

# Ecological Management Services Ecological Management Services

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## BIODIVERSITY ASSESSMENT REPORT FOR TAAIBOSCHFONTEIN FARM IRRIGATION DEVELOPMENT, DOUGLAS NORTHERN CAPE

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For  
EIMS

October 2020

**DECLARATION OF CONSULTANT**

I Natalie Birch declare that I –

- act as the independent specialist in this study;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2017;
- do not have and will not have any vested interest in the activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2017;
- will provide the competent authority with access to all information at my disposal regarding the study.



Natalie Birch Pr. Sci. Nat 400117/05

October 2020

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## ABBREVIATIONS

ADE	Aquifer Dependent Ecosystems
BGIS	Biodiversity Geographical Information System
CBA	Critical Biodiversity Area
CITES	Convention on International Trade in Endangered Species
DAFF	The Department of Agriculture, Forestry and Fisheries
DENC	Department of Environment and Nature Conservation
EIA	Environmental Impact Assessment
ESA	Ecological Support Area
EWT	Endangered Wildlife Trust
FEPA	Freshwater Ecosystem Priority Areas
GPS	Global Positioning System
GWC	Griqualand West Centre of Endemism
IUCN	International Union for Conservation of Nature
NCNCA	Northern Cape Nature Conservation Act
NEM:BA	National Environmental Management: Biodiversity Act
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas assessment
NPAES	National Protected Areas Expansion Strategy
PESEIS	Present Ecological State, Ecological Importance & Ecological Sensitivity
QDS	Quarter Degree Squares
SABAP	South African Bird Atlas Project
SABIF	South African Biodiversity Information Facility
SANBI	South African National Biodiversity Institute
SARCA	Southern African Reptile Conservation Assessment
SIBIS	SANBI's Integrated Biodiversity Information System
TOPS	Threatened or Protected Species



## 1.1. INTRODUCTION

The purpose of this project is to develop additional pivots under irrigation so that seed potatoes can be grown on a rotational basis thereby ensuring sustainability of the potato production. In order to establish the required additional pivots natural vegetation under the pivots will have to be cleared.

EIMS has been appointed to conduct the EIA process required for this development and a specialist fauna and flora assessment of the site is required as part of the EIA process.

The report was compiled by Dr N.V. Birch Pr. Sci Nat. (reg no 400117/05). Details of the specialist are attached in Appendix 3

### 1.1. TERMS OF REFERENCE & SCOPE OF WORK

This survey included;

- Desktop and field investigations to identify and map different habitats, concentrating on areas proposed for new infrastructure
- Assign species to each habitat through various sampling methods
- Rank each habitat type based on conservation importance (in terms of provincial biodiversity priorities) and ecological sensitivity
- Identify potential impacts (including cumulative) on ecology
- To have input, together with project proponent, into project alternatives and ecology management measures going forward

### 1.2. DATA SOURCING AND REVIEW

The data sources consulted and used where necessary in the study includes the following:

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006) (updated 2012).
- Information on plant and animal species recorded for the Quarter Degree Squares (QDS), was extracted from the SABIF/SIBIS database hosted by SANBI. This is a much larger extent than the study area, but the data was extracted from a larger area to account for the fact that the area has probably not been well sampled in the past.

- The IUCN conservation status of the species in the list (Table 1.1) was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2011).
- Threatened Ecosystem data was extracted from the NEM:BA listed ecosystems layer (SANBI 2008).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Information on Critical Biodiversity Areas (CBA) was extracted from the Northern Cape Critical Biodiversity Areas Project 2016.
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

#### Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (SANBI's SIBIS and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- Bird species lists for the area were extracted from the SABAP 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas was also consulted to ascertain if the site falls within the range of any range-restricted or globally threatened species.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site. For each species, the likelihood that it occurs at the site was rated according to the following scale:
  - **Low:** The available habitat does not appear to be suitable for the species and it is unlikely that the species occurs at the site.
  - **Medium:** The habitat is broadly suitable or marginal and the species may occur at the site.
  - **High:** There is an abundance of suitable habitat at the site and it is highly probable that the species occurs there.
  - **Definite:** Species that were directly or indirectly (scat, characteristic diggings, burrows etc.) observed at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 3.1 (2012) (See Table 1) and where species have not been

assessed under these criteria, the CITES status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

**Table 1.** The IUCN Red List Categories for fauna and flora. Species that fall within the categories in red and orange below are of conservation concern.

<b>IUCN Red List Category</b>
Critically Endangered (CR)
Endangered (EN)
Vulnerable (VU)
Near Threatened (NT)
Critically Rare
Rare
Declining
Data Deficient - Insufficient Information (DDD)
Data Deficient - Taxonomically Problematic (DDT)
Least Concern

The following is provided in Accordance with NEMA Appendix 6,

Section	NEMA 2014 Regs – Appendix 6 (1) Requirement	Position in Report
1	A specialist report prepared in terms of these Regulations must contain—	
(a)	Details of -	
	(i) the specialist who prepared the report; and	Cover page
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix 3

(b)	a declaration that the person is independent in a form as may be specified by the competent authority;	Page 2
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(d)	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment; an indication of the quality and age of base data used for the specialist report; a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 1.3 & 3  Section 1.3 & 3  Section 6
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.2 & 3
(f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 4.3, 4.7 and Section 5
(g)	an identification of any areas to be avoided, including buffers;	Section 5
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitive of the site including areas to be avoided, including buffers;	Section 5
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 6 and 7
(k)	any mitigation measures for inclusion in the EMPr;	Section 7
(l)	any conditions for inclusion in the environmental authorization;	Section 7

(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 6 & 7
(n)	a reasoned opinion- (i) whether the proposed activity, activities or portions thereof should be authorized; (ii) regarding the acceptability of the proposed activity or activities; and (iii) if the opinion is that the proposed activity of portion thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 7
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A at this stage,
(q)	any other information requested by the competent authority.	N/A at this stage

### 1.3. LIMITATIONS AND ASSUMPTIONS

The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure a comprehensive database of plant and animal species are captured. However, this is rarely possible due to time and cost constraints and therefore these surveys usually represent a “moment time” survey. The original site survey represents the winter/dry season survey as it was conducted in September prior to any seasonal rainfall events. A plant species list was compiled for the site from the site visit, this was augmented by a list of species which are known from other studies to occur in the broad vicinity of the site. The lists of amphibians, reptiles and mammals for the site are based on those observed at the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach that takes account of the study limitations. Protected tree species which are of concern within this area are easily accounted for as they are highly visible and timing of the survey does not influence the accuracy of their records.

## 2. REGULATORY AND LEGISLATIVE OVERVIEW

A summary of the relevant portions of the Acts which govern the activities and potential impacts to the environment associated with the development are listed below. Provided that standard mitigation and impact avoidance measures are implemented, not all the activities listed in the Acts below would actually be triggered.

### **National Environmental Management Act (NEMA) (Act No 107, 1998):**

NEMA requires that measures are taken that "prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." In addition:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied:
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

### **National Environmental Management: Biodiversity Act (NEM:BA) (Act 10 of 2004):**

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The Draft National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009) has been gazetted for public comment. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the NSBA 2004. In terms of the EIA regulations, a basic assessment report is required for the transformation or removal of indigenous vegetation in a critically endangered or endangered ecosystem regardless of the extent of transformation that will occur. However, all of the vegetation types within and surrounding the study site are classified as Least Threatened.

NEM:BA also deals with endangered, threatened and otherwise controlled species, under the TOPS Regulations (Threatened or Protected Species Regulations). The Act provides for listing of species as threatened or protected, under one of the following categories:

- **Critically Endangered:** any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered:** any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- **Vulnerable:** any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- **Protected species:** any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

A TOPS permit is required for any activities involving any TOPS listed species.

**National Forests Act (No. 84 of 1998):**

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: “no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated”. A permit is required for the destruction or transplant or transport of any protected tree species.

**National Veld and Forest Fire Act (Act No. 101 of 1998)**

The purpose of this Act is to prevent and combat veld, forest and mountain fires. The Act provides for a variety of institutions, methods and practices for achieving the purpose such as the formation of fire protection associations. It also places responsibility on landowners to develop and maintain firebreaks as well as be sufficiently prepared to combat veld fires in terms of equipment as well as suitably trained personnel.

**Conservation of Agricultural Resources Act (Act 43 of 1983):**

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. The Conservation of Agricultural Resources Act defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be

grown within a demarcated area under permit. Category 3 plants includes ornamental plants that may no longer be planted but existing plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodline of water courses and wetlands.

**Northern Cape Nature Conservation Act, No. 9 of 2009: (NCNCA)**

The Northern Cape Nature Conservation Act provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province. In terms of this act the following section may be relevant with regards to any security fencing the development may require.

Manipulation of boundary fences 19. No Person may –

*(a) erect, alter remove or partly remove or cause to be erected, altered removed or partly removed, any fence, whether on a common boundary or on such person's own property, in such a manner that any wild animal which as a result thereof gains access or may gain access to the property or a camp on the property, cannot escape or is likely not to be able to escape therefrom;*

The Act also lists protected fauna and flora under 3 schedules ranging from Endangered (Schedule 1), protected (schedule 2) to common (schedule 3). The majority of mammals, reptiles and amphibians are listed under Schedule 2, except for listed species which are under Schedule 1. A permit is required for any activities which involve species listed under schedule 1 or 2. A permit obtainable from the DENC permit office in Kimberly would be required for the site clearing. A permit would also be required to destroy or translocate any nationally or provincially listed species from the site. A single permit, which covers all of these permitting requirements as well as meets TOPS regulations, is used.



### 3. METHODOLOGY

A site survey, was undertaken in September 2020. During the site visit, the different biodiversity features, habitat, vegetation and landscape units present at the site were identified and mapped in the field. Walk-through-surveys were conducted across the site and all plant and animal species observed were recorded. Active searches for reptiles and amphibians were also conducted within habitats likely to harbor or be important for such species. The presence of sensitive habitats such as wetlands or pans and unique edaphic environments such as rocky outcrops or quartz patches were noted in the field if present and recorded on a GPS and mapped onto satellite imagery of the site.

#### Flora

Satellite images were used to identify homogenous vegetation/habitat units within the study area. These were then sampled on the ground with the aid of a GPS to navigate in order to characterise the species composition. The following quantitative data was collected:

- species composition,
- cover estimation of each species according to the Braun-Blanquet scale,
- vegetation height,
- amount of bare soil and rock cover,
- slope, aspect
- presence of biotic disturbances, e.g. grazing, animal burrows, etc.

Additional checklists of plant species were compiled by traversing a linear route and recording species as they were encountered. Searches for listed and protected plant species at the site were conducted and all listed plant species observed were recorded. This search was then repeated to update the information originally obtained.

#### Fauna

The faunal study was undertaken as a desktop / literature survey combined with a field survey. The tasks included in each are given below.

#### Desktop/literature survey:

A desktop survey was undertaken to determine the red data reptile, amphibian, mammalian and bird species occurring in the quarter degree square in which the study area falls. The likelihood of red data species occurring on-site has been determined using the i) distribution maps in the red data reference books and ii) a comparison of the habitat described from the field survey.

Field survey:

The habitats on-site were assessed to compare with habitat requirements of red data species determined during the literature survey. During the site visit the presence and identification of bird and mammal species was determined using the following methods / techniques:

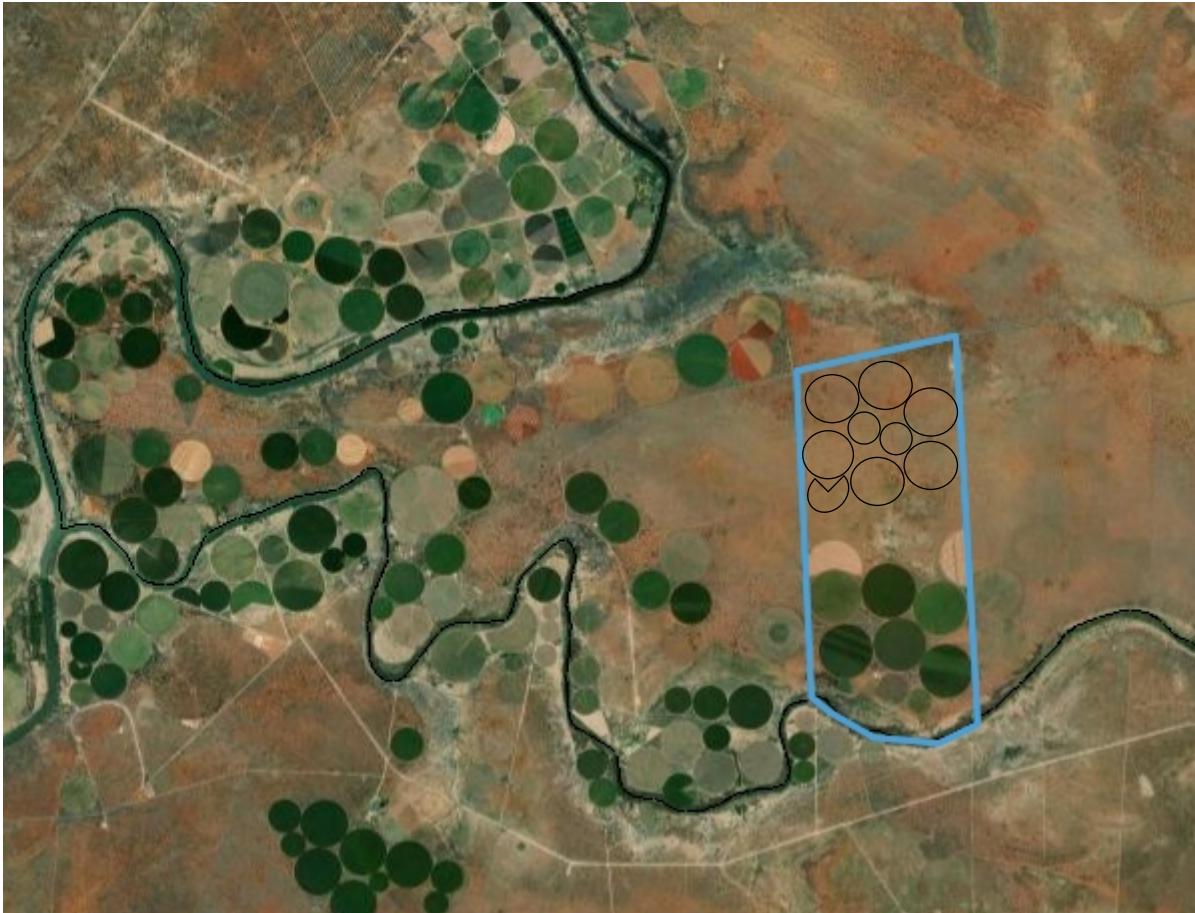
- Identification by visual observation.
- Identification of bird and mammal calls.
- Identification of spoor.
- Identification of faeces.
- Presence of burrows and / or nests.

**Criteria used in the assessment of impacts**

The methodology used in the assessment of the identified impacts is provided in appendix 4

#### 4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The property under application is described as Portion 2 of the Farm Taaiboschfontein no 168. It is located north east of Douglas.



**Figure 4.1.** The property of Taaiboschfontein (boundary indicated in blue) showing the layout of the existing pivots and the proposed additional pivots.

The study area falls within the land types Ia and Ae (ARC – Institute for Soil Climate & Water), a land-type being an area that is uniform with respect to terrain form, soil patterns and climate.

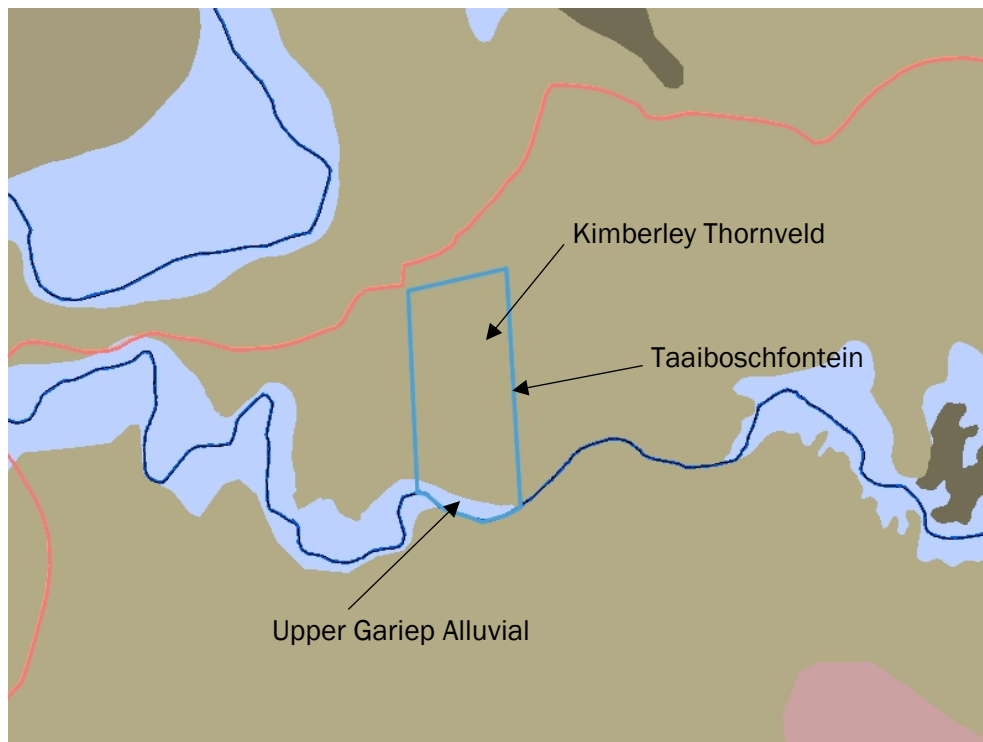
The soils within the Ae landtype are AC soils, which are red-yellow well drained soils lacking a strong texture contrast, with a high base status. They are eutrophic soils  $\geq 750$  mm deep with  $< 15\%$  clay. The soils within the Ia landtype are classified as EE soils which are soils with a negligible to weak profile development, usually occurring on recent flood plains. They  $\geq 750$  mm deep with  $< 15\%$  clay.

#### 4.1. BROAD-SCALE VEGETATION PATTERNS

The vegetation within the study area is classified as Kimberley Thornveld and Upper Gariep Alluvial Vegetation (Mucina & Rutherford 2006)

Kimberley Thornveld is described as having a well developed tree layer with *Vachellia erioloba*, *Vachellia tortilis* and *V. karroo* and *Boscia albitrunca*. The shrub layer is also described as well developed with occasional dense stands of *T. camphoratus* and *S. mellifera*. The grass layer is open with a lot of uncovered soil.

Upper Gariep Alluvial vegetation is found on the flat alluvial terraces supporting a complex of riparian thickets, flooded grasslands, reed beds and ephemeral herb-lands populating mainly sandy banks



**Figure 4.1:** The two Vegetation types that occur within the study area.

#### 4.2. PLANT COMMUNITY DESCRIPTION

The vegetation within the proposed development area is uniform and the terrain is flat. The proposed new pivots are located within the Kimberley Thornveld vegetation type.

The area of the proposed pivot development consisted of an open savannah dominated by *Vachellia spp.* Two distinct layers were evident within the area, namely a grassy layer and a tree/shrub layer. The grass layer which was between 10 – 30cm high, was poorly developed and open patches exposing the red substrate were clearly evident in some areas. The tree/shrub layer



was between 2m-4m and consists of species such as *Vachellia haematoxylon*, *Vachellia tortilis*, *Vachellia erioloba*, *Senegalia mellifera*, and *Lycium spp* . There was a low occurrence of karroid dwarf shrubs but species such as *Lasiosiphon polycephalus* and *Chrysocoma ciliata* were noted.



**Plate 4.1:** Vegetation typical of the open savannah within the planned development area.



**Plate 4.2:** *Senegalia mellifera* dominates the shrub layer in some areas along the northern boundary of the property.

Two pans are located within the property, one is located within center of the property and the other is located on the edge of the north eastern corner, very little of this pan is actually within the boundary of the property. The limestone layer is exposed in most of this habitat, and it consists of an open grassy area with trees/shrubs only occurring on the outer edges. The grass layer was cropped extremely short and large bare patches of exposed substrate occur. The central pan contains some infrastructure and has been significantly disturbed.

The southern section of the property contains pivots as well as open grassy areas which at one time were cultivated. The southern boundary of the property is along the Riet River, the riparian area of the river is easily distinguishable from the surrounding vegetation however it has been invaded by *Eucalyptus spp.*



**Plate 4.3:** The area adjacent to the river consists of open secondary grasslands. This area has historically been used as cultivation areas.





**Plate 4.4:** The riverine area where the existing pump station is located has been invaded by *Eucalyptus* spp.

#### 4.3. POPULATIONS OF SENSITIVE AND/OR THREATENED PLANT SPECIES

Historical records of Red List plant species were consulted in order to determine the likelihood of any such species occurring in the study area and these were searched for in the field. Plant species observed as well as a list of threatened plant species previously recorded in the quarter degree grid in which the study area is situated which was obtained from the South African National Biodiversity Institute, are listed in the table below

**Table 4.1:** Protected species that possibly occur on site.

Species	Legislation	Conservation status	Potential of occurrence on site
<i>Vachellia erioloba</i>	National Forests Act 1998	Protected	Recorded on site
<i>Vachellia haematoxylon</i>	National Forests Act 1998	Protected	Recorded on site
<i>Bosica albitrunca</i>	National Forests Act 1998 NCNCA	Protected Schedule 2	Recorded on site
<i>Titanopsis calcarea</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Low</b> potential of occurrence
<i>Plinthus karoocicus</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>High</b> potential of occurrence
<i>Ruschia ruralis</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Low</b> potential of occurrence
<i>Bulbine abyssinica</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Moderate</b> potential of occurrence
<i>Aloe claviflora</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Low</b> potential of occurrence

<i>Ornithogalum nanodes</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Moderate</b> potential of occurrence
<i>Nemesia pubescens</i>	NCNCA	Schedule 2	Not recorded during field survey, <b>Moderate</b> potential of occurrence

Owing to the narrow temporal window of sampling some species may not have been recorded, this however does not preclude them from occurring within the development site. Species that could possibly occur have been included in the species checklist. It is therefore recommended that prior to clearing an additional walk through is conducted. In order to remove species listed in Schedule 1 & 2 of the NCNCA, during site clearing activities an integrated permit application will have to be made to the DENC to obtain the required permission to remove and/or translocate these species from site. In order to remove the protected trees a license application will have to be made to the Department of Forestry.

#### 4.3. CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES

Kimberley Thornveld is classified as Least Threatened only 2% of this vegetation is formerly conserved and 18% is considered transformed, mostly by agricultural cultivation. Threats include bush encroachment by *Senegalia mellifera* owing to overgrazing. The Upper Gariep Alluvial Vegetation is classified as Vulnerable, with only 2% conserved and more than 20% transformed through cultivation. The planned additional pivots fall only within the Kimberley Thornveld.

Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy 2008 (NPAES). They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for freshwater ecosystems. The project area does not fall within a NPAES focus area but is located approximately 25km north west of the Mokala National Park and its proposed expansion area for the eastern Kalahari bushveld (appendix 2).

The study area is not considered a threatened ecosystem in terms of NEM:BA and does not fall within a within a River FEPA (Fresh Water Ecosystem Priority Area), there are however two identified NFEPA wetlands within the study area, these are usually associated with pans that occur in this vegetation type



The study site and surrounding area does not fall within an Important Bird and Biodiversity Area (IBA). IBAs are sites of international significance for the conservation of the world's birds and other biodiversity.

The study site falls with a Critical Biodiversity Area 2 (CBA2). CBA2 are areas that have been selected as the best option for meeting biodiversity targets, based on complementarity, efficiency, connectivity and/or avoidance of conflict with other land or resources uses.

#### **4.4. ALIEN/INVASIVE SPECIES**

The Conservation of Agricultural Resources Act (CARA) regulates and restricts the propagation, harboring and sale of invasive alien plant and weed species listed in a set of Regulations published in terms of the Act. CARA was amended in 2001 and is administered by the National Department of Agriculture.

The National Environmental Management: Biodiversity Act (NEMBA – Act no. 10 of 2004) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. All listed IAPs are divided into four categories in accordance with the Government Gazette Notice No. 40166 of July 2016 as listed below:

- **Category 1a (PROHIBITED): Listed Invasive Species**

A person in control of a Category 1a Listed Invasive Species must comply with the provisions of section 73(2) of the Act; immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species.

- **Category 1b (PROHIBITED / Exempted if in Possession or Under control): Listed Invasive Species**

A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act. A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.

- **Category 2 (PERMIT REQUIRED): Listed Invasive Species**

Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be. A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit. Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3. Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

- **Category 3 (PROHIBITED): Listed Invasive Species**

Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of the Act, as specified in the Notice. Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.

Species		Category
<i>Argemone mexicana</i>	Yellow flowered Mexican Poppy	1b
<i>Prosopis cf. glandulosa</i>	Mesquite	3
<i>Opuntia humifusa</i>	Prickly pear	1b
<i>Argemone ochroleuca</i>	White flowered Mexican poppy	1b
<i>Eucalyptus camaldulensis</i>	Red River Gum	1b

**Table 4.3:** Alien invasive species that occur in and around the property

#### 4.5. POPULATIONS OF SENSITIVE AND/OR THREATENED FAUNAL SPECIES

A substantial section of the property has already been disturbed by agricultural activity which has resulted in some disturbance to the faunal population on site. Disturbances that alter the natural environment have two effects namely, it may cause the loss of certain species due to the

destruction of habitat. It may also cause the influx of other species previously unable to colonise an area owing to lack of suitable habitat or because they have been excluded through competition.

It was not possible to compile a complete list of species present on the property during the field survey owing to the limited time frame of the assessment. It is therefore important to note that many species that potentially occur on-site may not have been identified thus emphasis was placed on the habitat in order to determine potential occurrence of species. The potential of occurrence is also assessed for the immediate surrounding area as to establish the possibility of ecological linking corridors for certain species.

Based on the bird species identified while on-site, the proposed development site hosts both grassland and bushveld bird species.

The loose sandy soils which occurs over a large portion of the study site, makes these areas suitable for burrowing mammals. Species such as, Suricate, Common, and ground squirrels were observed on site. Other than direct sightings, other observations such as droppings and tracks from animals such as warthog were noted and, the tell-tale signs of porcupine was also observed.

#### **Reptiles Species of Conservation Concern**

No red data terrapin, tortoises, snakes or lizards were identified as occurring in the quarter degree square, based on the distribution maps available in the South African Red Data Book for reptiles (Bates *et al.* 2014) and The Southern African Reptile Conservation Assessment (SARCA). The conservation status was cross checked on the IUCN website to determine most recent status listing for these species.

#### **Amphibians of Conservation Concern**

No red data amphibians were identified as occurring in the quarter degree squares, based on the distribution maps available in the South African Red Data Book for amphibians (Minter *et al.*, 2004) Du Preez and Carruthers (2009) and the South African Frog Atlas project.

#### **Birds of Conservation Concern**

A list of all red data bird species occurring in the quarter degree square, was extracted from the SABAP 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas and from the Red Data Book of Birds (Taylor *et al* 2015) with the distribution being confirmed in Roberts – Birds of Southern Africa, 7<sup>th</sup> edition (Hockey *et al.*, 2005). The IUCN 3.1. status is also presented in the table. Based on an evaluation of the habitat requirements for these red data species, the potential

of these species occurring either on-site or within 500m of the property boundary is provided in Table 4.4 below.

Eight red data bird species have been recorded for the quarter degree square, five have a high potential to occur on site. Most of these species will utilise the site for foraging purposes but they may not be totally dependent on the site.

Common Name	Scientific Name	Conservation Status (*Regional, Global)	Suitable Habitat requirements <sup>1</sup>	Potential for Occurrence On-site and surrounding area
Blue Crane	<i>Anthropoides paradiseus</i>	Near Threatened Vulnerable	Grasslands, cultivated lands Karoo scrub and edges of vleis	<b>Very Low</b> - Edge of distribution range, vegetation too dense
Kori Bustard	<i>Ardeotis kori</i>	Near Threatened Near Threatened	Dry thornveld grassland, arid scrub requires the cover of some trees	<b>High</b> - Recorded in the area Suitable habitat occurs on site
Greater Flamingo	<i>Phoenicopterus ruber</i>	Near Threatened Least Concerned	Greater Flamingos forage on open shallow eutrophic wetlands, both inland and coastal, with a preference for saline and brackish waters	<b>Very Low</b> - No large bodies of open water occur on the proposed development site.
Lanner Falcon	<i>Falco biarmicus</i>	Vulnerable Least Concerned	Lanner Falcons are generally a cliff nesting bird, but have adapted to using the disused nests of Black and Pied crows, situated either in trees or on power lines For foraging purposes, Lanner Falcons utilise a wide range of habitats, from semi desert to woodland, agricultural land and also occurs in cities, but appear to prefer open habitats	<b>High</b> - Suitable foraging habitat occurs on site
Lesser Flamingo	<i>Phoenicopterus minor</i>	Near Threatened Near Threatened	The Lesser Flamingo forages on large brackish or saline, inland and coastal waters, shallow eutrophic wetlands, salt pans and sheltered coastal lagoons This species may use water bodies more saline than those used by the Greater	<b>Very Low</b> - no large bodies of open water occur on the proposed development site
Secretary bird	<i>Asagittarius serpentarius</i>	Vulnerable Vulnerable	This species shows a preference for open country, mainly savannah, open woodland, grassland, dwarf shrubland, mountain slopes and man-made habitats such as grazing paddocks and fallow fields	<b>High</b> - Suitable habitat occurs on site
African White backed Vulture	<i>Gyps africanus</i>	Critically endangered Critically endangered	Savannah and bushveld. Nest in tall trees ( <i>Vachellia erioloba</i> ).	<b>High</b> - Ideal habitat on site. However no nests were recorded within the planned development

<sup>1</sup> Habitat requirements determined using the following reference material: Harrison *et al.*, 1997a; Harrison *et al.*, 1997b; ; Hockey *et al.*, 2005

Common Name	Scientific Name	Conservation Status (*Regional, Global)	Suitable Habitat requirements <sup>1</sup>	Potential for Occurrence On-site and surrounding area
				area. The fact that the site is located near operating pivots reduces its suitability but does not exclude it as potential habitat
Cape Vulture	<i>Gyps coprotheres</i>	Endangered Endangered	Widespread in southern Africa where it can be found in open grasslands and woodlands, from sea level to very high mountains provided there are high cliffs to breed on. They can, however, roost on trees and pylons far away from their breeding sites.	<b>High</b> -Ideal habitat on site. The fact that the site is located near operating pivots reduces its suitability but does not exclude it as potential habitat

**Table 4.4:** Bird species of conservation concern identified as occurring in and around the quarter degree squares and the potential for occurrence on the site.

### Mammals of Conservation Concern

A list of all red data mammal species occurring in the quarter degree squares, was extrapolated from the Red Data Book for Mammals (EWT, 2004) and the MammalMAP, the Mammal Atlas of Africa database. Based on an evaluation of the habitat requirements for these red data species (EWT, 2004; Skinner and Chimimba, 2005), the potential of these species occurring either on-site or within 500m of the property boundary is provided in Table 4.5 below.

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS <sup>2</sup>	SUITABLE HABITAT ON-SITE <sup>3</sup>	POTENTIAL FOR OCCURRENCE ON-SITE AND SURROUNDING AREA
South African hedgehog	<i>Atelerix frontalis</i>	Near Threatened	The South African Hedgehog is a nocturnal species that has been recorded to occur in grassland, resting curled up under matted grass, in debris under the shade of bushes or in holes under the ground	<b>High</b> – Area has sufficient grassland and bushes thus suitable habitat is present.
Brown hyaena	<i>Hyaena brunnea</i>	Near Threatened	They occur in semi-desert scrub, open scrub and open woodland savannah. As they are nocturnal, cover in which to lie in during the day is essential, such as dense shade or holes in the ground. This species has been	<b>Low</b> – For the most part, the vegetation cover of the proposed development site is suitable however the substantial amount of agricultural activity and its proximity to human habitation make it unlikely that this animal will occur in the area

<sup>2</sup> Status based on listing in the National Red List of Mammals 2016

<sup>3</sup> Habitat requirements determined using the following reference material: Skinner and Smithers, 1990; EWT, 2004; Skinner and Chimimba, 2005

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS <sup>2</sup>	SUITABLE HABITAT ON-SITE <sup>3</sup>	POTENTIAL FOR OCCURRENCE ON-SITE AND SURROUNDING AREA
			reported in the general vicinity of the site, and it is possible that this species may currently visit the site as a vagrant when feeding.	
Spotted-necked otter	<i>Lutra maculicollis</i>	Vulnerable	Spotted-necked Otters are found in fresh water of large rivers with prominent pools, lakes, dams and well watered swamps. They occur in deeper water than the Cape Clawless Otter, but do not move far from the water margins They are also dependent on adequate cover of dense vegetation or holes in which to hide.	<b>Low</b> – Although it is likely that it occurs around the river the proposed development site of the pivots is situated too far from the water margin

**Table 4.5:** Mammal species of conservation concern identified as occurring in and around the quarter degree squares and the potential for occurrence on the site.

## 5. SITE SENSITIVITY

The classification of areas into different sensitivity classes is based on information collected at various levels. This includes the national conservation status of the vegetation, the presence of species of special concern and the condition of the vegetation

Vegetation types can be categorised according to their conservation status, which is in turn, assessed according to the degree of the transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the national vegetation map (Mucina & Rutherford 2006) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale the thresholds are as depicted in Table 5.1 as determined by best available scientific approaches.

**Table 5.1:** Determining ecosystem status (from Driver *et al* 2005).

habitat remaining (%)	80-100	Least Threatened	LT
	60-80	Vulnerable	VU
	*BT -60	Endangered	EN
	0-*BT	Critically endangered	CR

\*BT = *biodiversity target (minimum conservation required)*

The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver *et al* 2005).

Updated transformation information is often required to improve the conservation assessment for any given vegetation type. On a local scale the various habitat types or vegetation communities may have varying degrees of sensitivity or conservation value owing to their particular species composition or habitat structure.

Sensitivity of habitats and sites within the study area were assessed using a combination of criteria as follows:

	<b>Criterion</b>	<b>Definition</b>
1	Conservation status of untransformed habitats occurring in the study area	The extent of each vegetation type occurring within the study area that is conserved and/or transformed relative to a targeted amount required for conservation
2	Presence and number of Red Data species and other species of special concern	Presence or potential presence of Red Data species within habitats
3	Within-habitat species richness of flora and the between-habitat (beta) diversity of the site	Presence or potential presence of Red Data Species within habitats.
4	The type or nature of topography of the site, ie presence of ridges koppies etc	Steepness and/or nature of topography in the study area.
5	The type and nature of important ecological processes on site, especially hydrological processes, ie wetlands drainage lines etc.	Habitats and/or terrain features that represent ecological processes such as water-flow migration routes etc.

The first two of these criteria are the most commonly used criteria for assessing the conservation value of a site and also constitute the criterion most commonly employed to justify the conservation of a site.

In terms of sensitivity of the region where the development is planned, the most important feature is that the project site falls within a CBA2. In terms of the Technical Guidelines for CBA Maps (June 2017), dryland and irrigated crop cultivation should not be allowed within a CBA2 area.

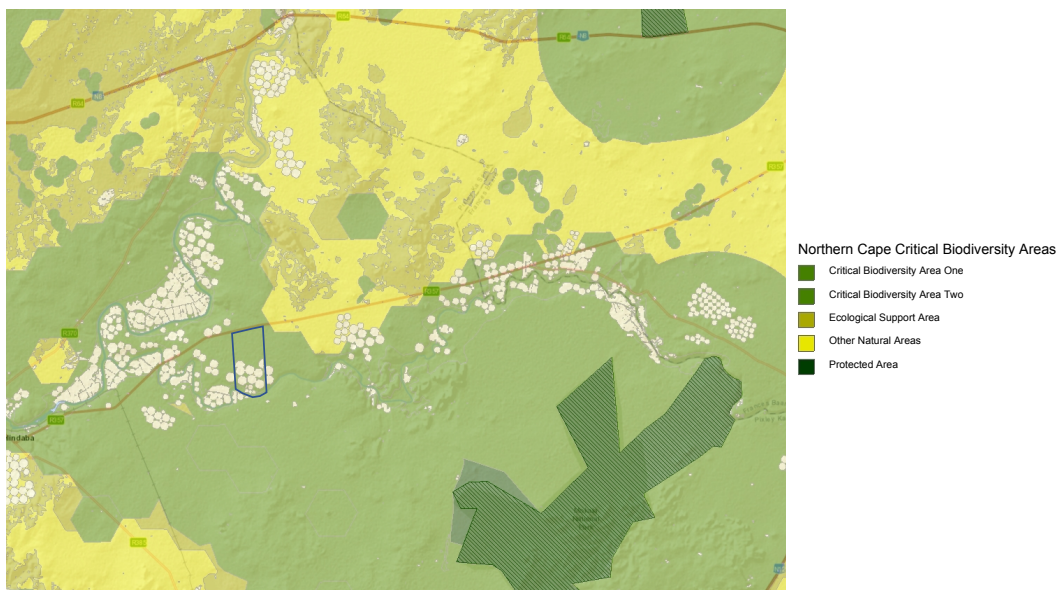
To understand the sensitivity of the area it is important to investigate why and how the area has been classified. The Northern Cape CBA map has been drawn up by means of a dual analysis which included a systematic target-based assessment using the actual extent of biodiversity features and a MARXAN analysis to identify areas of the landscape for meeting targets for broader features most efficiently.

The primary biodiversity features included in the MARXAN analysis were terrestrial vegetation types, however four additional criteria were applied when defining CBAs, namely ecosystem threat status (Critically Endangered and Endangered types), rarity, endemism and ecosystem process importance. The Upper Gariep Alluvial vegetation type is classified as vulnerable but has been



prioritised in the ecosystem process importance category as evidence gathered by DENC suggests that degradation of this vegetation type is just as intense as the Lower Gariep Alluvial (which is classified as endangered) and it is deemed to have significant process value for the maintenance of hydrological processes.

During the CBA mapping process, biodiversity features that needed to be included in the CBA map that were already precisely mapped were included as their actual extent (e.g. a wetland and its buffer) as a unit of assessment and a planning unit, however where these features were not available (i.e. had not been previously mapped or identified on the ground) a set of province-wide planning units were developed based on a hexagon grid, landcover and Protected Areas. The hexagons used were approximately 1600 ha in extent and had a 2.5km side. One of the reasons that such a large scale was used was because these larger units aimed to identify connected landscapes to secure areas for both fine-scale features such as wetlands, and broad units such as terrestrial ecosystem types. The large scale however can result in an inaccurate demarcation of an area, and thus some ground truthing operations are required to clarify the boundaries and validate these classifications of the CBA map.



**Figure 5.1:** The study area location within the Critical Biodiversity Area map of the site.

According to the available literature the classification of the CBA2 is attributed to the presence of a threatened vegetation type (the Upper Gariep Alluvial vegetation type), its landscape connectivity and the buffer zone around protected areas and national protected areas expansion priorities, namely the Mokala National Park.

The Northern Cape CBA technical guidelines states that the buffer zone around National Parks is 10km and that this 10km area should be included in at least a CBA2 if intact. It should be noted that the study area falls outside of this 10km buffer zone as it is located more than 20km away from the Park. The area immediately surrounding the study site already contains a significant amount of irrigation land and therefore a large amount of transformation has already occurred and therefore can no longer be classified as being intact.

In terms of sensitivity within the boundaries of the development site, areas of higher sensitivity include the pans and the riverine area. The central pan has already been disturbed as it contains some infrastructural development and some transformation has already occurred, lowering the significance of its conservation contribution. The riverine areas has unfortunately been subjected to some transformation most notably from the invasion of alien plants. The area of the pans and the riverine environment are however not within the development footprint for the expansion of the pivots and will not be directly affected by the proposed pivot development.

There are a number of protected trees within the planned development area. These will be lost when the vegetation is cleared for the construction of the pivots. *Vachellia haematoxylon* is classified as a protected species under the National Forests Act of 1998 (Act 84 of 1998), and has a narrow distribution range. The *Vachellia erioloba* is also a protected species under the National Forests Act of 1998 (Act 84 of 1998). Larger trees are important as nesting and as perching sites but the groups of smaller trees provide a unique habitat acting as a nursery for other plant species and creating important habitats for faunal species.

The site sensitivity map includes areas of LOW, MODERATE, and HIGH sensitivity. Moderate sensitivity areas are defined as those areas where the vegetation and habitats have had some disturbance but may include some potential habitat for red data species and/or the presence of some protected/red listed species. Areas identified as having a high sensitivity contain habitat for red data species, numerous threatened species or are listed as vulnerable or endangered and/or contains areas that have a low tolerance to disturbance. Areas of LOW sensitivity are already highly transformed and/or already contain development. Figure 5.2 shows the overlay of the areas of sensitivity with that of the planned expansion of the pivots



**Figure 5.2:** The site sensitivity map of the planned development area showing the planned layout of the new pivots.

## 6. POTENTIAL IMPACTS

Typically a development is divided into the construction phase and the operational phase. The construction phase usually results in the most significant impacts. It is during this phase that most of the destruction of habitat and microhabitat takes place. For this development the construction of the pivot and the initial preparation of the land can be considered the construction phase. Planting and harvesting the pivots is considered the operational phase. Although the construction phase will entail the initial clearing of the land the disturbance to the biodiversity will be perpetuated throughout the life of the project.

### 1. Habitat fragmentation, Loss of Natural vegetation and Alien invasion in a CBA 2

Vegetation clearing will occur as a result of the development of irrigation pivots. This loss of natural vegetation will cause additional fragmentation and habitat disturbance in the landscape. The disturbance destroys primary vegetation. As primary vegetation is more functional in an ecosystem, this could irreversibly transform the vegetation characteristics and faunal populations in the area. This area is situated in a CBA 2, the management objective of these areas is to maintain a natural or near natural ecological condition. Clearing of surface areas has the effect of creating unnatural open spaces through the vegetation and the matrix of the landscape. For the smaller species, it limits movement and restricts access to foraging sites. This results in reduced population density of prey species (invertebrates and / or smaller birds and / smaller mammals and / or herpetofauna) which then reduces the food availability for predators invertebrates and / or larger birds and / or larger mammals and / or herpetofauna). The changes in the vegetation structure also alter the availability of suitable cover for many faunal species. There is however a tarred road on the northern boundary of the property and a gravel road on the western boundary as well as pivots on the southern section, these structures already fragment the habitat and limit movement of smaller faunal species. Clearance of primary vegetation allows secondary pioneer species or invasive plants to enter and re-colonise disturbed areas, thus increasing the possibility of Alien species invading. Many alien species proliferate in disturbance areas such as the periphery of the irrigation lands. Invasive species affect our natural biodiversity in a number of ways. They may compete directly with natural species for food or space, may compete indirectly by changing the food web or physical environment, or hybridize with indigenous species. Rare species with limited ranges and restricted habitat requirements are often particularly vulnerable to the influence of these alien invaders. Invasive plants have claimed about 8 percent or 10 million hectares of land suitable for agricultural use in South Africa. These invasive alien plants steal about seven percent of South Africa's water bulk every year.

Mitigation:

Vegetation clearing should be restricted to areas of the pivot only. The significance of the loss of habitat may be mitigated slightly if there are areas with suitable ecological corridors this may be possible by ensuring that no disturbance occurs in the areas outside the development area and between the pivots. Alien vegetation that has grown as a result of land clearing must be removed by methods recommended by DWA.

Assessment of Impact:

<b>Impact Name</b>	<b>Habitat fragmentation, Loss of Natural vegetation and Alien invasion in a CBA 2</b>				
<b>Alternative</b>	0				
<b>Phase</b>	Construction & Operation				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre - mitigation</b>	<b>Post - mitigation</b>	<b>Attribute</b>	<b>Pre - mitigation</b>	<b>Post - mitigation</b>
Nature of Impact	-1	-1	Magnitude	4	3
Extent of Impact	3	3	Reversibility	3	3
Duration	4	4	Probability	5	4
Environmental Risk (pre- mitigation)					-17.5
Environmental Risk (post-mitigation)					-13
Degree of confidence in impact prediction					HIGH
Cumulative Impacts					2
Degree of Potential irreplaceable loss of resources					2
Prioritisation Factor					1.25
<b>Final Significance</b>					<b>-16.25</b>

**2. Loss of Species of Conservation Concern**

The clearing of vegetation will result in the loss of some protected flora. The cumulative impact of vegetation clearing and the subsequent loss of these trees for irrigation development in this area increases the significance of this impact as more of the vegetation type is transformed, however the development will not result in a loss of the resource from the area. The loss of suitable habitat for RDB faunal species which would result in these animals moving off the property into the surrounding areas. The reduction of suitable habitat from an area is always a cause for concern, and although suitable habitat may still be available it does impact on the number of these species that an area can carry.

Mitigation:

A search and rescue operation should be performed prior to clearing, it is however not a feasible or practical option with regard to the protected trees, so it's important to ensure that trees between the pivots remain undisturbed.



Assessment of Impact:

<b>Impact Name</b>	Loss of Species of Conservation Concern				
<b>Alternative</b>	0				
<b>Phase</b>	Construction				
<b>Environmental Risk</b>					
Attribute	Pre - mitigation	Post - mitigation	Attribute	Pre - mitigation	Post - mitigation
Nature of Impact	-1	-1	Magnitude	4	3
Extent of Impact	1	1	Reversibility	3	3
Duration	4	4	Probability	5	4
Environmental Risk (pre- mitigation)					-15
Environmental Risk (post-mitigation)					-11
Degree of confidence in impact prediction					HIGH
Cumulative Impacts					2
Degree of Potential irreplaceable loss of resources					1
Prioritisation Factor					1.13
<b>Final Significance</b>					<b>-12.37</b>

**3. Anthropogenic Disturbances, Intentional and/or accidental killing of fauna**

Anthropogenic disturbances include aspects such as, vibrations caused by machinery & vehicles. These aspects will impact on invertebrate species more than any other faunal species. These anthropogenic disturbances impact on the way invertebrates forage. For example; some invertebrates use vibrations caused by their prey to locate and catch them. Vibrations caused by construction equipment will make this impossible. Smaller fauna will inevitably be killed during land clearing activities as these activities will destroy their habitat. In addition to unintentional killing of fauna, some faunal species, particularly herpetofaunal species, are often intentionally killed as they are thought to be dangerous.

Mitigation

*There is unfortunately no mitigation for the vibrations caused by machinery/vehicles, except perhaps ensuring that activities are kept to a minimum. As the killing of herpetofauna is considered a result of ignorance, this can be ameliorated through education. The labour force involved should be educated regarding the conservation importance of herpetofauna.*

Assessment of Impact:

<b>Impact Name</b>	Anthropogenic Disturbances, Intentional and/or accidental killing of fauna				
<b>Alternative</b>	0				
<b>Phase</b>	Construction & Operation				
<b>Environmental Risk</b>					
Attribute	Pre - mitigation	Post - mitigation	Attribute	Pre - mitigation	Post - mitigation

Nature of Impact	-1	-1	Magnitude	2	1
Extent of Impact	1	1	Reversibility	2	2
Duration	3	3	Probability	3	2
Environmental Risk (pre- mitigation)					-6
Environmental Risk (post-mitigation)					-3.5
Degree of confidence in impact prediction					MEDIUM
Cumulative Impacts					2
Degree of Potential irreplaceable loss of resources					1
Prioritisation Factor					1.13
<b>Final Significance</b>					<b>-3.93</b>

## 7. RECOMMENDATIONS AND CONCLUSION

The area of the proposed development consists of a mixture of operational pivots and natural vegetation. The proposed development site has already been subjected to some disturbance and fragmentation.

The areas of highest conservation concern for this project is the area closest to the river (the riverine vegetation within the Upper Gariep Alluvial vegetation) and the area of the pans. Although no additional development will occur in these areas, it must still be protected from disturbance. This can be adequately achieved but ensuring all equipment is well maintained and by removing the alien vegetation. The area should be constantly monitored, to ensure the efficacy of the alien removal program.

The proposed development will have an impact on the biodiversity of the area, as it will result in further fragmentation of the habitat and will result in the loss of some protected tree species from site. The area does occur within a CBA 2 which is a cause for concern as generally areas of intensive agricultural development are not included in a CBA 2. The area adjacent to the river within this region contains a significant amount of other pivot developments, however further from the river the region consists of mostly natural vegetation used for extensive cattle or game farming. Although these are natural areas, they do contain fences which inhibits the natural movement of faunal species and thus some habitat fragmentation occurs throughout this region. While the area of the proposed development falls within a CBA 2 it does not fall within a listed endangered ecosystem, it falls outside of the 10km buffer zone around a national park, it does not fall within a focus area for protected area expansion, or an important bird area. There are no endangered or critically endangered flora or fauna on site that will be lost as a direct result of the proposed development. The endangered and critically endangered bird species that occur in the area are not directly dependent on the site. Thus the proposed development will not result in the loss of a biodiversity resource from the area despite the fact that it occurs within a CBA 2.

The amount of effective mitigation measures that can be implemented to reduce the significance of this development on the biodiversity is limited, as the layout of the pivots is determined by soil suitability it is difficult to try and avoid the protected trees in terms of layout plans. It is also not feasible to leave trees *in situ* within the footprint of the pivots and it not practical to translocate the affected trees. It is therefore important to maintain the integrity of the natural vegetation between the pivots, and actively manage any alien vegetation growth within these areas and along the edges of the pivots. It is recommended that prior to clearing an additional walk-through be



conducted, ideally this should be undertaken within the wet/summer season to account for any species not located during the initial survey.

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## APPENDIX 1

## SPECIES LISTS

## PLANT SPECIES CHECK LIST

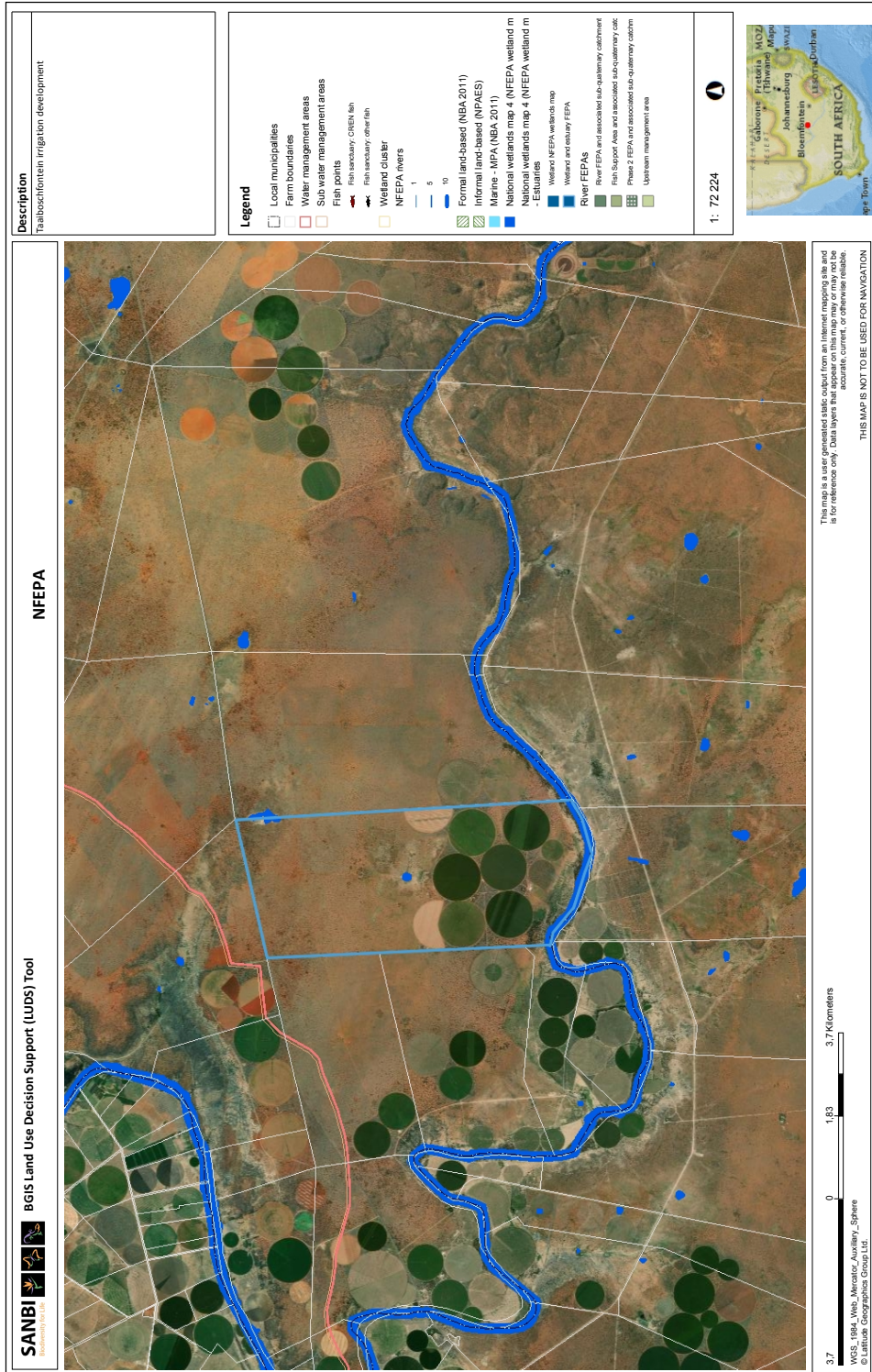
Family		Ecology	IUCN	NCNCA	Forest Act
Aizoaceae	<i>Titanopsis calcarea (Marloth) Schwantes</i>	Indigenous; Endemic	LC	Schedule 2	
Aizoaceae	<i>Ruschia sp.</i>			Schedule 2	
Aizoaceae	<i>Plinthus karoocicus I. Verd.</i>	Indigenous	LC	Schedule 2	
Aizoaceae	<i>Ruschia ruralis (N.E.Br.) Schwantes</i>	Indigenous; Endemic	LC	Schedule 2	
Amaranthaceae	<i>Salsola microtricha Botsch.</i>	Indigenous; Endemic	LC		
Asparagaceae	<i>Asparagus glaucus Kies</i>	Indigenous	LC		
Asphodelaceae	<i>Bulbine abyssinica A. Rich.</i>	Indigenous	LC	Schedule 2	
Asphodelaceae	<i>Aloe claviflora Burch.</i>	Indigenous	LC	Schedule 2	
Asteraceae	<i>Chrysocoma ciliata L.</i>	Indigenous	LC		
Asteraceae	<i>Helichrysum arenicola M.D. Hend.</i>	Indigenous	LC		
Asteraceae	<i>Euryops asparagoides (Licht. ex Less.) DC.</i>	Indigenous	LC		
Asteraceae	<i>Nolletia chrysocomoides (Desf.) Cass. ex Less.</i>	Indigenous	LC		
Brassicaceae	<i>Lepidium africanum (Burm.f.) DC.</i>	Indigenous	LC		
Brassicaceae	<i>Heliophila minima (Stephens) Marais</i>	Indigenous	LC		
Capparaceae	<i>Boscia albitrunca (Burch.) Gilg &amp; Gilg-Ben.</i>	Indigenous	LC	Schedule 2	Protected
Cactaceae	<i>Opuntia humifusa (Raf.) Raf</i>				
Cleomaceae	<i>Cleome rubella Burch.</i>	Indigenous	LC		
Convolvulaceae	<i>Cuscuta appendiculata Engelm.</i>	Indigenous; Endemic	LC		
Cucurbitaceae	<i>Kedrostis crassirostrata Bremek.</i>	Indigenous	LC		
Cucurbitaceae	<i>Acanthosicyos naudinianus (Sond.) C. Jeffrey</i>	Indigenous	LC		
Cyperaceae	<i>Pseudoschoenus inanis (Thunb.) Oteng-Yeb.</i>	Indigenous	LC		
Ebenaceae	<i>Diospyros lycioides Desf.</i>	Indigenous	LC		
Fabaceae	<i>Vachellia erioloba (E. Mey.) P.J.H. Hurter</i>	Indigenous	LC		Protected

Fabaceae	<i>Vachellia haematoxylon (Willd.) Seigler &amp; Ebinger</i>	Indigenous	LC	Protected
Fabaceae	<i>Vachellia tortilis (Forssk.) Gallaso &amp; Banfi</i>			
Fabaceae	<i>Pomaria burchellii (DC.) B.B.Simpson &amp; G.P.Lewis</i>	Indigenous	LC	
Fabaceae	<i>Senegalia mellifera (Vahl) Seigler &amp; Ebinger subsp. detinens (Burch.) Kyal. &amp; Boatwr.</i>	Indigenous	LC	
Fabaceae	<i>Prosopis glandulosa Torr. var. glandulosa</i>			
Gisekiaceae	<i>Gisekia pharnaceoides L.</i>	Indigenous	LC	
Hyacinthaceae	<i>Albuca sp.</i>			
Hyacinthaceae	<i>Albuca prasina (Ker Gawl.) J.C.Manning &amp; Goldblatt</i>	Indigenous		
Hyacinthaceae	<i>Ornithogalum nanodes F.M.Leight.</i>	Indigenous	LC	Schedule 2
Malvaceae	<i>Hermannia bryoniifolia Burch.</i>	Indigenous; Endemic	LC	
Malvaceae	<i>Melhania rehmannii Szyszyl.</i>	Indigenous	LC	
Malvaceae	<i>Hermannia pulchella L.f.</i>	Indigenous	LC	
Menispermaceae	<i>Antizoma angustifolia (Burch.) Miers ex Harv.</i>	Indigenous	LC	
Myrtaceae	<i>Eucalyptus camaldulensis Dehnh.</i>			
Ophioglossaceae	<i>Ophioglossum reticulatum L.</i>	Indigenous	LC	
Ophioglossaceae	<i>Ophioglossum polyphyllum A.Braun</i>	Indigenous	LC	
Papaveraceae	<i>Argemone mexicana L. forma mexicana</i>	Naturalised		
Papaveraceae	<i>Argemone ochroleuca Sweet subsp. ochroleuca</i>	Naturalised		
Poaceae	<i>Eragrostis curvula (Schrad.) Nees</i>	Indigenous	LC	
Poaceae	<i>Centropodia glauca (Nees) Cope</i>	Indigenous	LC	
Poaceae	<i>Aristida congesta Roem. &amp; Schult.</i>	Indigenous	LC	
Poaceae	<i>Aristida congesta Roem. &amp; Schult.</i>	Indigenous	LC	
Poaceae	<i>Stipagrostis uniplumis (Licht.) De Winter</i>	Indigenous	LC	

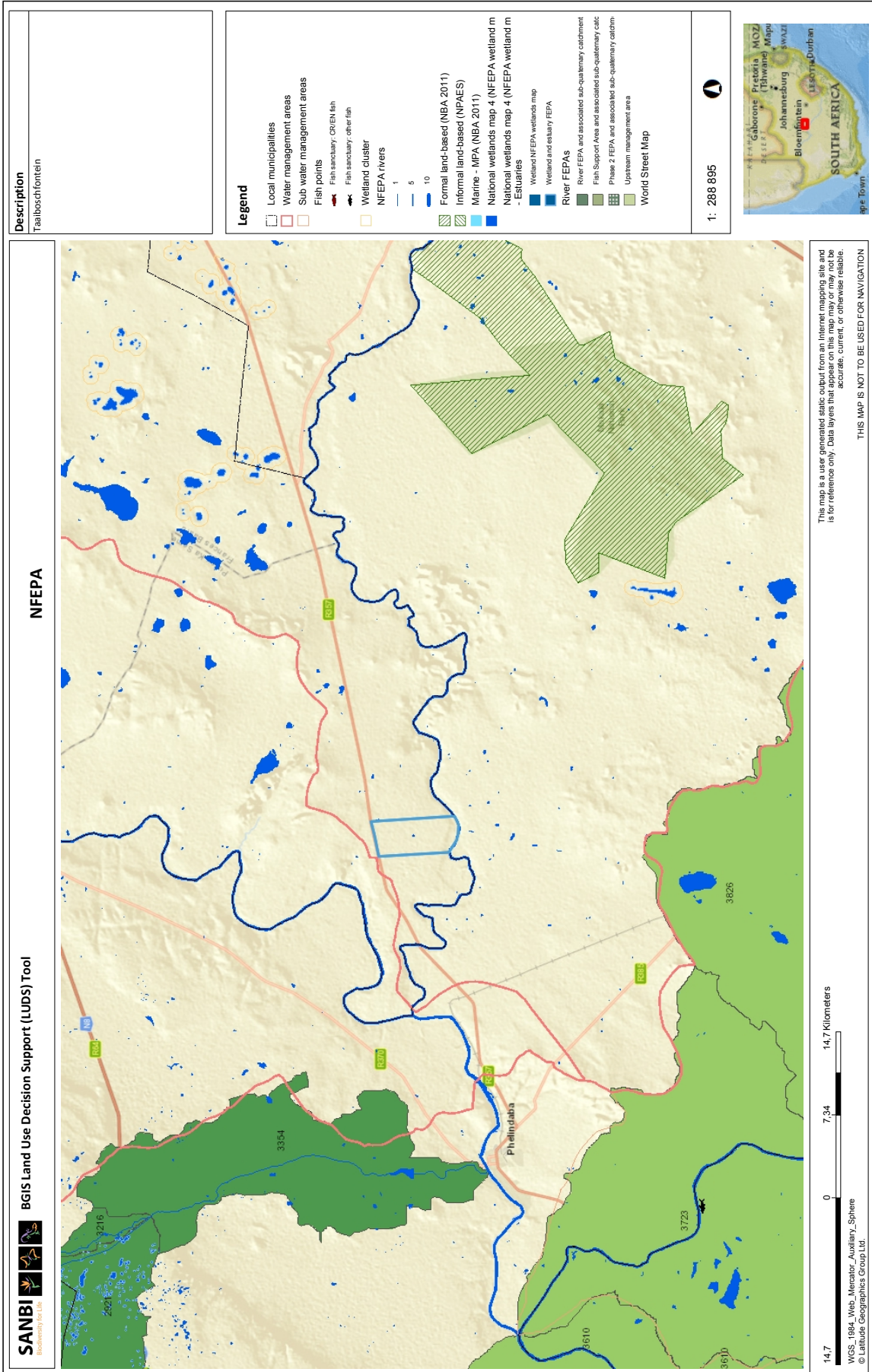
Poaceae	<i>Stipagrostis hirtigluma</i> (Steud.) De Winter	Indigenous	LC
Poaceae	<i>Tricholaena monachne</i> (Trin.) Stapf & C.E.Hubb.	Indigenous	LC
Poaceae	<i>Enneapogon scoparius</i> Stapf	Indigenous	LC
Poaceae	<i>Aristida stipitata</i> Hack.	Indigenous	LC
Poaceae	<i>Eragrostis pseudobtusa</i> De Winter	Indigenous; Endemic	NE
Polygalaceae	<i>Polygala seminuda</i> Harv.	Indigenous	LC
Ruscaceae	<i>Sansevieria aethiopica</i> Thunb.	Indigenous	LC
Scrophulariaceae	<i>Nemesia pubescens</i> Benth.	Indigenous	Schedule 2
Scrophulariaceae	<i>Selago mixta</i> Hilliard	Indigenous; Endemic	LC
Solanaceae	<i>Lycium pilifolium</i> C.H.Wright	Indigenous	LC
Solanaceae	<i>Lycium hirsutum</i> Dunal	Indigenous	LC
Solanaceae	<i>Lycium arenicola</i> Miers	Indigenous	LC
Thymelaeaceae	<i>Lasiosiphon polycephalus</i> (E.Mey. ex Meisn.) H.Pearson		LC
Zygophyllaceae	<i>Roepera lichtensteiniana</i> (Cham.) Beier & Thulin	Indigenous	

# APPENDIX 2

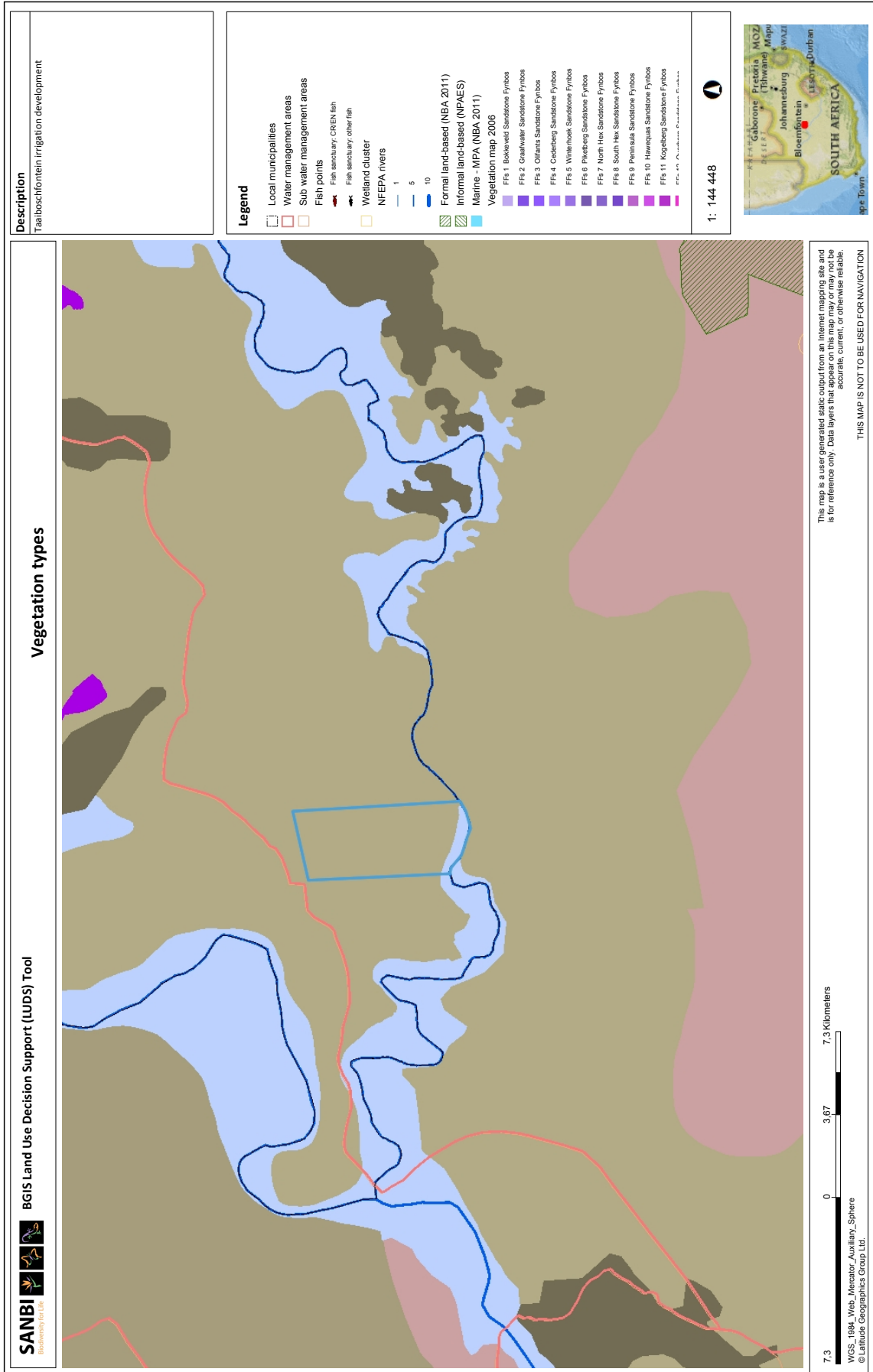
## REGIONAL CONSERVATION PLANNING

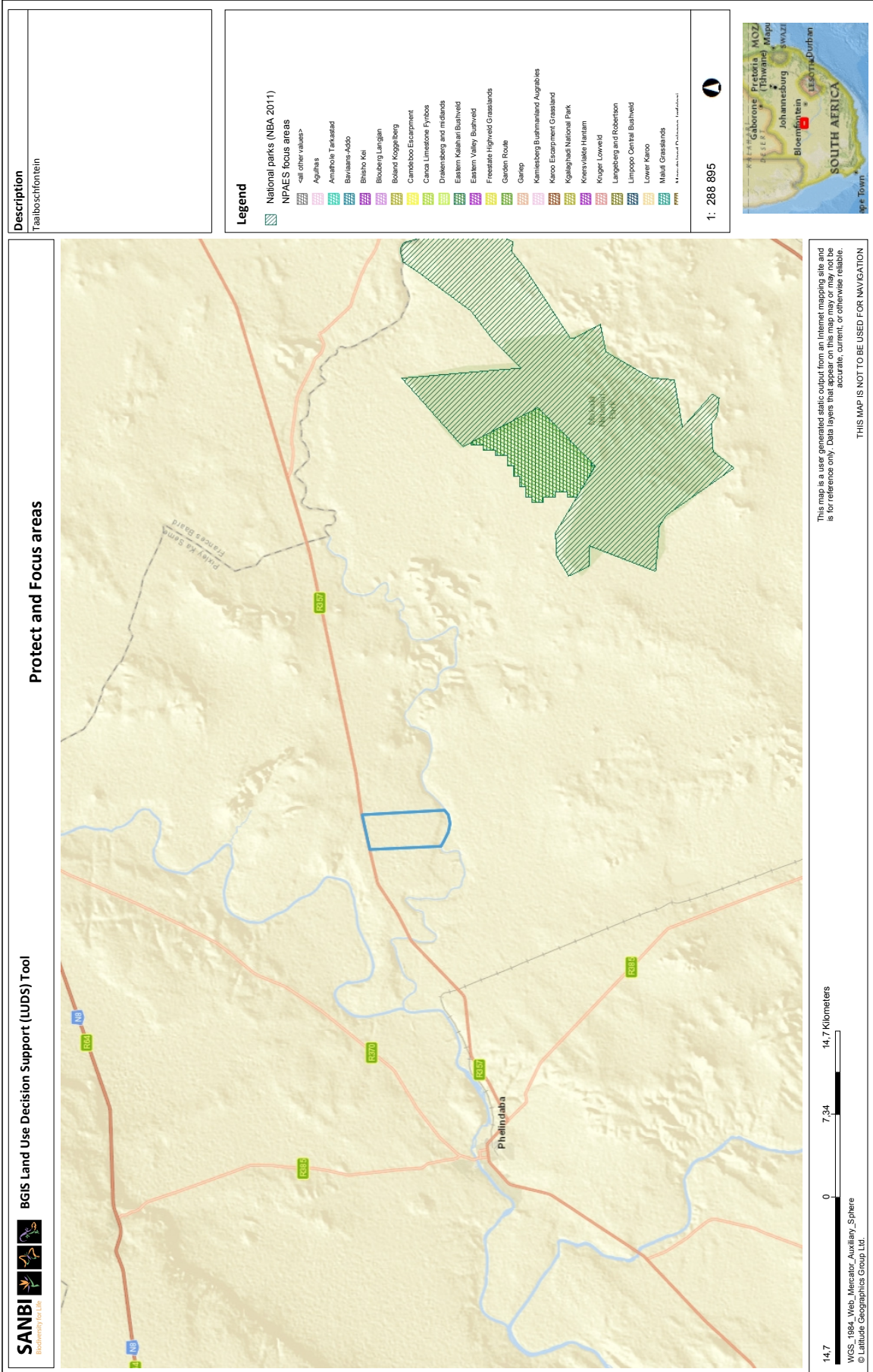




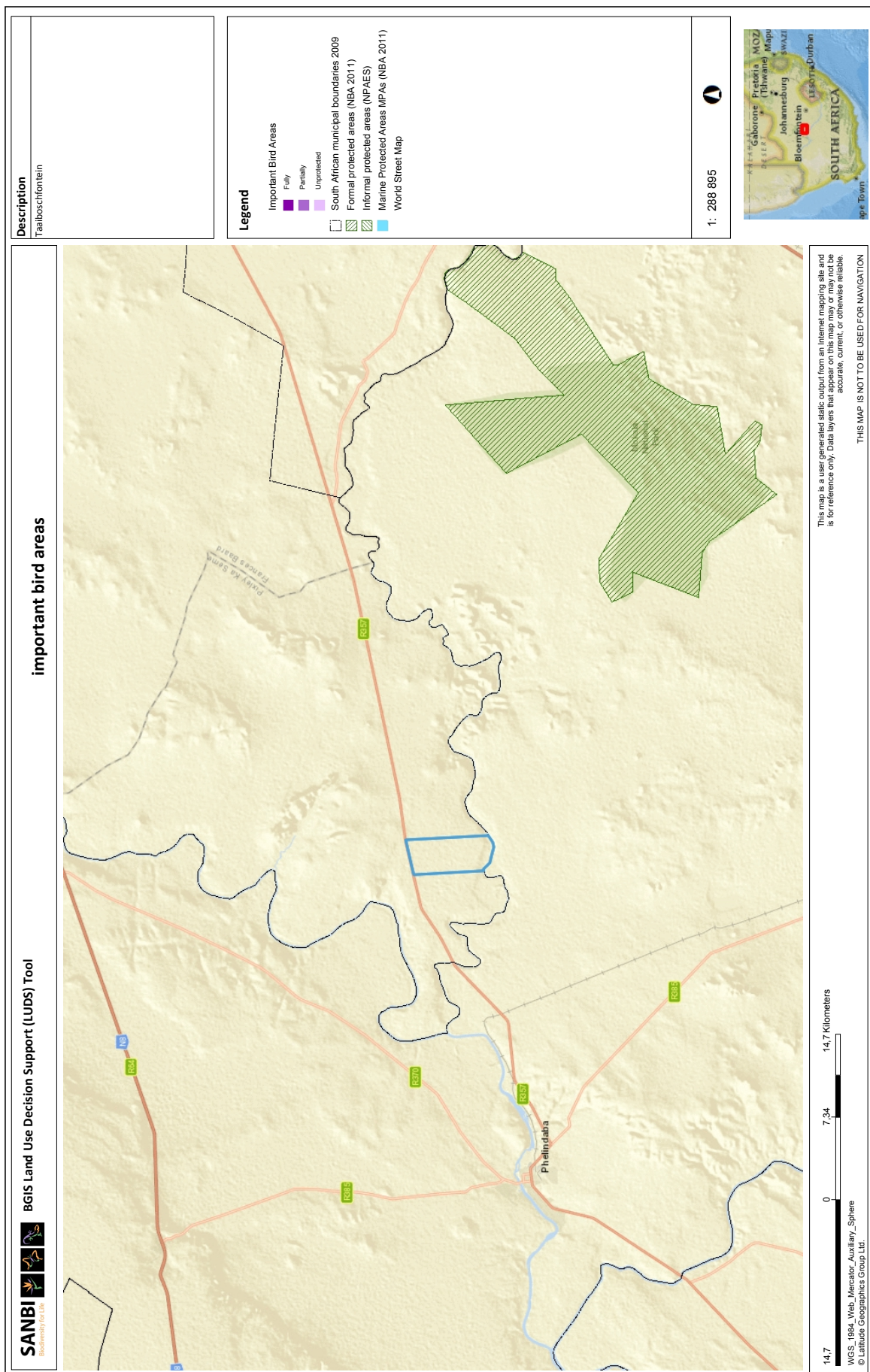


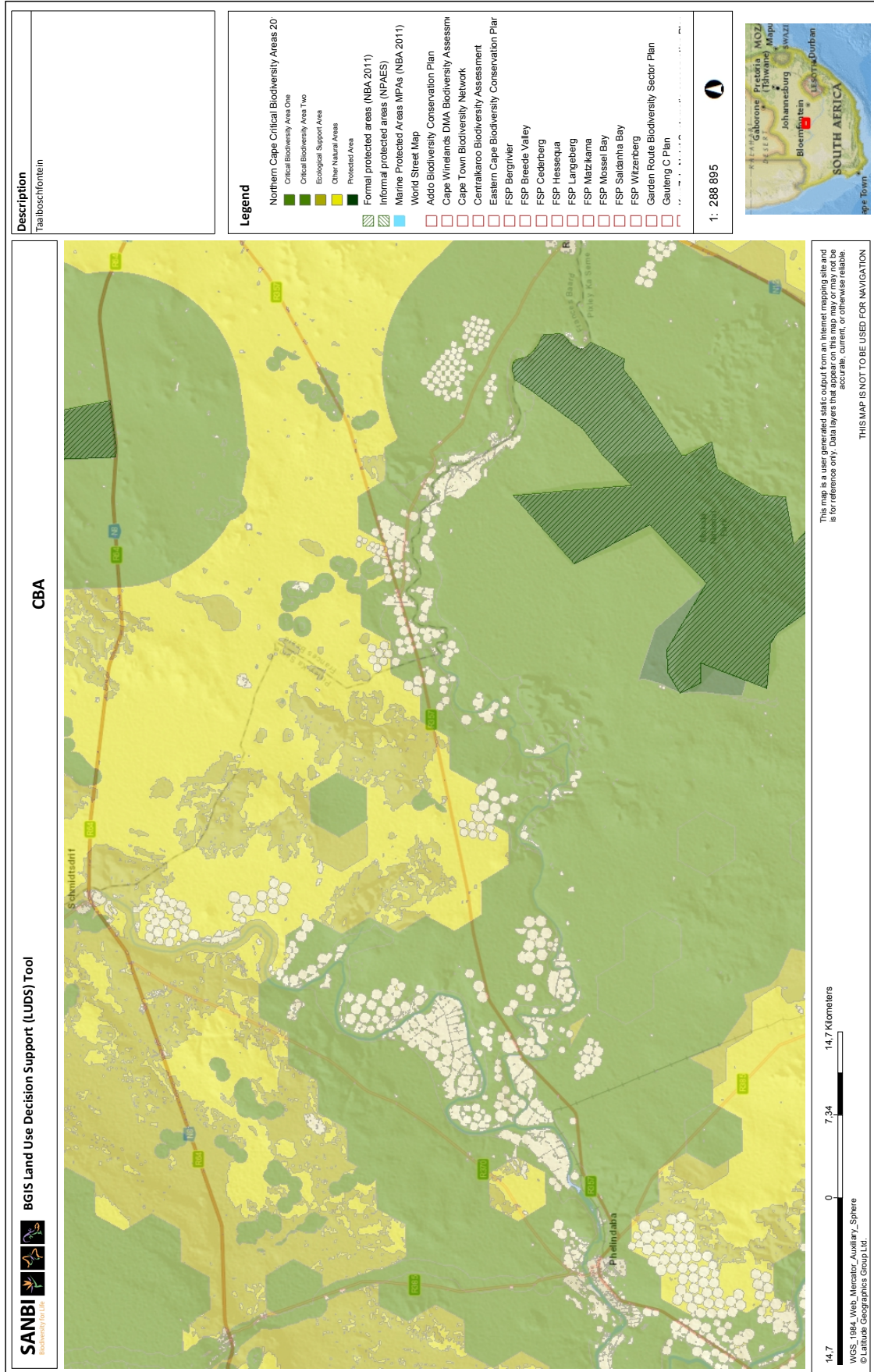














## APPENDIX 3

### DETAILS OF SPECIALIST

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## ABRIDGED CURRICULUM VITA

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### NATALIE VIVIENNE BIRCH

Date of birth: 21 August 1972

### QUALIFICATIONS

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BSc (Rhodes University) – Botany and Zoology  
BSc (Hons) Wildlife Management, Pretoria University  
PhD (Rhodes University)

### PHD DISSERTATION

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Vegetation potential of natural rangelands in the mid Fish River Valley. Towards a sustainable and acceptable management system.

### RESEARCH INTERESTS

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My academic interests cover various areas dealing with ecological functioning, and wildlife management, with a special interest in the functioning and management of arid and semi arid rangelands.

### ACADEMIC AWARD

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Awarded a medal in 2001 by the Grassland Society of Southern Africa for: Outstanding Student in Range and Forage Science

### PROFESSIONAL EXPERIENCE

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1999 – 2000	<u>Eastern Cape Parks Board</u>	Ecologist
2000 -2002	<u>Coastal &amp; Environmental Services</u>	Consultant
2003 – present	<u>Ecological Management Services</u>	Owner/Consultant

I am a founding member of Ecological Management Services, which is based in Kimberley, and we specialise in ecological management and impact assessment. Although we are based in Kimberley we cover most of South Africa and have projects in the Eastern Cape, Free State, North West Province, Northern Cape and Gauteng. We have undertaken impact assessments for various types of developments including urban and rural developments, agricultural developments, as well as

developments within the mining sector. We also provide specialist input to various types of projects and have formulated biodiversity offset studies required to offset impacts from large developments.

A selection of recent work is as follows:

- Department of Agriculture Northern Cape—Hopetown Piggery
- Department of Agriculture Northern Cape—Phillipstown Piggery
- Department of Agriculture Northern Cape—Chikiana Piggery
- Department of Agriculture Northern Cape—De Aar Hydroponics
- Sidi Parani—Fertilizer granulation plant in Christiana
- Tiva Enviro Services - Biodiversity study for De Aar Hospital
- Ghaap Ostrich Abattoir—Biodiversity Study
- Amakhala Nature Reserve—Development of lodge facilities
- IG van der Merwe Trust—Residential development, Douglas
- Valrena Trust—Residential development along Vaal River
- Idstone Pty Ltd—Development of irrigation ground for seed potatoes production
- Tiaan Trust—Development of irrigation ground
- C F Scholtz & Seuns - Development of irrigation ground for growing of crops
- Kosie Smith Trust - Development of irrigation ground for growing seed potatoes
- Bakgat Trust—Development of irrigation ground for growing of crops
- Mount Carmel (pty) Ltd—Development of irrigation ground for growing of crops
- Koppieskraal Plase Rietrivier Beperk—Development of irrigation ground for seed potatoes production
- Genade Boerdery (PTY) Ltd—Development of irrigation ground for growing of crops
- Santarose Investments (Pty) Ltd - Development of irrigation ground for seed potatoes production
- Valrena Trust—Development of irrigation ground for growing of crops
- Middeldrift Dairy Trust—Establishment of Dairy
- Eliweni Wildlife (Pty) Ltd - Lodge Development on Amakhala Nature Reserve
- Idstone Pty Ltd—Development of irrigation ground for the growing of seed potatoes
- Trisa Trust—Development of irrigation ground for the growing of seed potatoes
- GWK Pty Ltd—Development of irrigation pivots and vineyards
- Blair Athol Golf course development
- Rolfontein Nature Reserve lodge development
- SLR—Ecological Specialist survey for Kudumane Mine
- Biodiversity offset plan—UMK mine
- Biodiversity Action Plan for UMK mine
- Biodiversity offset Kudumane Mine
- IDC—Ecological Management & Business Plan: Siyancuma Women in Game Initiative
- Swanvest 123 Pty Ltd—Wolverfontein Breeding Facility
- De Beers—Ecological Evaluation and Management Plan for Kleinsee Game Farm
- Kalahari Oryx Game Reserve—Risk Assessment introduction of Lion
- Department of Land Affairs—Ecological Management and Business plan for Thwane Commonage
- Mauricedale Game Ranch—Paardefontein Specialist Vegetation Survey
- Santrosa Investments Pty Ltd—Olie Rivier Game Farm HA

- Manzi Safaris Habitat Assessment
- Thuru Lodge—Risk Assessment & Habitat Analysis
- Dugmore brothers—Habitat assessment Hartebeesthoek
- Schutte Boerdery Trust—Habitat Assessment Glenfrere
- F G. Taljaard—Habitat Assessment Namakwari Game Reserve
- Rivierfront Wild - Doornfontein Habitat Assessment
- Sjobbolet Trust—Hartsvally Habitat Assessment
- Raltefontein Habitat Assessment
- Kalahari Oryx Game Reserve—Specialist Vegetation survey

#### PROFESSIONAL ASSOCIATIONS

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Grassland Society of Southern Africa

South African Council for Natural scientific Professions Registration number 400117/05

#### RESEARCH PUBLICATIONS

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Evans, N.V., Avis, A.M. and Palmer, A.R. 1997. Changes to the vegetation of the mid-Fish River valley, Eastern Cape South Africa, in response to land-use, as revealed by a direct gradient analysis. *African Journal of Range & Forage science*, **14**(2): 68-74.

Birch N.V., Avis, A.M. and Palmer, A.R. (1999) The Effect Of Land-Use On The Vegetation Communities Along A Topo-Moisture Gradient In The Mid-Fish River Valley, South Africa. *African Journal of Range & Forage science*, **16**(1): 1-8

Birch, N.V., Avis, A.M. and Palmer, A.R. 1999. Changes to the vegetation communities of natural rangelands in response to land-use in the mid-Fish River valley, South Africa. *People and Rangelands Building the Future* (Eds D. Eldridge & D. Freudenberger) pp.319-320 vol 1. Proceeding of the VI International Rangeland Congress, Townsville, Queensland, Australia

## **APPENDIX 4**

### **IMPACT ASSESSMENT METHODOLOGY**

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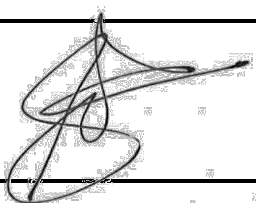

**TITLE:**

# ENVIRONMENTAL IMPACT ASSESSMENT RATING PROCEDURE



# EIMS

ENVIRONMENTAL  
IMPACT  
MANAGEMENT  
SERVICES

<b>REV:</b>	00	<b>AUTHOR</b>		<b>APPROVED</b>	
<b>EFFECTIVE DATE:</b>	<b>NAME:</b>	L. WHITLOW	<b>NAME:</b>	A. SMITH	
	<b>DATE:</b>	17 JUNE 2020	<b>DATE:</b>		
	<b>SIGN:</b>		<b>SIGN:</b>		
<b>COPY / STATUS No:</b>		MASTER COPY		<b>DOCUMENT No:</b>	PRO 106

<b>TITLE:</b>	ENVIRONMENTAL IMPACT ASSESSMENT RATING PROCEDURE	<b>DOC No:</b>	PRO 106	<b>REV:</b>	00	<b>Page 2 of 7</b>
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### 1. Purpose

The purpose of this procedure is to guide the undertaking of an impact and risk assessment process, as required under the regulations promulgated under the National Environmental Management Act (Act 107 of 1998 - NEMA).

### 2. Scope

This procedure provides the methodology to be applied to environmental impacts and risks identified during the Environmental Impact Assessment Process. The methodology ensures that consistent impact assessment rating is carried out that is legally compliant and aligned with EIMS's objective of providing a quality service.

### 3. References

GNR. 982 National Environmental Management Act (Act No. 107 of 1998): Environmental Impact Assessment Regulations, 2014 – hereafter referred to as the Regulations.

### 4. Additional Guidelines and References

<b>Guidelines and Reference Docs (not exhaustive – please verify with the applicable competent authority).</b>	
Compulsory Compliance: GNR. 982 National Environmental Management Act (Act No. 107 of 1998 - NEMA): Environmental Impact Assessment Regulations, 2014.	National
Companion Guideline for Implementation: Environmental Management Assessment Regulations, 2010 - GN 805/2012 (NEMA)	National
DEAT (2002) Impact Significance, Integrated Environmental Management, Information Series 5, Department of Environmental Affairs and Tourism (DEAT), Pretoria	National

### 5. Definitions and Abbreviations

Refer to Chapter 1 of the Regulations.

### 6. Procedure

The impact significance rating methodology, as presented herein and utilised for all EIMS Impact Assessment Projects, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. The ER is determined for the pre- and post-mitigation scenario. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). The impact assessment will be applied to all identified alternatives.

#### a. Determination of Environmental Risk

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER). The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and Reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E + D + M + R) * N}{4}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 1 below.

Table 1: Criteria for Determining Impact Consequence

Aspect	Score	Definition
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<b>TITLE:</b>	<b>ENVIRONMENTAL IMPACT ASSESSMENT RATING PROCEDURE</b>	<b>DOC No:</b>	PRO 106	<b>REV:</b>	00	<b>Page 3 of 7</b>
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<b>Nature</b>	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
<b>Extent</b>	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary)
	3	Local (i.e. the area within 5 km of the site)
	4	Regional (i.e. extends between 5 and 50 km from the site)
	5	Provincial / National (i.e. extends beyond 50 km from the site)
<b>Duration</b>	1	Immediate (<1 year)
	2	Short term (1-5 years)
	3	Medium term (6-15 years)
	4	Long term (15-65 years, the impact will cease after the operational life span of the project)
	5	Permanent (>65 years, no mitigation measure of natural process will reduce the impact after construction)
<b>Magnitude/ Intensity</b>	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected)
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected)
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way, moderate improvement for +ve impacts)
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease, high improvement for +ve impacts)
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease, substantial improvement for +ve impacts)
<b>Reversibility</b>	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact.

Once the C has been determined, the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per Table 2.

Table 2: Probability Scoring

<b>Probability</b>	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

$$ER = C \times P$$

Table 3: Determination of Environmental Risk

<b>Consequence</b>	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
<b>Probability</b>						

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 4.

Table 4: Environmental Risk Scores

ER Score	Description
<9	Low (i.e. where this impact is unlikely to be a significant environmental risk/ reward).
≥9 ≤17	Medium (i.e. where the impact could have a significant environmental risk/ reward),
>17	High (i.e. where the impact will have a significant environmental risk/ reward).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

#### b. Impact Prioritisation

Further to the assessment criteria presented in the section above, it is necessary to assess each potentially significant impact in terms of:

1. Cumulative impacts; and
2. The degree to which the impact may cause irreplaceable loss of resources.

To ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the

decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 5: Criteria for Determining Prioritisation

<b>Cumulative Impact (CI)</b>	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/ definite that the impact will result in spatial and temporal cumulative change.
<b>Irreplaceable Loss of Resources (LR)</b>	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 5. The impact priority is therefore determined as follows:

$$Priority = CI + LR$$

The result is a priority score which ranges from 2 to 6 and a consequent PF ranging from 1 to 2 (Refer to Table 6).

Table 6: Determination of Prioritisation Factor

Priority	Prioritisation Factor
2	1
3	1.125
4	1.25
5	1.375
6	1.5

In order to determine the final impact significance, the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is an attempt to increase the post mitigation environmental risk rating by a factor of 0.5, if all the priority attributes are high (i.e. if an impact comes out with a high medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 7: Final Environmental Significance Rating

<b>Significance Rating</b>	<b>Description</b>
<-17	High negative (i.e. where the impact must have an influence on the decision process to develop in the area).
≥-17, ≤-9	Medium negative (i.e. where the impact could influence the decision to develop in the area).
>-9, < 0	Low negative (i.e. where this impact would not have a direct influence on the decision to develop in the area).
0	No impact
>0, <9	Low positive (i.e. where this impact would not have a direct influence on the decision to develop in the area).
≥9, ≤17	Medium positive (i.e. where the impact could influence the decision to develop in the area).
>17	High positive (i.e. where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

**7. Responsibilities**

It is the responsibility of each EIMS employee and each external Specialist appointed by EIMS to ensure that this procedure is carried out as described. All the personnel within the organization have the responsibility to report any deviations/changes from the procedures to management. This is to ensure that the necessary changes are documented after approval.

It is the responsibility of the senior/ junior consultant (as applicable) assigned with the task of report compilation to ensure that this methodology/ procedure is strictly applied. It is the responsibility of the assigned Senior Consultant or Quality Reviewer to review and verify that the procedure has been complied with, and such documented at the specified quality check intervals.

**8. Records**

<b>RECORD</b>	<b>STORAGE LOCATION</b>	<b>STORAGE SYSTEM</b>	<b>RESPONSIBLE PERSON</b>	<b>RETENTION PERIOD</b>
Significance Rating Input Spreadsheet	Project File - /Server/assignments/ Job#/Records	Electronic- Scanned PDF	Project Manager	10 Years

**9. Record of Changes, Revisions and Cancellations**

<b>RECORD OF CHANGES, REVISIONS AND CANCELLATIONS</b>		
<b>DATE</b>	<b>NATURE / DETAIL OF CHANGE</b>	<b>REV No.</b>