during the construction phase will leave bare patches of soil enhancing the colonisation by ruderal weeds or declared alien species.	Similar to construction phase.
Impact Type	Negative / Direct	Negative / Direct
Stakeholders/ Receptors Affected	All sites	All sites

Construction Phase Impacts

The clearing of vegetation during the construction phase will leave bare patches of soil (e.g. the construction camps), thereby enhancing the colonisation by ruderal weeds (mostly annual weeds) or declared alien species that will prohibit the natural succession during rehabilitation procedures. Such soil disturbances (as well as the inappropriate handling of topsoil) could enhance the spread of invader taxa to other systems or vegetation units of high sensitivities. Furthermore, the anticipated increase in freight volume could also facilitate the spread of unwanted plant taxa to and from the study area.

Also, increased disturbances along drainage lines (e.g. 12. Mortimer) could also contribute towards the spread of alien invader species. It is also possible that bush encroacher species may become dominant in the immediate surrounding areas (e.g. *Acacia natalitia* & *A. karroo*). All these species will impact on the natural dynamics of the system at hand, which in turn will also affect faunal habitats and diversity.

Box 6.8 Construction/Operation Impact: Establishment of Alien Invader and Weed Taxa

Nature: Construction/Operational activities would result in a **negative direct** impact on the vegetation and fauna of the study area
Impact Magnitude: Low
- **Extent:** Regional
- **Duration:** Long-term
- **Intensity**: Low

Likelihood - Medium
Impact significance (Pre-mitigation) - Medium
Degree of Confidence: High

Operation Phase Impacts

Similar to construction phase, however in addition, no rehabilitation of borrow pits and poor monitoring measures are likely to lead to an increase in alien species.

Mitigation

The objective of mitigation is to minimise the impacts on vegetation communities, faunal habitats and species diversity.

Specific measures include:

- All declared invader and weed species should be eradicated as indicated in **Table 5.54**. The railway servitude should regularly (biannually) be inspected for the re-establishment of invader species and the follow-up removal thereof;
- Cleared areas should be succeeded by proper soil stabilisation procedures and rehabilitation to prevent soil erosion; and
- Monitoring programmes need to be implemented.

Residual Impact

The implementation of the above mitigation measures would reduce the construction impacts from moderate to minor significance. The proposed mitigation measures would alleviate the operational impacts from moderate to low.

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Construction	Moderate	Minor
Operation	Moderate	Minor

6.9 POTENTIAL MANGANESE/IRON ORE DUST POLLUTION

Operation Phase Impacts

The potential for manganese/iron ore dust pollution is essentially an operational impact. In the context of this project, manganese/iron ore dust pollution cannot be ignored since the anticipated increase in freight traffic could potentially increase the risk of pollution. In general, dust is a global problem and it impacts on all levels of both the abiotic and biotic environment.

However, various methods of dust suppression have been proposed and in most cases resolved to rather short-term (and sometimes costly) solutions such as wetting the ore with water. In fact little information is available on the effect of dust pollution on vegetation specifically that of manganese dust pollution. Possible negative effects of dust on plant physiology are likely to be reflected in a significant reduction of photosynthesis and through high manganese/iron concentrations in the soil, thereby altering plant metabolism.

However, Low and Pond (2000) have conducted long-term monitoring on the effects of iron ore dust in and around the Port of Saldanha. Their research, although still in progress, has postulated a number hypotheses dealing with the impacts of iron ore dust on the plant communities at Saldanha Bay. Some

noteworthy postulations based on anecdotal observations maintain that (1) dust cause death in some plant species as seen from unusually high numbers of dead dust-covered wood in affected areas, (2) dust is not a major impact on plant communities since the plant composition remained stable for over 15 years, (3) some plant taxa could escape the effects of dust by growing outside the period of excessive dust deposition, (4) dust deposition affect annuals worse than perennial taxa. However, since their studies have not yet been able to determine the effect of dust on plant communities, it is fair to reason that excessive dust deposition is likely to a have a net-negative effect.

Box 6.9 Operation Impact: Potential Manganese/Iron Ore Dust Pollution

Nature: Operational activities would result in a **negative direct/indirect** impact on the vegetation of the study area
Impact Magnitude: Uncertain

- **Extent:** Regional
- **Duration:** Long-term
- **Intensity**: High

Likelihood - High
Impact significance (Pre-mitigation) - High
Degree of Confidence: Low

Mitigation

The objective of mitigation is to minimise the impacts on vegetation growth and structure.

Specific measures include:

- All railway freight should be implemented with dust suppression devices such as tarpaulins. Wetting of the manganese ore would also alleviate the problem. However, please be advised that water is a scarce and valuable commodity in South Africa; and
- An ecological study is proposed to determine the impact of manganese dust deposition on natural plant communities (both structurally and compositionally) at selected areas known to be affected by dust deposition. The study should focus on a quantitative pairwise comparison of impacted and non-impacted areas, as well as growth trials (testing the effect of different dust loads under controlled conditions). It is recommended that the work be undertaken in partnership with a credible academic (tertiary) institution.

Residual Impact

The proposed mitigation measures would alleviate the operational impacts from high to moderate (albeit at a low degree of confidence).

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Operation	High	Moderate

7 REHABILITATION

7.1 INTRODUCTION

Rehabilitation entails the active re-vegetation of cleared areas such as the construction camps, laydown areas and borrow pits. Active re-vegetation is essential to prevent erosion of disturbed areas.

A large number of sites correspond to the Nama-Karoo Biome (Upper Northern and Eastern Karoo and Albany Broken Field) and Albany Thicket Biome, both floristic regions where active rehabilitation is deemed necessary. Most of these sites will remain barren after construction ceases, and will eventually deteriorate during a mild rainstorm event and subsequent runoff. If left unattended, these sites will eventually become degraded with the resultant loss of valuable topsoil, especially on sloping or broken terrain.

An important consideration to take into account during any rehabilitation process is the slow rate of seed dispersal and veld recruitment of karroid-type vegetation. As an example, it could take up to 10 years for certain plant species to colonise an area as far as 500 m from the parent plant if the seed are wind or water dispersed over 10-50 m in a year (Esler *et al*., 2006). In addition, many of the Karoo species only flower when they are two years or older.

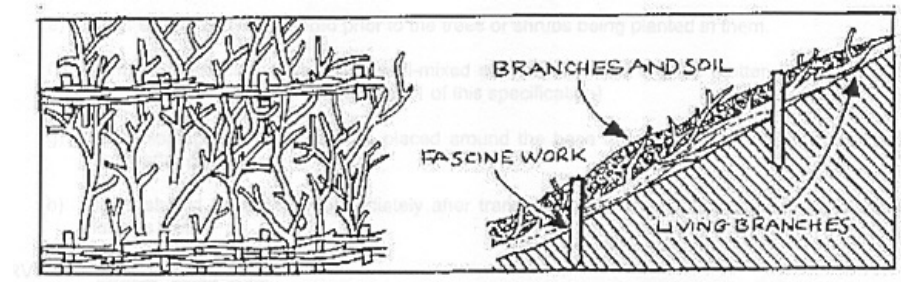
In most cases, the clearing of vegetation, either to make room for construction camps or to excavate borrow material, will leave bare patches of soil behind, necessitating soil stabilisation. The basal grass and forb cover on these areas would be extremely low due to a low incidence of rainfall. It is therefore recommended that rehabilitation should follow a phased approach and should entail (1) soil stabilisation and (2) active re-vegetation.

7.2 PHASE 1: SOIL STABILISATION

- Hard compacted soil requires soil management to improve the infiltrating of water and to reduce the loss of topsoil. Soil management is an essential precursor towards preparing the soil for re-vegetation and to speed up the natural process of plant succession. Furthermore, in areas with a low and unpredictable rainfall pattern, soil salinity tends to increase, demanding expensive treatment/remediation of the soil layer before permanent vegetation could be established;
- Compacted soil and the soil crust should be ripped (preferably to a depth of 25 cm) and loosened before planting/sowing could take place;
- Runoff water should be trapped through the breaking of the soil surface (as explained above) and by packing of stones brushwood or mulch along the natural contours of the landscape. The brush and rocks will trap soil sediment which also contains part of the seed bank;

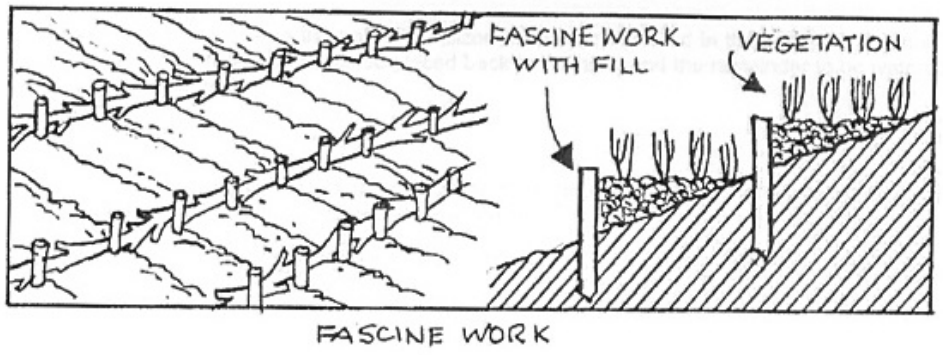
- Areas destined for seeding/sowing should be covered with brushwood (the covering should not exceed 0.5 m). The brushwood will retain the soil moisture and prevent surface erosion during precipitation events. Mulch (e.g. straw or fine brushwood material) should be added to control erosion during seed germination, and to provide organic matter for plant growth (*Figure 8.2a*). Mulch also reduces the impact of raindrops on bare soil. Raindrops causes the soil to breakdown and this facilitate the dispersion of clay fractions into the soil pores – thereby "sealing" the soil surface and preventing infiltration of water (Esler *et al*., 2006);

Figure 7.2a A typical example of brushwood (mulch) application (Ethekwini Municipality, 2002).



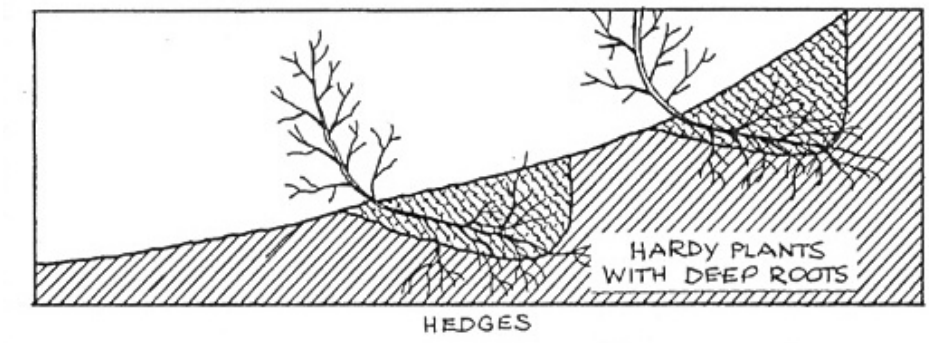
- Pitter basins (small shallow depressions) should be created on sites corresponding to areas with low precipitation or unpredicted rainfall (e.g. loop sites and borrow pits between Cradock and Hotazel). The basins should be orientated and shaped to face upslope with the main aim of trapping rainwater and organic matter containing the seed bank; and
- Areas with very little topsoil could be augmented by creating fascine work filled with topsoil to facilitate plant establishment (*Figure 8.2b*);

Figure 7.2b An example of fascine work and fascine work with fill (Ethekwini Municipality, 2002).



- Areas left with little plant cover or none should be re-seeded or re-planted. Re-vegetation, where possible must make use of locally occurring plant species typical to the vegetation affected by the development. It would be appropriate to map the vegetation of each designated footprint prior to development in order to replace any lost individuals. The selected species should be suitable for both local soil conditions and climate, and should represent the natural composition at hand;
- Suitable soil-binding species include many of the succulent taxa pertaining to the genera Portulacaria, Aloe and the family Mesembryanthemaceae. Many of these species could be produced from cuttings and are good ground covers. All species harvested, mainly from the affected areas, should be kept at an onsite nursery. Please not that relocation of any taxa should not exceed a radius of 10 km from the original collected locality;
- All indigenous plant material sourced from outside the study area for the purpose of augmenting re-vegetation must be in good condition, free from pests or diseases and weed free. Indigenous plant material should not be sourced from a radius of more than 50 km away;
- Seed should be hand-collected or by means of a modified vacuum cleaner from the adjacent veld. Seed collection should preferably correspond to a period 6-8 weeks after the major spring rainfall event;
- All seed collected should be sown within a year of collection;
- Timing of sowing should take place immediately after the first reliable rains;
- Seeding of pitter basins with Acacia karroo, A. natalitia, Stipagrostis spp. and Salsola spp. would encourage soil stabilisation and plant succession;
- On steep gradients, sowing should be in rows and should take place between barrier lines (or fascine work). Barrier lines must follow the natural contour line of the land (Figure 5.2). The barrier lines will slow the movement of surface water in the event of heavy rains and prevent bank erosion;
- During the rehabilitation of steep gradients it is recommended that woody species in particular *Acacia spp*. and *Rhus spp*. be established along gradients to facilitate soil binding and stabilisation (Figure 8.3);

Figure 7.3: An example of slope stabilisation by means of woody species (Ethekwini Municipality, 2002).



- No gardening or cultivation of exotic ornamental species may occur, and the planting of Kikuyu (*Pennisetum clandestinum*) or any lawn should be prohibited;
- The original soil composition should be retained to prevent slope failure due to different weights and textures of different soil types when saturated;
- The use of fertiliser should be prohibited; and
- The success of rehabilitation must be evaluated through continual monitoring.

7.4 GENERAL CONSIDERATIONS DURING REHABILITATION

- Topsoil should be sourced and stockpiled during the construction period. Topsoil should not be sourced from adjacent areas as this will lead to unnecessary erosion, disturbance and inappropriate composition. Imported soils should be scanned for alien and invader plants;
- Recommendations during alien eradication:
  - All alien and invader plants should be eradicated;
  - Rehabilitate areas where infestation is the most severe;
  - Always rehabilitate in a downstream direction of a drainage line;
  - Follow-up eradication is important during alien clearing;
  - Flat or gently sloping (1:3) areas shall be ripped in lines 30-50 cm apart and to a depth of at least 25-30 cm parallel to the contours to alleviate soil compaction and to establish a seedbed suitable for the establishment of growth;
  - The Environmental Control Officer (ECO) should be satisfied that the soil composition is adequate before re-vegetation;
  - The final surface should not be smooth but furrowed along with the natural contours to promote the soil:root binding ratio;
- General planting guidelines:
  - Seed shall be sown by means of broadcast sowing. During seeding, the seed mixture shall be regularly mixed by hand in order to prevent the

separation of smaller and larger seeds in the mixture. To ensure an even distribution of seed, divide the seed to be sown into two equal portions. Sow the land twice, in opposite directions. Sowing depths should not exceed 0.5 cm.

- After seeding, the soil surface shall be lightly raked parallel to the contours in order to cover the seed. During raking, care shall be taken to prevent the redistribution or removal of seed from any area.
- Planting holes for individual plants (trees) should be large enough and squared holes are preferred to round ones. The latter will increase the probability of root strangulation.
- Trees must be well spaced.
- All holes should be well watered prior to planting and again after planting took place;
- Hay and wood chips could be scattered around the base of the stems of trees to increase moisture retention.

- Maintenance:
  - All seeded or planted areas should be monitored and supervised by the ECO;
  - The water used for irrigation (when available) should be free from pollutants.

The proposed linear development includes 51 sites (some sites have been combined because of their close proximity) over a considerable distance. A terrestrial ecological assessment was undertaken at each of the relevant sites and the ecological importance and taxa of importance were identified at each site. These results have been summaries in **Table 8** below.

Table 8 ***Site Ecological Importance and important Flora and Fauna at each Site (Areas of Concern).***

Site	Ecological importance	Taxa of importance:	
		Flora	Fauna
1 Barkly Bridge	Low	*Delosperma spp., Drosanthemum hispidum, Malephora spp.*	None
1.1 Borrow pit Barkley Bridge	High	*Sideroxylon inerme*, *Euphorbia meloformis* subsp. *valida*, *Carpobrotus edulis, Delosperma rogersii, Mesembryanthemum aitonis, Ruschia hamata, Ruschia spp. Trichodiadema bulbosum, Drosanthemum spp. Haworthia attenuate, Aloe humilis Pachypodium bispinosum, Carpobrotus edulis*	High faunal activity
2 Addo	Medium	*Malephora spp*	None
3 Coerney	Low	*Drosanthemum hispidum, Malephora spp*, *Lampranthus productus*	None
4 Verby	Low	None	None
5 Eagle's Crag	Medium	*Aloe speciosa, A. tenuior, Delosperma echinatum, Ruschia putterillii, R. uncinata, Lampranthus productus, Brunsvigia nr. striata, Nerine cf. flexuosa, Pachypodium succulentum, Hypoxis cf. iridifolia*	Possible burrowing scorpion (*Opistophthalmus spp.) & h*igh faunal activity
6 Tootabi	Low	*Aloe tenuior, A. speciosa*	None
7 Blinkhof.	Medium	None	Possible burrowing scorpion (*Opistophthalmus spp.) & h*igh faunal activity

Site	Ecological importance	Taxa of importance:	
		Flora	Fauna
8 Saltaire	Low	*Aloe striata, Mestoklema spp. Phyllobolus splendens*	Possible burrowing scorpion (*Opistophthalmus spp.) &* high faunal activity
9 Kommadagga	Low	*Ruschia spp. Aloe striata*	Baboon Spider (possible Family Theraphosidae)
10 Golden Valley	Low	None	None
10.1 Road borrow pit near Cookhouse	Medium	*Cyrtanthus smithiae*	Baboon Spider (possible Family Theraphosidae)
10.2 Cookhouse possible burrow pit	Medium	*Cyrtanthus smithiae, Aloe tenuior, Stapelia grandiflora* var. *grandiflora*	Baboon Spider (possible Family Theraphosidae)
10.3 Golden Valley possible burrow pit	Medium	None	None
11 Klipfontein	Low	*Aloe tenuior, A. striata*	None
11.1 Klipfontein cutting as borrow pit	Low	None	None
12 Mortimer.	Medium	None	None
13 Halesowen	Low	*Drosanthemum hispidum, Phyllobolus splendens, Psilocaulon coriarium, P. articulatum, Malephora spp.*	None
14 Marlow	Low	*Psilocaulon articulatum*	None
14.1 Marlow borrow pit	High	*Haemanthus humilis, Cyrtanthus contractus, Haworthia bolusii var. blackbeardiana, Trichodiadema pomeridianum, Ruschia spinosa*	Possible burrowing scorpion (*Opistophthalmus spp.) &* high faunal activity
15 Kaptein	Low	*Psilocaulon coriarium, Drosanthemum hispidum*	None
16 Knutsford	Low	None	None
16.1 Kuntsford borrow pit	Medium	*Ruschia spinosa, Delosperma multiflora, Drosanthemum hispidum, Malephora spp., Ruschia cradockensis subsp. cradockensis, Trichodiadema spp. Pachypodium succulentum*	High faunal activity

Site	Ecological importance	Taxa of importance:	
		Flora	Fauna
16.2 Knutsford Borrow material	Low	*Ruschia spinosa, Boophone disticha*	None
17 Visrivier	Low	*Psilocaulon cf. coriarium*	None
17.1 Visrivier Collett se quarry	Low	*Ruschia spinosa*	None
17.2 Visrivier possible burrow pit (existing)	Low	None	None
18 Conway	Low	None	None
18.1 Conway possible burrow pit	High	*Ruschia spinosa, Aloe broomii, Stomatium (?) spp.*	Possible burrowing scorpion (*Opistophthalmus spp.) &* high faunal activity
19 Glenheath	Low	*Delosperma spp.*	None
20 Tafelberg	Low	*Ruschia spinosa*	None
21 Rosmead	Low	None	None
22 Flonker	Medium	None	None
23 Carlton	Medium	None	None
24 Barredeel	Low	None	None
25 Wildfontein	Low	None	None
25.1 Borrow pit near Wildfontein	Low	None	High faunal activity
25.2 Borrow pit near Wildfontein	Low	None	High faunal activity
26 Linde	Low	None	None
27 Hanover Road	Low	None	None
27.1 Hanover Road existing borrow pit	Medium	*Ruschia spinosa, Titanopsis spp.*	High faunal activity
28 Burgervilleweg	Low	None	None
29 Bletterman	Low	None	None
29.1 Bletterman road borrow pit.	Low	*Ruschia spinosa*	None
30 Hotazel	Low	*Acacia erioloba, Acacia haematoxylon*	None
30.2 HZL Tie in of triangle	Low	*Acacia haematoxylon*	None
31 Mamathwane loops	Low	None	None
31.3 Middelplaats take off	Low	*Acacia haematoxylon*	None

Site	Ecological importance	Taxa of importance:	
		Flora	Fauna
32 Postmasburg yard (PMG Electrifying line)	Low	None	None
33 Ronaldsvlei & Beaconsfield Yards	Low	None	None
34 Emil Substation	Low	None	Possible burrowing scorpion (*Opistophthalmus spp.)*

In addition, the railway section between De Aar and Kimberly was also assessed at a broad level (drive through visual scan), and the refurbishment of the route is unlikely to cause significant disturbance to terrestrial ecology. However, a number of stands of alien invasive and weedy species were identified. It is recommended that this issue be addressed by implementing an 'Alien Invasive Programme'.

Three sites (Barkly Bridge borrow pit, Marlow borrow pit & the possible borrow pit at Conway), either existing or a potentially new borrow pit, were recorded as having a high ecological importance (**Table 8**). The use of borrow material from these sites is likely to have a significant negative affect on terrestrial ecology onsite and within the adjacent areas. If possible it is recommended that these sites not be utilized. In the event of this being unavoidable mitigation measures recommended in Section 6 should be strictly adhered to, or perhaps alternative sites could be sourced, however, these would need to be investigated.

With the extent of existing impacts (e.g. existing railway reserve, existing borrow pits, etc.) throughout the study sites it was hypothesized that potential future impacts would not have a major effect on the terrestrial ecology. This was true for some of the potential impacts, however four were assessed to have major impact pre- mitigation, these included:

- Loss of vegetation communities;
- Loss of conservation important plant species;
- Loss of riparian vegetation and disturbance to the Boesmans River; and
- Potential Manganese / Iron Ore dust pollution.

By implementing the recommended mitigating measures all of these impacts will be reduced to a moderate significance. Key mitigating measures include:

- An Alien Invasive Programme;
- Rehabilitation Programme – A general rehabilitation programme has been discussed in Section 7 (Rehabilitation guidelines are broad guidelines due to the size of the study area, therefore they are not specific for each site);
- Remaining within the indentified 'Footprint Areas';
- On-going Monitoring Programme;
- A Management Plan for important plant species; and
- Education on Ecological Processes for labour and visitors.

A further study would be to determine the significance of manganese/iron ore dust pollution on fauna and flora.

Agrestal Weed: A weed that commonly invades cultivated land.

Alien species: Plant taxa in a given area, whose presence there, is due to intentional or accidental introduction as a result of human activity.

Annual plant: A plant that survives only a single season.

Austral: Pertaining to the southern hemisphere.

Biodiversity: Biodiversity is the variability among living organisms from all sources including inter alia terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Biome: A major biotic unit consisting of plant and animal communities having similarities in form and environmental conditions, but not including the abiotic portion of the environment.

Climax: Species that are perennial plants under normal optimal conditions without experiencing any disturbance events. The ultimate stage of succession.

Conservation: The management of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. The wise use of natural resources to prevent loss of ecosystem function and integrity.

Critically Endangered: A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.

Cultural: Plants used during spiritual or traditional ceremonies or used as charms (e.g. protection against lightning).

Data Deficient: A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. Data Deficient is therefore not a category of threat or Lower Risk. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available.

Ecosystem: Organisms together with their abiotic environment, forming an interacting system, inhabiting an identifiable space.

Endangered:	A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.
Endemic:	Occurring in a particular region, and nowhere else.
Environment:	NEMA defines "environment" as "the surroundings within which humans exist and that are made up of the land, water and atmosphere of the earth; microorganisms, plant and animal life; any interrelationships among and between them and the physical, chemical aesthetic and cultural properties and conditions that influence human health and well-being".
Faunal Activity:	A general term to broadly define the level of faunal diversity and richness. Evidence of activity includes: visual observations, evidence of presence (spoor, droppings, nests, burrows, etc.), and potential suitable habitat.
Flora:	The plant life of a region.
Geophyte:	A perennial plant with renewal buds located on the plant below the soil surface.
Graminoid:	Referring to a grass species of the family Poaceae or a grass-like member of the Cyperaceae (sedges).
Grassland:	A natural vegetation formation type in which grasses and forb species are dominant.
Habitat:	Type of environment in which a plant lives.
Indigenous:	Any species of plant, shrub or tree that occurs naturally in South Africa.
Invasive species:	Naturalised alien plants that have the ability to reproduce, often in large numbers. Aggressive invaders can spread and invade large areas.
Medicinal:	Used to prevent or cure illnesses and diseases.
Near-endemic:	Occurring in a particular region but do spill over to a small area of another region (e.g. a species may occur in South Africa but extends into the southern part of Namibia due to the presence of suitable habitat.
Perennial plant:	A plant that survives for longer than a season.
Pioneer species:	Hardened, annual plants, which can grow in very unfavourable conditions. Benefits of having these species include less run-off and more available moisture, cooler soil surfaces and less evaporation, protection against wind and build up of organic matter thereby increased enrichment of the soil.
Protected plant:	According to the Cape Nature and Environmental Conservation Ordinance (No. 19 of 1974) no one is allowed to sell, buy, transport, or remove this plant without a permit from the responsible authority.
Rare species:	Species, which have naturally small populations, and species, which have been reduced to small (often unstable) populations by man's activities.

Ruderal Weed:	A plant that grows on waste or disturbed areas.
Threatened species:	Species, which have naturally small populations, and species, which have been reduced to small (often unstable) populations by man's activities.
Red Data:	A list of species, fauna and flora that require environmental protection. Based on the IUCN definitions.
Secondary:	An early to mid successional stage in a plant community, usually disturbed.
Spatial Heterogeneity:	The variability measured across spatial scales.
Species diversity:	A measure of the number and relative abundance of species (see biodiversity).
Species richness:	The number of species in an area or habitat.
Soil:	A mixture of organic and inorganic substances, the composition and structure of the latter is derived from the parent rock material. Soil also contains bacteria, fungi, viruses and micro-arthropods, nematodes and worms.
Suffrutex:	A woody plant with most of its woody components (e.g. main stem and branches) underground. An adaptation for survival in grassland frequented by regular veld fires.
Vulnerable:	A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.

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11 APPENDICES

11.1 APPENDIX A – FAUNAL SPECIES IDENTIFIED AT EACH SITE

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS												
			1	2	3	4	5	6	7	8	9	10	11	12	13
			BARKLY BRIDGE	ADDO	COERNEY	VERBY	EAGLE'S CRAG	TOOTABI	BLINKHOFF	SALTAIRE	KOMMA DAGGA	GOLDEN VALLEY	KLIPFON TEIN	MORTIMER	HALESOWEN
BIRDS															
Acacia Pied Barbet	*Tricholaema leucomelas*	LC					Y			Y					
African Firefinch	*Lagonosticta rubricata*	LC				Y									
African Fish Eagle	*Haliaeetus vocifer*	LC													
African Hoopoe	*Upupa africana*	LC					Y						Y		
African Paradise-flycatcher	*Terpsiphone viridis*	LC									Y				
African Pied Starling	*Spreo bicolor*	LC	Y	Y											
African Red - eyed Bulbul	*Pycnonotus nigricans*	LC					Y	Y							
African Stonechat	*Saxicola torquata*	LC													
Anteating Chat	*Myrmecocichla formicivora*	LC													
Bar - throated Apalis	*Apalis thoracica*	LC		Y											
Barn Swallow	*Hirundo rustica*	LC		Y			Y								
Black - collared Barbet	*Lybius torquatus*	LC	Y				Y								

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS												
			1	2	3	4	5	6	7	8	9	10	11	12	13
			BARKLY BRIDGE	ADDO	COERNEY	VERBY	EAGLE'S CRAG	TOOTABI	BLINKHOFF	SALTAIRE	KOMMA DAGGA	GOLDEN VALLEY	KLIPFON TEIN	MORTIMER	HALESOWEN
Black - headed Heron	*Ardea melanocephala*	LC				Y	Y						Y		
Black - headed Oriole	*Oriolus larvatus*	LC				Y		Y							
Black - shouldered Kite	*Milvus caeruleus*	LC				Y									
Black - throated Canary	*Serinus atrogularis*	LC													
Blue Crane	***Anthropoides paradiseus***	**VU**												**Y**	
Bokmakierie	*Telophorus zeylonus*	LC			Y		Y	Y		Y	Y				
Booted Eagle	*Aquila pennata*	LC											Y		
Brimstone Canary	*Serinus sulphuratus*	LC				Y									
Brown - hooded Kingfisher	*Halcyon albiventris*	LC													
Burchell's Coucal	*Centropus burchellii*	LC	Y												
Cape Crow	*Corvus capensis*	LC	Y					Y		Y					
Cape Glossy Starling	*Lamprotornis nitens*	LC					Y	Y		Y			Y		
Cape Longclaw	*Macronyx capensis*	LC													
Cape Robin - chat	*Cossypha caffra*	LC	Y			Y									
Cape Sparrow	*Passer melanurus*	LC	Y	Y			Y					Y			
Cape Turtle Dove	*Streptopelia capicola*	LC	Y	Y	Y	Y	Y	Y		Y		Y		Y	
Cape Wagtail	*Motacilla capensis*	LC												Y	

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS												
			1	2	3	4	5	6	7	8	9	10	11	12	13
			BARKLY BRIDGE	ADDO	COERNEY	VERBY	EAGLE'S CRAG	TOOTABI	BLINKHOFF	SALTAIRE	KOMMA DAGGA	GOLDEN VALLEY	KLIPFON TEIN	MORTIMER	HALESOWEN
Cape Weaver	*Ploceus capensis*	LC		Y			Y								
Cape White - eye	*Zosterops virens*	LC				Y									
Cattle Egret	*Bubulcus ibis*	LC				Y	Y								
Common Buzzard	*Buteo buteo*	LC										Y			
Common Fiscal	*Lanius collaris*	LC	Y			Y							Y		
Common Kestrel	*Falco tinnunculus*	LC				Y			Y						
Common Moorhen	*Gallinula chloropus*	LC						Y							
Eastern Clapper Lark	*Mirafra fasciolata*	LC													
Eastern Long - billed Lark	*Certhilauda semitorquata*	LC								Y					
Egyptian Goose	*Alopochen aegyptiaca*	LC	Y				Y					Y			
European Starling	*Sturnus vulgaris*	LC	Y												
Fiscal Flycatcher	*Sigelus silens*	LC				Y			Y		Y				
Fork - tailed Drongo	*Dicrurus adsimilis*	LC	Y				Y		Y						
Greater Striped-Swallow	*Hirundo cucullata*	LC							Y						
Green-spotted Dove	*Turtur chalcospilos*	LC				Y									
Hadeda Ibis	*Bostrychia hagedash*	LC	Y	Y		Y	Y			Y		Y	Y	Y	Y
Helmeted Guineafowl	*Numida meleagris*	LC					Y								
Jackal Buzzard	*Buteo rufofuscus*	LC				Y									

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS												
			1	2	3	4	5	6	7	8	9	10	11	12	13
			BARKLY BRIDGE	ADDO	COERNEY	VERBY	EAGLE'S CRAG	TOOTABI	BLINKHOFF	SALTAIRE	KOMMA DAGGA	GOLDEN VALLEY	KLIPFON TEIN	MORTIMER	HALESOWEN
Kalahari Scrub Robin	*Erythropygia paena*	LC									Y				
Karoo Korhaan	*Eupodotis vigorsii*	LC													
Karoo Prinia	*Prinia maculosa*	LC	Y												
Karoo Scrub Robin	*Erythropygia coryphaeus*	LC				Y									
Lanner Falcon	***Falco biarmicus***	**NT**													
Laughing Dove	*Streptopelia senegalensis*	LC	Y	Y					Y			Y			
Lesser Grey Shrike	*Lanius minor*	LC													Y
Lesser Striped-Swallow	*Hirundo abyssinica*	LC		Y			Y								
Ludwig's Bustard	***Neotis ludwigii***	**VU**													
Malachite Sunbird	*Nectarinia famosa*	LC		Y											
Mocking Cliff-chat	*Myrmecocichla cinnamomeiventris*	LC							Y	Y					
Namaqua Dove	*Oena capensis*	LC							Y						
Neddicky	*Cisticola fulvicapillus*	LC											Y		Y
Northern Black Korhaan	*Eupodotis afraoides*	LC								Y					
Pied Crow	*Corvus albus*	LC		Y				Y						Y	
Red - billed Quelea	*Quelea quelea*	LC										Y			
Red - faced Mousebird	*Urocolius indicus*	LC					Y	Y					Y		

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS												
			1	2	3	4	5	6	7	8	9	10	11	12	13
			BARKLY BRIDGE	ADDO	COERNEY	VERBY	EAGLE'S CRAG	TOOTABI	BLINKHOFF	SALTAIRE	KOMMA DAGGA	GOLDEN VALLEY	KLIPFON TEIN	MORTIMER	HALESOWEN
Red - fronted Tinkerbird	*Pogoniulus pusillus*	LC		Y											
Red - headed Finch	*Amadina erythrocephala*	LC	Y												
Red - winged Starling	*Onychognathus morio*	LC							Y						
Rock Dove (Feral Pigeon)	*Columba livia*	LC		Y											
Rufous - eared Warbler	*Malcorus pectoralis*	LC													
Sacred Ibis	*Threskiornis aethiopicus*	LC				Y	Y								
Sombre Greenbul	*Andropadus importunus*	LC						Y							
South African Shelduck	*Tadorna cana*	LC													
Southern Boubou	*Laniarius vaillantii*	LC					Y			Y			Y	Y	
Southern Red Bishop	*Euplectes orix*	LC												Y	
Speckled Mousebird	*Colius striatus*	LC	Y				Y			Y			Y		
Speckled Pigeon	*Columba guinea*	LC							Y						
Trumpeter Hornbill	*Bycanistes bucinator*	LC	Y												
Wattled Starling	*Creatophora cinerea*	LC	Y												
White - throated Canary	*Serinus albogularis*	LC	Y							Y					
MAMMALS															

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS												
			1	2	3	4	5	6	7	8	9	10	11	12	13
			BARKLY BRIDGE	ADDO	COERNEY	VERBY	EAGLE'S CRAG	TOOTABI	BLINKHOFF	SALTAIRE	KOMMA DAGGA	GOLDEN VALLEY	KLIPFON TEIN	MORTIMER	HALESOWEN
Aardvark	*Orycteropus afer*	LC							Y						
Cape Porcupine	*Hystrix africaeaustralis*	LC						Y		Y					
Chacma Baboon	*Papio hamadryas ursinus*	LC					Y			Y					
Grey Duiker	*Sylvicapra grimmia*	LC						Y	Y						
Grey Rhebok	*Pelea capreolus*	LC								Y					
Grysbok (Cape Grysbok)	*Raphicerus melanotis*	LC													
Rock Hyrax	*Procavia capensis*	LC								Y					
Scrub Hare	*Lepus saxatilis*	LC					Y			Y	Y				
Slender Mongoose	*Galerella sanguinea*	LC												Y	
Small Grey Mongoose	*Galerella pulverolenta*	LC	Y						Y	Y	Y			Y	
South African Ground Squirrel	*Xerus inauris*	LC													Y
Steenbok	*Raphicerus campestris*	LC						Y	Y	Y	Y				
Vervet Monkey	*Cercopithecus aethiops*	LC			Y	Y				Y				Y	
Yellow Mongoose	*Cynictis penicillata*	LC							Y	Y	Y			Y	
REPTILES															
Parrot-beaked Padloper	*Homopus areolatus*	LC													Y
INVERTEBRATES															
Possible Baboon Spiders Burrows	specimens to be collected	**PS**									**Y**				

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS												
			1	2	3	4	5	6	7	8	9	10	11	12	13
			BARKLY BRIDGE	ADDO	COERNEY	VERBY	EAGLE'S CRAG	TOOTABI	BLINKHOFF	SALTAIRE	KOMMA DAGGA	GOLDEN VALLEY	KLIPFON TEIN	MORTIMER	HALESOWEN
Possible Burrowing Scorpions	*Opistophthalmus spp.*	**PS**					**Y**		**Y**	**Y**					
Trapdoor Spider	likely Family - Ctenizidae	LC					Y								

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS									
			14	15	16	17	18	19	20	21	22	23
			MARLOW	KAPTEIN	KNUTSFORD	VISRIVIER	CONWAY	GLENHEATH	TAFELBERG	ROSMEAD	FLONKER	CARLTON
BIRDS												
Acacia Pied Barbet	*Tricholaema leucomelas*	LC	Y									
African Firefinch	*Lagonosticta rubricata*	LC										
African Fish Eagle	*Haliaeetus vocifer*	LC										
African Hoopoe	*Upupa africana*	LC	Y			Y						
African Paradise-flycatcher	*Terpsiphone viridis*	LC										
African Pied Starling	*Spreo bicolor*	LC									Y	Y
African Red - eyed Bulbul	*Pycnonotus nigricans*	LC					Y					
African Stonechat	*Saxicola torquata*	LC					Y	Y				
Anteating Chat	*Myrmecocichla formicivora*	LC		Y								
Bar - throated Apalis	*Apalis thoracica*	LC										

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS									
			14	15	16	17	18	19	20	21	22	23
			MARLOW	KAPTEIN	KNUTSFORD	VISRIVIER	CONWAY	GLENHEATH	TAFELBERG	ROSMEAD	FLONKER	CARLTON
Barn Swallow	*Hirundo rustica*	LC										
Black - collared Barbet	*Lybius torquatus*	LC										
Black - headed Heron	*Ardea melanocephala*	LC										
Black - headed Oriole	*Oriolus larvatus*	LC										
Black - shouldered Kite	*Milvus caeruleus*	LC			Y							
Black - throated Canary	*Serinus atrogularis*	LC	Y									
Blue Crane	***Anthropoides paradiseus***	**VU**										
Bokmakierie	*Telophorus zeylonus*	LC										
Booted Eagle	*Aquila pennata*	LC										
Brimstone Canary	*Serinus sulphuratus*	LC										
Brown - hooded Kingfisher	*Halcyon albiventris*	LC	Y									
Burchell's Coucal	*Centropus burchellii*	LC										
Cape Crow	*Corvus capensis*	LC										
Cape Glossy Starling	*Lamprotornis nitens*	LC										
Cape Longclaw	*Macronyx capensis*	LC		Y								
Cape Robin - chat	*Cossypha caffra*	LC	Y									
Cape Sparrow	*Passer melanurus*	LC								Y		
Cape Turtle Dove	*Streptopelia capicola*	LC	Y			Y		Y	Y	Y		

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS									
			14	15	16	17	18	19	20	21	22	23
			MARLOW	KAPTEIN	KNUTSFORD	VISRIVIER	CONWAY	GLENHEATH	TAFELBERG	ROSMEAD	FLONKER	CARLTON
Cape Wagtail	*Motacilla capensis*	LC									Y	Y
Cape Weaver	*Ploceus capensis*	LC										
Cape White - eye	*Zosterops virens*	LC										
Cattle Egret	*Bubulcus ibis*	LC				Y						
Common Buzzard	*Buteo buteo*	LC				Y						
Common Fiscal	*Lanius collaris*	LC	Y			Y						
Common Kestrel	*Falco tinnunculus*	LC										
Common Moorhen	*Gallinula chloropus*	LC										
Eastern Clapper Lark	*Mirafra fasciolata*	LC		Y	Y						Y	Y
Eastern Long - billed Lark	*Certhilauda semitorquata*	LC										
Egyptian Goose	*Alopochen aegyptiaca*	LC										
European Starling	*Sturnus vulgaris*	LC										
Fiscal Flycatcher	*Sigelus silens*	LC										
Fork - tailed Drongo	*Dicrurus adsimilis*	LC										
Greater Striped-Swallow	*Hirundo cucullata*	LC										
Green-spotted Dove	*Turtur chalcospilos*	LC										
Hadeda Ibis	*Bostrychia hagedash*	LC	Y		Y	Y						
Helmeted Guineafowl	*Numida meleagris*	LC				Y						
Jackal Buzzard	*Buteo rufofuscus*	LC										

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS									
			14	15	16	17	18	19	20	21	22	23
			MARLOW	KAPTEIN	KNUTSFORD	VISRIVIER	CONWAY	GLENHEATH	TAFELBERG	ROSMEAD	FLONKER	CARLTON
Kalahari Scrub Robin	*Erythropygia paena*	LC										
Karoo Korhaan	*Eupodotis vigorsii*	LC			Y							
Karoo Prinia	*Prinia maculosa*	LC										
Karoo Scrub Robin	*Erythropygia coryphaeus*	LC										
Lanner Falcon	***Falco biarmicus***	**NT**							**Y**			
Laughing Dove	*Streptopelia senegalensis*	LC				Y						
Lesser Grey Shrike	*Lanius minor*	LC										
Lesser Striped-Swallow	*Hirundo abyssinica*	LC										
Ludwig's Bustard	***Neotis ludwigii***	**VU**		**Y**								
Malachite Sunbird	*Nectarinia famosa*	LC										
Mocking Cliff-chat	*Myrmecocichla cinnamomeiventris*	LC										
Namaqua Dove	*Oena capensis*	LC	Y									
Neddicky	*Cisticola fulvicapillus*	LC			Y							
Northern Black Korhaan	*Eupodotis afraoides*	LC		Y								
Pied Crow	*Corvus albus*	LC	Y		Y		Y	Y			Y	Y
Red - billed Quelea	*Quelea quelea*	LC										
Red - faced Mousebird	*Urocolius indicus*	LC										

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS									
			14	15	16	17	18	19	20	21	22	23
			MARLOW	KAPTEIN	KNUTSFORD	VISRIVIER	CONWAY	GLENHEATH	TAFELBERG	ROSMEAD	FLONKER	CARLTON
Red - fronted Tinkerbird	*Pogoniulus pusillus*	LC										
Red - headed Finch	*Amadina erythrocephala*	LC										
Red - winged Starling	*Onychognathus morio*	LC										
Rock Dove (Feral Pigeon)	*Columba livia*	LC										
Rufous - eared Warbler	*Malcorus pectoralis*	LC										Y
Sacred Ibis	*Threskiornis aethiopicus*	LC										
Sombre Greenbul	*Andropadus importunus*	LC										
South African Shelduck	*Tadorna cana*	LC										
Southern Boubou	*Laniarius vaillantii*	LC										
Southern Red Bishop	*Euplectes orix*	LC			Y							
Speckled Mousebird	*Colius striatus*	LC										
Speckled Pigeon	*Columba guinea*	LC										
Trumpeter Hornbill	*Bycanistes bucinator*	LC										
Wattled Starling	*Creatophora cinerea*	LC			Y							
White - throated Canary	*Serinus albogularis*	LC										
MAMMALS												
Aardvark	*Orycteropus afer*	LC		Y		Y		Y	Y		Y	

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS									
			14	15	16	17	18	19	20	21	22	23
			MARLOW	KAPTEIN	KNUTSFORD	VISRIVIER	CONWAY	GLENHEATH	TAFELBERG	ROSMEAD	FLONKER	CARLTON
Cape Porcupine	*Hystrix africaeaustralis*	LC										
Chacma Baboon	*Papio hamadryas ursinus*	LC						Y				Y
Grey Duiker	*Sylvicapra grimmia*	LC										
Grey Rhebok	*Pelea capreolus*	LC										
Grysbok (Cape Grysbok)	*Raphicerus melanotis*	LC										
Rock Hyrax	*Procavia capensis*	LC										
Scrub Hare	*Lepus saxatilis*	LC									Y	
Slender Mongoose	*Galerella sanguinea*	LC										
Small Grey Mongoose	*Galerella pulverolenta*	LC			Y							
South African Ground Squirrel	*Xerus inauris*	LC		Y								
Steenbok	*Raphicerus campestris*	LC		Y		Y		Y	Y			
Vervet Monkey	*Cercopithecus aethiops*	LC										
Yellow Mongoose	*Cynictis penicillata*	LC		Y		Y						
REPTILES												
Parrot-beaked Padloper	*Homopus areolatus*	LC										
INVERTEBRATES												
Possible Baboon Spiders Burrows	specimens to be collected	**PS**										

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE LOOPS									
			14	15	16	17	18	19	20	21	22	23
			MARLOW	KAPTEIN	KNUTSFORD	VISRIVIER	CONWAY	GLENHEATH	TAFELBERG	ROSMEAD	FLONKER	CARLTON
Possible Burrowing Scorpions	*Opistophthalmus spp.*	**PS**										
Trapdoor Spider	likely Family - Ctenizidae	LC										

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE BORROW PITS										
			1.1	10.1	10.2	10.3	11.1	14.1	16.1	16.2	17.1	17.2	18.1
			BORROW PIT BARKLY BRIDGE	ROAD BORROW PIT NEAR COOKHOUSE	COOKHOUSE POSSIBLE BORROW PIT	GOLDEN VALLEY POSSIBLE BORROW PIT	KLIPFONTEIN CUTTING AS BORROW PIT	MARLOW NEW BORROW PIT	KNUTSFORD BORROW PIT	KNUTSFORD BORROW MATERIAL	VISRIVIER QUARRY	VISRIVIER POSSIBLE BORROW PIT	CONWAY POSSIBLE BORROW PIT
BIRDS													
Acacia Pied Barbet	*Tricholaema leucomelas*	LC							Y				
African Fish Eagle	*Haliaeetus vocifer*	LC						Y					
African Hoopoe	*Upupa africana*	LC					Y					Y	
African Pied Starling	*Spreo bicolor*	LC	Y						Y				
African Red - eyed Bulbul	*Pycnonotus nigricans*	LC											Y
African Stonechat	*Saxicola torquata*	LC									Y		Y
Anteating Chat	*Myrmecocichla formicivora*	LC									Y		
Barn Swallow	*Hirundo rustica*	LC			Y							Y	
Black - collared Barbet	*Lybius torquatus*	LC	Y										
Black - headed Heron	*Ardea melanocephala*	LC					Y						
Black - headed Oriole	*Oriolus larvatus*	LC	Y										
Black - shouldered Kite	*Milvus caeruleus*	LC			Y		Y		Y	Y			
Black - throated Canary	*Serinus atrogularis*	LC						Y					
Blue Crane	***Anthropoides paradiseus***	**VU**						**Y**					
Bokmakierie	*Telophorus zeylonus*	LC	Y					Y					

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE BORROW PITS										
			1.1	10.1	10.2	10.3	11.1	14.1	16.1	16.2	17.1	17.2	18.1
			BORROW PIT BARKLY BRIDGE	ROAD BORROW PIT NEAR COOKHOUSE	COOKHOUSE POSSIBLE BORROW PIT	GOLDEN VALLEY POSSIBLE BORROW PIT	KLIPFONTEIN CUTTING AS BORROW PIT	MARLOW NEW BORROW PIT	KNUTSFORD BORROW PIT	KNUTSFORD BORROW MATERIAL	VISRIVIER QUARRY	VISRIVIER POSSIBLE BORROW PIT	CONWAY POSSIBLE BORROW PIT
Booted Eagle	*Aquila pennata*	LC					Y						
Brimstone Canary	*Serinus sulphuratus*	LC	Y										
Brown - hooded Kingfisher	*Halcyon albiventris*	LC						Y					
Cape Bunting	*Emberiza capensis*	LC	Y										
Cape Crow	*Corvus capensis*	LC	Y										
Cape Glossy Starling	*Lamprotornis nitens*	LC					Y						
Cape Longclaw	*Macronyx capensis*	LC		Y									
Cape Robin - chat	*Cossypha caffra*	LC	Y										
Cape Sparrow	*Passer melanurus*	LC	Y	Y								Y	
Cape Turtle Dove	*Streptopelia capicola*	LC	Y	Y	Y	Y	Y	Y			Y		
Cape Wagtail	*Motacilla capensis*	LC								Y			
Cattle Egret	*Bubulcus ibis*	LC		Y									
Common Fiscal	*Lanius collaris*	LC	Y	Y	Y		Y	Y		Y		Y	
Common Kestrel	*Falco tinnunculus*	LC			Y		Y						
Common Waxbill	*Estrilda astrild*	LC	Y										
Eastern Clapper Lark	*Mirafra fasciolata*	LC									Y		
Egyptian Goose	*Alopochen aegyptiaca*	LC		Y		Y							
European Starling	*Sturnus vulgaris*	LC	Y										
Familiar Chat	*Cercomela familiaris*	LC								Y			
Fork - tailed Drongo	*Dicrurus adsimilis*	LC	Y										
Greater Striped-swallow	*Hirundo cucullata*	LC						Y					
Hadeda Ibis	*Bostrychia hagedash*	LC		Y	Y	Y	Y	Y	Y	Y			
Helmeted Guineafowl	*Numida meleagris*	LC						Y					
Jackal Buzzard	*Buteo rufofuscus*	LC			Y								
Kalahari Scrub Robin	*Erythropygia paena*	LC						Y					
Karoo Korhaan	*Eupodotis vigorsii*	LC							Y		Y		

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE BORROW PITS										
			1.1	10.1	10.2	10.3	11.1	14.1	16.1	16.2	17.1	17.2	18.1
			BORROW PIT BARKLY BRIDGE	ROAD BORROW PIT NEAR COOKHOUSE	COOKHOUSE POSSIBLE BORROW PIT	GOLDEN VALLEY POSSIBLE BORROW PIT	KLIPFONTEIN CUTTING AS BORROW PIT	MARLOW NEW BORROW PIT	KNUTSFORD BORROW PIT	KNUTSFORD BORROW MATERIAL	VISRIVIER QUARRY	VISRIVIER POSSIBLE BORROW PIT	CONWAY POSSIBLE BORROW PIT
Karoo Prinia	*Prinia maculosa*	LC	Y										
Karoo Scrub Robin	*Erythropygia coryphaeus*	LC	Y										
Laughing Dove	*Streptopelia senegalensis*	LC			Y						Y		
Malachite Sunbird	*Nectarinia famosa*	LC	Y										
Namaqua Dove	*Oena capensis*	LC	Y				Y						Y
Neddicky	*Cisticola fulvicapillus*	LC						Y	Y	Y			
Pied Crow	*Corvus albus*	LC		Y				Y	Y	Y	Y		Y
Red - billed Quelea	*Quelea quelea*	LC				Y							
Red - faced Mousebird	*Urocolius indicus*	LC					Y	Y					
Sacred Ibis	*Threskiornis aethiopicus*	LC						Y					
South African Shelduck	*Tadorna cana*	LC						Y					
Southern Boubou	*Laniarius vaillantii*	LC					Y						
Southern Double-collard Sunbird	*Cinnyris chalybeus*	LC						Y					
Speckled Mousebird	*Colius striatus*	LC	Y				Y	Y					
Wattled Starling	*Creatophora cinerea*	LC							Y				
White - throated Canary	*Serinus albogularis*	LC	Y										
White-browed Scrub-robin	*Cercotrichas leucophrys*	LC	Y										
MAMMALS													
Aardvark	*Orycteropus afer*	LC						Y	Y	Y	Y		Y
Black-backed Jackal	*Canis mesomelas*	LC						Y					
Cape Porcupine	*Hystrix africaeaustralis*	LC							Y				
Chacma Baboon	*Papio hamadryas ursinus*	LC					Y						
Grey Duiker	*Sylvicapra grimmia*	LC	Y	Y	Y			Y	Y				
Grey Rhebok	*Pelea capreolus*	LC											Y
Grysbok (Cape Grysbok)	*Raphicerus melanotis*	LC	Y										
Mountain	*Redunca*	LC											Y

COMMON NAME	SCIENTIFIC NAME	STATUS	EASTERN CAPE BORROW PITS										
			1.1	10.1	10.2	10.3	11.1	14.1	16.1	16.2	17.1	17.2	18.1
			BORROW PIT BARKLY BRIDGE	ROAD BORROW PIT NEAR COOKHOUSE	COOKHOUSE POSSIBLE BORROW PIT	GOLDEN VALLEY POSSIBLE BORROW PIT	KLIPFONTEIN CUTTING AS BORROW PIT	MARLOW NEW BORROW PIT	KNUTSFORD BORROW PIT	KNUTSFORD BORROW MATERIAL	VISRIVIER QUARRY	VISRIVIER POSSIBLE BORROW PIT	CONWAY POSSIBLE BORROW PIT
Reedbuck	*fulvorufula*												
Scrub Hare	*Lepus saxatilis*	LC		Y	Y					Y			
Slender Mongoose	*Galerella sanguinea*	LC							Y	Y			Y
Small Grey Mongoose	*Galerella pulverolenta*	LC	Y		Y			Y	Y				
South African Ground Squirrel	*Xerus inauris*	LC						Y					
Steenbok	*Raphicerus campestris*	LC	Y	Y	Y			Y	Y		Y		Y
Water Mongoose	*Atilax paludinosus*	LC								Y			
Yellow Mongoose	*Cynictis penicillata*	LC			Y						Y		Y
REPTILES													
Angulate Tortoise	*Chersina angulata*	LC	Y										
Spotted Harlequin Snake	*Homoroselaps lacteus*	LC	Y										
INVERTEBRATES													
Centipede		LC											
Granulated Thick - tailed Scorpion	*Parabuthus granulatus*	LC											Y
Possible Baboon Spiders Burrows	*likely Family - Theraphosidae*	**PS**		**Y**	**Y**								
Possible Burrowing Scorpions	*Opistophthalmus spp.*	**PS**						**Y**					**Y**
Pygmy Thick - tailed Scorpion	*Uroplectes carinatus*	LC											Y
Ketsi Blue	*Lepidochrysops ketsi*	LC	Y										
Yellow Pansy	*Viola pedunculata*	LC	Y										

COMMON NAME	SCIENTIFIC NAME	STATUS	NORTHERN CAPE LOOPS						NORTHERN CAPE BORROW PITS				YARDS				NEW SUBSTATION
			24	25	26	27	28	29	25.1	25.2	27.2	29.1	30	31	32	33	34
			BARREDEEL	WILDFONTEIN	LINDE	HANOVER ROAD	BURGERVILLE WEG	BLETTERMAN	BORROW PIT NEAR WILDFONTEIN	BORROW PIT NEAR WILDFONTEIN	HANOVER ROAD EXISTING BORROW PIT	BLETTERMAN ROAD BORROW PIT	HOTAZEL	MAMATHWANE	POSTMASBURG	RONALDSVLEI & BECONSFIELD	EMIL
BIRDS																	
African Pied Starling	*Spreo bicolor*	LC				Y	Y				Y						
African Pipit	*Anthus cinnamomeus*	LC			Y												
African Red-eyed Bulbul	*Pycnonotus nigricans*	LC															Y
African Stonechat	*Saxicola torquata*	LC	Y														
Anteating Chat	*Myrmecocichla formicivora*	LC	Y	Y	Y				Y	Y							
Barn Swallow	*Hirundo rustica*	LC											Y				
Black-shouldered Kite	*Milvus caeruleus*	LC				Y											
Blue Crane	***Anthropoides paradiseus***	**VU**		**Y**			**Y**		**Y**	**Y**							
Bokmakierie	*Telophorus zeylonus*	LC	Y													Y	
Cape Glossy Starling	*Lamprotornis nitens*	LC												Y			
Cape Longclaw	*Macronyx capensis*	LC			Y											Y	
Cape Sparrow	*Passer melanurus*	LC		Y		Y		Y	Y	Y		Y			Y	Y	
Cape Turtle Dove	*Streptopelia capicola*	LC		Y	Y		Y	Y				Y		Y	Y	Y	
Cape Wagtail	*Motacilla capensis*	LC		Y	Y												
Chat Flycatcher	*Bradornis infuscatus*	LC		Y													
Chestnut-vented Tit-babbler	*Parisoma subcaeruleum*	LC														Y	
Common Buzzard	*Buteo buteo*	LC			Y												
Common Fiscal	*Lanius collaris*	LC	Y	Y		Y					Y					Y	
Common Kestrel	*Falco tinnunculus*	LC						Y				Y					Y

COMMON NAME	SCIENTIFIC NAME	STATUS	NORTHERN CAPE LOOPS						NORTHERN CAPE BORROW PITS				YARDS				NEW SUBSTATION
			24	25	26	27	28	29	25.1	25.2	27.2	29.1	30	31	32	33	34
			BARREDEEL	WILDFONTEIN	LINDE	HANOVER ROAD	BURGERVILLE WEG	BLETTERMAN	BORROW PIT NEAR WILDFONTEIN	BORROW PIT NEAR WILDFONTEIN	HANOVER ROAD EXISTING BORROW PIT	BLETTERMAN ROAD BORROW PIT	HOTAZEL	MAMATHWANE	POSTMASBURG	RONALDSVLEI & BECONSFIELD	EMIL
Crimson-breasted Shrike	*Laniarius atrococcineus*	LC														Y	
Eastern Clapper Lark	*Mirafra fasciolata*	LC	Y	Y	Y		Y	Y	Y	Y		Y					
European Bee-eater	*Merops apiaster*	LC			Y						Y		Y				
Fawn-coloured Lark	*Mirafra africanoides*	LC														Y	
Fiscal Flycatcher	*Sigelus silens*	LC														Y	
Fork - tailed Drongo	*Dicrurus adsimilis*	LC				Y											
Greater Kestrel	*Falco rupicoloides*	LC															Y
Greater Striped-Swallow	*Hirundo cucullata*	LC											Y			Y	
Grey - backed Cisticola	*Cisticola subruficapillus*	LC		Y					Y	Y							
Grey-backed Sparrowlark	*Eremopterix verticalis*	LC	Y														
Hadeda Ibis	*Bostrychia hagedash*	LC				Y					Y						
Helmeted Guineafowl	*Numida meleagris*	LC														Y	
House Sparrow	*Passer domesticus*	LC		Y					Y	Y						Y	
Kalahari Scrub Robin	*Erythropygia paena*	LC	Y										Y				
Karoo Korhaan	*Eupodotis vigorsii*	LC		Y					Y	Y	Y						
Karoo Scrub Robin	*Erythropygia coryphaeus*	LC	Y														
Kimberley Pipit	*Anthus pseudosimilis*	LC														Y	
Lanner Falcon	***Falco biarmicus***	**NT**			**Y**												
Large - billed Lark	*Galerida magnirostris*	LC		Y					Y	Y							
Laughing Dove	*Streptopelia senegalensi*	LC			Y									Y			

COMMON NAME	SCIENTIFIC NAME	STATUS	NORTHERN CAPE LOOPS						NORTHERN CAPE BORROW PITS				YARDS				NEW SUBSTATION
			24	25	26	27	28	29	25.1	25.2	27.2	29.1	30	31	32	33	34
			BARREDEEL	WILDFONTEIN	LINDE	HANOVER ROAD	BURGERVILLE WEG	BLETTERMAN	BORROW PIT NEAR WILDFONTEIN	BORROW PIT NEAR WILDFONTEIN	HANOVER ROAD EXISTING BORROW PIT	BLETTERMAN ROAD BORROW PIT	HOTAZEL	MAMATHWANE	POSTMASBURG	RONALDSVLEI & BECONSFIELD	EMIL
	s																
Lesser Grey Shrike	*Lanius minor*	LC															Y
Lilic-breasted Roller	*Coracias caudatus*	LC															Y
Ludwig's Bustard	***Neotis ludwigii***	**VU**					**Y**	**Y**									
Namaqua Dove	*Oena capensis*	LC	Y					Y					Y				Y
Northern Black Korhaan	*Eupodotis afraoides*	LC		Y													
Pale - winged Starling	*Onychognathus nabouroup*	LC									Y						Y
Pied Crow	*Corvus albus*	LC		Y		Y			Y	Y	Y		Y	Y		Y	
Red - winged Starling	*Onychognathus morio*	LC									Y						
Red-backed Shrike	*Lanius collurio*	LC															Y
Red-breasted Swallow	*Hirundo semirufa*	LC											Y				
Red-crested Korhaan	*Eupodotis ruficrista*	LC															Y
Rock Dove (Feral Pigeon)	*Columba livia*	LC														Y	
Rock Martin	*Hirundo fuligula*	LC					Y						Y				
Rufous - eared Warbler	*Malcorus pectoralis*	LC	Y														
Southern Pale Chanting Goshawk	*Melierax canorus*	LC					Y	Y				Y					
Southern Red Bishop	*Euplectes orix*	LC											Y				
Southern-masked Weavers	*Ploceus velatus*	LC														Y	
MAMMALS																	
Aardvark	*Orycteropus afer*	LC			Y				Y	Y		Y					
Black-backed Jackal	*Canis mesomelas*	LC					Y	Y			Y						

COMMON NAME	SCIENTIFIC NAME	STATUS	NORTHERN CAPE LOOPS						NORTHERN CAPE BORROW PITS				YARDS				NEW SUBSTATION
			24	25	26	27	28	29	25.1	25.2	27.2	29.1	30	31	32	33	34
			BARREDEEL	WILDFONTEIN	LINDE	HANOVER ROAD	BURGERVILLE WEG	BLETTERMAN	BORROW PIT NEAR WILDFONTEIN	BORROW PIT NEAR WILDFONTEIN	HANOVER ROAD EXISTING BORROW PIT	BLETTERMAN ROAD BORROW PIT	HOTAZEL	MAMATHWANE	POSTMASBURG	RONALDSVLEI & BECONSFIELD	EMIL
Cape Fox	***Vulpes chama***	**PS**								**Y**	**Y**						
Cape Hare	*Lepus capensis*	LC					Y										Y
Common Mole-rat	*Cryptomys hottentotus*	LC							Y				Y				
Cape Porcupine	*Hystrix africaeaustralis*	LC			Y				Y	Y			Y				Y
Scrub Hare	*Lepus saxatilis*	LC		Y			Y		Y	Y							Y
Slender Mongoose	*Galerella sanguinea*	LC											Y	Y			
South African Ground Squirrel	*Xerus inauris*	LC	Y		Y			Y			Y						
South African Hedgehog	***Atelerix frontalis***	**NT**											**Y**	**Y**			
Springbok	*Antidorcas marsupialis*	LC										Y					
Springhare	*Pedetes capensis*	LC									Y		Y				
Steenbok	*Raphicerus campestris*	LC			Y		Y		Y	Y	Y		Y				Y
Suricate	*Suricata suricatta*	LC									Y						
Yellow Mongoose	*Cynictis penicillata*	LC					Y						Y	Y			
REPTILES																	
Ground Agama	*Agama aculeata*	LC													Y		
Puff Adder	*Bitis arietans*	LC													Y		
Southern Rock Agama	*Agama atra*	LC											Y				
INVEREBRATES																	
Possible Burrowing Scorpions	*Opistophthalmus spp.*	**PS**															**Y**

11.2 APPENDIX B - A LIST OF PLANT SPECIES OBSERVED DURING THE SURVEY. *- DENOTE EXOTIC TAXA

Scientific Name	Common Name	Family	Growth Form
Barleria cf. rigida		Acanthaceae	Perennial Herb
Blepharis capensis		Acanthaceae	Perennial Spiny Herb
Blepharis mitrata	Klapperbossie	Acanthaceae	Perennial Spiny Herb
Justicia cf. petiolaris	Blue Justicia	Acanthaceae	Perennial Herb
Monechma divaricatum		Acanthaceae	Perennial Herb
Galenia africana	Yellow Bush	Aizoaceae	Shrub
Galenia sarcophylla	Vanwyksbrak	Aizoaceae	Perennial Prostrate Herb
Plinthus karooicus	Silver Karoo	Aizoaceae	Perennial Herb
Tetragonia sp.		Aizoaceae	Perennial Herb
Aloe ferox	Bitter Aloe	Aloacaceae	Spiny Tree
Aloe grandidentata		Aloacaceae	Perennial Succulent Herb
Aloe speciosa		Aloacaceae	Spiny Tree
Aloe africana		Aloaceae	Succulent Tree
Aloe broomii	Mountain Aloe	Aloaceae	Perennial Succulent Herb
Aloe humilis	Hedgehog Aloe	Aloaceae	Perennial Succulent Herb
Aloe microstigma		Aloaceae	Perennial Succulent Herb
Aloe striata	Coral Aloe	Aloaceae	Perennial Succulent Herb
Aloe tenuior		Aloaceae	Perennial Succulent Herb
*Alternanthera pungens**	Paperthorn	Amaranthaceae	Annual Herb
Hermbstaedtia fleckii	Katstert	Amaranthaceae	Annual Herb
Boophone disticha	Oxbane	Amaryllidaceae	Geophyte
Brunsvigia nr. striata	Candelabra Flower	Amaryllidaceae	Geophyte
Cyrtanthus contractus	Natal Fire-lily	Amaryllidaceae	Geophyte
Cyrtanthus smithiae		Amaryllidaceae	Geophyte
Haemanthus humilis		Amaryllidaceae	Geophyte
Nerine cf. flexuosa		Amaryllidaceae	Geophyte
Rhus burchellii	Karoo Kuni-bush	Anacardiaceae	Shrub
Rhus erosa	Broom Karee	Anacardiaceae	Shrub
Rhus glauca		Anacardiaceae	Shrub
Rhus incisa	Rub-rub Berry	Anacardiaceae	Shrub

Scientific Name	Common Name	Family	Growth Form
Rhus lancea	Karee	Anacardiaceae	Tree
Rhus longispina		Anacardiaceae	Spiny Shrub
Rhus lucida	Glossy Current	Anacardiaceae	Shrub
*Schinus molle**	Pepper Tree	Anacardiaceae	Tree
Carissa bispinosa (=C. haematocarpa)	Num-num	Apocynaceae	Spiny Shrub
Carissa bispinosa subsp. bispinosa	Num-num	Apocynaceae	Spiny Shrub
Cynanchum ellipticum		Apocynaceae	Perennial Woody Climber
Gomphocarpus fruticosus	Milkweed	Apocynaceae	Perennial Herb
Pachypodium bispinosum	Krachtman	Apocynaceae	Perennial Succulent Spiny Herb
Pachypodium succulentum	Krachtman	Apocynaceae	Perennial Succulent Spiny Herb
Pergularia daemia var. daemia	Kgaba	Apocynaceae	Perennial Climbing Herb
Sarcostemma viminale	Melktou	Apocynaceae	Perennial Succulent Scrambler
Stapelia grandiflora var. grandiflora		Apocynaceae	Perennial Succulent Herb
Cussonia spicata	Cabbage-tree	Araliaceae	Tree
Asparagus africanus	Bush Asparagus	Asparagaceae	Perennial Spiny Herb
Asparagus cf. aethiopicus	Haakdoring	Asparagaceae	Perennial Spiny Herb
Asparagus cf. burchellii	Wild Asparagus	Asparagaceae	Perennial Spiny Herb
Asparagus cf. capensis		Asparagaceae	Perennial Spiny Herb
Asparagus retrofractus		Asparagaceae	Perennial Spiny Herb
Asparagus striatus		Asparagaceae	Perennial Spiny Herb
Asparagus suaveolens	Bushveld Asparagus	Asparagaceae	Perennial Spiny Herb
Bulbine abyssinica		Asphodelaceae	Succulent Geophyte
Bulbine frutescens	Snake Flower	Asphodelaceae	Succulent Geophyte
Gasteria bicolor		Asphodelaceae	Perennial Succulent Herb
Haworthia attenuata var. attenuata		Asphodelaceae	Perennial Succulent Herb
Haworthia bolusii var. blackbeardiana		Asphodelaceae	Perennial Spiny Succulent Herb
Trachyandra cf. affinis		Asphodelaceae	Geophyte
Asplenium cordatum (=Ceterach cordatum) (Pteridophyte)	Resurrection Fern	Aspleniaceae	Perennial Pteridophye
Arctotis sp.		Asteraceae	Perennial Herb
Brachylaena ilicifolia		Asteraceae	Shrub
Chrysanthemoides incana	Bietou	Asteraceae	Shrub
Chrysocoma ciliata	Bitterbos	Asteraceae	Perennial Herb

Scientific Name	Common Name	Family	Growth Form
Cineraria lobata		Asteraceae	Perennial Herb
*Cirsium vulgare**	Thistle	Asteraceae	Annual Herb
Disparago cf. ericoides		Asteraceae	Perennial Herb
Elytropappus rhinocerotis	Renosterbos	Asteraceae	Shrub
Eriocephalus ericoides	Kapok Bush	Asteraceae	Perennial Herb
Eriocephalus spinescens	Doringkapok	Asteraceae	Perennial Spiny Herb
Felicia cf. aethiopica		Asteraceae	Perennial Herb
Felicia filifolia	Needle-leaved Felicia	Asteraceae	Shrub
Felicia hirsuta	Bloublommetjie	Asteraceae	Perennial Herb
Felicia muricata	Bloublommetjie	Asteraceae	Perennial Herb
Garuleum bipinnatum	Kowerbos	Asteraceae	Perennial Herb
Gazania krebsiana	Common Gazania	Asteraceae	Perennial Herb
Geigeria ornativa	Vermeerbossie	Asteraceae	Perennial Fob
Helichrysum argyrosphaerum	Wild Everlasting	Asteraceae	Perennial Herb
Helichrysum aureum		Asteraceae	Perennial Fob
Helichrysum cf. dregeanum		Asteraceae	Perennial Herb
Helichrysum zeyheri	Vaalbergkaroo	Asteraceae	Perennial Herb
Hirpicium gazanioides	Botterblom	Asteraceae	Perennial Herb
Kleinia longiflora	Sjambokbos	Asteraceae	Perennial Succulent Herb
Lagerra decurrens	Wolbos	Asteraceae	Shrub
Macledium spinosum	Karmedik	Asteraceae	Perennial Spiny Herb
Nidorella resedifolia		Asteraceae	Annual Herb
Osteospermum imbricatum		Asteraceae	Shrub
Osteospermum sinuatum		Asteraceae	Shrub
Pentzia globosa	Vaalkaroo	Asteraceae	Perennial Herb
Pentzia incana	Anchor Karoo	Asteraceae	Perennial Herb
Pentzia sphaerocephala	Grootberggansieskaroo	Asteraceae	Perennial Herb
Pseudognaphalium undulatum	Cudweed	Asteraceae	Annual Herb
Pteronia glauca	Perdekaroo	Asteraceae	Perennial Herb
Pteronia incana	Asbossie	Asteraceae	Perennial Herb
Pteronia pallens	Scholtzbos	Asteraceae	Perennial Herb
Rosenia glomerata	Perdebossie	Asteraceae	Perennial Shrub
Rosenia humilis	Perdekaroo	Asteraceae	Perennial Shrub

Scientific Name	Common Name	Family	Growth Form
*Schkuhria pinnata**		Asteraceae	Annual Herb
Senecio cf. burchellii		Asteraceae	Perennial Herb
Senecio cf. linifolius		Asteraceae	Shrub
Senecio consanguineus	Starvation Senecio	Asteraceae	Perennial Herb
Senecio inaequidens		Asteraceae	Annual Herb
Senecio radicans	Bokkos	Asteraceae	Perennial Succulent Decumbent Herb
*Tagetes minuta**	Khaki Weed	Asteraceae	Annual Herb
Tarchonanthus camphorates	Camphor Tree	Asteraceae	Shrub
Tragopogon dubius		Asteraceae	Biennial Herb
Rhigozum obovatum	Wild Pomegranate	Bignoniaceae	Spiny Shrub
Rhigozum trichotomum	Driedoring	Bignoniaceae	Spiny Shrub
Ehretia rigida	Cape Lilac	Boraginaceae	Shrub
Heliotropium ciliatum	Heliotrope	Boraginaceae	Perennial Herb
Buddleja saligna		Buddlejaceae	Tree
*Opuntia cf. humifusa**	Creeping Prickly Pear	Cactaceae	Perennial Succulent Herb
*Opuntia imbricatum**		Cactaceae	Perennial Succulent Herb
*Opuntia ficus-indica**	Prickly Pear	Cactaceae	Perennial Succulent Herb
Boscia oleoides	Karoo Shepard's Tree	Capparaceae	Tree
Cadaba aphylla	Wild Swartstormbos	Capparaceae	Shrub
Capparis sepiaria	Wild Caper	Capparaceae	Spiny Woody Climber
Maerua cafra	Witbos	Capparaceae	Shrub
Gymnosporia buxifolia	Stinkpendoring	Celastraceae	Spiny Tree
Gymnosporia capitata	Vaalpendoring	Celastraceae	Spiny Shrub
Gymnosporia maranguensis	Tropical Spikethorn	Celastraceae	Spiny Shrub
Mystroxylon aethiopicum	Kooboo-berry	Celastraceae	Shrub
*Atriplex lindleyi**	Australian Saltbush	Chenopodiaceae	Perennial Herb
Atriplex semibaccata	Creeping Saltbush	Chenopodiaceae	Perennial Creeping Herb
Atriplex vestita	Cape Saltbush	Chenopodiaceae	Perennial Herb
*Chenopodium album**	Goosefoot	Chenopodiaceae	Annual Herb
Exomis microphylla	Brakbossie	Chenopodiaceae	Perennial Herb
Salsola calluna	Swartganna	Chenopodiaceae	Perennial Herb
*Salsola kali**	Tumble Weed	Chenopodiaceae	Perennial Herb
Commelina africana		Commelinaceae	Perennial Creeping Herb

Scientific Name	Common Name	Family	Growth Form
Commelina livingstonii		Commelinaceae	Perennial Creeping Herb
Convolvulus sagittatus	Wild Bindweed	Convolvulaceae	Perennial Twining Herb
Cotyledon campanulata		Crassulaceae	Perennial Succulent Herb
Cotyledon orbiculata	Varkoor	Crassulaceae	Perennial Succulent Herb
Crassula capitella		Crassulaceae	Perennial Succulent Herb
Crassula cf. cultrata		Crassulaceae	Perennial Succulent Herb
Crassula cf. tetragona		Crassulaceae	Perennial Succulent Herb
Crassula mucosa	Lizard's Tail	Crassulaceae	Perennial Succulent Herb
Crassula ovata	Kerky Bush	Crassulaceae	Succulent Shrub
Crassula perforata		Crassulaceae	Perennial Succulent Herb
Crassula spathulata		Crassulaceae	Perennial Succulent Herb
Acanthosicyos naudinianus	Gemsbok Cucumber	Cucurbitaceae	Perennial Trailing Herb
Coccinea quinqueloba		Cucurbitaceae	Perennial Twining Herb
Sansevieria aethiopica	Mother-in-law's Tongue	Dracaenaceae	Perennial Succulent Herb
Diospyros dichrophylla		Ebenaceae	Shrub
Diospyros lycioides	Star Apple	Ebenaceae	Shrub
Diospyros pallens		Ebenaceae	Shrub
Euclea crispa	Bush Guarri	Ebenaceae	Tree
Euclea undulata		Ebenaceae	Shrub
Eriospermum sp.		Eriospermaceae	Geophyte
Clutia sp.		Euphorbiaceae	Perennial Herb
Euphorbia braunsii	Vingerpol	Euphorbiaceae	Perennial Succulent Herb
Euphorbia enopla		Euphorbiaceae	Perennial Succulent Shrub
Euphorbia inaequilatera var. inaequilatera		Euphorbiaceae	Annual Herb
Euphorbia mauritanica	Yellow Mikbush	Euphorbiaceae	Perennial Succulent Shrub
Euphorbia meloformis		Euphorbiaceae	Perennial Succulent Herb
Euphorbia nr. burmannii	Steenbokmelkbos	Euphorbiaceae	Perennial Succulent Herb
Euphorbia stellata		Euphorbiaceae	Perennial Succulent Herb
Euphorbia tetragona		Euphorbiaceae	Perennial Succulent Herb
Acacia erioloba	Camel Thorn	Fabaceae	Spiny Tree
Acacia haematoxylon	Gray Camel Thorn	Fabaceae	Spiny Tree
Acacia hebeclada subsp. hebeclada	Candle Thorn	Fabaceae	Spiny Shrub
Acacia karroo	Sweet Thorn	Fabaceae	Spiny Tree

Scientific Name	Common Name	Family	Growth Form
Acacia mellifera subsp. detinens	Black Thorn	Fabaceae	Spiny Tree
Acacia natalitia		Fabaceae	Spiny Tree
Acacia tortilis	Umbrella Thorn	Fabaceae	Spiny Tree
Elephantorrhiza elephantina	Eland's Bean	Fabaceae	Suffrutex
Indigofera daleoides		Fabaceae	Perennial Herb
Lessertia inflata	Seeroogbossie	Fabaceae	Perennial Herb
Lotononis sp.		Fabaceae	Perennial Herb
Melolobium cf. candicans	Heuningbos	Fabaceae	Perennial Shrub
Parkinsonia africana	Wild Green-hair Tree	Fabaceae	Tree
*Prosopis glandulosa**	Mesquite	Fabaceae	Spiny Tree
Requienia sphaerosperma		Fabaceae	Perennial Prostrate Herb
Schotia afra var. afra	Karoo Boerboon	Fabaceae	Tree
Senna italica subsp. arachnoides	Wild Senna	Fabaceae	Perennial Decumbent Herb
Sutherlandia microphylla	Kankerbos	Fabaceae	Shrub
Pelargonium alternans	Blomkoolmalva	Geraniaceae	Perennial Herb
Pelargonium carnosum		Geraniaceae	Perennial Succulent Herb
Pelargonium inquinans		Geraniaceae	Perennial Herb
Pelargonium peltatum	Ivy-leaved Pelargonium	Geraniaceae	Perennial Scrambling Herb
Albuca cf. setosa		Hyacinthaceae	Geophyte
Albuca sp.		Hyacinthaceae	Geophyte
Drimia spp.		Hyacinthaceae	Geophyte
Ledebouria sp.		Hyacinthaceae	Geophyte
Hypoxis iridifolia	Star-flower	Hypoxidaceae	Geophyte
Becium burchellianum		Lamiaceae	Perennial Herb
Salvia repens		Lamiaceae	Annual Herb
Stachys cuneata	Vaaltee	Lamiaceae	Perennial Herb
Stachys sp.		Lamiaceae	Perennial Herb
Melianthus cf. comosus	Kruidjie-roer-my-nie	Melianthaceae	Shrub
Carpobrotus cf. edulis	Sour Fig	Mesembryanthemaceae	Perennial Succulent Creeper
Delosperma echinatum		Mesembryanthemaceae	Perennial Succulent Herb
Delosperma multiflora		Mesembryanthemaceae	Perennial Succulent Herb
Delosperma rogersii		Mesembryanthemaceae	Perennial Succulent Herb
Delosperma sp.		Mesembryanthemaceae	Perennial Succulent Herb

Scientific Name	Common Name	Family	Growth Form
Drosanthemum hispidum		Mesembryanthemaceae	Perennial Succulent Herb
Drosanthemum sp.		Mesembryanthemaceae	Perennial Succulent Herb
Lampranthus productus		Mesembryanthemaceae	Perennial Succulent Herb
Malephora sp.		Mesembryanthemaceae	Perennial Succulent Herb
Mesembryanthemum aitonis		Mesembryanthemaceae	Perennial Succulent Herb
Mestoklema sp.		Mesembryanthemaceae	Perennial Succulent Herb
Phyllobolus splendens		Mesembryanthemaceae	Perennial Succulent Herb
Psilocaulon articulatum	Asbos	Mesembryanthemaceae	Perennial Succulent Herb
Psilocaulon coriarium	Asbos	Mesembryanthemaceae	Perennial Succulent Herb
Psilocaulon junceum		Mesembryanthemaceae	Perennial Succulent Herb
Rhombophyllum rhomboideum		Mesembryanthemaceae	Perennial Succulent Herb
Ruschia cradockensis subsp. cradockensis		Mesembryanthemaceae	Perennial Succulent Herb
Ruschia hamata		Mesembryanthemaceae	Perennial Succulent Herb
Ruschia putterillii		Mesembryanthemaceae	Perennial Succulent Herb
Ruschia sp.		Mesembryanthemaceae	Perennial Succulent Herb
Ruschia spinosa	Doringvygie	Mesembryanthemaceae	Perennial Succulent Herb
Ruschia uncinata		Mesembryanthemaceae	Perennial Succulent Herb
Stomatium (?) sp.		Mesembryanthemaceae	Perennial Succulent Herb
Titanopsis sp.		Mesembryanthemaceae	Perennial Succulent Herb
Trichodiadema bulbosum		Mesembryanthemaceae	Perennial Succulent Herb
Trichodiadema pomeridianum		Mesembryanthemaceae	Perennial Succulent Herb
Trichodiadema sp.		Mesembryanthemaceae	Perennial Succulent Herb
Eucalyptus camaldulensis *	Gum Tree	Myrtaceae	Tree
Jasminum angulare		Oleaceae	Perennial Woody Climber
Olea europaea subsp. africana	Wild Olive	Oleaceae	Tree
*Oenothera rosea**	Evening Primrose	Onagraceae	Annual Herb
*Argemone ochroleuca**	Mexican Poppy	Papaveraceae	Annual Herb
Sesamum triphyllum	Wild Sesame	Pedaliaceae	Annual Herb
*Pinus ssp.**	Pine trees	Pinaceae	Tree
*Plantago lanceolata**	Lamb's Tongue	Plantaginaceae	Perennial Herb
Plumbago auriculata	Plumbago	Plumbaginaceae	Shrub
Anthephora pubescens	Wool Grass	Poaceae	Perennial Tufted Graminoid
Aristida adscensionis	Annual Three-awn	Poaceae	Annual Tufted Graminoid

Scientific Name	Common Name	Family	Growth Form
Aristida congesta subsp. barbicollis	Spreading Three-awn	Poaceae	Perennial Tufted Graminoid
Aristida diffusa	Iron Grass	Poaceae	Perennial Tufted Graminoid
Aristida meridionalis	Giant Three-awn	Poaceae	Perennial Tufted Graminoid
*Bromus pectinatus**	Japanese Brome	Poaceae	Annual Tufted Graminoid
Cenchrus cilliaris	Foxtail Buffalo Grass	Poaceae	Perennial Tufted Graminoid
Chloris virgata	Feather-top Grass	Poaceae	Perennial Tufted Graminoid
Cymbopogon pospischilii	Narrow-leaved Turpentine Grass	Poaceae	Perennial Tufted Graminoid
Cynodon dactylon	Couch Grass	Poaceae	Perennial Stoloniferous Graminoid
Cynodon incompletus		Poaceae	Perennial Stoloniferous Graminoid
Digitaria argyrograpta	Silver Finger Grass	Poaceae	Perennial Tufted Graminoid
Digitaria eriantha	Common Finger Grass	Poaceae	Perennial Tufted Graminoid
Ehrharta calycina	Common Erhharta	Poaceae	Perennial Tufted Graminoid
Enneapogon desvauxii	Eight Day Grass	Poaceae	Perennial Tufted Graminoid
Enneapogon scoparius	Bottlebrush Grass	Poaceae	Perennial Tufted Graminoid
Eragrostis bergiana		Poaceae	Perennial Stoloniferous Graminoid
Eragrostis bicolor	Speckled Vlei Grass	Poaceae	Perennial Tufted Graminoid
Eragrostis chloromelas	Narrow Curly Leaf	Poaceae	Perennial Tufted Graminoid
Eragrostis curvula	Weeping Love Grass	Poaceae	Perennial Tufted Graminoid
Eragrostis echinochloidea	Tick Grass	Poaceae	Perennial Tufted Graminoid
Eragrostis lehmanniana	Lehmann's Love Grass	Poaceae	Perennial Tufted Graminoid
Eragrostis obtusa	Dew Grass	Poaceae	Perennial Tufted Graminoid
Eustachys paspaloides	Brown Rhodes Grass	Poaceae	Perennial Tufted Graminoid
Ficinia truncata		Poaceae	Perennial Tufted Herb
Fingerhuthia africana	Thimble Grass	Poaceae	Perennial Tufted Herb
Heteropogon contortus	Spear Grass	Poaceae	Perennial Tufted Graminoid
*Hordeum murinum**	False Barley	Poaceae	Annual Graminoid
Hyparrhenia hirta	Common Thatching Grass	Poaceae	Perennial Tufted Graminoid
Melinis repens	Natal Red Top	Poaceae	Annual Graminoid
Panicum maximum	Guinea Grass	Poaceae	Perennial Tufted Graminoid
Panicum schinzii	Sweet Grass	Poaceae	Annual Tufted Graminoid
*Pennisetum setaceum**	Fountain Grass	Poaceae	Perennial Tufted Graminoid
Phragmites australis	Common Reed	Poaceae	Perennial Rhizomatous Graminoid
Schmidtia pappophoroides	Sand Quick	Poaceae	Perennial Tufted Graminoid

Scientific Name	Common Name	Family	Growth Form
Setaria sphacelata	Common Bristle Grass	Poaceae	Perennial Tufted Graminoid
Setaria verticillata	Bur Bristle Grass	Poaceae	Annual Tufted Graminoid
Sporobolus fimbriatus	Dropseed Grass	Poaceae	Perennial Tufted Graminoid
Sporobolus ioclados	Pan Dropseed	Poaceae	Perennial Tufted Graminoid
Sporobolus ludwigii		Poaceae	Perennial Stoloniferous Graminoid
Stipa dregeana		Poaceae	Perennial Tufted Graminoid
Stipagrostis obtusa	Small Bushman Grass	Poaceae	Perennial Tufted Graminoid
Stipagrostis uniplumis	Silky Bushman Grass	Poaceae	Perennial Tufted Graminoid
Themeda triandra	Red Grass	Poaceae	Perennial Tufted Graminoid
Tragus berteronianus	Carrot-seed Grass	Poaceae	Annual Tufted Graminoid
Tragus koelerioides		Poaceae	Perennial Stoloniferous Graminoid
Emex australis	Spiny Emex	Polygalaceae	Annual Herb
Polygala cf. rehmanni		Polygalaceae	Perennial Herb
Polygala ephedroides	Skaap-ertjie	Polygalaceae	Perennial Herb
*Rumex crispus**	Curly Dock	Polygalaceae	Perennial Herb
Portulacaria afra	Spekboom	Portulacariaceae	Succulent Tree
Talinum cf. tenuissimum		Portulacariaceae	Perennial Herb
Scutia myrtina	Cat's Thorn	Rhamnaceae	Perennial Woody Climber
Ziziphus mucronata	Buffalo-thorn	Rhamnaceae	Spiny Tree
Anthospermum rigidum		Rubiaceae	Perennial Herb
Anthospermum sp.		Rubiaceae	Perennial Decumbent Herb
Nenax microphylla	Daggapit	Rubiaceae	Perennial Herb
Azima tetracantha	Needle-bush	Salvadoraceae	Spiny Shrub
Thesium lineatum	Witstorm	Santalaceae	Perennial Parasitic Herb
Hippobromus pauciflorus	False Horsewood	Sapindaceae	Tree
Pappea capensis	Jacket-plum	Sapindaceae	Tree
Sideroxylon inerme		Sapotaceae	Tree
Aptosimum procumbens	Karoo Violet	Scrophulariaceae	Perennial Decumbent Herb
Jamesbrittenia cf. tysonii		Scrophulariaceae	Perennial Herb
Jamesbrittenia microphylla		Scrophulariaceae	Perennial Herb
Manulea sp.		Scrophulariaceae	Annual Herb
Nemesia fruticans	Leeubekkie	Scrophulariaceae	Annual Herb
Peliostomum leucorrhizum	Veld Violet	Scrophulariaceae	Perennial Herb

Scientific Name	Common Name	Family	Growth Form
Selago dinteri		Scrophulariaceae	Perennial Herb
Sutera campanulata		Scrophulariaceae	Perennial Herb
Lycium cinereum	Kriedoring	Solanaceae	Spiny Shrub
Lycium hirsutum	Rivierkareedoring	Solanaceae	Spiny Shrub
Lycium horridum		Solanaceae	Spiny Shrub
Lycium oxycarpum	Wolwedoring	Solanaceae	Spiny Shrub
*Nicotiana glauca**	Wild Tobacco	Solanaceae	Shrub
Solanum supinum		Solanaceae	Perennial Herb
Solanum tomentosum		Solanaceae	Perennial Spiny Herb
Hermannia althaeoides	Doll's Roses	Sterculiaceae	Perennial Herb
Hermannia cf. desertorum	Suikerbos	Sterculiaceae	Perennial Herb
Hermannia cf. pulverata		Sterculiaceae	Perennial Herb
Hermannia cuneifolia	Agtdaegeneesbossie	Sterculiaceae	Perennial Herb
Hermannia nr. filifolia	Doll's Roses	Sterculiaceae	Perennial Herb
Hermannia tomentosa	Lusernbos	Sterculiaceae	Perennial Herb
Hermannia vestita	Swaelbossie	Sterculiaceae	Perennial Herb
Gnidia polycephala	January Bush	Thymelaeaceae	Perennial Herb
Grewia retinervis	Kalahari Sand Raisin	Tiliaceae	Shrub
Grewia robusta	Kruisbessiebos	Tiliaceae	Shrub
*Forsskaolea candida**	Kwaaibul	Urticaceae	Perennial Herb
Viscum rotundifolium	Mistletoe	Viscaceae	Perennial Parasitic Herb
Cyphostemma cf. quinatum		Vitaceae	Perennial Woody Climber
Rhoicissus digitata	Wild Grape	Vitaceae	Perennial Woody Climber
Lantana rugosa		Verbenaceae	Shrub
*Verbena tenuisecta**		Verbenaceae	Perennial Herb
Zygophyllum cf. foetidum	Slymbos	Zygophyllaceae	Perennial Scrambling Herb
Zygophyllum pubescens	Spekbos	Zygophyllaceae	Perennial Herb

11.3 APPENDIX C - INTERIM TSP LISTING CATEGORIES

EXTINCT (EX)
A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

EXTINCT IN THE WILD (EW)
A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

ENDANGERED (EN)
A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.

VULNERABLE (VU)
A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.

NEAR THREATENED (NT)
A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC)

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

DATA DEFICIENT (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

STILL TO BE ASSESSED (STBA)

RARE

Taxa with limited distribution ranges within South Africa and/or known from very few subpopulations, but that are not threatened are included on the national list as species of conservation concern. Their global status according to IUCN categories and criteria of these taxa is Least Concern (LC)

DECLINING

Widespread taxa that do not qualify for threatened status under any of the IUCN criteria but that are nonetheless under pressure, often as a result of harvesting for medicinal purposes, are also noted on the national list as taxa of conservation concern

11.4 APPEDIX D - RED DATA AVIFAUNAL AND MAMMAL SPECIES RECORDED IN THE RELEVANT QDS

Avifauna

COMMON NAME	*SCIENTIFIC NAME*	STATUS	2722BB	2722BD	2722DB	2723AC	2823AC	2824DD	2824DC	3024CA	3024CD	3024DC	3124BA	3124BB	3124BD	3125AC	3125CA	3125CB	3125CD	3125DC	3225BA	3225BC	3225DA	3225DB	3225DD	3325BB	3325BC	3325BD	3325DA	3326AA	3326AC
Martial Eagle	*Polemaetus bellicosus*	VU	√	√	√	√		√		√			√				√	√	√	√	√	√	√	√		√	√	√	√	√	√
Lesser Kestrel	*Falco naumanni*	VU	√					√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√							
Ludwig's Bustard	*Neotis ludwigii*	VU		√	√					√	√	√	√	√		√	√	√	√	√	√	√		√				√		√	
White - backed Vulture	*Gyps africanus*	VU						√	√																						
Blue Crane	*Anthropoides paradiseus*	VU						√	√	√	√	√	√	√		√	√	√	√	√	√		√	√	√		√	√	√	√	√
Kori Bustard	*Ardeotis kori*	VU						√	√	√																		√		√	
Lappet - faced Vulture	*Aegypius tracheliotus*	VU						√																							
Tawny Eagle	*Aquila rapax*	VU						√				√					√	√	√	√	√										
African Marsh Harrier	*Circus ranivorus*	VU									√	√							√		√								√		
Denham's Bustard	*Neotis denhami*	VU																	√	√				√	√			√	√	√	
Pel's Fishing Owl	*Scotopelia peli*	VU																	√												
Cape Vulture	*Gyps coprotheres*	VU																		√			√	√							
Grey - crowned Crane	*Balearica regulorum*	VU																			√										
African Finfoot	*Podica sengalensis*	VU																					√								
Denham's Bustard	*Neotis denhami*	VU																													√
Black Stork	*Ciconia nigra*	NT	√							√	√	√		√	√			√	√	√			√	√	√	√	√	√	√	√	
Black Harrier	*Circus maurus*	NT		√	√			√		√		√	√		√			√	√		√		√	√			√	√	√	√	
Lanner Falcon	*Falco biarmicus*	NT				√	√		√		√					√	√		√	√	√	√		√		√	√	√	√	√	
Greater Flamingo	*Phoenicopterus ruber*	NT						√	√	√	√	√	√					√	√												
Lesser Flamingo	*Phoenicopterus minor*	NT						√	√		√	√	√						√												
Secretarybird	*Sagittarius serpentarius*	NT						√	√	√	√				√	√	√	√	√	√	√		√	√	√	√		√	√	√	
Marabou Stork	*Leptoptilos crumeniferus*	NT						√																							
Blue Korhaan	*Eupodotis caerulescens*	NT						√			√	√	√	√	√	√	√	√	√	√	√	√									
Chestnut - banded Plover	*Charadrius pallidus*	NT										√																			
Melodious Lark	*Mirafra cheniana*	NT														√		√	√						√						
Yellow - billed Stork	*Mycteria ibis*	NT																	√	√	√		√	√					√		
African Crowned Eagle	*Stephanoaetus coronatus*	NT																					√	√			√	√		√	√
Knysna Woodpecker	*Campethera notata*	NT																					√	√			√	√	√	√	√
Bush Blackcap	*Lioptilus nigricapillus*	NT																					√								
Great White Pelican	*Pelecanus onocrotalus*	NT																						√							
Peregrine Falcon	*Falco peregrinus*	NT																									√				
Caspian Tern	*Hydroprogne caspia*	NT																									√		√		
Half - collared Kingfisher	*Alcedo semitorquata*	NT																									√	√	√		√
Black - winged Lapwing	*Vanellus melanopterus*	NT																										√	√		

Mammals

COMMON NAME	*SCIENTIFIC NAME*	STATUS	2722BB	2722BD	2722DB	2723AC	2823AC	2824DD	2824DC	3024CA	3024CD	3024DC	3124BA	3124BB	3124BD	3125AC	3125CA	3125CB	3125CD	3125DC	3225BA	3225BC	3225DA	3225DB	3225DD	3325BB	3325BC	3325BD	3325DA	3326AA	3326AC
African Weasel	*Poecilogale albinucha*	DD	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
Hottentot's Golden Mole	*Amblysomus hottentotus*	DD																			√	√	√	√	√	√	√	√	√	√	√
Sclater's Golden Mole	*Chlorotalpa sclateri*	DD															√	√	√	√											
Reddish - grey Musk Shrew	*Crocidura cyanea*	DD	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Greater Musk Shrew	*Crocidura flavescens*	DD															√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Tiny Musk Shrew	*Crocidura fuscomurina*	DD						√		√	√	√	√	√	√	√															
Lesser Grey - brown Musk Shrew	*Crocidura silacea*	DD											√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Forest Shrew	*Myosorex varius*	DD													√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Least Dwarf Shrew	*Suncus infinitesimus*	DD																									√	√	√		√
Woodland Mouse	*Grammomys dolichurus*	DD																							√	√	√	√	√	√	√
Slogget's Rat	*Otomys slogetti*	DD									√	√	√	√	√	√															
Lesser Red Musk Shrew	*Crocidura hirta*	DD	√	√	√	√	√																								
Bushveld Gerbil	*Tatera leucogaster*	DD	√	√	√	√	√	√	√																						
Samango Monkey	*Cercopithecus mitis labiatus*	EN																			√		√	√	√						
White - tailed Rat	*Mystromys albicaudatus*	EN											√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Lesser Long - fingered Bat	*Miniopterus fraterculus*	NT																								√	√	√	√	√	√
Schreiber's Long - fingered Bat	*Miniopterus schreibersii*	NT	√	√	√	√	√	√	√												√	√	√	√	√	√	√	√	√	√	√
Temminck's Hairy Bat	*Myotis tricolor*	NT																								√	√	√	√	√	√
Cape Horseshoe Bat	*Rhinolophus capensis*	NT																			√	√	√	√	√	√	√	√	√	√	√
Geoffroy's Horseshoe Bat	*Rhinolophus clivosus*	NT	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Darling's Horseshoe Bat	*Rhinolophus darlingi*	NT					√																								
Dent's Horseshoe Bat	*Rhinolophus denti*	NT	√	√	√	√	√	√	√																						
Littledale's Whistling Rat	*Parotomys littledalei*	PS					√																								
Reedbuck	*Redunca arundinum*	PS																					√	√	√	√	√	√	√	√	√
Black - footed Cat	*Felis nigripes*	PS	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Brown Hyaena	*Hyaena brunnea*	PS						√	√												√	√	√	√	√	√	√	√	√	√	√
Spotted - necked Otter	*Lutra maculicollis*	PS						√	√							√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Honey Badger	*Mellivora capensis*	PS	√	√	√	√	√	√	√							√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Leopard	*Panthera pardus*	PS	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
South African Hedgehog	*Atelerix frontalis*	PS	√			√		√	√																						
Cape Fox	*Vulpes chama*	PS	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√						√	√	√	√		
Blue Duiker	*Philantomba monticola*	VU																										√		√	√
Tree Hyrax	*Dendrohyrax arboreus arboreus*	VU																								√	√	√	√	√	√
Samango Monkey	*Cercopithecus mitis*	VU	√			√																									

11.5 APPENDIX E – REPTILE LIST

Name	Common Name	De Aar to Hotazel	De Aar to the Port of Ngqura	Conservation	Mitgation
Homopus femoralis	Greater Padloper	Peripheral in the south	Occurs of much of area	SA endemic, relatively restricted	
Stegmochelady s pardalis	Leopard Tortoise	Occurs throughout	Occurs of much of area	Common and widespread	
Chersina angulata	Angulate Tortoise	Does not occur	Occurs in near PE only	Abundant but has a relatively restricted distribution. Endemic to South Africa	
Psammobates oculiferus	Kalahari Tent Toritoise	Occurs only in nothern parts	Does not occur	Widespread but generally not common	
Psammobates tentorius	Tent Tortoise	Does not occur	Occurs only just north of PE	Widespread but generally not common and current work indicates that this taxon may actually represent several species. Thus the form that exists on the site may actually be more restricted than is currently understood.	
Pelomedusa subrufa	Marsh Terrapin	Occurs only in the south eastern extreme	Occurs throughout	Widspread and very common	
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	Occurs throughout	Occurs throughout	Widespread and fairly common	
Leptotyphlops nigricans	Black Thread Snake	Does not occur	Occurs only just north of PE	Endemic to South Africa, fairly restricted range	
Leptotyphlops scutifrons	Peters' Thread Snake	Occurs throughout but peripheral	Does not occur	Common and widespread	
Aparallactus capensis	Common Centipede Eater	Does not occur	Southern limit is at PE. Does not occur in other parts of the area	Very common and widepread	
Lycodomorphus laevissimus	Dusky-bellied Water Snake	Does not occur	Only in the southern extreme	South African endemic	
Lycodomorphus rufulus	Common Water Snake	Does not occur	Only in the south near to PE	South African endemic, and common and widespread	
Lamprophis capensis	Common House Snake	Occurs throughout	Occurs throughout	Very widespread and common	

Name	Common Name	De Aar to Hotazel	De Aar to the Port of Ngqura	Conservation	Mitgation
Lamprophis guttatus	Spotted House Snake	Does not occur	Occurs throughout all southern parts	Specialist for rocky habitats	
Lamprophis aroura	Aurora House Snake	Does not occur	Occurs only just north of PE	South African endemic, grassland specialist	
Lycophidion capense	Common Wold Snake	Occurs through much of eastern section	Occurs throughout	Widspread and very common	
Duberria lutrix	Common Slug Eater	Does not occur	Occurs only just north of PE	Fairly widspread and relatively common. South African endemic	
Pseudaspis cana	Mole Snake	Occurs throughout	Occurs throughout	Widspread and common	
Prosymna sundevallii	Sundevall's Shovel-snout	Occurs in eastern extremes	Occurs throughout	Relatively widespread, but uncommon	
Dipsina multimaculata	Dwarf Beaked Snake	Does not occur	Occurs in the northern parts	Widespread and common	
Psammophylax rhombeatus	Spotted Skaapsteker	Occurs in southern parts	Occurs throughout	Widespread and common	
Psammophis notostictus	Karoo Sand Snake	Occurs throughout	Occurs throughout	Widespread and common	
Psammophis trinasalis	Fork-marked Sand Snake	Occurs throughout	Occurs in northern parts	Widespread and common	
Psammophis crucifer	Cross-marked Grass Snake	Does not occur	Occurs in southern parts	Wdespread and common	
Philothamnus natalensis	Natal Green Snake	Does not occur	Occurs in southern parts	Relatively widespread, and common	
Dasypeltis scabra	Common Egg Eater	Occurs throughout	Occurs throughout	Widespread and very common	
Crotaphopeltis hotamboeia	Herald	Occurs in eastern parts	Occurs throughtout	Widespread and very common	
Telescopus semiannulatus	Eastern tiger Snake	Peripheral, occurs in the west	Does not occur	Widespread and common	
Dispholidus typus	Boomslang	Peripheral, occurs throughout	Peripheral, occurs in the south	Widespread and common	
Homoroselaps lacteus	Spotted Harlequin Snake	Does not occur	Peripheral, occurs in the south	Widespread, fairly common in places but rare in others	
Aspidelaps lubricus	Coral Shield Cobra	Does not occur	Occurs in the southern	Widespread and common in places	

Name	Common Name	De Aar to Hotazel	De Aar to the Port of Ngqura	Conservation	Mitgation
			parts		
Elapsoidea sundevallii media	Highveld Garter Snake	Occurs in the estern parts	Does not occur	Widspread but rare	
Naja nivea	Cape Cobra	Occurs throughout	Occurs throughout	Widespread and common	
Bitis arietans	Puff Adder	Occurs throughout	Occurs throughout	Wisespread and common	
Bitis atropas	Berg Adder	Does not occur	Occurs in southern parts	Restricted, but common in places	
Bitis caudalis	Horned Adder	Peripheral, occurs in parts	Peripheral, occurs in parts	Widespread and common	
Bitis inornata	Plain Mountain Adder	Does not occur	Check QDSs	Restricted and rare	IUCN Listed
Bitis albanica	Albany Adder	Does not occur	Check QDSs	Restricted and rare	IUCN Listed
Zygaspis quadrifrons	Kalahari Round-headed Worm Lizard	Occurs in northern parts	Does not occur	Widespread	
Monopeltis capensis	Cape Spade-snouted Worm Lizard	Occurs in the estern parts	Does not occur	Patchy and restricted, endemic to South Africa	
Acontias gracilocauda	Thin-tailed Legless Skink	Does not occur	Occurs in southern parts	Endemic to South Africa, fairly restricted range	
Acontias meleagris	Cape Legless Skink	Does not occur	Occurs in southern parts	Endemic to South Africa, fairly restricted range	
Acontias percivali	Percival's Legless Sking	Does not occur	Occurs in southern parts	Endemic to South Africa, fairly restricted range	
Scelotes anguineus	Algo Dwarf Burrowing Skink	Does not occur	Occurs around Algoa Bay	Endemic to South Africa, very restricted range	
Scelotes caffer	Cape Dwarf Burrowing Skink	Does not occur	Occurs around Algoa Bay	Endemic to South Africa, very restricted range	
Trachylepis capensis	Cape Skink	Occurs throughout	Occurs throughtout	Endemic to southern Africa. Common and widespread	
Trachylepis homalocephala	Red-sided Skink	Does not occur	Occurs in southern parts	Endemic to South Africa, fairly restricted range	
Trachylepis occidentalis	Western Three-striped Skink	Occurs in western parts	Occurs in northern parts	Endemic to southern Africa. Common and widespread	

Name	Common Name	De Aar to Hotazel	De Aar to the Port of Ngqura	Conservation	Mitgation
Trachylepis spilogaster	Kalahari Tree Skink	Occurs in western parts	Occurs in northern parts	Endemic to southern Africa. Common and widespread	
Trachylepis varia	Variable Skink	Occurs in eastern extremes	Occurs in southern extremes	Common and widespread	
Trachylepis variegata	Variegated Skink	Occurs throughout	Occurs throughout apart from southern extremes	Common and widespread	
Ichnotropis squamulosa	Common Rough-scaled Lizard	Occurs in northern parts	Does not occur	Common and widespread	
Nucras intertexta	Spotted Sandveld Lizard	Occurs in northern parts	Does not occur	Common and widespread	
Nucras lalandii	Delalande's Sandveld Lizard	Does not occur	Occurs in southern extremes	Endemic to South Africa, patchy and rare	
Nucras taeniolata	Striped Sandveld Lizard	Does not occur	Occurs around Algoa Bay and Albany	Endemic and very restriced	
Nucras livida	Karoo Sandveld Lizard	Does not occur	Occurs in southern parts	Endemic to South Africa, restricted and uncommon	
Pedioplanis burchelli	Burchell's Sand Lizard	Does not occur	Occurs throughout	Endemic to South Africa, relatively widespread and common in places	
Pedioplanis lineoocellata	Spotted Sand Lizard	Occurs throughout	Occurs throughout	Endemic to southern Africa. Common and widespread	
Pedioplanis namaquensis	Namaqua Sand Lizard	Does not occur	Occurs in western parts	Widespread and common	
Tropidosaurus gularis	Cape Mountain Lizard	Does not occur	Occurs in southern extremes	Endimic to South Africa; restricted, patchy and rare	
Tropidosaurus montana	Common Mountain Lizard	Does not occur	Occurs in southern extremes	Endimic to South Africa; restricted, patchy and rare	
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	Occurs throughout	Occurs in southern parts	Widespread and common	
Gerrhosaurus typicus	Namaqua Plated Lizard	Does not occur	Occurs in southern parts	South African endemic, restricted and rare	

Name	Common Name	De Aar to Hotazel	De Aar to the Port of Ngqura	Conservation	Mitgation
Tetrachactylus africanus	FitzSimons' Long-tailed Seps	Does not occur	Occurs in southern parts	South African endemic, restricted and rare	
Tetrachactylus seps	Short-legged Seps	Does not occur	Occurs in southern extremes	South African endemic, restricted and rare	
Tetrachactylus tetradactylus	Common Long-tailed Seps	Does not occur	Occurs in southern parts	South African endemic, restricted and rare	
Chamaesaura anguina	Cape Grass Lizard	Does not occur	Occurs in southern parts	Restricted and patchy, but may be locally common	
Cordylus cordylus	Cape Girdled Lizard	Does not occur	Occurs in southern half	South African endemic; relatively widespread and common	
Cordylus polyzonus	Karoo Girdled Lizard	Occurs throughout	Occurs throughout	Southern African endemic; widespread and common	
Cordylus tasmani	Tasman's Girdled Lizard	Does not occur	Occurs in southern parts	South African endemic; restricted	
Pseudocordylus microlepidotus	Cape Crag Lizard	Does not occur	Occurs in northern parts and southern extremes	South African endemic; relatively widespread and common	
Varanus albigularis	Rock Monitor	Occurs throughout	Occurs throughout	Widespread and common	
Varanus niloticus	Water Monitor	Occurs in eastern parts	Occurs in southern parts	Widespread and common	
Agama aculeata	Ground Agama	Occurs throughout	Occurs throughout	Widespread and common	
Agama atra	Rock Agama	Occurs throughout	Occurs throughout	Widespread and common	
Bradypodium taeniabronchum	Elandsberg Dwarf Chameleon	Does not occur	Occurs in southern parts	South African Endemic; restricted distribution; IUCN listed	
Bradypodium ventrale	Eastern Cape Dwarf Chameleon	Does not occur	Coccurs throughout	South African endemic; widespread and common	
Afroedura karroica	Karoo Flat Gecko	Does not occur	Occurs in central parts	South African endemic; restricted range	
Afrogecko porphyreus	Marbled Leaf-toed Gecko	Does not occur	Occurs in southern extremes	South African endemic; restricted range	
Cryptactities peringueyi	Peringuey's Coastal Leaf-toed Gecko	Does not occur	Occursfrom Chelsea Point to Kromme estuary	South African endemic; very restricted range; very rare	

Name	Common Name	De Aar to Hotazel	De Aar to the Port of Ngqura	Conservation	Mitgation
Goggia essexi	Essex's Dwarf Leaf-toed Gecko	Does not occur	Occurs in the southern extremes	South African endemic; restricted range	
Chondradactylus bibronii	Bibron's Tubercled Gecko	Occurs throughout	Occurs throughout	South African endemic; widespread and common	
Pachydactylus capensis	Cape Gecko	Occurs throughout	Occurs throughout	South African endemic; widespread and common	
Pachydactylus maculatus	Spotted Gecko	Does not occur	Occurs in southern parts	Southern African endemic; relatively widespread	
Pachydactylus oculatus	Golden Spotted Gecko	Does not occur	Occurs of much of area	South African endemic; relatively restricted	
Pachydactylus mariquensis	Marico Gecko	Occurs over southern parts	Occurs throughout	Southern African endemic; widespread and common	