INYANDA- ROODEPLAAT WIND ENERGY PROJECT ENVIRONMENTAL IMPACT ASSESSMENT, EASTERN CAPE

ECOLOGICAL SPECIALIST REPORT

Prepared for:	Prepared by:
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Tarryn holds a BSc (Botany and Zoology), a BSc (Hons) in African Vertebrate Biodiversity and a MSc with distinction in Botany from Rhodes University. Tarryn's Master's thesis examined the impact of fire on the recovery of C3 and C4 Panicoid and non-Panicoid grasses within the context of climate change for which she won the Junior Captain Scott-Medal (Plant Science) for producing the top MSc of 2010 from the South African Academy of Science and Art as well as an Award for Outstanding Academic Achievement in Range and Forage Science from the Grassland Society of Southern Africa. She conducts vegetation assessments including vegetation and sensitivity mapping to guide developments and thereby minimise their impacts on sensitive vegetation. Tarryn has conducted a number of vegetation and impact assessments in Mozambique (to IFC standards) which include the Lurio Forestry Project in Nampula, the Syrah Graphite Mine in Cabo del Gado and the Baobab Iron Ore Mine in Tete, Mozambique. Tarryn has also designed and implemented the Terrestrial Monitoring Program for Kenmare, MOMA, a heavy minerals mine in Mozambique. She has worked on the Lesotho Highlands Development Authority botanical baseline survey for phase 2 of the Lesotho Highlands Water Project.

EXECUTIVE SUMMARY

This will be completed after the client has reviewed the report.

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ACRONYMS

ACE	African Conservation Ecology
ADU	Animal Demography Unit
BNR	Baviaanskloof Nature Reserve
BSP	Biodiversity Sector Plan
CBA	Critical Biodiversity Areas
CES	Coastal and Environmental Services
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CR	Critically Endangered
DWA	Department of Water Affairs
ECBCP	Eastern Cape Biodiversity Conservation Plan's
ECPTA	Eastern Cape Parks and Tourism Agency
ECPTA	Eastern Cape Province and South Africa
EIA	Environmental Impact Assessment
EN	Endangered
ESA	Ecological Support Areas
GIS	Geographical Information System
IDP	Integrated Development Plan
IUCN	International Union for Conservation of Nature
NEM:BA	National Environmental Management: Biodiversity Act
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
PAES	Protected Areas Expansion Strategy
RDB	Red Data Book
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SDF	Spatial Development Frameworks
SKEP	Succulent Karoo Ecosystem Plan
SRVM	Sunday's River Valley Municipality
STEP	Subtropical Ecosystem Planning
VU	Vulnerable
WEF	Wind Energy facility
WHS	World Heritage Site

1. INTRODUCTION

1.1 Objectives

An Ecological Impact Assessment for the proposed Inyanda Wind Energy Project was undertaken to address the following objectives:

1. To provide a general description of the natural vegetation of the specific area to be developed, and adjacent areas that will be impacted.
2. To provide a general description of the indigenous fauna of the area, using a habitat approach and based on the natural vegetation of the site.
3. To identify plant and animal species of conservation concern.

1.2 Terms of reference

The following terms of reference were provided for this report:

- Identify and map the main vegetation types and plant communities;
- Identify and record the main plant species that occur within the project area;
- Where possible identify any Red Data Book (RDB) flora species;
- In the absence of specific information on RDB species, adopt a habitat approach by identifying areas likely to contain RDB species;
- Assess the extent of alien plant species over the site, and associated risks of alien invasion as a result of the wind energy project;
- Identify any significant landscape features or rare or important vegetation/faunal associations such as wetlands or rocky areas that might support rare or important vegetation/faunal associations;
- Identify the main animal communities associated with the plant communities (mammals, amphibians and reptiles);
- Describe the likelihood of other RDB faunal species or species of conservation concern occurring in the vicinity. In the absence of specific information on RDB species, adopt a habitat approach by identifying areas likely to contain RDB species;
- Assess the condition of the site in terms of current or previous land uses;
- Provide a general overview of the project area in terms of connectivity, corridors, rivers and streams and ecological viability in relation to the surrounding region;
- Place the project area within the biodiversity context of the wider area (i.e. provide the “bigger picture”);
- Identify (as far as is possible from the data collected) the principal ecological processes evident within the project site and its relative importance in determining the biodiversity characteristics present;
- Assess the potential direct and indirect impacts resulting from the proposed development and associated infrastructure, both on the footprint and the immediate surrounding area during construction and operation; and
- Provide a detailed description of appropriate mitigation measures that can be adopted to reduce negative impacts for each phase of the project, where required.

1.3 Assumptions and Limitations

Study specific assumptions and limitations include:

- Species of conservation concern are difficult to find and difficult to identify, thus species described in this report do not comprise an exhaustive list. It is almost certain that additional species of conservation concern will be found during the construction and operational phases of the development.

- Sampling could only be carried out at one stage in the annual or seasonal cycle. Some plant species may therefore have gone undetected.
- Impacts are assessed based on the current turbine layout. Should the layout change, the impacts and associated mitigation measures, will need to be revisited.

2. APPROACH TO THE ECOLOGICAL ASSESSMENT

The aim of this assessment was to identify the ecological importance of the area in which the proposed project will be undertaken and to evaluate these in terms of their conservation importance. In order to do so, the ecological sensitivity of areas was assessed as well as the species of conservation concern that may occur in the habitats in the area.

To a large extent, the condition and sensitivity of the vegetation will also determine the presence of animal species of conservation concern and areas with high faunal biodiversity. It is for this reason that the assessment focused on the vegetation aspects of the site, and includes only a small section on the fauna recorded from, and expected to inhabit, the site. Due to the size of the project area and the possible high levels of biodiversity it is not possible to conduct an exhaustive study that covers all project lad portions, rather those areas to be impacted by project infrastructure. The aim of this study is not to produce a complete list of all animal and plant species occurring in the region, but rather to examine a representative sample as identified and confirmed residing in the study area. It is however, important to note areas of high sensitivity as well as species of conservation concern have been identified as far as possible, either from records from the site or a review of their habitat requirements and whether or not these habitats occur within the site. The aim of this study was to identify areas of high sensitivity and those that may be subject to significant impacts from the project. Aspects that would increase impact significance include:

- Presence of plant species of conservation concern.
- Presence of animal species of conservation concern.
- Vegetation types (which also constitute faunal habitats) of conservation concern.
- Areas of high biodiversity.
- The presence of process areas:
  - Ecological corridors
  - Wetlands (including rivers)
  - Complex topographical features (especially steep and rocky slopes that provide niche habitats for both plants and animals)

2.1 Species of conservation concern

2.1.1 Plant species of conservation concern

Data on the known distribution and conservation status for each potential species of special concern has to be obtained in order to develop a list of 'Species of Concern'. These species are those that may be impacted significantly by the proposed activity. In general these will be species that are already known to be, endemic, threatened or at risk according to the IUCN Red Data list.

Species that are afforded special protection, notably those that are protected by CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna) are also regarded as Species of Concern (see http://www.cites.org/). Efforts to provide assessments of conservation status ('red list' status) of individual species may provide additional valuable information on Species of Concern (see http://www.iucnredlist.org/).

A list of 'Species of Conservation Concern (SCC) that could potentially occur in the study area was derived from the species list by examining the relevant literature and databases and eliminating those that have a widespread distribution and which are not covered by CITES regulations or red listed. From this initial list, the status of Confirmed SCC may be conferred if the species is substantially restricted to the study area based on previous or current study observations. Please note that all uncertain identifications of species from the study area are regarded as SCC until they can be collected or recollected and studied further.

2.1.2 Faunal species of special concern

Species of conservation concern (SCC) in terms of the project area were defined as:

- **Threatened species**: Species included in other international lists (e.g., 2012 IUCN Red List of Threatened Animals, Measey *et al.* 2011, Bates *et al*. 2014). Definitions include:
    - 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, 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 at present, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

- **Sensitive species**: Species not falling in the categories above but listed in Appendix I or II of the Convention of International Trade in Endangered Species (CITES).
    - Appendix I lists species that are the most endangered among CITES-listed animals and plants.
    - Appendix II lists species that are not necessarily at present threatened with extinction but that may become so unless trade is closely controlled.
- **Endemic species**: Species endemic to the Eastern Cape Province and South Africa.
- **Species of conservation value**: Species not listed above, but which have been identified by ECPTA as species worth adding to conservation efforts.

2.2 Sample site selection

A site visit was conducted from the 19-23 May 2014. A sampling protocol was developed that would enable us to evaluate the existing interpretations of the vegetation of the study area, to improve on them if necessary, and to add detailed information on the plant communities present. The protocol took into account the amount of time available for the study, the accessibility of different parts of the area, and limitations such as the seasonality of the vegetation.

The sampling approach for this study was to try and assess the areas that will be mostly affected by the proposed project. Initial assumptions were made about the diversity of vegetation, based on initial reconnaissance visits, previous studies or from aerial photographs and satellite imagery and the area stratified into these basic types. In this way the time available was used much more efficiently than in random sampling, but there is a risk of bias and the eventual results may simply ‘prove’ the assumptions.

In general, the stratification of the site was influenced by obvious features of the vegetation, such as the presence of conspicuous species or vegetation structure. These factors may be largely independent of the floristic make-up of the vegetation, and by definition the biological communities present. Sample plots (Figure 2-1) were analysed by determining the dominant species in each plot, as well as any alien invasive species and potential species of special concern occurring within the plots. Vegetation communities were then described according to the dominant species recorded from each type, and these mapped and assigned a sensitivity score.

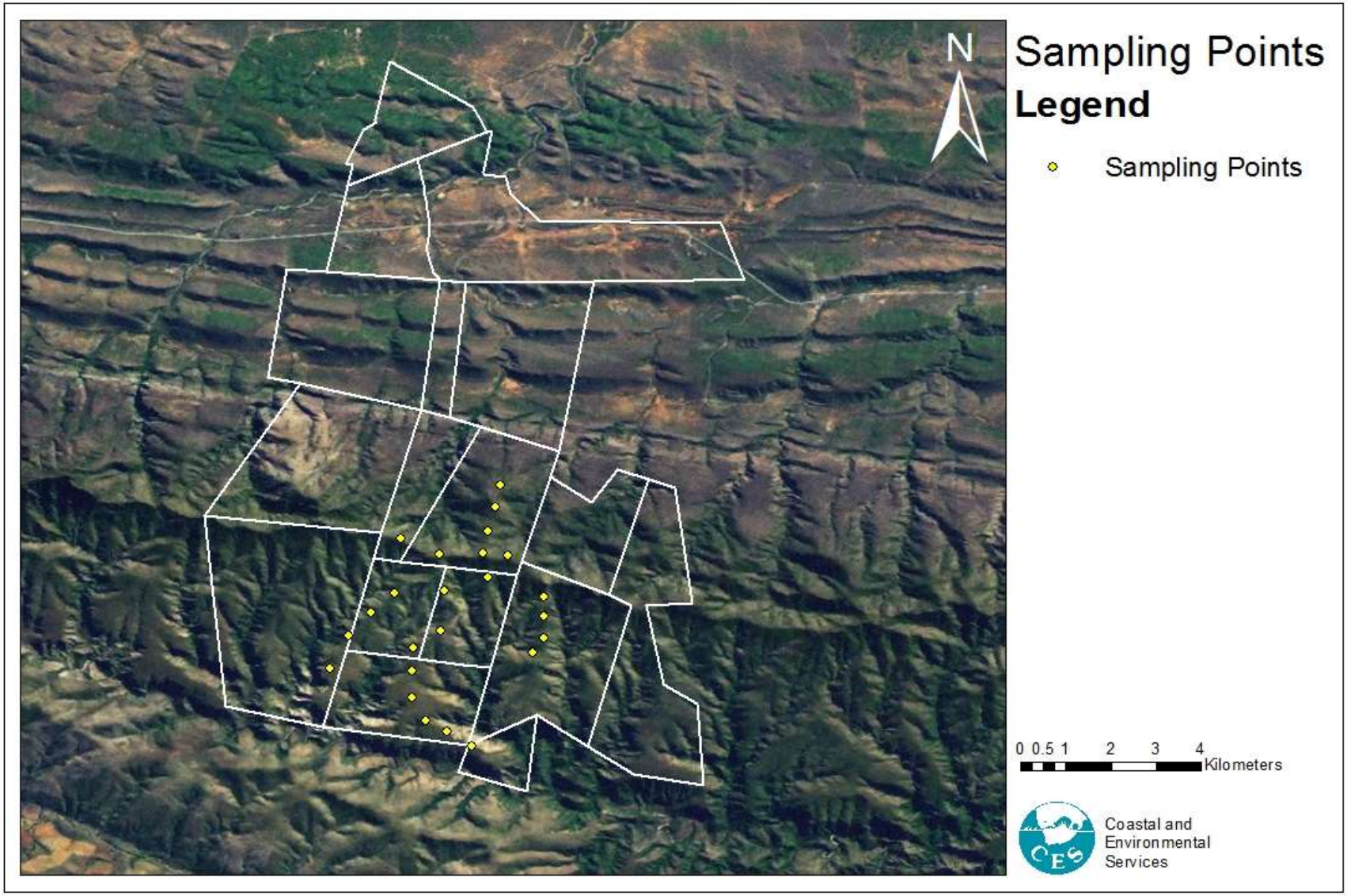

Figure 2-1: Sampling sites of the proposed Inyanda-Roodeplaat wind energy project area.

2.3 Vegetation mapping

Vegetation is usually mapped from aerial photographs and/or satellite images, and related to data gathered on the ground.

2.4 Amphibian and Reptile Assessment

Given the potential impacts the development could have on the herpetofauna in the area, an assessment was conducted using the following methods:

- Desktop assessment and literature review relating to herpetofauna assessed, including examination of published and unpublished literature, relevant databases, historical museum records and discussion with other experts who have additional information relating to the area;
- Analysis of herpetofauna data compiled during the initial desktop assessment in conjunction with high-detail aerial imagery and vegetation/land use spatial data, to identify areas of differing faunal importance;
- A one day short site visit was done to validate the desktop assessment.
- The following techniques were used:
    - Reptiles: active searches in suitable habitat.
    - Amphibians: active searches in suitable habitat, D-netting for tadpoles.
    - Specimens will be deposited in the Port Elizabeth Museum (amphibians and reptiles) or other relevant institutions; images will be deposited with Animal Demography Unit (ADU) virtual museum.

The known diversity of the herpetofauna present in the project area was determined by a literature review. Species known from the region, or from adjacent regions whose preferred habitat(s) were known to occur within the study area, were also included. Literature sources included: Burger & Smith (1999), Conradie *et al.* (2013) and Conradie *et al*. (2012).

The following identification guides were consulted in identification of specimens:

- Amphibians – Channing (2001), Du Preez & Carruthers (2009).
- Reptiles – Branch (1998), Marais (2004).

2.5 Sensitivity assessment

This section of the report explains the approach to determining the ecological sensitivity of the study area on a broad scale. The approach identifies zones of very high, high, moderate and low sensitivity according to a system developed by CES and used in numerous proposed development studies. It must be noted that the sensitivity zonings in this study are based solely on ecological (primarily vegetation) characteristics and social and economic factors have not been taken into consideration.

The sensitivity analysis described here is based on 10 criteria which are considered to be of importance in determining ecosystem and landscape sensitivity, and have been used in past studies. The method predominantly involves identifying sensitive vegetation or habitat types, topography and land transformation (Table 2-1).

The study area was zoned into areas which were homogenous in terms of vegetation types. Alternatively topography and drainage areas were used as boundaries for homogenous zones. Once the study area had been zoned, the sensitivity criteria described in Table 2-1 were applied to each zone and scored as HIGH (3), MODERATE (2) or LOW (1).

A total score for each zone was then calculated and the overall ecological sensitivity was determined using the following percentage scale:

- 0 - 33.3% : LOW ecological sensitivity
- 33.4 – 64.9% : MODERATE ecological sensitivity
- 65 – 85% : HIGH ecological sensitivity
- 85.1 – 100%: VERY HIGH ecological sensitivity.

Although very simple, this method of analysis provides a good, yet conservative and precautionary assessment of the ecological sensitivity.

Table 2-1: Criteria used for the analysis of the sensitivity of the area

CRITERIA		LOW SENSITIVITY (1)	MODERATE SENSITIVITY (5)	HIGH SENSITIVITY (10)
1	**Topography**	Level, or even	Undulating; fairly steep slopes	Complex and uneven with steep slopes
2	**Vegetation -** Extent or habitat type in the region	Extensive	Restricted to a particular region/zone	Restricted to a specific locality / site
3	**Conservation status** of fauna/ flora or habitats	Well conserved independent of conservation value	Not well conserved, moderate conservation value	Not conserved - has a high conservation value
4	**Species of special concern** - Presence and number	None, although occasional regional endemics	No endangered or vulnerable species, some indeterminate or rare endemics	One or more endangered and vulnerable species, or more than 2 endemics or rare species
5	**Habitat fragmentation** leading to loss of viable populations	Extensive areas of preferred habitat present elsewhere in region not susceptible to fragmentation	Reasonably extensive areas of preferred habitat elsewhere and habitat susceptible to fragmentation	Limited areas of this habitat, susceptible to fragmentation
6	**Biodiversity** contribution	Low diversity, or species richness	Moderate diversity, and moderately high species richness	High species diversity, complex plant and animal communities
7	**Visibility** of the site or landscape from other vantage points	Site is hidden or barely visible from any vantage points with the exception in some cases from the sea.	Site is visible from some or a few vantage points but is not obtrusive or very conspicuous.	Site is visible from many or all angles or vantage points.
8	**Erosion potential** or instability of the region	Very stable and an area not subjected to erosion.	Some possibility of erosion or change due to episodic events.	Large possibility of erosion, change to the site or destruction due to climatic or other factors.
9	**Rehabilitation** potential of the area or region	Site is easily rehabilitated.	There is some degree of difficulty in rehabilitation of the site.	Site is difficult to rehabilitate due to the terrain, type of habitat or species required to reintroduce.
10	**Disturbance** due to human habitation or other influences (Alien invasive species)	Site is very disturbed or degraded.	There is some degree of disturbance of the site.	The site is hardly or very slightly impacted upon by human disturbance.

A Geographical Information System (GIS) map was drawn up and with the aid of a satellite image the sensitive regions and vegetation types plotted. The description of the sample plots helped to map the vegetation, and these descriptions as well as sensitivity ratings were illustrated on the resultant maps.

2.6 Impact assessment

2.6.1 Impact rating methodology

To ensure a direct comparison between various specialist studies, a standard rating scale has been defined and will be used to assess and quantify the identified impacts. This is necessary since impacts have a number of parameters that need to be assessed. Five factors need to be considered when assessing the significance of impacts, namely:

- **Relationship of the impact to temporal scales** - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
- **Relationship of the impact to spatial scales** - the spatial scale defines the physical extent of the impact.
- **The severity of the impact** - the severity/beneficial scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word 'mitigation' means not just 'compensation', but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.
- **The likelihood of the impact occurring** - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

Each criterion is ranked to determine the overall **significance** of an activity. The criterion is then considered in two categories, viz. effect of the activity and the likelihood of the impact. The overall significance is either negative or positive.

The significance scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment.

Cumulative Impacts
Cumulative Impacts affect the significance ranking of an impact because it considers the impact in terms of both on-site and off-site sources. For example, pollution making its way into a river from a development may be within acceptable national standards. Activities in the surrounding area may also create pollution which does not exceed these standards. However, if both on-site and off-site activities take place simultaneously, the total pollution level at may exceed the standards. For this reason it is important to consider impacts in terms of their cumulative nature.

Seasonality
Although seasonality is not considered in the ranking of the significance, it may influence the evaluation during various times of year. As seasonality will only influence certain impacts, it

will only be considered for these, with management measures being imposed accordingly (i.e. dust suppression measures being implemented during the dry season).

2.6.2 Example of an environmental significance statement for a power line project

Impact 1: Loss of Degraded Shale Renosterveld

Cause and Comment

The power line and associated infrastructure will cross this vegetation type. It is considered to be of moderate sensitivity due to the presence of species of conservation concern, its conservation status and the need for process areas to be maintained. As pylon footprints are small; impacts are considered to be low. Given that the power line will cross this vegetation type, the probability of the impact occurring is definite. The mitigation recommendation is to ensure that the footprints of the pylons should be kept as small as possible and service roads kept to a minimum.

Without mitigation:

In the construction phase of this development, the impact will be permanent, localised, definite and of moderate severity. The overall Significance of the impact will thus be a moderate negative. This impact was assessed with a high level of confidence.

With mitigation:

With mitigation, in the construction phase of the development, the impact is reduced to low.

Significance statement

Impact	Effect			Risk or Likelihood	Total Score
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction phase					
Without mitigation	Permanent	Localised	Moderate	Definite	**MODERATE -**
With mitigation	Permanent	Localised	Low	Probable	**LOW -**

3. DESCRIPTION OF THE STUDY AREA

3.1 Location of the site

The proposed wind farm is located off the R75 between Kirkwood and Patensie in the Sundays River Valley Municipality, Eastern Cape Province, South Africa (Figure 3-1 & 3-2). The project has a study area of approximately 9500 ha. These farms are currently used for animal husbandry and agriculture, primarily the grazing of domestic and game animals, as well as for conservation and tourism.

3.2 Geology

The Eastern Cape Province contains a wide variety of landscapes, from the stark Karoo (the semi-desert region of the central interior) to mountain ranges and gentle hills rolling down to the sea. The climate and topography gives rise to the great diversity of vegetation types and habitats found in the region. The mountainous area on the northern border forms part of the Great Escarpment. Another part of the escarpment lies just north of Bisho, Somerset East and Graaff-Reinet. In the south of the province, the Cape Fold Mountains start between East London and Port Elizabeth and continue westward into the Western Cape.

The dominant geological feature in these biomes is the east-west trending Cape Fold Belt. These mountain ranges consist mostly of the folded strata of the Cape Supergroup. The study area is found to be underlain by the Table Mountain and Bokkeveld Groups, these being groups within the Cape Supergroup sequence of rocks (Kunz *et al*., 2007).The coarse textured rocks of the Table Mountain Group, typically found in sharply folded mountain systems, combined with steep slopes and a high percentage of quartz sand, gives rise to coarse, unstructured soils that are shallow and nutrient poor.

Topography

The project area is characterised by steep hills arranged on an east-west axis, with slopes facing north and south. The elevation ranges between 280 and 1400 meters above sea level with steep hills and high summits. The site is transected by three rivers which flow in an easterly direction across the site. Furthest south is the Elands River. In approximately the centre of the site is the Kwazungu River. Furthest north is the Kariega River. The rivers are fed by numerous streams draining off the surrounding slopes.

3.3 Climate

The Eastern Cape Province of South Africa has a complex climate due to its location at the confluence of several climatic regimes, namely temperate and subtropical. As a result there are wide variations in temperature, rainfall and wind patterns, mainly as a result of movements of air masses, altitude, mountain orientation and the proximity of the Indian Ocean.

The climatic data described here has been obtained from Buckle (1989) describing the nearby Baviaanskloof Nature Reserve, and as such is relevant to the project site. Rainfall is distributed equally over the year with the highest rainfall generally occurring in March and November. The average annual rainfall is 451 mm with the southern slopes being wetter (average annual rainfall: 461 mm) than the northern slopes (435 mm) (Buckle, 1989). Thunderstorms are frequent. Temperatures as high as 44°C are not uncommon, occurring as a result of warm winds from the high plateau. In low lying areas, the average maximum temperature recorded is 32°C in January and 18°C in July. The average minimum temperature is 15°C in January and 5°C in July. Frost is experienced in winter. In summer the prevailing wind direction is south to south-east. In winter the prevailing wind direction is northwest (Buckle, 1989).

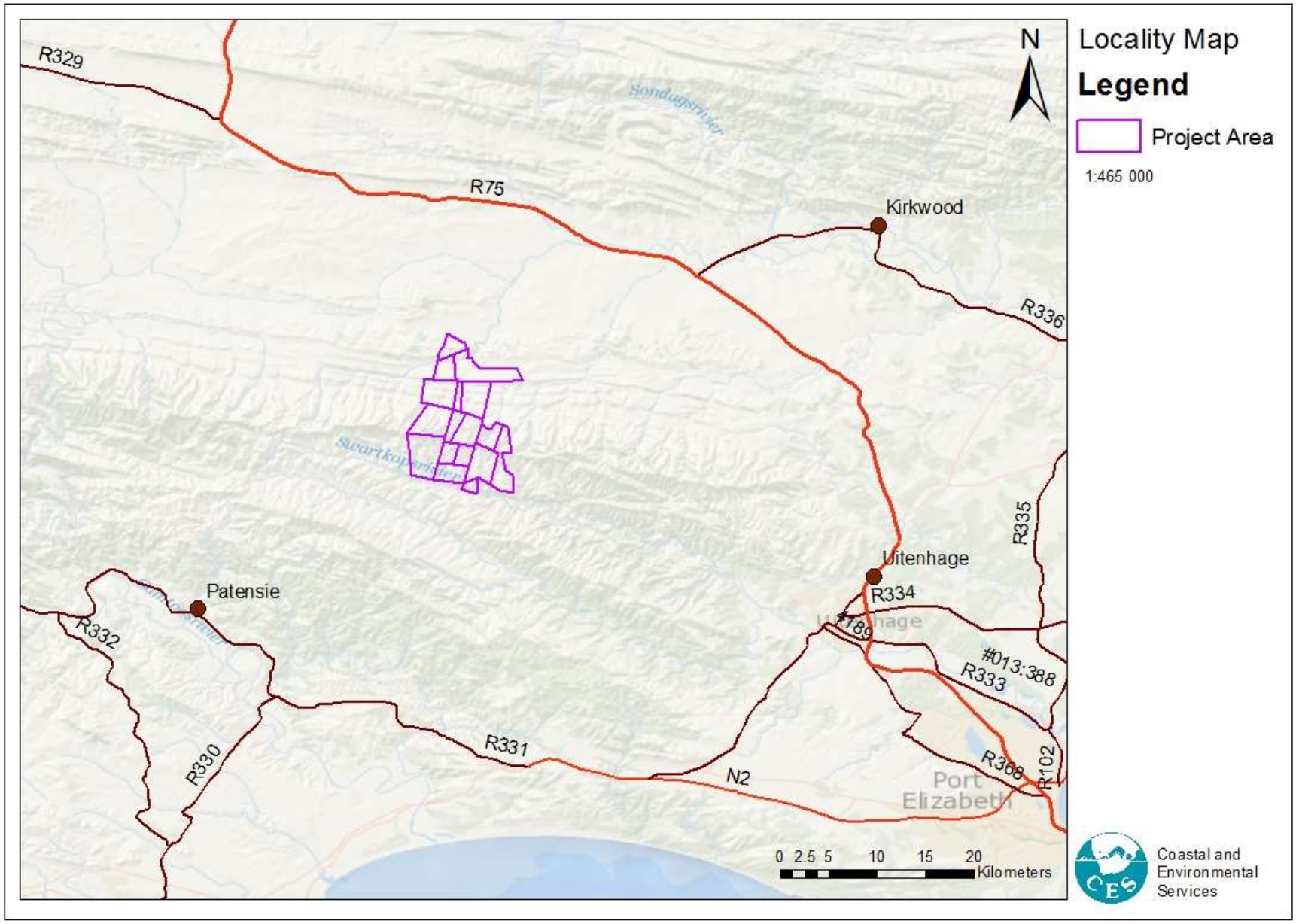

Figure 3-1: Location of the proposed Inyanda-Roodeplaat wind energy project.

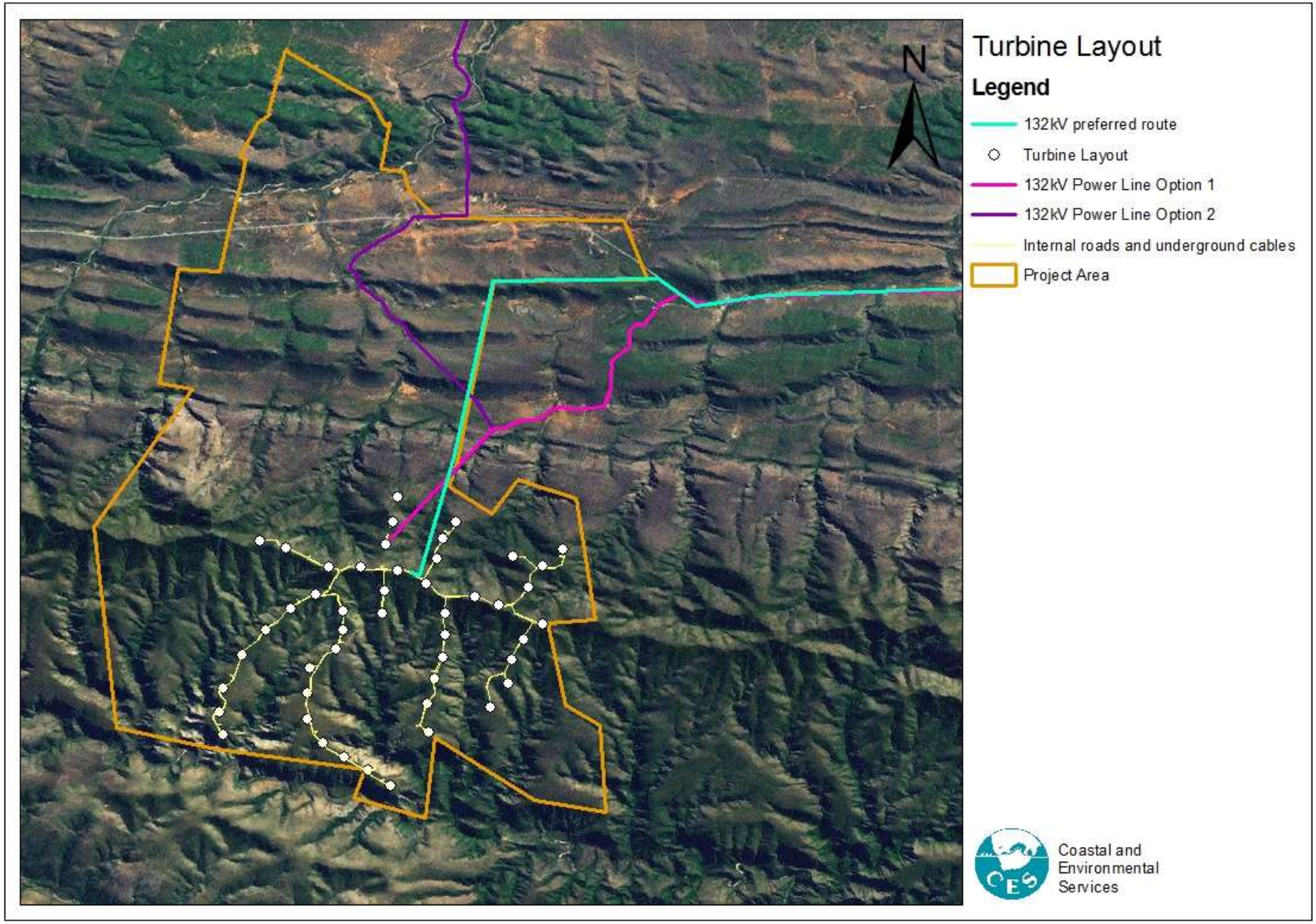

Figure 3-2: Turbine layout and power line options of the proposed Inyanda-Roodeplaat WEF.

Plate 3-1: Photographs illustrating the general topography of the area

3.4 Land Use

The majority of the study area is currently used as a private lodge and game farm by the landowner. The owner has removed livestock from the southern regions of the project area where the turbines will be placed and consequently the vegetation is in fairly good condition. As a result, antelope species have begun to recolonize the area.

The northern section of the project area is still used for small livestock farming and the condition of the vegetation is in poor condition compared to the areas where livestock has been removed.

3.5 Vegetation of the study area (Desktop investigation)

Published literature on the ecology of the area was referenced in order to describe the study site in the context of the region and the Eastern Cape Province. The following documents/plans are referenced (discussed in detail in the sections that follow):

- SANBI vegetation (Mucina and Rutherford)
- SANBI Working for Wetlands
- ECBCP
- SKEP
- STEP
- CITES
- SA Red Data List
- NEMBA
- CARA
- Protected trees
- PNCO

3.5.1 Regional Vegetation

Mucina and Rutherford:

Mucina and Rutherford (2006) have developed the National Vegetation map as part of a South African National Biodiversity Institute (SANBI) funded project: "*It was compiled in order to provide floristically based vegetation units of South Africa, Lesotho and Swaziland at a greater level of detail than had been available before."*

The map was developed using a wealth of data from several contributors and has allowed for the best national vegetation map to date, the last being that of Acocks developed over 50 years ago.

This is a Regional scale mapping tool presented at 1:250 000 and supplies a general idea of vegetation types in the area which forms the base of finer scale bioregional plans such as STEP. This SANBI project has two main aims:

- to determine the variation in and units of southern African vegetation based on the analysis and synthesis of data from vegetation studies throughout the region, and
- to compile a vegetation map. The map was to accurately reflect the distribution and variation on the vegetation and indicate the relationship of the vegetation with the environment. For this reason the collective expertise of vegetation scientists from universities and state departments were harnessed to make this project as comprehensive as possible."

The map and accompanying book describe each vegetation type in detail, along with the most important species which include endemic and biogeographically important species.

Mucina and Rutherford (2006) define the following vegetation types that occur within the project area (Figure 3-3) and from which source these descriptions are derived:

Sundays Thicket
This vegetation type occurs in the Eastern Cape Province and is characterised by undulating plains and low mountains and foothills covered with tall dense thicket. The Sundays Thicket is composed of a mosaic of predominantly spinescent species that include trees, shrubs and succulents. It is classified as **Least Threatened** with a conservation target of 19%. 6% has been transformed by cultivation and urban development. This vegetation type occurs in the northern section of the project site and will be affected by the power lines and access roads.

Albany Alluvial Vegetation
Albany Alluvial Vegetation occurs in the Eastern Cape between East London and Cape St. Francis. Thornveld and riverine thicket are the two major vegetation types that occur in this vegetation type. It is classified as **Endangered** with a conservation target of 31%. Only 6% has been statutorily conserved. A small section of this vegetation type occurs in the northern section of the project site. This vegetation type maybe affected by the power lines and access roads of the proposed wind energy facility.

Kouga Grassy Sandstone Fynbos
This vegetation type occurs between Uniondale and Uitenhage in the Western and Eastern Cape Provinces respectively. It is characterised by low shrubland with sparse, emergent tall shrubs and an understory dominated by grasses with scattered ericoid shrubs. It is classified as **Least Threatened** with a conservation target of 23%. Approximately 20% is conserved and 9% has been transformed. This is one of the dominant vegetation types in the project area occurring in the southern portion of the project site. This vegetation type will be impacted by the infrastructure associated with the wind energy facility.

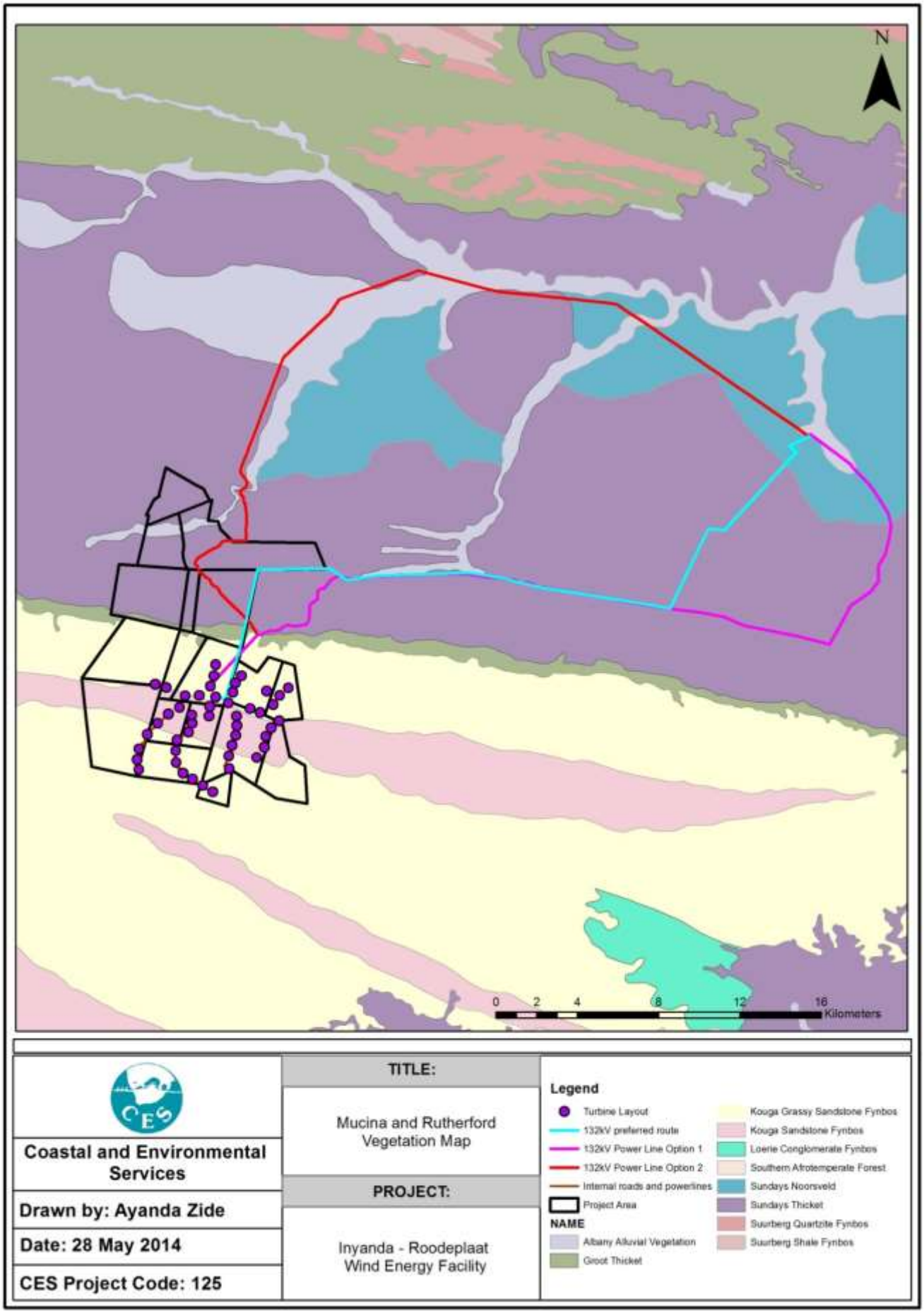

Figure 3-3: Mucina and Rutherford vegetation map of the study area

Kouga Sandstone Fynbos
The Kouga Sandstone Fynbos occurs in the Western and Eastern Cape along moderately steep to gentle slopes. The high altitude slopes support communities dominated by low fynbos and the intermediate slopes support three strata with Proteaceae shrubs forming the dominant tall shrub stratum. This vegetation type is classified as **Least Threatened** with a conservation target of 23%. About 40% is statutorily conserved. A narrow band of this vegetation type traverses the project site. This vegetation type will be impacted by the wind energy facility.

Groot Thicket
This vegetation type occurs in the Eastern Cape Province along moderate to steep slopes on the ridges of the mountain ranges dominated by a low succulent thicket, usually fairly dense and closed. It is classified as **Least Threatened** with a conservation target of 19%. Approximately 11% is currently statutorily conserved. This vegetation type occurs as a narrow band, separating the Sundays Thicket from the Kouga Grassy Sandstone Fynbos. A small section of this vegetation type may be affected by the wind energy facility.

Sundays Noorsveld
The Sundays Noorsveld occurs in the Eastern Cape Province along flat lowlands. It is characterised by succulent thicket consisting of a mosaic of *Euphobia caerulescens* and low karoo shrub vegetation (dominated by *Pentzia incana* and *Rhigozum obovayum*). This vegetation type is classified as **Least Threatened** with a conservation target of 19%. About 15% is statutorily conserved in the Greater Addo Elephant National Park and some 3% in private game ranches. Approximately 4% of this vegetation type has been transformed by cultivation. A small section of this vegetation type may be affected by the powerlines connecting the WEF to the ESKOM grid.

Subtropical Ecosystem Planning (STEP) Project:

The Subtropical Ecosystem Planning (STEP) Project aims to identify priority areas that would ensure the long-term conservation of the subtropical thicket biome and to ensure that the conservation of this biome is considered in the policies and practices of the private and public sector that are responsible for land-use planning and the management of natural resources in the region (Pierce *et al.* 2005). STEP (Figure 3-4) identifies six vegetation types in this region. Pierce and Mader (2006) define the following vegetation types from which source these descriptions are derived:

Baviaans Spekboom Thicket
Baviaans Spekboom Thicket is a type of valley thicket dominated by *Portulacaria afra* and *Pappea capensis* and typified by the abundance of *Aloe speciosa*. This vegetation type is listed as **Vulnerable** by STEP. This vegetation type occurs as a thin band that traverses the northern section of the study area and separates the Sundays Spekboomveld from the Cockscomb Mountain Fynbos Thicket. A small section of this vegetation type may be impacted by the wind energy facility.

Cockscomb Mountain Fynbos Thicket
The Cockscomb Mountain Fynbos Thicket is a mosaic of different vegetation types growing in the Elandsberg and Groot Winterhoek Mountains. The lower south facing slopes are characterised as being grassy while the proteas and conebushes are common at higher altitudes and in the wetter south-eastern parts. The lower north-facing slopes are generally sparse. This vegetation type is listed as **Currently Not Vulnerable.** This is the dominant vegetation type that occurs within the study site and will be impacted on by the wind energy facility.

Zuurberg Forest Thicket
The Zuurberg Forest Thicket is characterised as being tall and dense with species typical of the Sundays Thicket but including patches of temperate forest, with species such as

Afrocarpus falcatus and *Ekebergia capensis,* occurring on the wetter slopes. This vegetation type is listed as **Currently Not Vulnerable.** A small section of this vegetation type occurs towards the south east section of the study site. This vegetation will remain unaffected by the turbines.

Sundays Spekboomveld
This vegetation type is dominated by *Pappea capensis* and *Portulacaria afra* while *Euphorbia coerulescens* and *Crassula ovata* are abundant succulent plants that characterise this vegetation type. This spekboomveld is distinguished from adjacent noorsveld by the relatively high cover of *Portulacaria afra, Pappea capensis* and *Schotia afra.* This vegetation type is listed as **Endangered.** This vegetation type occurs in the northern section of the project site and may be affected by the power line connecting the wind energy facility to the ESKOM grid

Sundays Doringveld
Sundays Doringveld is characterised by a mosaic of thicket clumps and a Nama-karoo matrix. Thicket clumps often have low species diversity with species that are typical of the Sundays Valley Thicket. Dominant species in the Nama-karoo matrix comprise of *Acacia karoo, Lycium sp.* and *Cynodon dactylon* and include a suite of succulents, some of which are rare endemics such as *Haworthia sordida.* This vegetation type is listed as **Vulnerable.** A small section of this vegetation type occurs in the northern section of the study site. This vegetation is unlikely to be affected by the wind energy facility.

Sundays Spekboom thicket
The tree component of this vegetation type is dominated by *Portulacaria afra* and *Pappea capensis*. Other common species include *Euphorbia ledienii* and *Rhigozum obovatum*. This vegetation type is listed as **Vulnerable by STEP.** The power lines and access roads traverse a small area of this vegetation type. This vegetation will be slightly affected by the wind energy facility.

Succulent Karoo Ecosystem Plan (SKEP):

The Succulent Karoo biome extends from the south-west through to the north west of South Africa and up into Namibia (Driver *et al.*, 2003). It is classified as one of the 25 internationally recognised biodiversity hotspots and is the world's only arid hotspot. It is remarkably diverse with 6 356 plant species, 40% of which are endemic and 17% of which are listed on the Red Data list. Despite this rich diversity and high level of endemism, only 3.5% of the biome is formally conserved. As a result the biome's diversity is under pressure from human impacts, especially mining, agriculture, overgrazing and climate change. The goal of the Succulent Karoo Ecosystem Plan (SKEP) is therefore to provide a framework to guide conservation efforts of this unique biome (Driver *et. al.*, 2003).The three main aims of the project are to:

- "provide a hierarchy of priority actions to guide conservation efforts and donor investment in the biome (both on and off formal reserves);
- build human resource capacity to implement the plan by including training and mentorship activities as part of the planning process;
- generate the institutional and government support required to ensure its effective implementation"

Three of the six vegetation types described by SKEP are found in the project area (as reflected in Figure 3-5):

- Thicket
- Fynbos
- Skep River Corridors

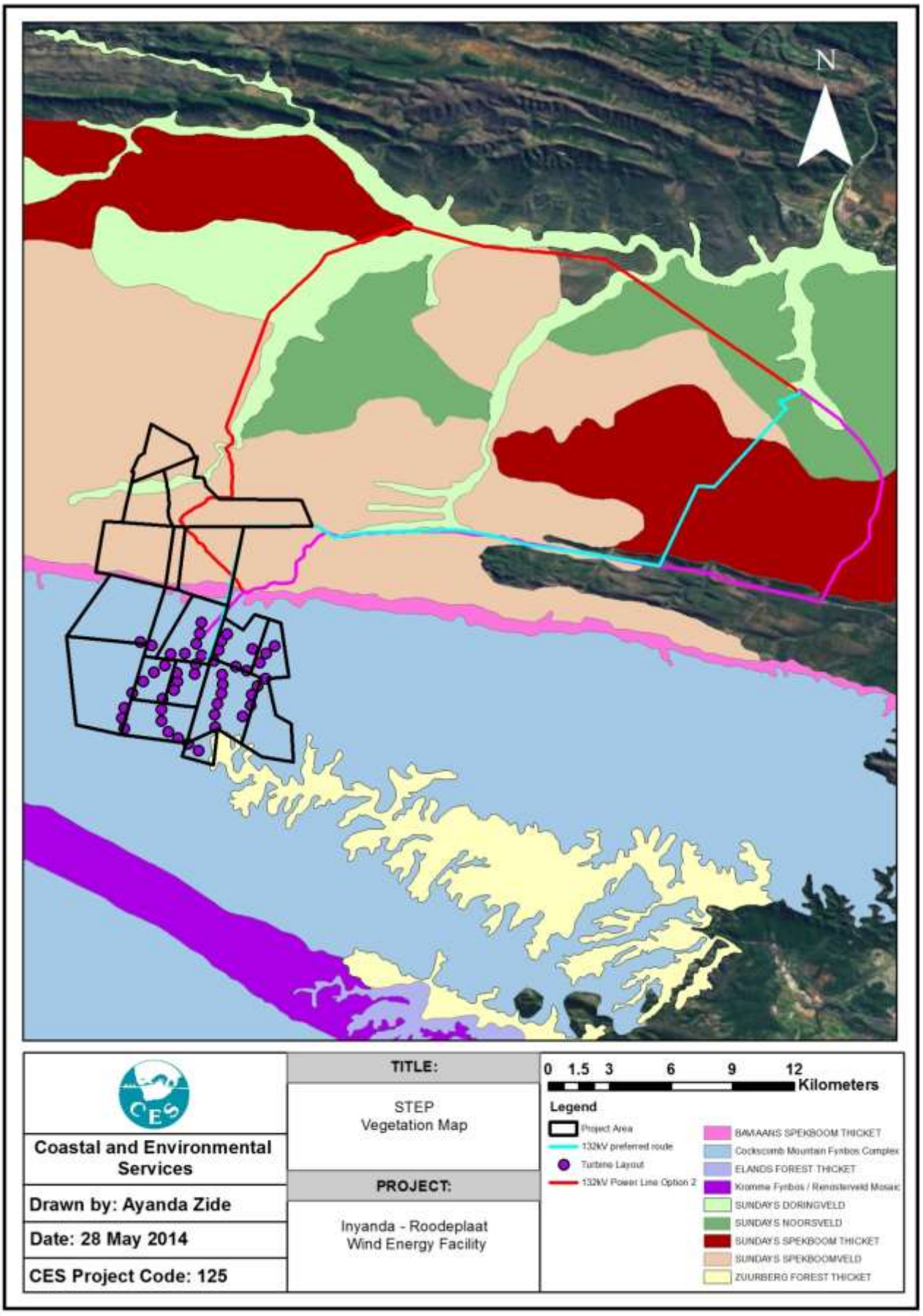

Figure 3-4: STEP vegetation map of the study area

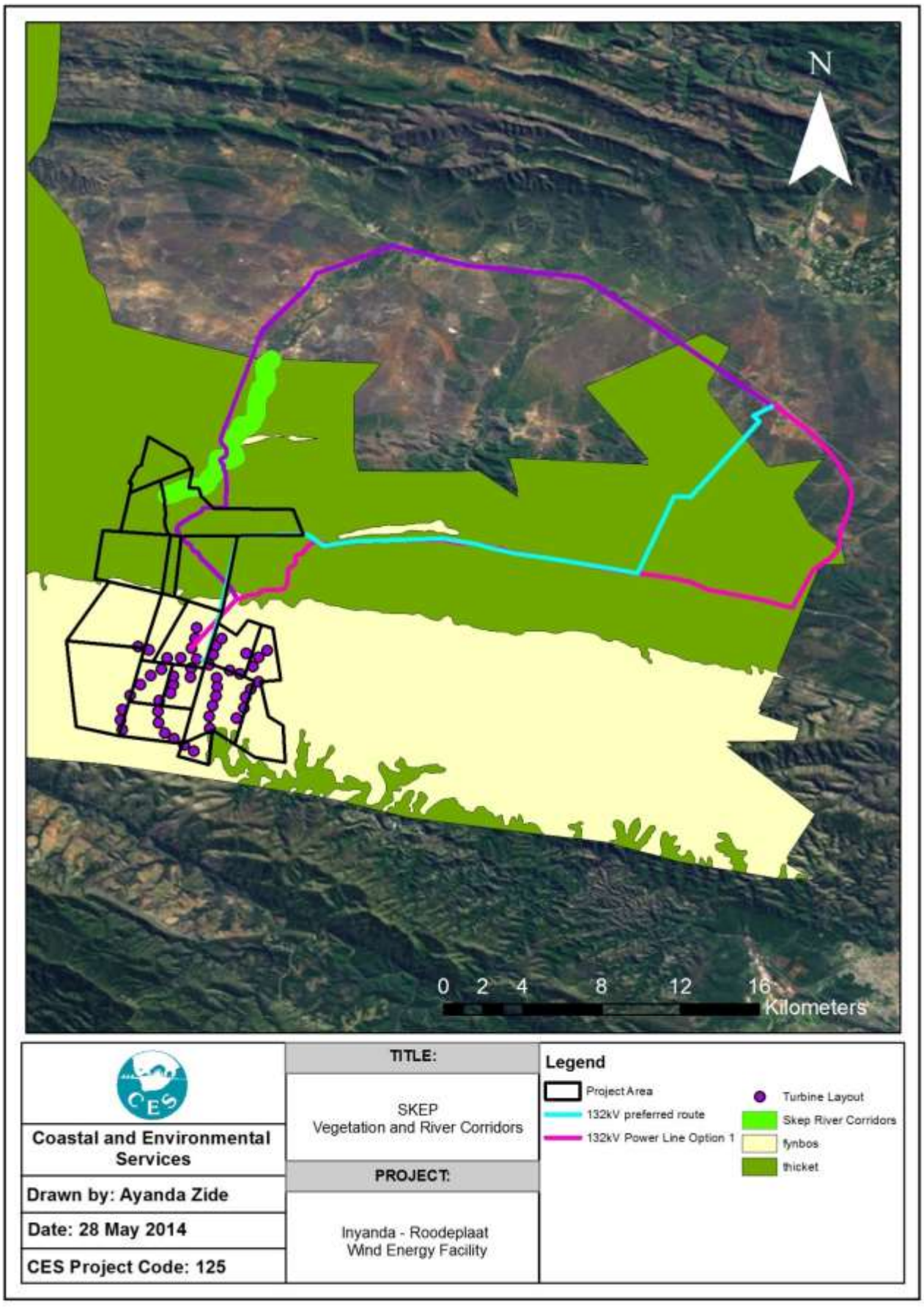

Figure 3-5: SKEP vegetation map of the study area

3.6 National Water Act (No. 36 of 1998)

Purpose of the Act (Section 2)

The purpose of the Act is to ensure that the Nation's water resources are protected, used, developed, conserved and controlled in ways which take into account, including:

- Promoting sustainable use of water.
- Protect aquatic and associated ecosystems and their biological diversity.
- Reducing and preventing pollution and degradation of water resources.

Protection of water resources (Section 12-20)

Provides details of measures intended to ensure the comprehensive protection of all water resources, including the water reserve and water quality. With respect to the establishment of water quality objectives, objectives may relate to (Section 13):

- the presence and concentration of particular substances in the water
- the characteristics and quality of the water resource and the in-stream and riparian habitat
- the characteristics and distribution of aquatic biota
- the regulation and prohibition of in-stream and land-based activities which may affect the quantity and quality of the water resource

Section 19 deals with Pollution Prevention (Part 4)

The person (including a municipality) who owns, controls occupies or uses the land in question, is responsible for taking reasonable measures to prevent pollution of water resources. If the measures are not taken, the catchment management agency concerned, may itself do whatever is necessary to prevent the pollution or remedy its effects and recover all reasonable costs from the persons responsible for the pollution. The 'reasonable measures' which have to be taken may include measures to:

- Cease, modify or control any act or process causing the pollution;
- Comply with any prescribed waste standard or management practice;
- Contain or prevent the movement of pollutants;
- Eliminate any source of the pollution;
- Remedy the effects of the pollution; and
- Remedy the effect of any disturbance to the bed and banks of a watercourse.

With respect to pollution of rivers, the following definition is relevant when considering the potential impacts of development on water resources. Pollution may be deemed to occur when the following are affected:

- the quality, pattern, timing, water level and assurance of instream flow;
- the water quality, including the physical, chemical and biological characteristics of the water;
- the character and condition of the in-stream and riparian habitat;
- the characteristics, condition and distribution of the aquatic biota.

The Act defines 'instream habitat' as including the physical structure of a watercourse and the associated vegetation in relation to the bed of the watercourse.

Riparian ecosystems

'Riparian habitat' includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species and physical structure distinct from those of adjacent land areas.

Section 21 deals with the Use of Water

Section 21 (a-k) describes activities defined as a water use under the act. These activities may only be undertaken subject to the application for, and issue of, a water use licence.

Implications for the Inyanda WEF:

- **Appropriate measures must be taken to prevent the pollution of water courses**
- **Riparian zones must be protected**
- **Construction within a water course or within 500 metres of a wetland will require a Water Use licence under section 21 (c) & (i) issued by the Department of Water Affairs (DWA).**

SANBI Working for Wetlands and Rivers:

The South African National Biodiversity Institute (SANBI) compiled a National Wetland Inventory, which aims to map and classify (i.e. type) the major wetlands and water bodies in the country at a coarse spatial scale. A wetland classification system is required for application to the National Wetland Inventory, so that different types of wetlands can be distinguished for management and conservation purposes.

This classification system is intended to be used throughout the country for a number of different applications, largely with a view to facilitating common usage of terminology amongst wetland scientists and managers. However, at the same time, it is envisaged that further refinements to the classification system may be necessary in the future, to address problems that may be encountered in its application by a wide range of different users for a number of different purposes. As such, the classification system presented in this report should not be seen as the final word but, rather, as a "living" work in progress that will be continuously improved.

Three wetland types were found to occur on the study site, namely; Bench flat, channelled valley bottom wetland and unchannelled valley bottom wetland.

Channelled valley bottom - can be described as a wetland that receives most of its water inputs from the following sources; overland flow from adjacent valley-side slopes, lateral seepage or interflow from adjacent hillslope seeps and channel overspill occurs during flooding. Water generally moves through the wetland as diffuse surface flow, although occasional, short-lived concentrated flows are possible during flooding events. Small depressional areas within a channelled valley bottom wetland can result in the temporary containment and storage of water within the wetland.

Bench flat – a near-level wetland area (i.e. with little or no relief) with little or no gradient, situated on a plain or a bench in terms of landscape setting. The primary source of water is precipitation, with the exception of flats along the coast (usually in a plain setting) where the water table (i.e. groundwater) may rise to the surface or near to the surface in areas of little or no relief because of the location near to the base level of the land surface represented by the presence of the ocean. Dominant hydrodynamics are bidirectional vertical fluctuations, although there may be limited multidirectional horizontal water flow in some cases. Water exits in a flat through evaporation and infiltration.

Unchannelled valley bottom - a flat valley-bottom wetland without a major channel running through it, characterised by an absence of distinct channel banks and the prevalence of diffuse flows, even during and after high rainfall events. Water inputs are typically from an upstream channel, as the flow becomes dispersed, and from adjacent slopes (if present) or groundwater. Water generally moves through the wetland in the form of diffuse surface flow and/or interflow (with some temporary containment of water in depressional areas), but the outflow can be in the form of diffuse or concentrated surface flow. Infiltration and evaporation from unchannelled valley-bottom wetlands can be significant, particularly if there are a number of small depressions within the wetland area. Horizontal, unidirectional surface-flow tends to dominate in terms of the hydrodynamics.

Power line option three crosses the 500 m buffer of three unchannelled valley bottom wetlands and Turbines 35, 36 and 38 occur within 500 meters of the bench flat wetland (Figure 3.6). Where practical and feasible, powerline pylons and turbines must be located away from these wetlands. Infrastructure occurring within 500m of these water courses will require a Licence Application from DWA. The DWA will advise whether a general authorisation or a water use license is required.

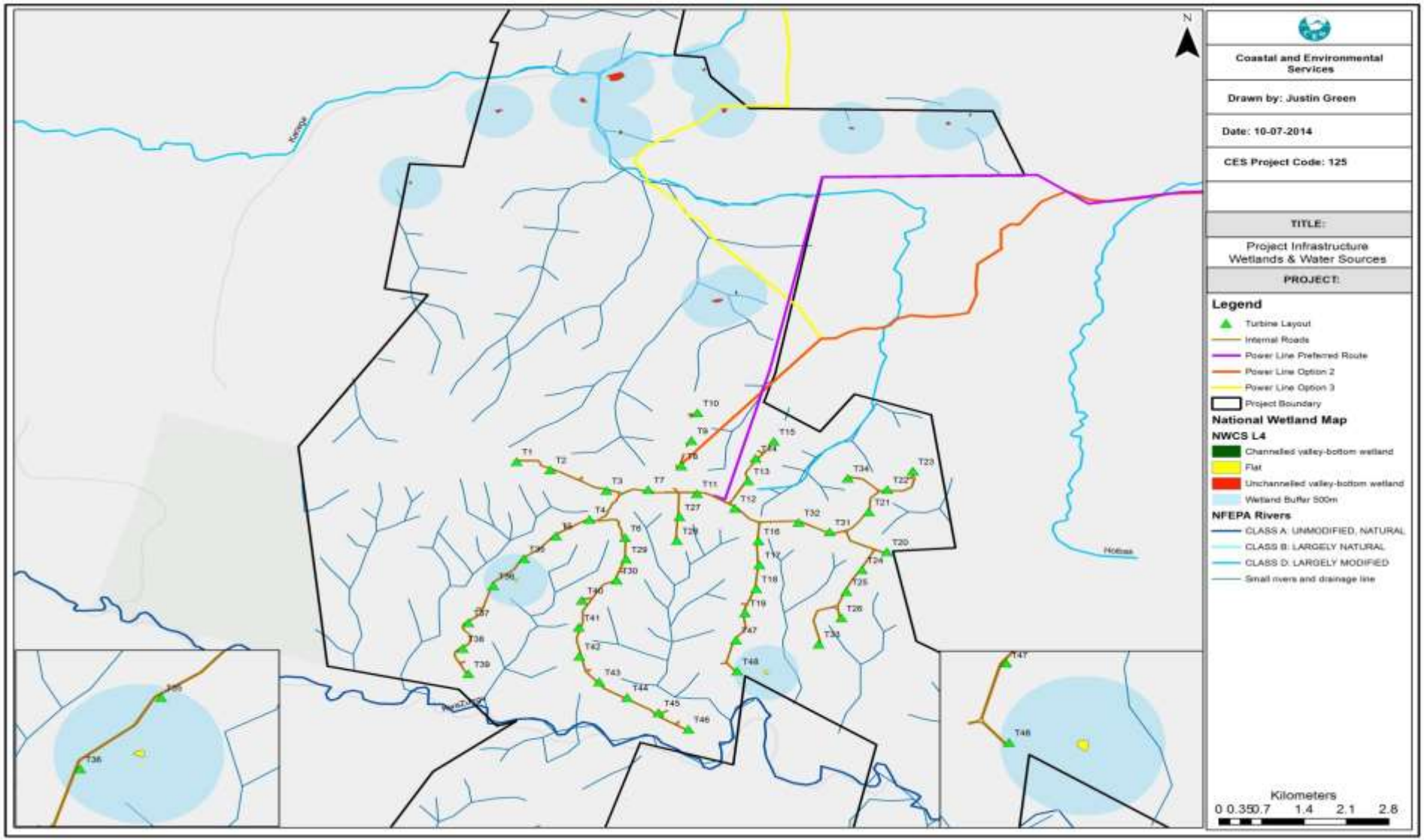

Figure 3.6: SANBI Wetlands and NFEPA Rivers occurring within the proposed project area.

3.6.1 Vegetation types found in the study area

The ecological survey determined the existence of 5 main vegetation types within the study site. These are described in further detail below.

Grassy Fynbos

This vegetation type was found to occur in the southern portion of the project area and occurs on the ridges and spurs of the high lying mountainous regions (Figure 3-7). This vegetation was mostly intact and considered to be in good to moderate condition in the high lying areas of its distribution.

In the lower lying areas this vegetation type became degraded, evident by the loss of shrub cover. In most of the sampled areas this vegetation type consisted of two strata namely the grasses (which had a higher percentage cover) and the shrubs with the occasional tree.

Dominant species included grass species such as *Eragrostis curvula, Cymbopogon plurinodis (Cymbopogon pospischilii), Tristachya rehmannii, Aristida diffusa and Themeda triandra* and short shrub species such as the *Clutia dregeana, Leucadendron salignum, Diospyros villosa and Anthospermum aethiopicum. Bobartia orientalis* was also dominant.

There were a number of *Encephalartos longifolius* (Cycad) individuals located within this vegetation type. There was no evidence of recent livestock grazing in the area.

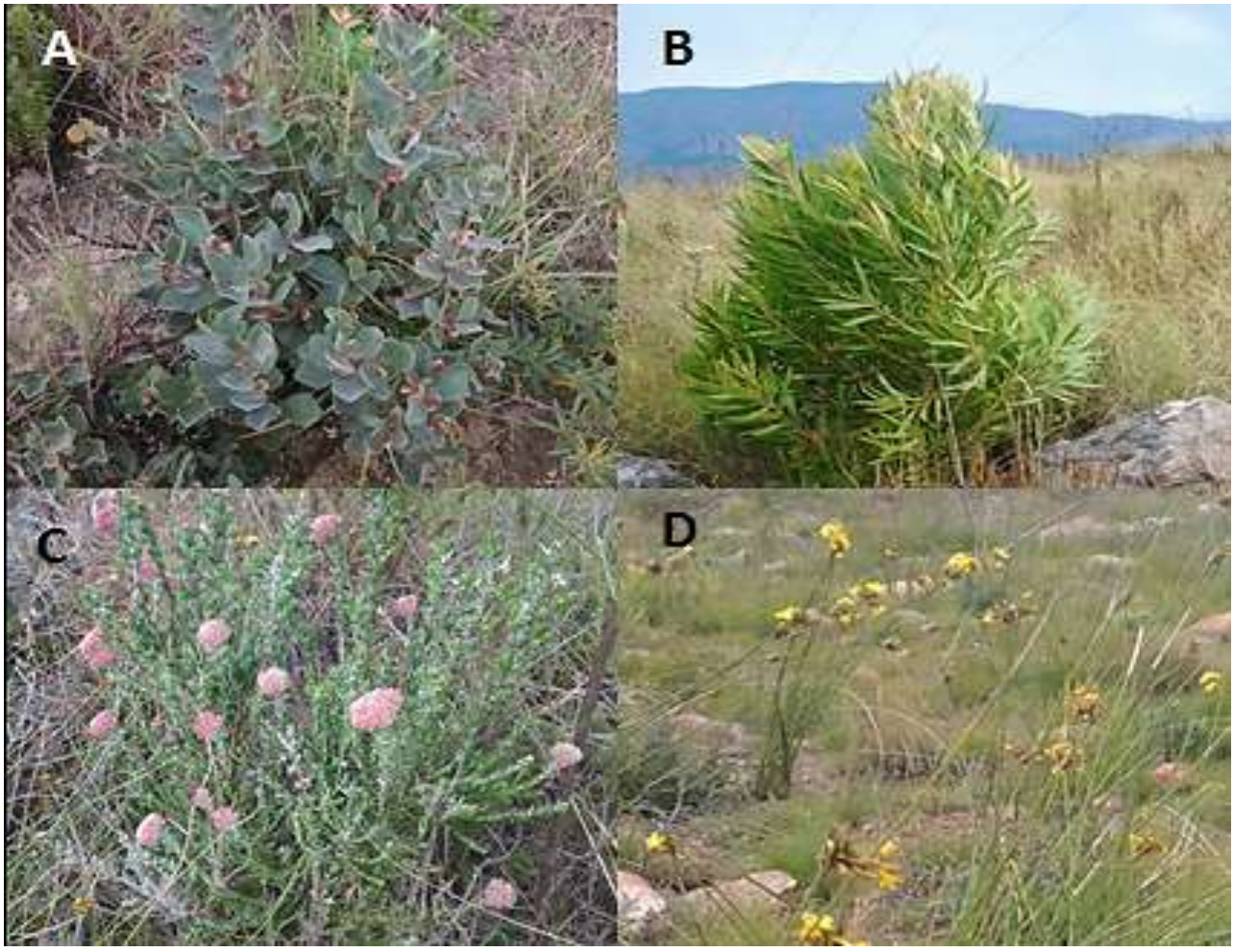

Plate 3-2: Common species found in the grassy fynbos A) *Diospyros villosa* B) *Leucodendron salignum* C) *Metalasia densa* D) *Bobartia orientalis*.

Plate 3-3: *Encephalartos longifolius* a species of special concern was observed on various sites, some were not easy to spot, for example in C and D.

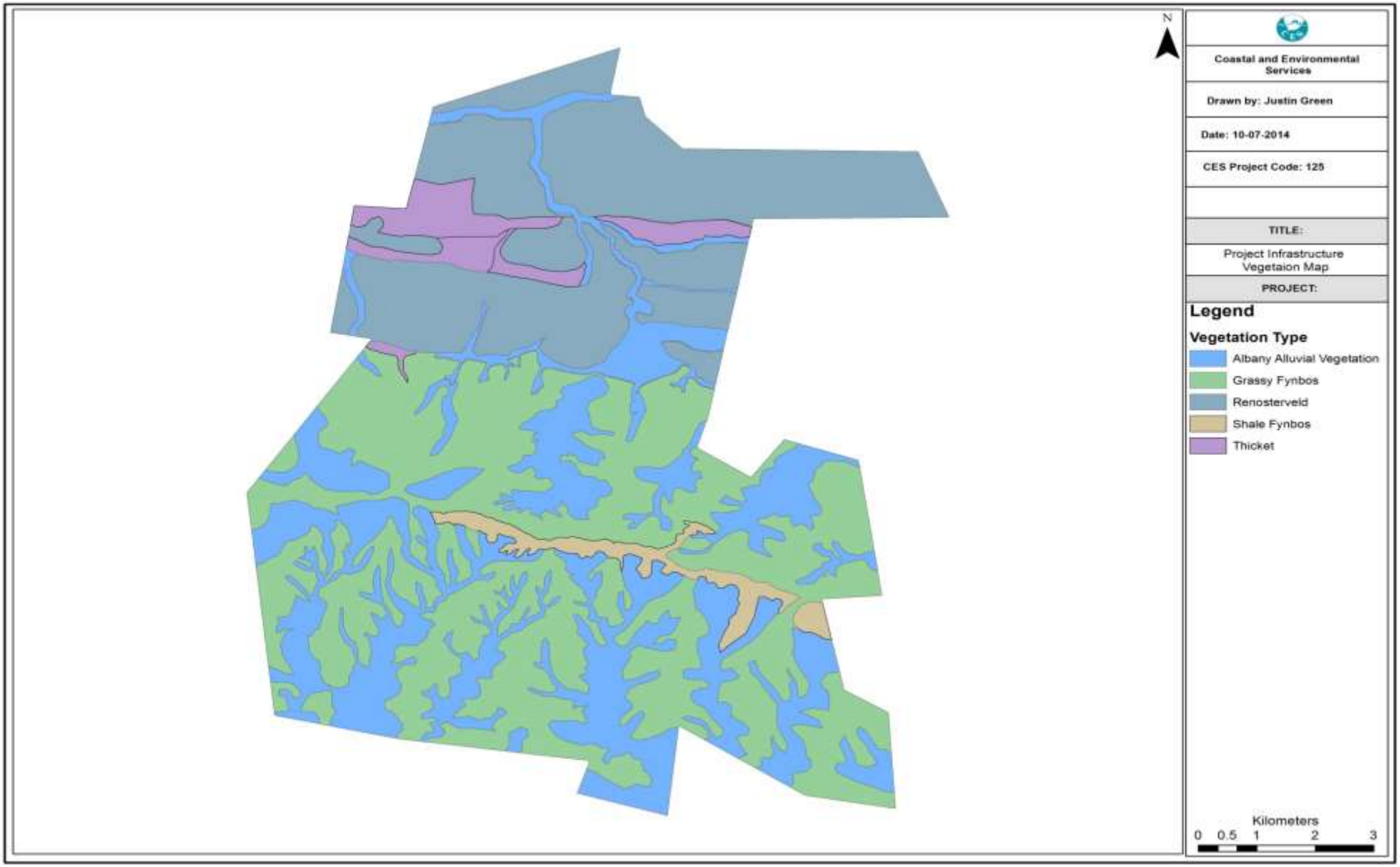

Figure 3-7: Vegetation Map for the Proposed Inyanda WEF.

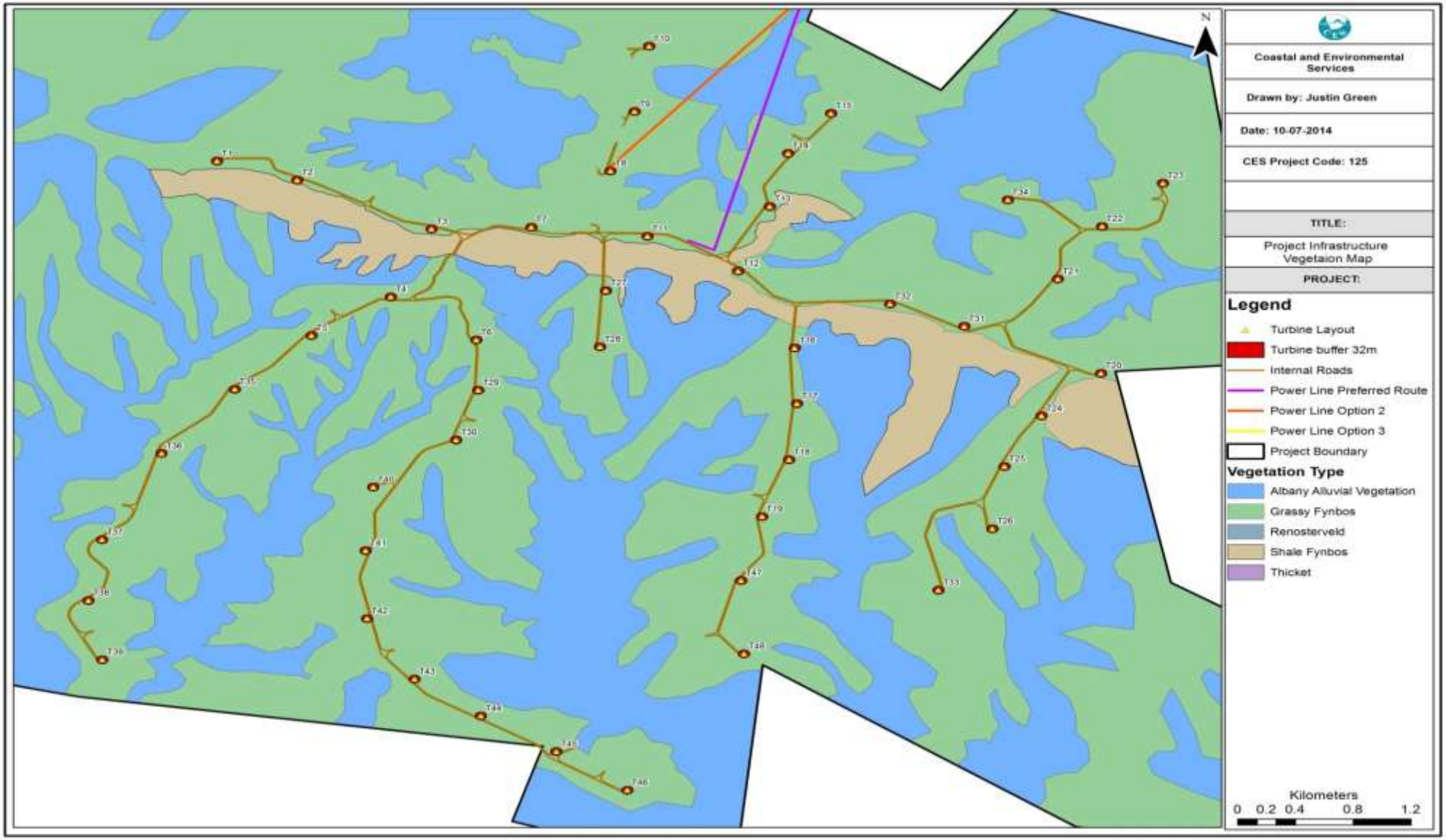

Figure 3-8: Vegetation Map with turbine layout and road access layout for the Proposed Inyanda WEF. A 32 metre buffer has been placed around turbines to account for access roads, transformer, blade unloading & prep area and other infrastructure or activities associated with the turbine.

Shale Fynbos

This vegetation is intact and in good condition and was found to occur as a band that ran along the high lying ridges of southern parts of the project area (Figure 3-7). Common species included *Protea mundii*, *Leucadendron salignum and Protea nerifolia.*

Species such *Metalsia muricata*, *Merxmuellera marcowani and Restio triticeus* were also present.

Plate 3-4: Photograph illustrating the intact Shale fynbos vegetation within the project area.

Plate 3-5: Photoragraph illustrating common species occurring in the shale fynbos (A) *Protea nerifolia* and (B) *Protea mundii*.

Ronosterveld

This vegetation type is characterised by the presence of *Elytropappus rhinoceratis* (Ronestebos) and other common species such as *Aloe ferox.* This vegetation type is associated with the low lying areas in the northern portion of the project area and was fairly degraded as a result of the current land use. Although not directly impacted by the turbines, it is likely that the access roads and power lines will affect this vegetation type.

Plate 3-6: Photograph illustrating the Ronosterveld found within the project area.

Thicket

This vegetation type was characterised by small spinescent trees, succulents and shrubs. It was found to occur in the northern, low lying areas and was associated with gentle slopes.

Common thicket species associated with this vegetation type included *Apodytes dimidiata, Euclea undulata, Brachylaena illicifolia, Cussonia spicata, Schotia afra and Aloe ferox.* The thicket vegetation associated with slopes and at higher altitudes was in moderate condition, becoming degraded in the lower lying areas. This vegetation type will be impacted by the construction of the power lines and access roads.

Plate 3-7: Photograph illustrating the degraded Thicket vegetation within the project area.

Albany Alluvial Vegetation

This vegetation type was found to occur in the riverine areas. It is characterised by tree species such as *Acacia karroo*, *Salix mucronata*, *Schotia afra, Rhus longispina*, *Aloe ferox* and *Dodonea angustifolia*. Reed species such as *Phragmites australis* were also found.

3.6.2 Floristics

The vegetation of the Eastern Cape is complex and is transitional between the Cape and subtropical floras, and many taxa of diverse phytogeographical affinities reach the limits of their distribution in this region. The region is best described as a tension zone where four major biomes converge and overlap (Lubke *et al*. 1988). The dominant vegetation is Succulent Thicket (Spekboomveld or Valley Bushveld), a dense spiny vegetation type unique to this region. While species in the canopy are of subtropical affinities, and generally widespread species, the succulents and geophytes that comprise the understory are of karroid affinities and are often localised endemics.

The study area falls within the Cape Floristic Kingdom which covers nearly 90 000km^2 and stretches from the Cederberg in the north-west, down to the Western Cape coast and into the Eastern Cape. The Cape Floristic Kingdom is a biodiversity hotspot with over 9 600 recorded plant species, 70% of which are endemic to the area.

Species endemic to the area are described by Mucina and Rutherford (2006). In addition to the endemic taxa, there are also a number of species expected to be found in the study area, some of which are listed as protected by various conservation bodies. The list is not complete as many species and taxa require additional study. The taxa with many data deficient species include specifically the *Mesembryanthemaceae* family, as well as members of the *Amaryllidaceae* (Amaryllids), *Iridaceae* (Irises), *Orchidaceae* (Orchids) and *Apocynaceae* (Lianas), as well as members of the genus Aloe.

Potential Species of Conservation Concern (SCC) include all those plants listed in terms of the IUCN, CITES and both national and provincial legislation that may occur in the area of study. The list of potential SCC includes an estimated 450 species which are listed individually by the IUCN red data list (2012), the South African National Biodiversity Institute (SANBI) and the Forests Act.

3.6.3 Plant Species of Conservation Concern

Confirmed SCC were identified from the site visit and have been listed in Table 3-1 and Table 3-2. A full species list of all species found during the site visit has been included in Appendix C. Only *Encephalartos longifolius* found at the project site occurs on the IUCN red data list, two species were listed on Appendix II of the CITES list, namely *Aloe ferox* and *Encephalartos longifolius.*

Two species (*Encephalartos longifolius* and *Pelargonium reniforme*) are listed as Near Threatened on the South African Red Data List, *Agathosma gonaquensis* is listed as Critically Rare and *Kniphofia triangularis* as rare. *Encephalartos longifolius* is listed as a protected tree species under the National Forest Act, 1998 (Act no. 84 of 1998) as well as a protected species under NEM:BA. A number of species are listed as protected species on the Provincial Nature Conservation Ordinance (1974).

It is very likely that more SCC will be found on site in the construction phase of the development, especially along the rocky slopes and ridges. Permits will be required from DAFF and the provincial authorities should any of the protected species listed need to be removed or transplanted.

Table 3-1: Species of Conservation Concern recorded from the site according to the IUCN and SA Red Data List.

Scientific Name	IUCN	SA Red Data Status
Agathosma gonaquensis	-	Critically Rare
Encephalartos longifolius	Near Threatened	Near Threatened
Kniphofia triangularis	-	Rare
Loxostylis alata	-	Declining
Pelargonium reniforme	-	Near Threatened

Table 3-2: Species of Conservation Concern recorded from the site according to CITES, Protected Tree Species, NEMBA and PNCO.

Scientific Name	CITES	Protected Tree Species	NEMBA	PNCO
Aloe ferox	Appendix II	-	-	-
Bobartia orientalis	-	-	-	Schedule 4
Carpobrotus edulis	-	-	-	Schedule 4
Diascia capsularis	-	-	-	Schedule 4
Encephalartos longifolius	Appendix II	Protected tree	Protected Species	Schedule 3
Erica cerinthoides	-	-	-	Schedule 4
Erica cf chamissonis	-	-	-	Schedule 4
Erica cf copiosa	-	-	-	Schedule 4
Erica imbricate	-	-	-	Schedule 4
Geissorhiza heterostyla	-	-	-	Schedule 4
Kniphofia triangularis	-	-	-	Schedule 4
Lampranthus spectabilis	-	-	-	Schedule 4
Leucadendron salignum	-	-	-	Schedule 4
Leucospermum cuneiforme	-	-	-	Schedule 4
Protea foliosa	-	-	-	Schedule 4
Protea lanuginosa subs. Intermedia	-	-	-	Schedule 4
Protea mundii	-	-	-	Schedule 4
Protea nerifolia	-	-	-	Schedule 4
Protea nitida	-	Protected tree	-	Schedule 4

Table 3-3: SCC found within each turbine. Other SCC may have been observed in the Renosterveld, Thicket, Shale fynbos and Albany Alluvial Vegetation where turbines will not be placed, but maybe affected by access roads, powerlines and infrastructure associated with the proposed development.

Site	Turbine No.	SCC found on turbine site	Comment and Recommendations
1	7	* *Bobartia orientalis* * *Erica cf copiosa* * *Lampranthus spectabilis* * *Protea foliosa,* * *Protea nerifolia*	* This turbine occurs on Grassy Fynbos vegetation, this site was in good condition. This site had a good shrub cover dominated by grass species. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/destruction of species which are listed as Schedule 4 under the PNCO (eg. *Erica cf copiosa*)
2	8	* *Lampranthus spectabilis* * *Bobartia orientalis* * *Leucadendron salignum*	* This turbine occurs on Grassy Fynbos vegetation and site was degraded. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/ destruction of species which are listed as Schedule 4 under the PNCO (eg *Lampranthus spectabilis*)
3	4	* *Encephalartos longifolius* * *Bobartia orientalis* * *Leucadendron salignum*	* This turbine occurs on grassland vegetation and was a less sensitive area (fair condition, with some degradation) * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit is required to remove Protected Trees, PNCO species and Species which are listed on NEMBA (eg. *Encephalartos longifolius*)

Site	Turbine No.	SCC found on turbine site		Comment and Recommendations
4	6	* *Encephalartos longifolius* * *Bobartia orientalis* * *Carpobrotus edulis*	* *Geissorhiza heterostyla* * *Lampranthus spectabilis* * *Leucadendron salignum*	* Turbine occurs in Grassy fynbos, was in good condition and sensitive due to the presence of SCC species such as *Encephalartos longifolius*. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit is required to remove Protected Trees, PNCO species and Species which are listed on NEMBA (eg. *Encephalartos longifolius*)
5	45	* *Encephalartos longifolius,* * *Bobartia orientalis* * *Protea lanuginose subs. intermedia*	* *Erica cf chamissonis* * *Leucadendron salignum* * *Leucospermum cuneiforme* * *Protea nitida*	* This turbine occurs on Grassy Fynbos vegetation and site was is in good condition. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit is required to remove Protected Trees, PNCO species and Species which are listed on NEMBA (eg.*Protea nitida*)
6	44	* *Bobartia orientalis*	* *Leucadendron salignum*	* This turbine occurs on Grassy Fynbos vegetation and site was is in good condition. * These species must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/ destruction of species which are listed as Schedule 4 under the PNCO (eg. *Leucadendron salignum*)
7	43	* *Bobartia orientalis*	* *Leucadendron salignum*	* This turbine occurs on grassland vegetation and was a less sensitive area (high bare areas).

Site	Turbine No.	SCC found on turbine site	Comment and Recommendations
			* SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/ destruction of species which are listed as Schedule 4 under the PNCO (eg. *Leucadendron salignum*)
8	5	* *Encephalartos longifolius* * *Bobartia orientalis* * *Lampranthus spectabilis* * *Leucadendron salignum*	* This turbine occurs on Grassy Fynbos vegetation; site showed signs of disturbance but was in a fair condition. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit is required to remove Protected Trees, PNCO species and Species which are listed on NEMBA (eg. *Encephalartos longifolius*)
9	35	* *Bobartia orientalis* * *Carpobrotus edulis* * *Erica cf chamissonis* * *Erica imbricate* * *Leucadendron salignum*	* This turbine occurs on Grassy Fynbos vegetation with a high grass cover. The site was in good condition. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/ destruction of species which are listed as Schedule 4 under the PNCO (eg. *Leucadendron salignum*)
10	36	* *Bobartia orientalis* * *Erica cf chamissonis* * *Erica imbricate* * *Leucadendron salignum* * *Leucospermum cuneiforme*	* This turbine occurs on Grassy Fynbos vegetation; site showed signs of disturbance but was in a fair condition. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting

Site	Turbine No.	SCC found on turbine site	Comment and Recommendations
			process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/ destruction of species which are listed as Schedule 4 under the PNCO (e.g. *Erica imbricate*)
11	37	* *Bobartia orientalis* * *Erica imbricate*	* This turbine occurs on Grassy Fynbos vegetation, this site was in good condition. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit is required to remove Protected Trees, PNCO species and Species which are listed on NEMBA (eg. *Erica imbricate*)
12	30	* *Pelargonium reniforme* * *Bobartia orientalis* * *Erica cerinthoides*	* This turbine occurs on Grassy Fynbos vegetation. This vegetation was dominated by reeds. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/ destruction of species which are listed as Schedule 4 under the PNCO (eg. *Leucospermum cuneiforme*)
13	40	* *Pelargonium reniforme* * *Bobartia orientalis* * *Leucospermum cuneiforme*	* This turbine occurs on Grassy Fynbos vegetation dominated by shrub species. This area was in good condition. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/relocation of species which are listed as Schedule 4 under the PNCO (eg. *Leucospermum*

Site	Turbine No.	SCC found on turbine site		Comment and Recommendations
				cuneiforme)
14	41	* *Pelargonium reniforme* * *Agathosma gonaquensis*	* *Bobartia orientalis*	* This turbine occurs on Grassy Fynbos vegetation dominated by shrub species. This area was in fair condition. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/ destruction of species which are listed as Schedule 4 under the PNCO (eg. *Agathosma gonaquensis*)
15	42	* *Pelargonium reniforme* * *Bobartia orientalis*	* *Erica imbricate*	* This turbine occurs on Grassy Fynbos vegetation. * This site was dominated by grasses, and had a low species composition. * Site was not in good condition (degraded). * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit is required to remove Protected Trees, PNCO species and Species which are listed on NEMBA (eg. *Erica imbricate*)
16	12	* *Pelargonium reniforme* * *Bobartia orientalis*	* *Diascia capsularis* * *Erica cerinthoides*	* This turbine occurs on Grassy Fynbos vegetation; this site had a high shrub cover and was in good condition. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit is required to remove Protected Trees, PNCO species and

Site	Turbine No.	SCC found on turbine site		Comment and Recommendations
				Species which are listed on NEMBA (eg. *Erica imbricate*)
17	18	* *Pelargonium reniforme* * *Bobartia orientalis* * *Erica imbricate*	* *Leucadendron salignum* * *Leucospermum cuneiforme*	* This turbine occurs on Grassy Fynbos vegetation; this site was burnt and had a low shrub cover. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit is required to remove Protected Trees, PNCO species and Species which are listed on NEMBA (eg. *Erica imbricate*)
18	17	* *Kniphofia triangularis* * *Encephalartos longifolius* * *Bobartia orientalis* * *Erica imbricate*	* *Lampranthus spectabilis* * *Leucadendron salignum* * *Protea foliosa*	* This turbine occurs on Grassy Fynbos vegetation, some areas of this site were burnt. The site is sensitive, having a high number of species present. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit is required to remove Protected Trees, PNCO species and Species which are listed on NEMBA (eg. *Encephalartos longifolius and Kniphofia triangularis*)
19	16	* *Pelargonium reniforme* * *Agathosma gonaquensis*	* *Bobartia orientalis* * *Leucadendron salignum*	* This turbine occurs on Grassy Fynbos vegetation and was in a fair condition. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist.

Site	Turbine No.	SCC found on turbine site	Comment and Recommendations
			* A permit is required to remove Protected Trees, PNCO species and Species which are listed on NEMBA (eg. *Leucadendron salignum*)
20	11	* *Agathosma gonaquensis* * *Erica cf chamissonis* * *Leucadendron salignum*	* This turbine occurs on Grassy Fynbos vegetation and was in a fair condition. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specigfvgalist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit is required to remove Protected Trees, PNCO species and Species which are listed on NEMBA (eg. *Erica cf chamissonis*).
21	2	* *Bobartia orientalis* * *Carpobrotus edulis* * *Leucadendron salignum*	* This turbine occurs on Grassy Fynbos vegetation (interface with thicket vegetation, few thicket species are found in this area) * Site is burnt (experienced fire recently). * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/ destruction of species which are listed as Schedule 4 under the PNCO (eg. *Leucadendron salignum*)
22	3	* *Agathosma gonaquensis* * *Encephalartos longifolius* * *Bobartia orientalis* * *Carpobrotus edulis* * *Leucadendron salignum*	* This turbine occurs on Grassy Fynbos vegetation (interface with thicket vegetation, few thicket species are found in this area) * Site is in a fair condition. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting

Site	Turbine No.	SCC found on turbine site	Comment and Recommendations
			process and the final site must be approved by the ECO and vegetation specialist. * A permit is required to remove Protected Trees, PNCO species and Species which are listed on NEMBA (eg. *Encephalartos longifolius*)
23	9	* *Bobartia orientalis* * *Erica imbricate* * *Leucadendron salignum* * *Leucospermum cuneiforme*	* This turbine occurs on Grassy Fynbos vegetation (interface with thicket vegetation, few thicket species are found in this area). * The site was burnt and degraded due to the road created in the area. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/ destruction of species which are listed as Schedule 4 under the PNCO (eg. *Erica imbricate*)
24	10	* *Bobartia orientalis* * *Leucadendron salignum* * *Leucospermum cuneiforme*	* This turbine occurs on Grassy Fynbos vegetation, this site was not in good condition as there were rocks laid upon the vegetation. * SCC must be conserved onsite through transplanting, some may be difficult to transplant eg. *Borbartia orientalis*. The appointed Environmental Control Officer (ECO), Construction Manager and a vegetation specialist must be consulted during the transplanting process and the final site must be approved by the ECO and vegetation specialist. * A permit will be required for the removal/ destruction of species which are listed as Schedule 4 under the PNCO (eg. *Erica imbricate*)

3.6.4 Invasive and problematic species

Only three alien invasive species were identified on site; *Acacia mearnsii* (Black Wattle), *Cuscuta campestris* (Dodder) and *Pinus sp.*

The control of alien invasive plant species is controlled by the Alien and Invasive Species Regulations (published on the 19 July 2013) under the National Environmental Management: Biodiversity Act (NEM:BA) 2004 (Act NO, 10 of 2004) as well as the Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983) (CARA). Regulations 15 and 16 under this Act, which concern problem plants, were amended during March 2001.

Acacia mearnsii is listed as a category 2 weed on the National List of Invasive Species in Terms of Section 70(1)(A) and is listed as a category 2 weed under CARA (Act No 43 of 1983). *Cuscuta campestris* is also listed as a Category 1b weed on the National List of Invasive Species in Terms of Section 70(1)(A) and under CARA (Act No 43 of 1983). The implications associated with these species are outline below.

The Pinus species could not be identified to the species level, thus one could not determine the category that it falls in, measures to control this species are advised such as clearing or other alien management methods that maybe used. Monitoring of the project area of any alien species that may have been missed and those that maybe introduced due to the disturbance of the project is advised.

According to the National Environmental Management: Biodiversity Act (NEM:BA) 2004 (Act NO, 10 of 2004).

Category 1b weeds are:

1) Are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be contained.
2) A landowner upon whose land a Category 1 b Listed Invasive Species occurs and which species is under the landowner's control must:
    (a) comply with the provisions of section 73(2) of the Act; and
    (b) contain the listed invasive species in compliance with section 75 (1), (2) and (3) of the Act;
3) If an Invasive Species Management Programme has been developed in terms of regulation 7, a landowner must control the listed invasive species in accordance with such programme.
4) A landowner 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 containment of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in regulation 7.

Category 2 weeds are:

1) 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, the Fish Sanctuary Areas, within National Parks Provincial Reserves, Mountain Catchment areas or Forestry Reserves specified in the Protected Areas Act, or in the Permit as the case may be.
2) Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit.
3) A landowner on whose land a Category 2 Listed Invasive Species occurs must ensure that the specimens of the species do not spread outside of the land or the area specified in the permit.
4) Unless otherwise specified in the List, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in subregulation (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.

5) Individual specimens of listed invasive plant species that are declared as National Heritage Trees or National Monuments, in terms of the National Heritage Act 1999, (Act No. 25 of 1999), are Category 2 specimens.

Combating of category 2 plants (Section 15B) according to CARA (Act No 43 of 1983)

1) Category 2 plants may not occur on any land or inland water surface other than a demarcated area or a biological control reserve.
2)
    a. The executive officer may on application in writing demarcate an area as an area where category 2 plants may occur, be established and be maintained.
    b. An area in respect of which a water use license for stream flow reduction activities has been issued in terms of section 36 of the National Water Act, 1998 (Act No. 36 of 1998) shall be deemed to be a demarcated area.
3) The executive officer shall demarcate an area for the occurrence, establishment and maintenance of category 2 plants only if –
    a. the category 2 plants in the area are cultivated under controlled circumstances; and
    b. the land user concerned has been authorised to use water in terms of the National Water Act, 1998 (Act No. 36 of 1998); and
    c. the category 2 plants or products of category 2 plants in the area are demonstrated to primarily serve a commercial purpose, use as a woodlot, shelter belt, building material, animal fodder, soil stabilisation, medicinal or other beneficial function that the executive officer may approve; and
    d. all reasonable steps are taken to curtail the spreading of propagating material of the category 2 plants outside the demarcated areas.
4) When an area is demarcated for the occurrence, establishment and maintenance of category 2 plants the executive officer may impose such additional conditions as may reasonably be deemed necessary to keep the category 2 plants in the area in check.
5) No person shall sell propagating material of category 2 plants or any category 2 plants to another person unless such other person is a land user of a demarcated area or of a biological control reserve.
6) No person shall acquire propagating material of category 2 plants or any category 2 plants unless such material or such plants are intended for use in a demarcated area or in a biological control reserve.
7) Propagating material of category 2 plants or category 2 plants shall only be imported or sold in accordance with the provisions of the Plant Improvement Act, 1976 (Act No. 53 of 1976), the Agricultural Pests Act, 1983 (Act No. 36 of 1983) and the environment conservation regulations.
8) A land user shall control any category 2 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
9) Unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.
10) The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with one or more of the requirements of sub-regulations (1), (3), (5), (6), (8) and (9) on such conditions as the executive officer may determine in each case.

4. ANIMAL SPECIES

4.1 Amphibians and Reptiles in the study

Amphibians and reptiles are well represented in sub-Saharan Africa. However, distribution patterns in southern Africa are uneven both in terms of species distribution and in population numbers (du Preez and Carruthers, 2009). Climate, centres of origin and range restrictions are the three main factors that determine species distribution. The eastern coast of South Africa has the highest amphibian diversity and endemicity while reptile diversity is generally highest in the north eastern extremes of South Africa and declines to the south and west (Alexander and Marais, 2010).

4.1.1 Amphibians General

During the one day site visit, only two (the Clicking River Frog and the Cape River Frog) out of a potential 13 species were recorded from the study site (Appendix B). The two species recorded are winter breeders, explaining their presence. In optimal breeding conditions (eg. summer) more species would be expected to be found in the area. All the species that are expected to occur in the project area are common and widespread and of no conservation concern (see Appendix B). All species are dependent on temporary pools or streams for breeding, except for the Rain Frog (*Breviceps a. pentheri*) which is a terrestrial breeder. No evidence of the endangered Hewitt's ghost Frog was found on the project site (see section 4.2.1).

4.1.2 Reptiles General

During the survey only two (Common mountain lizard and Spotted tick-toed gecko) out of a potential 66 species were recorded in the study site (Appendix B). This was due to most reptile activity having already ended as the colder winter months approach. It is expected that a high number of potential species are present in the project area due to the presence of varying vegetation types that range from grassy and shale fynbos on the southern slopes to Karooid vegetation on the northern slopes. The fynbos habitat (especially the restios) is the ideal habitat for the Dwarf Chameleons (see section 4.2.2).

4.2 Species of Conservation Concern (SCC)

4.2.1 Hewitt's Ghost Frog (Heleophryne hewitti)

Hewitt's ghost frog is an endangered species only known from two confirmed locations, the Elandsberg Mountains and Cockscomb Mountains. Three more localities (Enkeldoorn-, Diep- and Wittiver) in the Baviaanskloof WHS site discovered by Richard Boycott in the mid-80s may be assigned to this species. Subsequent surveys (Burger, Clark & Smith in 1995; Burger & Tolley in 2006) confirmed the presence of this species at only one of the sites (eg. Enkeldoorn), but at very low numbers. Recent target surveys conducted by Port Elizabeth Museum and ECPTA of both Enkeldoorn and Diepriver site failed in finding this species and it may be an indication that these populations may be extinct due to climate change. It is thought that this frog could also occur in Groendal Nature Reserve (UNEP 2006, Burger 1994) but no confirmed records of this exist (Conradie *et al.* 2012).

Thus surveying the kloofs in the current project site is very important to determine the presence/absence of the species. Although the streams had running water at the time of the site visit in late May, they seem not to be perennial enough to hold a viable population. These species are restricted to perennial streams and the tadpoles have an extended larval period of 18+ months and can't tolerate dry conditions. It cannot be stated with confidence however that the frog does not occur elsewhere on the project site and additional surveys of the remaining potentially suitable habitat on the project site are required.

Plate 4-1: Forested gorge with flowing stream, potential Ghost Frog habitat

4.2.2 Groendal Dwarf Chameleon (Bradypodion sp. "sp4")

The status of the cryptic Groendal dwarf chameleon is still unresolved and has been proposed to be a separated undescribed species. It is closely related to the Elandsberg chameleon (*Bradypodion taeniabronchum*) from the Elandsberg mountain range, but morphologically it is similar to the Baviaanskloof dwarf chameleon and the beardless dwarf chameleon (Tolley & Burger 2004). As yet these three species are undescribed and thus not assessed against IUCN standards. Morphology and landscaping techniques are needed to define these species (K. Tolley pers. comm.).

The whole of the project site, except for the northern sections, have suitable habitat for this species and it is highly likely to occur within the project site.

Plate 4-2: Ideal habitat for Dwarf Chameleons, eg. Fynbos with restios.

4.2.3 Baviaanskloof Flat Gecko (Afroedura sp. "Kouga")

Recently a new species of Flat Gecko was discovered from Cockscomb area, less than 25km west from project site. It is highly likely this species will occur on the project site, but will be restricted to larger north facing rocky outcrops. Thus very unlikely to be affected by the construction of the wind farm. It is recommended that more surveys need to be conducted in the area to determine the presence of this species on the project site.

4.2.4 Threatened Species

The only Red List species that may occur on the project site is the Elandsberg chameleon (*Bradypodion taeniabronchum*) (Table 4-1). The taxonomy between this species and the Groendal dwarf chameleon is still unresolved and may represent an undescribed species (see section 4.2.2 above). If a separated species it will also be regarded as rare and listed by IUCN. They are restricted to montane fynbos (especially restios).

4.2.5 CITES Species

Ten reptile species of special concern (Elandsberg Dwarf Chameleon – *Bradypodion taeniabronchum*, Eastern Cape Dwarf Chameleon – *Bradypodion ventrale*, Cape Girdle Lizard – *Cordylus cordylus*, Karoo Girdle Lizard - *Karusasaurus polyzonus*, Rock Monitor – *Varanus albigularis*, Water Monitor – *Varanus niloticus*, Leopard Tortoise – *Stigmochelys pardalis*, Angulate Tortoise – *Chersina angulata*, Parrot-beaked Dwarf Tortoise – *Homopus areolatus*, and Tented Tortoise – *Psammobates tentorius*) are listed on Appendix II of CITES (Table 4-1). CITES protects the international trade of species.

Table 4-1: Reptile species of SCC likely to be encountered in the project area and surrounds.

Full Name	*Scientific Name*	IUCN	CITES
Elandsberg Dwarf Chameleon	*Bradypodion taeniabronchum*	ED	II
Eastern Cape Dwarf Chameleon	*Bradypodion ventrale*		II
Angulate Tortoise	*Chersina angulata*		II
Cape Girdle Lizard	*Cordylus cordylus*		II
Parrot-beaked Dwarf Tortoise	*Homopus areolatus*		II
Karoo Girdle Lizard	*Karusasaurus polyzonus*		II
Tented Tortoise	*Psammobates tentorius*		II
Leopard Tortoise	*Stigmochelys pardalis*		II
Rock Monitor	*Varanus albigularis*		II
Water Monitor	*Varanus niloticus*		II
Total	***10***	**1**	**10**

4.2.6 Mammals (excluding bats)

Large game makes up less than 15% of the mammal species in South Africa and a much smaller percentage in numbers and biomass. In developed and farming areas, this percentage is greatly reduced, with the vast majority of mammals present being small or medium-sized.

The conservation status of South African mammals has recently been re-assessed and a number of species have been downgraded, for example, the African wild cat, Aardvark, Blue duiker, and Honey badger are no longer considered threatened.

According to NEMBA, three protected mammal species and one vulnerable species have distributions that coincide with the project area (Table 4-2). Based on habitat availability it is likely that all four of these species are likely to occur on site (Stuart and Stuart, 2007).

One species (the White tailed mouse) is listed as Endangered by the IUCN red data list and may occur on the site

During the site visit termite mounds, vervet monkeys and mountain Rheebucks were observed and there was evidence of porcupines in the area. Baboons were heard in the kloofs. Based on available habitat it is likely that species such as kudu, Cape Fox, Leopards are present. Leopards are discussed in further detail below.

Table 4-2: Mammals of conservation concern likely to be found within the project site.

Scientific Name	Common Name	IUCN	NEMBA
Atelerix frontalis	South African hedgehog	-	Protected
Mystromys albicaudatus	White-tailed mouse	EN	
Panthera pardus	Leopard	NT	Vulnerable
Mellivora capensis	Honey Badger	-	Protected
Vulpes chama	Cape Fox	LC	Protected

Leopards

Of conservation importance in the Bavianskloof Mega Reserve is the presence of leopard populations. Internationally this species is classified as Near Threatened. In South Africa this species is listed by NEM:BA (2004) as vulnerable meaning that it faces *"a high risk of extinction in the wild in the medium-term future, although they are not critically endangered".*

The Centre for African Conservation Ecology (ACE) estimate that there are between 10-17 individuals living in the BMR and that one of the major threats to this population is its vulnerability to becoming genetically isolated. Recent studies on leopard populations in the south eastern and western region of South Africa suggest that at least 21 individuals occur in the Cape Fold Mountains with nearly half of these originating between Addo Elephant National Park in the east and Uniondale in the west (Jeanine McManus pers. comm.; 2013).

The data collected from this study raises concerns that further habitat fragmentation in this area will result in further isolating these populations, especially since leopards are territorial animals with large home ranges (30 000ha for males and 15 000 for females).

Based on habitat availability and because the project area is located between two protected areas (Groendal Nature Reserve) it is very likely that this area is inhabited by leopards.

Birds and bats are being monitored by bird and bat specialists and don't form part of this report

5. CONSERVATION AND PLANNING TOOLS

Several conservation planning tools can be applied to this site. These tools allow for the determination of any sensitive and important areas from a vegetation and faunal point of view. They allow for the fine-tuning of plans with a view to reducing potential environmental impacts at the planning stage of the development. The tools used are outlined in Table 5-1.

Table 5-1: Conservation Planning Tools

Tool	Motivation	Relevancy	Notes
NATIONAL TOOLS			
Protected Areas	Protected areas are areas that are already conserved. Areas in close proximity to the proposed development may be affected by the development and thus must be taken into account.	Relevant. The study site falls between 3 portions of the Groendal Nature Reserve (Figure 5-1).	Protected areas and their relevance to the project are described below (Section 5.1.).
Protected Areas Expansion Strategy	The objective of the PAES is to form an overarching strategic framework for a protected area network that 'conserves a comprehensive, representative and adequate sample of biodiversity and maintains key ecological processes across the landscape and seascape.' The areas earmarked by this study should be protected.	Relevant. The study site falls within the Baviaans-Addo NPAES (Figure 5-1).	NPAES and their relevance to the project are described below (Section 5.2).
National Wetlands Inventory	Wetlands are very important aspects of the ecosystem as they are process areas. Not only do they form habitat for both flora and fauna, they also perform vital ecosystem functions. It is for this reason that wetlands are always rated with a high sensitivity and should be conserved.	Relevant. The cables and access roads are likely to cross at least one water course (Figure 5-2).	Wetlands and their relevance to the project are described below (Section 5.3.).
National List of Ecosystems that are Threatened and in need of Protection. (NEMBA, Act 10 of 2004)	The National Environmental Management: Biodiversity Act provides a list of threatened terrestrial ecosystems. This has been established as little attention has historically been paid to the protection of ecosystems outside of protected areas. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems.	Threatened ecosystem occurs in the northern portions where proposed project will not pose a threat. (Figure 4.2)	N/A
PROVINCIAL TOOLS			
STEP	The Subtropical Thicket Ecosystem Planning Project maps vegetation and assigns	Relevant. The northern portion of the project site falls into the STEP category	STEP conservation areas and their

	each of these a conservation criterion. It is very important in determining sensitivity.	ENDANGERED and VULNERABLE. A small section of the southern portion of the project site is classified as VULNERABLE. The rest of the area is classified as CURRENTLY NOT VULNERABLE (Figure 5-3).	planning tools described below (Section 5.4).
The Eastern Cape Biodiversity Conservation Plan (ECBCP)	The Eastern Cape Biodiversity Conservation Plan (ECBCP) is responsible for mapping areas that are priorities for conservation in the province, as well as assigning land use categories to the existing land depending on the state that it is in (Berliner et al. 2007). Critical Biodiversity Areas (CBAs) are defined as "terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning".	Relevant. The proposed project site occurs in areas classified as Critical Biodiversity Areas (CBA) 1, 2 and 3(Figure 4-4).	CBA's and their relevance are discussed further in section 5.5.
MUNICIPAL TOOLS			
SRVM Biodiversity Sector Plan	Provides information on biodiversity for the SRVM to assist in planning procedures. Developed in 2012, this plan is a finer scale revision of the ECBCP CBA map and the STEP map and was developed specifically for the SRVM. This tool divides the landscape into formal Protected Areas, Critical Biodiversity Areas, Ecological Support Areas, Other Natural Areas and No Natural Areas Remaining. The first 3 categories should be maintained in a natural or near natural state with only low intensity developments possible. The last 2 categories can be targeted for sustainable development.	**Relevant.** The central portion of the site is defined as an "Critical Biodiversity Area" and areas where power lines and underground cables will be placed are defined as "Ecological Support Area".	The SRVM BSP and its relevance is discussed further in section (Section 5.6)

5.1 Protected Areas

According to the National Environmental Management: Protected Areas (Act No 57 of 2003) the declaration of protected areas is:

- "to protect ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes in a system of protected area;
- to preserve the ecological integrity of these areas;
- to conserve biodiversity in these areas;
- to protect areas representative of all ecosystems, habitats and species naturally occurring in South Africa;
- to protect South Africa's threatened or rare species;

- to protect an area which is vulnerable or ecologically sensitive;
- to assist in ensuring the sustained supply of environmental goods and services;
- to provide for the sustainable use of natural or biological resources;
- to create or augment destinations for nature based tourism;
- to manage the inter-relationship between natural environment biodiversity, human settlement and economic development;
- generally to contribute to human, social, cultural, spiritual and economic development;
- to rehabilitate and restore degraded ecosystems and promote the recovery of endangered and vulnerable species"

The project site is located between three portions of the Groendal Nature Reserve (Figure 5-1) and lies within an area identified as a National Protected Expansion Strategy Area (see further details below).

5.2 Protected Areas Expansion strategy

A National Spatial Biodiversity Assessment was conducted in 2004, revealing a lack of protection for a representative sample of the country's biodiversity, nor conserving adequate process areas. The Protected Areas Expansion Strategy allows for increased conservation of these aspects of the country in order to meet national biodiversity targets. The strategy outlines two methods of expanding the current National Protected Areas:

- For public land, the declaration of available, under-utilised and strategic parcels of public land in concordance with the relevant legal requirements for disposal of such land;
- For private land, contractual agreements with the affected landowners.

An area is considered important for expansion if it contributes to meeting biodiversity thresholds, maintaining ecological processes or climate change resilience. Forty-two focus areas for land-based protected area expansion have been identified and are composed of large, intact and fragmented areas suitable for the creation or expansion of large protected areas. The project area occurs within the National Protected Area Expansion Strategy (NPAES) (Figure 5-1). The majority landowner of the project area land portions has indicated his willingness to engage with the relevant panning authorities Eastern Cape Parks and Tourism Agency (ECPTA) and SANParks as to the viability of utilising these land portions as a connectivity corridor between two Groendal Nature Reserve portions.

5.3 Subtropical Thicket Ecosystem Planning (STEP) Project

STEP was developed originally in 2003 in order to provide conservation and planning tools for the STEP region (Pierce and Mader 2006). The STEP region is the region containing the Subtropical Thicket Biome and its constituents, as well as those biomes closely related to it. The STEP region includes 6 Biomes and forms a Bioregional Programme. A Bioregional Programme is defined by Pierce and Mader (2006 pg 27) as: *"Bioregional programmes are initiatives that aim to secure the conservation of priority biodiversity within a specific biome or bioregion, involving a variety of stakeholders*". The aims include (pg 28):

- Promote the conservation of biodiversity both within and outside protected areas;
- Promote the sustainable use of natural resources and the development of sustainable livelihoods based on principles of sustainable land-use management- a "biodiversity economy";
- Strengthen partnerships, institutions and governance and continue to involve communities throughout the lifespan of the programme; and
- Support implementation of projects and guide them to ensure that funds achieve maximum conservation benefit.

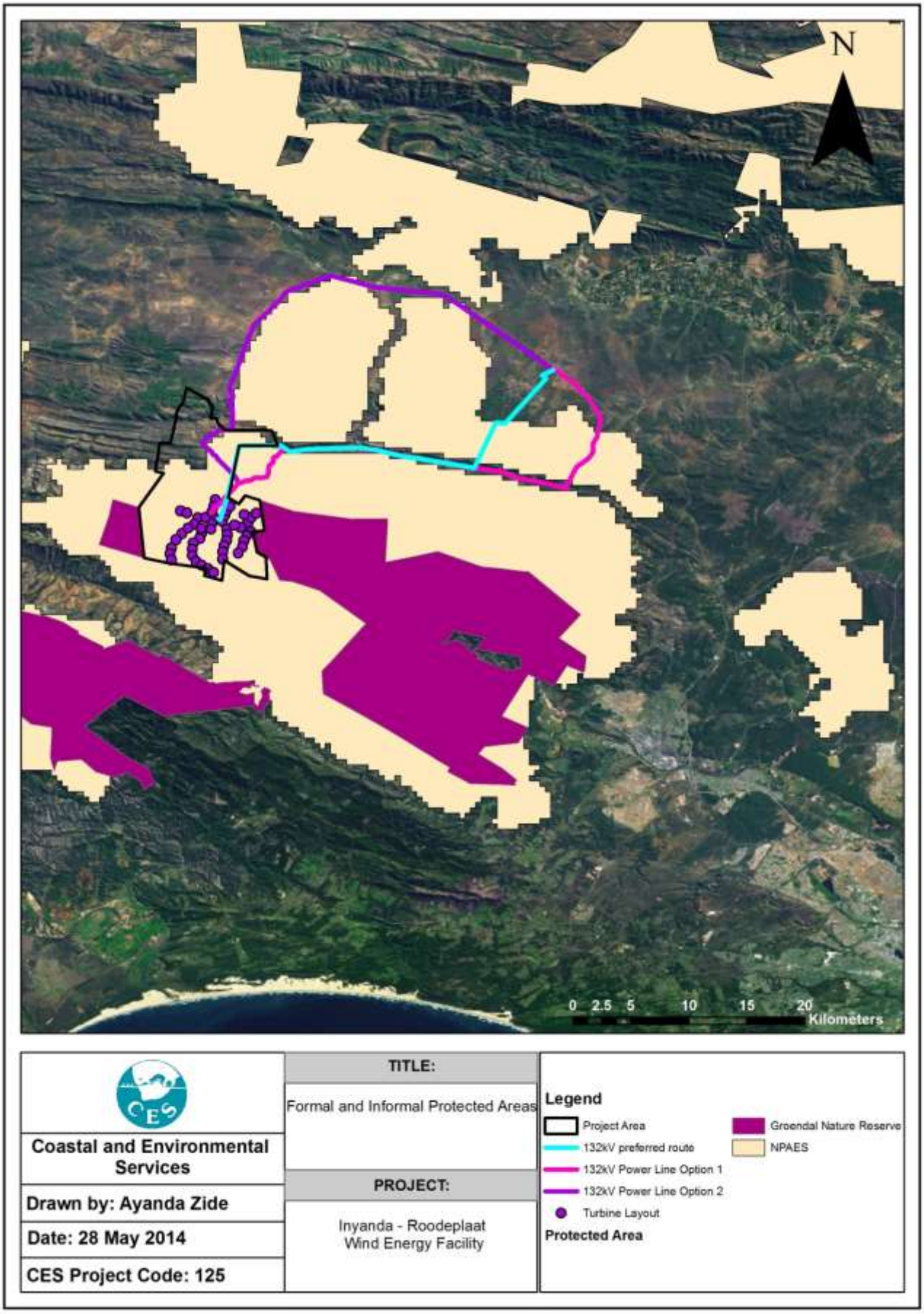

Figure 5-1: Protected Areas and Expansion Strategy Areas that occur within and near the project study area

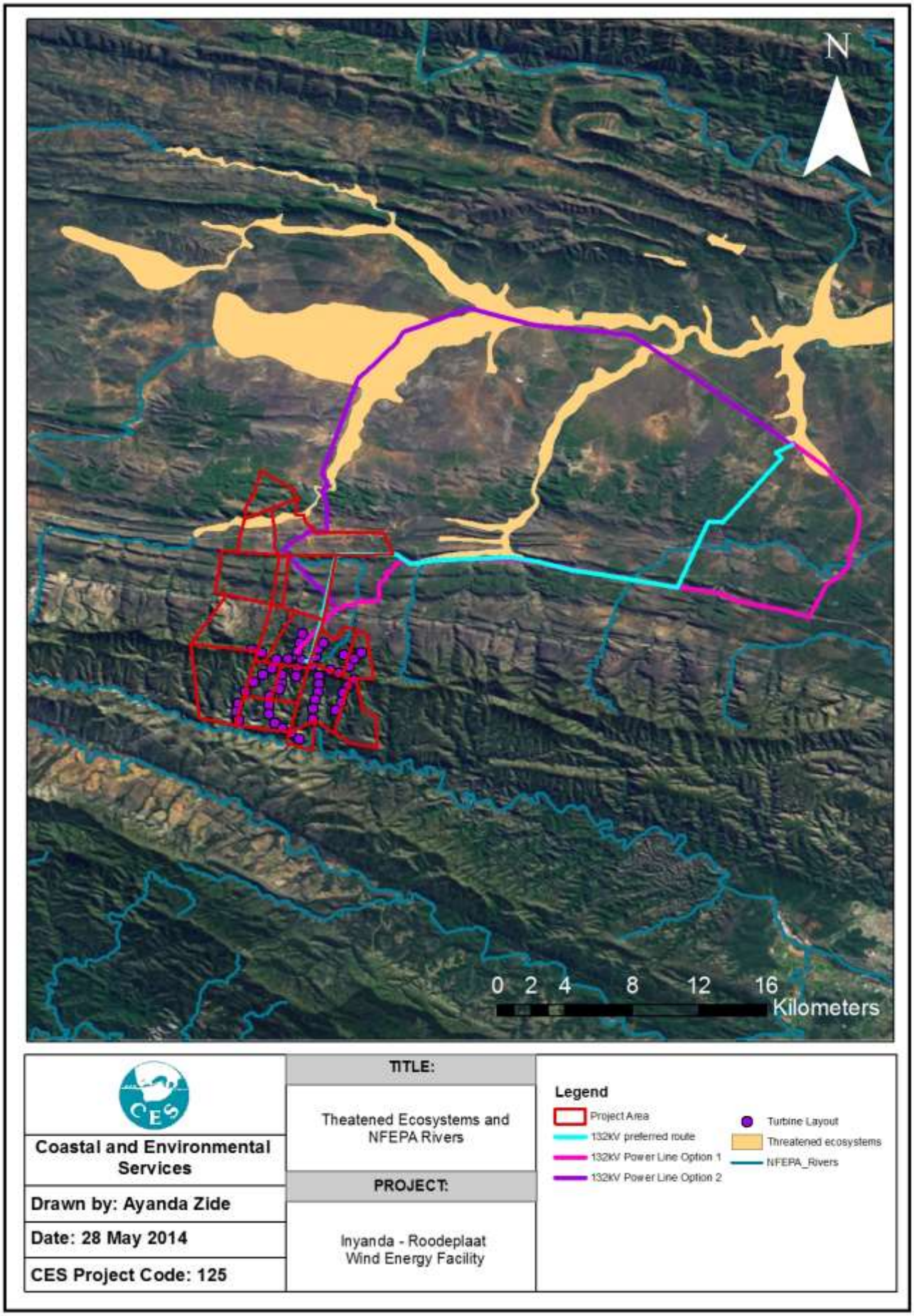

Figure 5-2: Threatened Ecosystems and the National Freshwater Ecosystems Priority Rivers relative to the study area

Several of these bioregional plans have been developed that occur within the borders of the Eastern Cape, and these may overlap in areas (Pierce and Mader, 2006). The STEP mapping and related information is specifically designed to be incorporated into planning and spatial development frameworks. It indicates areas for priority conservation, and what kind of development is appropriate for each landscape class. It is important to note that it cannot be used for fine scale planning. Each vegetation type is assigned an ecosystem status, which indicates if it is sufficiently conserved, how much of its original extent is still covered, and how healthy and functioning they may be (Pierce and Mader, 2006). The project aims to guide the necessary but destructive development away from areas of endangered biodiversity and promote sustainable land use. In terms of STEP, a feature that has much more extant habitat than is needed to meet its target, is considered Currently Not Vulnerable or Least Threatened (Table 5-2)

STEP provides management recommendations for each of the classes given to vegetation types. As the study area contains vegetation types listed as Least Threatened (Currently Not Vulnerable), Vulnerable and Endangered by STEP, recommendations for these classes are provided below and summarised in Table 5-2.

Table 5-2: Summary of the STEP Project conservation priorities, classifications and general rules (Pierce, 2003)

Conservation priority	Classification	Brief Description	General Rule
IV	Currently not vulnerable area	Ecosystems which cover most of their original extent and which are mostly intact, healthy and functioning	Depending on other factors, this land can withstand loss of natural area through disturbance or development
III	Vulnerable area	Ecosystems which cover much of their original extent but where further disturbance or destruction could harm their health and functioning	This land can withstand limited loss of area through disturbance or development
II	Endangered area	Ecosystems whose original extent has been severely reduced, and whose health, functioning and existence is endangered	This land can withstand minimal loss of natural area through disturbance or development
I - Highest Priority	Critically endangered area	Ecosystems whose original extent has been so reduced that they are under threat of collapse or disappearance. Included here are special ecosystems such as wetlands and natural forests	This Class I land can NOT withstand loss of natural area through disturbance or development. Any further impacts on these areas must be avoided. Only biodiversity-friendly activities must be permitted.
High Priority	Network Area	A system of natural pathways e.g. for plants and animals, which if safeguarded, will ensure not only their existence, but also their future survival.	Land in Network can only withstand minimal loss of natural area through disturbance and developments
Highest Priority	Process Area	Area where selected natural processes function e.g. river courses, including their streams and riverbanks, interfaces between solid thicket and other vegetation types and sand corridors	Process area can NOT withstand loss of natural area through disturbance and developments
	Municipal, provincial, or national reserve	Protected areas managed for nature conservation by local authorities, province or SA National Parks.	No loss of natural areas and no further impacts allowed

Conservation priority	Classification	Brief Description	General Rule
Dependant on degree on existing impacts	Impacted Area	Areas severely disturbed or destroyed by human activities, including cultivation, urban development and rural settlements, mines and quarries, forestry plantations and severe overgrazing in solid thicket.	Ability for this land to endure further disturbance of loss of natural area will depend on the land's classification before impacts, and the position, type and severity of the impacts

The project area falls within four classes outlined by STEP, namely Currently Not Vulnerable, Vulnerable, Endangered and Critically Endangered. These are discussed in further detail below.

Currently Not Vulnerable (Class IV)

A vegetation type that has much more extant habitat than is needed to meet its conservation target, is considered Currently Not Vulnerable, or Least Threatened. For Currently Not Vulnerable vegetation, STEP recommends three Land use management procedures, these include:

1. Proposed disturbance or developments should preferably take place on portions which have already undergone disturbance or impacts rather than on portions that are undisturbed or unspoilt by impacts.
2. In response to an application for a non-listed activity which will have severe or large-scale disturbance on a relatively undisturbed site (unspoilt by impacts), the Municipality should first seek the opinion of the local conservation authority.
3. For a proposed "listed activity", EIA authorisation is required by law.

From a Spatial planning (forward planning – Spatial Development Framework (SDF)) point of view, for Currently Not Vulnerable vegetation, STEP presents two restrictions and gives examples of opportunities. The two spatial planning restrictions are as follows:

1. Proposed disturbance or developments should preferably take place on portions which have already undergone disturbance or impacts rather than on portions that are undisturbed.
2. In general, Class IV land can withstand loss due to disturbance of natural areas through human activities and developments.

Opportunities depend on constraints (such as avoidance of spoiling scenery or wilderness, or infra-structure limitations) Class IV land can withstand loss of, or disturbance to, natural areas. Within the constraints, this class may be suitable for a wide range of activities (e.g. extensive urban development, cultivation, tourist accommodation, ecotourism and game faming). The proposed turbines are all located in an area designated as Currently Not Vulnerable by STEP. According to this planning tool, this vegetation type can withstand loss due to disturbance.

Vulnerable (III)

Vulnerable ecosystems are those where further disturbance or destruction could harm their health and functioning. For Vulnerable vegetation, STEP recommends four Land use management procedures, these include:

1. As a rule, developments with limited area or impacts should be allowed on Class III land.
2. In response to an application for a non-listed activity which will have severe or large-scale disturbance on a relatively undisturbed site (unspoilt by impacts), the Municipality should first seek the opinion of the local conservation authority.

3. Proposed disturbance or developments should preferably take place on sites which have undergone disturbance or impacts rather than on sites that are undisturbed.
4. For a proposed "listed activity", EIA authorisation is required by law.

From a Spatial planning (forward planning – Spatial Development Frameworks (SDF)) point of view, for Vulnerable vegetation, STEP presents three restrictions and gives examples of opportunities. The three spatial planning restrictions are as follows:

1. In general, Class III land can withstand only limited loss of natural area or limited disturbance through human activities and developments.
2. Proposed disturbance or developments should preferably take place on sites which have undergone disturbance or impacts rather than on sites that are undisturbed.
3. In general, Class IV land should be developed in preference to Class III land.

Depending on constraints (such as avoidance of spoiling scenery or wilderness, or infra-structure limitations), Class III land can withstand a limited loss of, or disturbance to, natural areas. Within the constraints, this class may be suitable for a moderate range of activities that are either compatible with the natural environment (e.g. sustainable stock-farming, ecotourism, game farming and wilderness) or of limited extent (e.g. small-scale housing or urban development, small-scale cultivation). A very narrow band of this ecosystem traverses the project area. The only impacts on this will be associated with access roads and power lines. These can be minimised by using existing roads and aligning power lines in areas that are already disturbed.

Endangered

Endangered ecosystems existence and functioning is endangered as a result of the original extent of the system being severely reduced. For Endangered vegetation, STEP recommends two Land use management procedures, these include:

1. The Municipality should require an on-site investigation to verify the site's condition relative to impacts and its classification:
    a. If the site has had severe impacts, and is verified as Endangered, then Municipality should recommend restoration of the portion of land which will remain undeveloped and its management/ proclamation as a nature reserve area
    b. If the site is relatively undisturbed with medium to low impacts, and is verified as Endangered, then the Municipality should request a Biodiversity Specialist Study as part of an EIA.
2. For a proposed "listed activity" that by law requires EIA authorisation, the Municipality should recommend a Biodiversity Specialist Study as part of an EIA.

From a Spatial planning (forward planning – Spatial Development Frameworks or SDF's) point of view, for Endangered vegetation, STEP presents two restrictions and gives examples of opportunities. The two spatial planning restrictions are as follows:

1. Proposed disturbance or developments should take place on portions which have already undergone disturbance or impacts rather than on portions that are undisturbed/ undeveloped.
2. In general, Endangered land can withstand only very limited loss of/disturbance to natural areas through human activities and developments.

Depending on constraints (such as avoidance of spoiling scenery or wilderness, or infra-structure limitations), Endangered land can withstand only negligible loss of, or disturbance to, natural areas. Within the constraints, this class may be suitable for eco-friendly activities such as sustainable game farming and responsible ecotourism (hiking trails etc). In those areas which have undergone severe impacts, Endangered land presents opportunities for

IDP projects for restoration. The powerlines and access roads will cross areas listed as endangered. Impact can be minimised in these areas by using existing roads and placing the pylons in areas that have already been disturbed.

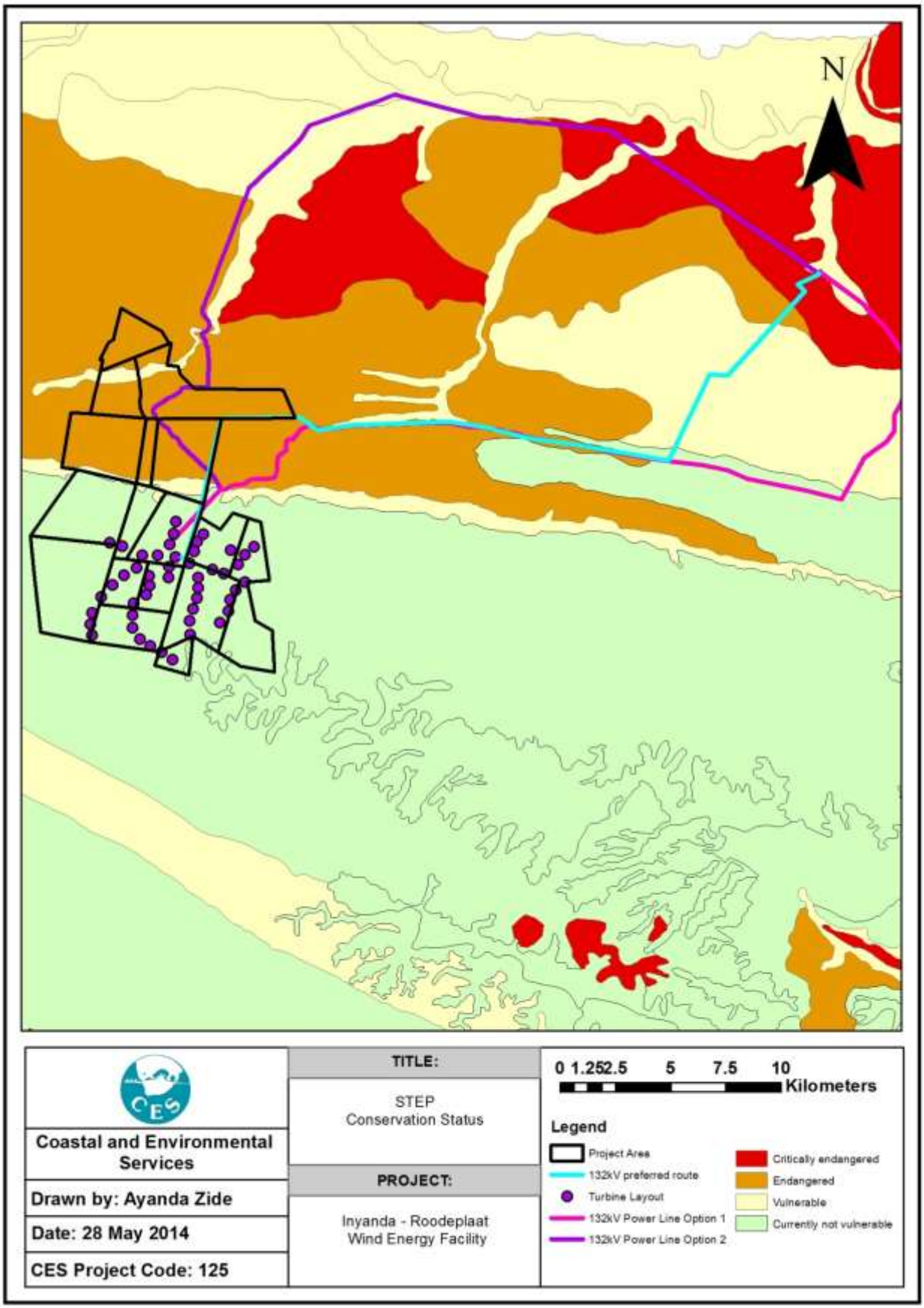

Figure 5-3: STEP Conservation Status map

5.4 The Eastern Cape Biodiversity Conservation Plan

The Eastern Cape Biodiversity Conservation Plan (ECBCP) provides a map of the "critical biodiversity areas" CBAs, based on extensive biological data and input from key stakeholders. The ECBCP, although mapped at a finer scale than the National Spatial Biodiversity Assessment (Driver et al., 2005) is still, for the large part, inaccurate and "coarse". Therefore it is imperative that the status of the environment, for any proposed development MUST first be verified before the management recommendations associated with the ECBCP are considered (Berliner and Desmet, 2007). In spite of these short-comings, the ECBCP has been adopted by the Provincial Department of Economic Development, Environmental Affairs & Tourism as a strategic biodiversity plan for the Eastern Cape.

The Eastern Cape Biodiversity Conservation Plan (ECBCP) is responsible for mapping areas that are priorities for conservation in the province, as well as assigning land use categories to the existing land depending on the state that it is in (Berliner et al. 2007).

Critical Biodiversity Areas (CBAs) are defined by Berliner *et al.* (2007) as: *"CBAs are terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning".* These areas are classified as natural to near-natural landscapes. In addition to the CBA's, the ECBCP also defines Other Natural Areas (ONA) as well as Transformed Areas. Biodiversity Land Management Classes (BLMCs) are also used in the plan: "Each BLMC sets out the desired ecological state that an area should be kept in to ensure biodiversity persistence. For example, BLMC 1 refers to areas which are critical for biodiversity persistence and ecosystem functioning, and which should be kept in as natural a condition as possible". Table 5-3 shows how the BLMCs relate to the CBAs.

Table 5-3: Terrestrial Critical biodiversity Areas and Biodiversity Land Management Classes as described by the Eastern Cape Biodiversity Conservation Plan.

CBA map category	Code	BLMC		Recommended land use objective
Protected areas	PA1	BLMC 1	Natural landscapes	Maintain biodiversity in as natural state as possible. Manage for no biodiversity loss.
	PA2			
Terrestrial CBA 1 (not degraded)	T1			
Terrestrial CBA 1 (degraded)	T1	BLMC 2	Near-natural landscapes	Maintain biodiversity in near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted.
Terrestrial CBA 2	T2			
	C1			
	C2			
Other natural areas	ONA T3	BLMC 3	Functional landscapes	Manage for sustainable development, keeping natural habitat intact in wetlands (including wetland buffers) and riparian zones. Environmental authorisations should support ecosystem integrity.
	ONA			
Transformed areas	TF	BLMC 4	Transformed landscapes	Manage for sustainable development.

The study site falls within CBA 1, CBA 2 and CBA 3 areas. As indicated in Figure 5-4, 14 turbines are located within the CBA 1 area and 26 occur in a CBA 2 area. The vegetation and habitat in southern portion of the project site (where the turbines are located) is for the most part fairly intact and considered to be in good condition, supporting the land use classes identified by the ECBCP. However, the vegetation in the northern portion of the study site was found to be degraded.

5.5 Baviaanskloof Reserve Cluster

The Eastern Cape Parks and Tourism Agency (ECPTA) is responsible for the management of the Baviaanskloof Nature Reserve (BNR) which forms the core of the Baviaanskloof Mega Reserve (BMR). In 2004 the Baviaanskloof Nature reserve was proclaimed a World heritage Site based on the high level of biodiversity and threatened species that are characteristic of the area (Boshoff, 2008). The BNR forms part of the Baviaanskloof Reserve Cluster which includes the Groendal and Formosa Nature Reserves. The Groendal Wilderness Area lies at the eastern extremity of the Groot Winterhoek Mountains and protects the water catchment of the Swartkops and KwaZunghu River. It is characterised by unspoilt vegetation with numerous kloofs and streams that form a pristine wilderness area.

It is estimated that the Baviaanskloof Nature Reserve and World Heritage Site houses over 1100 plant species, 20 of which are known to be endemic and 52 that are listed as Red Data Book Species (Erlank, 2010). It is expected that this list will increase by at least 100 species if Groendal Nature Reserve and Formosa Nature Reserve are also included. The project area lies adjacent to two portions of the Groendal Wilderness Area. (Figure 5-4)The ECPTA and SANParks were engaged in the Scoping phase to solicit preliminary opinion on the proposed project as well as the potential for private landowner conservancy agreements for the property portions in question. Early indications from the ECPTA are that they are not supportive of the above option or the project in general, with SANParks indicating that the proposal does not intrude on any areas within their conservation planning domain.

5.6 SRVM Biodiversity Sector Plan

The Biodiversity Sector Plan (BSP) for the SRVM represents the biodiversity informant for all multi-sectoral planning procedures, such as the Integrated Development Plan and Spatial Development Framework. It is intended to support land-use planning and decision-making in order to achieve the sustainable development agenda. The BSP is comprised of a relatively fine-scale Critical Biodiversity Areas (CBA) Map, mapped at a scale of 1:20 000 (Skowno and Holness, 2012). Associated with the CBA Map is a set of biodiversity-compatible land-use guidelines, including a series of land and water use management guidelines. The BSP also includes an explanatory handbook (with a biodiversity profile) and the various maps used to prepare the CBA Map (e.g. vegetation, rivers, wetlands and land cover).

The CBA Map has refined the spatial accuracy of the Eastern Cape Biodiversity Conservation Plan's (ECBCP) CBA Map (Berliner and Desmet, 2007), including the Subtropical Thicket Ecosystem Programme (STEP) Map (Cowling *et al.,* 2003). In other words, it is a more accurate spatial representation of important biodiversity areas in the SRVM. The CBA Map divides the landscape into formal Protected Areas, Critical Biodiversity Areas, Ecological Support Areas, Other Natural Areas and No Natural Areas Remaining. The first three categories represent the biodiversity priority areas, which should be maintained in a natural to near-natural state, with low intensity developments possible.

The remaining two categories are not considered biodiversity priority areas, and can be targeted for sustainable development. The land use guidelines are specified for Critical Biodiversity Areas and Ecological Support Areas, while the general land use management guidelines are specified for Critical Biodiversity Areas, Ecological Support Areas and Other Natural Areas (The Sunday's River Valley Municipality Final IDP 2013/2014).

According to the Sunday's River Valley Municipality Biodiversity Sector Plan (Figure 5.6), all of the turbines and infrastructure are located within a Critical Biodiversity Areas. According to the plan, areas defined as Critical Biodiversity Areas (along with Protected Areas and Ecological Support Areas) should be "maintained in a natural or near natural state" (Holness and Skowno, 2012). The site survey found the southern portion of the project area to be intact and in good condition ecologically.

The power line routes of the project also fall within the Ecological Support Areas (ESA) which are supporting zones or areas which must be safeguarded as they are needed to prevent degradation of Critical Biodiversity Areas and formal Protected Areas. Although many ESA consist of natural veld, there are areas of land - partially or wholly transformed or degraded - that have been classified as ESA even though they are no longer in a natural state. Although these areas are heavily degraded or transformed, they still play an important role in supporting ecological processes.

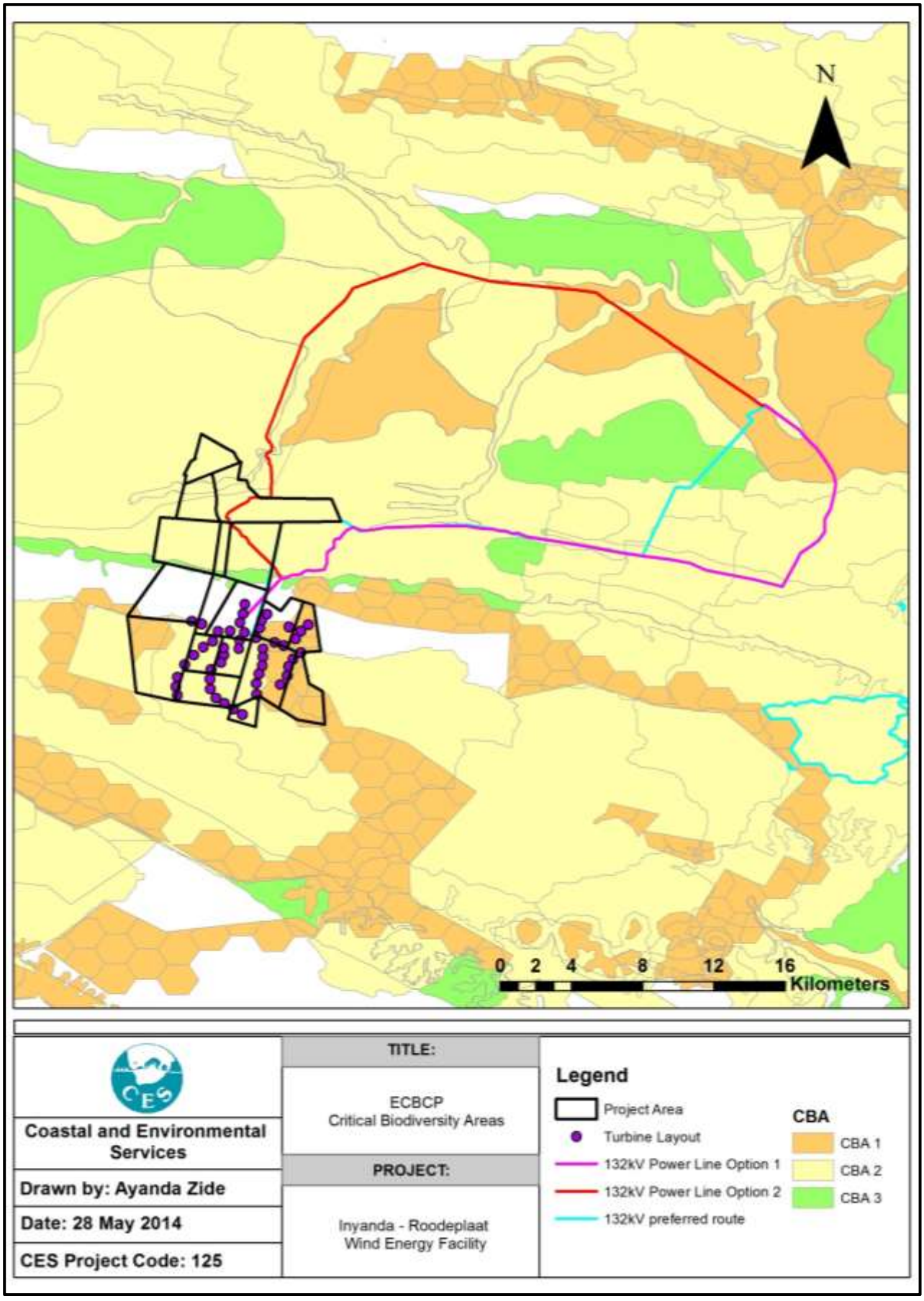

Figure 5-4: Critical Biodiversity Areas found within the project site

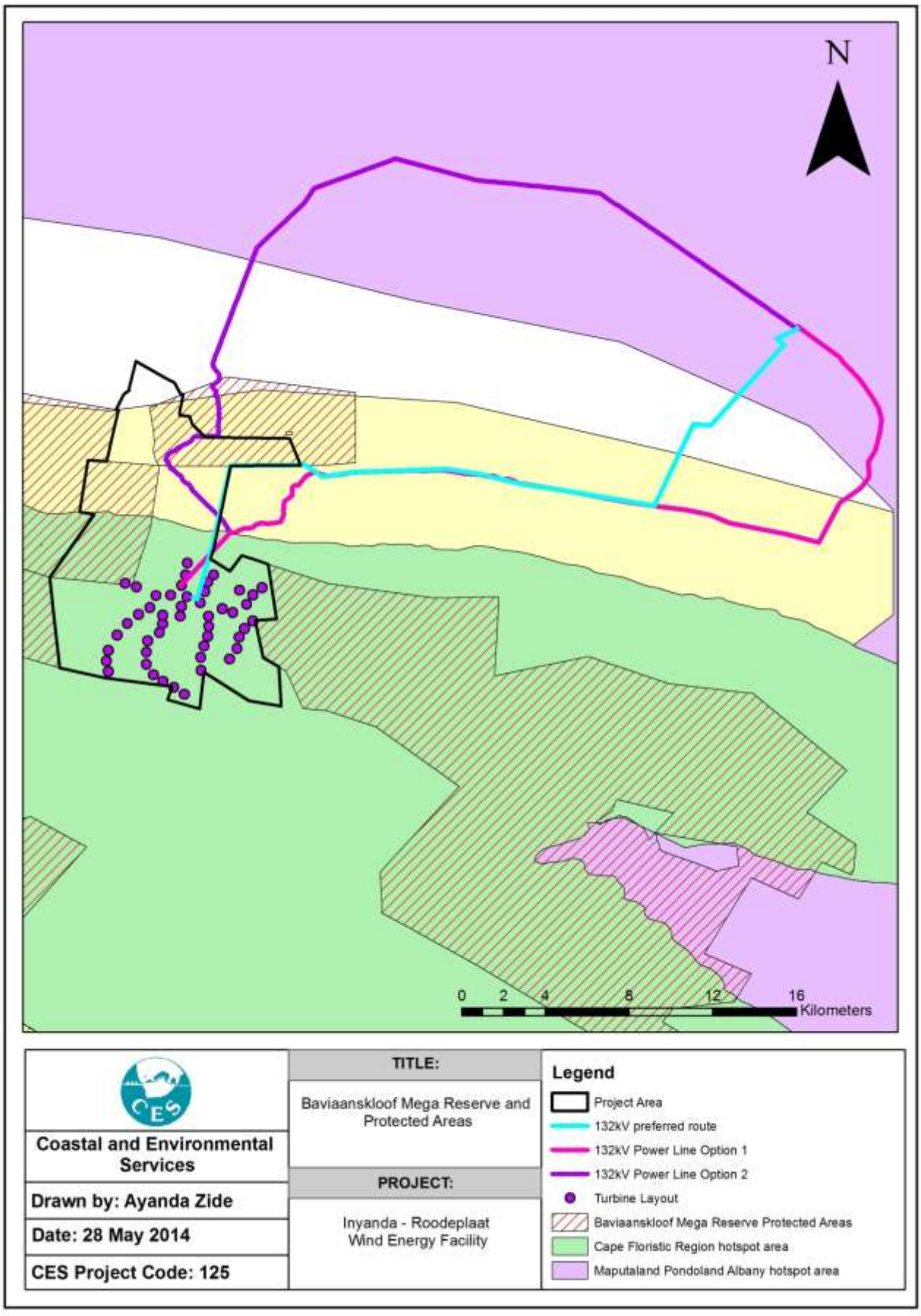

Figure 5-5: Baviaanskloof planning tools

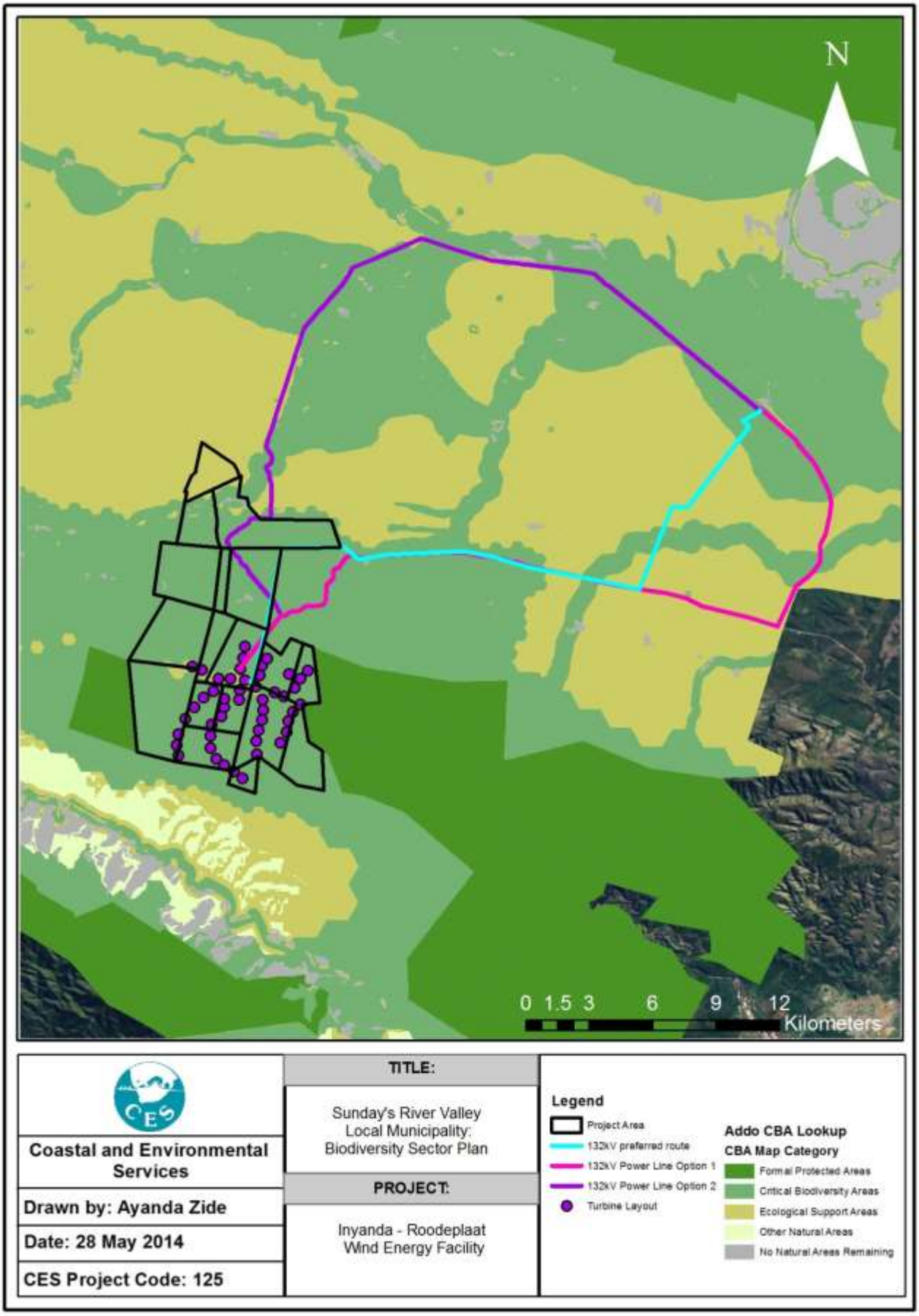

Figure 5-6: Sunday's River Valley Municipality Biodiversity Sector Plan

6. SITE SENSITIVITY

The sensitivity map was developed by identifying areas of high, low and medium areas of sensitivity (Figure 6.1 and Figure 6.2) for both fauna and flora.

6.1 Vegetation

6.1.1 Albany Alluvial

The Albany Alluvial vegetation was found in the gorges and valleys of the project area and were assigned a high sensitivity as these areas are associated with process areas such as rivers, wetlands and streams that are important for ecosystem functioning as well as animal and plant dispersal. These areas also had large populations of Cycads which are listed as a Protected species by NEMBA.

6.1.2 Shale Fynbos

The Shale fynbos vegetation was found to occur along ridges and was in good condition. This vegetation had a high species richness being dominated by SCC (eg. *Protea species* and *Leucadendron salignum*). This vegetation community was assigned high sensitivity.

6.1.3 Grassy Fynbos and Thicket Plant Communities

The Grassy Fynbos and Thicket plant communities were fairly intact with relatively high species richness. Cycad and Protea species, which are considered to be SCC were evident in the fynbos communities. These vegetation communities were assigned a moderate sensitivity as they are still important for ecosystem functioning.

6.1.4 Renosterveld

The Renosterveld found in the northern section of the project area was degraded and transformed by human activities. For this reason this plant community was assigned a low sensitivity.

6.2 Fauna

6.2.1 Streams

These areas are characterised by drainage lines and rivers, giving way to associated swampy wetlands and riparian vegetation (forest). These wet areas show excellent refugia and/or corridors for faunal movement. The presence of amphibians in the river/drainage lines will attract reptilian predators such as snakes, terrapins and monitor lizards who feed on this predictable and plentiful resource. Furthermore, the presence of moisture in the wetlands leads to dense plant growth. This habitat is also ideal for lizards feeding on insects attracted to the rich plant material supply and will in turn attract snake predators. Although construction of the wind farm will be restricted to the ridges, road erosion can lead to siltation of these streams.

6.2.2 Rocky Outcrops

Rocky areas also constitute important features for conservation concern as they provide areas that are difficult to rehabilitate and are easily affected by changes in land use, with erosion being an important impact factor. Depending on their size and exposure, rocky outcrops form specialised habitats for some reptiles. Rocky outcrop habitats are considered to be of moderate sensitivity as these areas provide significant refugia for faunal species, especially reptiles and small mammals. Large rock formations are considered to be of an ecologically sensitive nature for all vertebrate groups, due to the micro-habitat potential and

structural complexity of the systems. Because of this, they form the basis of a variety of food chains. Many lizards are rupiculous (live among rocks) and therefore require habitat with exposed rocks usually only found on high-lying areas such as hills and ridges. The shelter provided by exposed rocks attracts other non-rupiculous species that utilize this habitat for the provision of refugia. This is especially important in areas where only a few rocky ridges exist as these are used as migratory "stepping stones" for rupiculous (and other) species between adjacent hilly areas. The presence of lizards and the availability of refugia on rocky ridges will also attract several species of snake.

6.2.3 Montane Fynbos (Shale and Grassy Fynbos)

The Ealandsberg Dwarf Chameleon or the Greondal Dwarf Chameleon have only been observed in montane fynbos vegetation (Tolley & Burger 2004). They prefer low growing fynbos dominated by restios. These are slow moving animals and don't like crossing large open spaces. For this reason the fynbos communities have been assigned a moderate sensitivity.

Turbines in sensitive areas:

The project area of the proposed Inyanda WEF has been mapped in terms of ecological sensitivity. The following areas are deemed as sensitive:

1. Water courses with a 32 metre buffer
2. Wetlands (HIGH NO-GO areas) with a 500 metre buffer
3. Albany Alluvial and Shale fynbos have been assigned as areas of high sensitivity

Possible Problem areas	Recommendations
T48	Turbine 48 occurs within the 500m buffer of the Bench Flat Wetland (Figure 3.6). It is recommended that this turbine should be moved about 50m West from the proposed position to avoid being within the 500m buffer.
T35 &T36, access roads and associated infrastructure	These turbines occur within the 500 m buffer of the Bench Flat Wetland (Figure 3.6). As seen on Figure 3.6 there is limited space in the area due to the wetland and drainage lines. It is recommended that alternative areas for the two turbines and route for the access should be considered to minimise potential impact on the wetlands. If this current layout is used, a Full Water Use Licence Applications (WULAs) would be required.
Power line Option 3	Due to the proposed power line occurring within the 500m buffer of two wetland types (Figure 3.6). It is recommended that the preferred powerline route or Option 2 powerline route be used instead as they do not cross any wet land. But all three powerline options cross a river (watercourse) in more than one area. (Kariega and Holbak rivers as observed on Figure 3.6) Due to the development activities occurring within the 32m buffer of the watercourse (river) a Water Use Licence Applications (WULAs) would be required.
T2	This turbine is close to the shale fynbos vegetation, it is recommended that this turbine is moved 25m North to avoid this vegetation type (Figure 3.8)
Access roads to reach T27 – T28 and T16-T48 ,	To reach these turbines, access roads need to be constructed within the shale fynbos (Figure 6.2). • Careful planning to minimise damage within this vegetation type is required • A search and rescue plan must be written and implemented • Existing paths or areas which are disturbed should be used where possible.
T24	This turbine occurs close to the shale fynbos (Figure 3.8 and

	Figure 6.2), it is recommended that this vegetation is avoided; the turbine can be shifted to the east. • Turbine footprint should only affect the grassy fynbos where feasible.

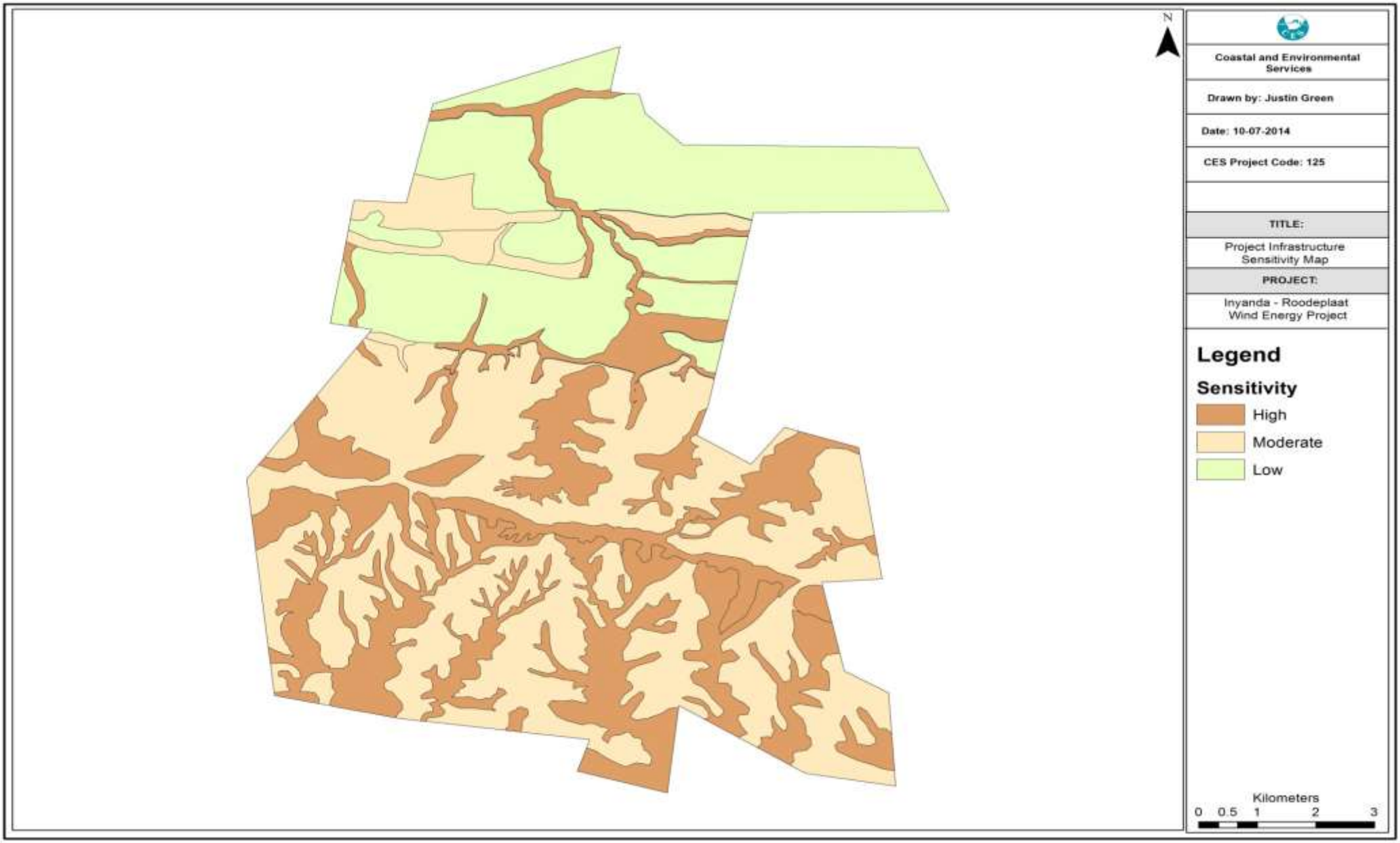

Figure 6-1: Sensitivity map for the proposed Inyanda WEF.

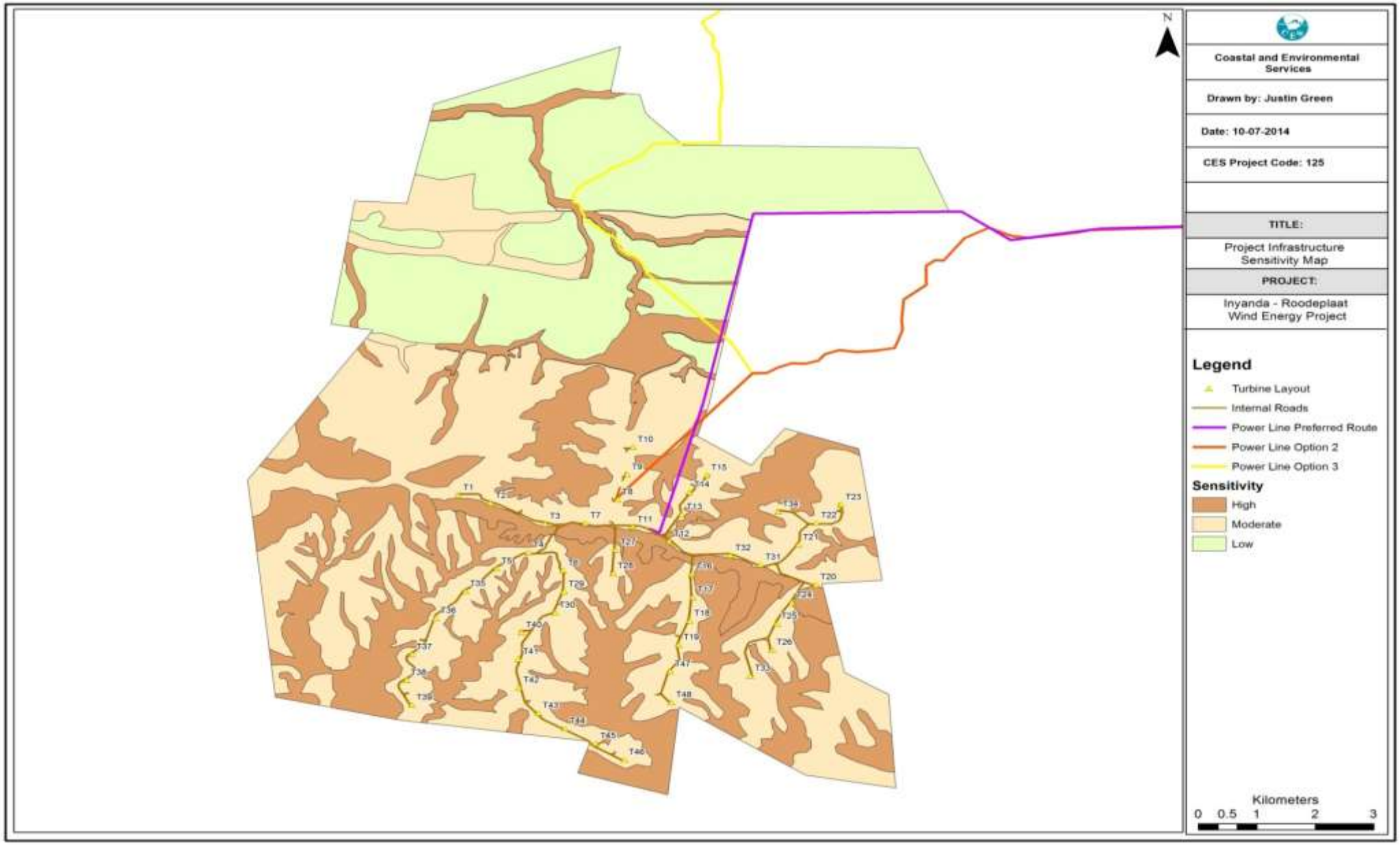

Figure 6-2: Sensitivity map of the project area with the project infrastructure.

7. IMPACTS IDENTIFIED AND ASSESSED

The ecological study undertaken provides the necessary information in order to assess the impacts of the proposed Wind Energy facility on the vegetation and the flora at various relevant spatial and temporal scales. The individual impacts can be grouped together as a series of key environmental issues. All of the issues relate to the removal of the existing vegetation cover within the footprint area of the Wind Energy facility. At the spatial scale of the Wind Energy facility impacts described below will not be considerable, but nonetheless these need to be seen in the context of the study area as a whole. Impacts of the current land use are taken into account in order to provide a comparison between the Wind Energy facility impacts and those that are already occurring.

7.1 Impacts

There are several issues that will arise as a result of the proposed project, these include:

Issue 1 - Loss of vegetation communities: this includes the loss of each of the vegetation community types identified on the site, as a result of the clearing of the land for construction. This issue describes only the direct loss of the vegetation communities and no associated loss of animal nor plant species of special concern, nor the effect on ecosystem functioning or the loss of habitats.

Issue 2 - Loss of species of conservation concern and biodiversity: this includes loss of both animal and plant species of conservation concern over the entire site, including all vegetation community types. It also encompasses the loss of biodiversity as a whole, which includes all species that occur on site taking into account their contribution to the biodiversity of the surrounding area and within the site.

Issue 3 - Disruption of ecosystem function and process: this includes the impacts on process areas, and those areas important to ecosystem function either being completely eliminated by the proposed development, or secondary impacts on these systems as a result of the proposed development. This issue encompasses the effect of the inevitable introduction of alien vegetation on the site and the impact of edge effects; the change in vegetation as a result of large-scale clearing and exposing relatively undisturbed areas to transformation.

Impacts are assessed based on the current turbine layout, project boundary, power line and access roads. Should the area change, the impacts and associated mitigation measures, will need to be revisited.

7.1.1 Impacts Associated with the Construction Phase

ISSUE 1: Loss of vegetation communities

Construction of the wind turbines will result in loss of vegetation on the site. This loss will occur as a result of, active clearing, trampling as well as extra clearing needed for construction. Mitigation measures can be used in order to reduce the trampling and rehabilitate the vegetation respectively. If nothing were built on the site, the overall significance would be positive. This would be due to the vegetation not being removed and the continuation of the current land use, which is game farming.

Mitigation and management

General mitigation measures include the following:

- Keep removal of vegetation to a minimum.
- Ensure that turbine platforms are placed in previously impacted areas if possible.

- Do not remove vegetation in areas set aside for conservation within the site, should an area be set aside for conservation: this is recommended.
- All areas of high sensitivity on the site as well as the wetland and river networks should be actively conserved.
- Areas impacted on during the construction phase but not required during the operational phase (such as laydown areas) must be rehabilitated.
- Where feasible, existing roads must be used.
- All species of special concern, protected or vulnerable must be avoided or transplanted

Impact 1 – Loss of Grassy Fynbos

Cause and Comment

The wind turbines and associated infrastructure such as underground cables and internal roads will directly impact this vegetation type. It is considered to be of moderate sensitivity due to the presence of species of conservation concern, its conservation status and the need for process areas to be maintained. Given that the turbines will be placed on this vegetation type, the probability of the impact occurring is definite.

Mitigation and management

Mitigation measures include the following:

- The footprints of the turbine and any associated construction required should be kept to a minimum;
- Rehabilitation of the existing vegetation should be done to control alien invasion and provide some ecological corridors;
- Existing tracks must be used where feasible;
- A search and rescue plan must be written and implemented, particularly since protected species such as *Encephalartos longifolius* is prevalent.

Significance statement

Project:

The loss of Grassy Fynbos will definitely occur and will have a Moderate severity and long term impact. The environmental significance of this unmitigated impact will be Moderate Negative. With mitigation this will remain a Moderate Negative impact.

No-Go Option:

If no development was to occur on the site the overall impact would be positive. This would be due to no loss of the vegetation occurring since the current land use favours the re-establishment of Grassy Fynbos.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long term	Study Area	Moderate	Definite	MOD-
With Mitigation	Long term	Study Area	Slight	Definite	MOD-
No-Go					
Without mitigation	Long term	Study area	Beneficial	Probable	**MODERATE+**

Impact 2: Loss of Shale fynbos

This vegetation type is considered to be of High sensitivity due to the presence of species of conservation concern, its conservation status and the need for process areas to be maintained. No turbines will be placed on this vegetation type, but will be affected by road access and powerline infrastructure as seen on Figure 3.8.

Mitigation and management

Mitigation measures include the following:

- removal of vegetation should be kept to a minimum
- access roads should use existing paths where feasible, in other areas there are no paths, thus damage in these areas should be minimised
- rehabilitation of the existing vegetation should be done to control alien invasion and provide some ecological corridors
- a search and rescue plan must be implemented and species of conservation concern removed prior to construction and placed in a nursery for rehabilitation.

Significance statement

Project:

The loss of Shale Fynbos is definitely going to occur and will have a severe, long term impact. The environmental significance of this unmitigated impact will be HIGH NEGATIVE. Even with mitigation this will remain a HIGH NEGATIVE impact.

No-Go Option:

If no development was to occur on the site the overall impact would be positive. This would be due to no loss of the vegetation occurring since the current land use favours the re-establishment of Shale Fynbos.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long term	Study Area	Severe	Definite	HIGH-
With Mitigation	Long term	Study Area	Severe	Definite	HIGH-
No-Go					
Without mitigation	Long term	Study area	Beneficial	Probable	**MODERATE+**

Impact 3: Loss of Renosterveld

No turbines will be placed within the Renosterveld, but this vegetation type will be affected by the construction of the power lines and access roads.

Mitigation and management

Mitigation measures include the following:

- Vegetation clearing and trampling must be kept to a minimum;
- Existing roads must be used where feasible;
- The placement of pylons for the powerline must be placed in areas of low sensitivity (i.e. disturbed areas) where feasible;

- A search and rescue plan for the areas that will be affected by the power lines must be implemented and species of conservation concern removed prior to construction and placed in a nursery for rehabilitation.

Significance statement

Project:

The loss of Renosterveld will definitely occur and will have a moderate, long term impact. The environmental significance of this unmitigated impact will be MODERATE NEGATIVE. With mitigation this will have a LOW NEGATIVE impact.

No-Go Option:

If no development was to occur on the site the overall impact would be LOW NEGATIVE. The vegetation has been impacted on by the current land use which will continue.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long term	Localised	Moderate	Definite	MOD-
With Mitigation	Short term	Localised	Slight	Definite	LOW-
No-Go					
Without mitigation	Long term	Localised	Slight	Probable	**LOW-**

Impact 4: Loss of Thicket

No turbines will be placed within the thicket, but this vegetation type will be affected by the construction of the power lines and infrastructures. Powerline (Option 3) crosses very little of the thicket vegetation, but this impact should still be evaluated.

Mitigation and management

Mitigation measures include the following:

- Vegetation clearing and trampling must be kept to a minimum;
- Existing roads must be used where feasible;
- Preferred route or Option 2 should be used to avoid the thicket vegetation.

Significance statement

Project:

The loss of Thicket may occur, will have a slight severity and long term impact. The environmental significance of this unmitigated impact will be Low Negative. This will be Low Negative with mitigation measures.

No-Go Option:

If no development was to occur on the site the overall impact would be Low Negative. The vegetation has been impacted on by the current land use which will continue

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long term	Localised	Slight	May Occur	LOW-
With Mitigation	Long term	localised	Slight	Unlikely	LOW-
No-Go					
Without mitigation	Long term	Study area	Moderate	Probable	**LOW -**

Impact 5: Loss of Albany Alluvial Vegetation

No turbines occur in this vegetation type, however it may be affected by the power lines and access roads thus possible impacts for this region must be considered. It should be noted that his vegetation type is highly sensitive.

Mitigation and management

Mitigation measures include the following:

- Vegetation clearing and trampling must be kept to a minimum;
- Existing roads must be used where feasible;
- Infrastructure should not be placed in this vegetation type;
- The placement of pylons for the powerline must be placed in areas of low sensitivity (i.e. disturbed areas) where feasible;
- A search and rescue plan must be implemented and species of conservation concern removed prior to construction and placed in a nursery for rehabilitation.

Significance statement

Project:

The loss of Albany Alluvial vegetation will probably occur, has moderate severity and will have a long term impact. The environmental significance of this unmitigated impact will be MODERATE Negative. This will be reduced to LOW Negative with mitigation measures.

No-Go Option:

If no development was to occur on the site the overall impact would be positive. This would be due to no loss of the vegetation occurring since the current land use favours the re-establishment of Albany Alluvial vegetation.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long term	Localised	Moderate	Probable	**MODERATE-**
With Mitigation	Long term	Localised	Slight	May Occur	**LOW-**
No-Go					
Without mitigation	Long term	Study area	Beneficial	Probable	**MODERATE +**

ISSUE 2: Loss of species of special concern and biodiversity (general)

Impact 6: Loss of plant species of conservation concern

Cause and Comment

According to the SA Red data list 5 species of special concern were found to occur on the site. An additional 19 species are listed on CITES, PNCO, NEMBA and Protected tree list thus are SCC and should be conserved. There may be many additional species of special concern that will be found on site during construction that were not observed during this study. These species should be relocated if they occur in areas of low and medium sensitivity earmarked for development. No development should take place in areas of high sensitivity. Areas where species of conservation concern cannot be moved should be avoided. If no development was to occur on the site the overall impact would be positive. This would be due to the continuation of the current land use.

Mitigation and management

Mitigation measures include the following:

- Species of special concern must be marked prior to construction.
- The area must be surveyed prior to construction during spring and mid-summer in order to locate protected geophytic plant species and transplant them in the neighbouring environment.
- A search and rescue plan must be developed in order to transplant these species. Some SCC will not transplant. These individuals should, as far as possible, be left undisturbed.
- Avoid placing infrastructure in dense populations of cycads (*Encephalartos longifolius*).
- In the event that a protected tree species needs to be removed, a permit to do so must be attained from DAFF.

Significance statement

Project:

The loss of Species of Conservation Concern will definitely occur and will have a severe, permanent impact. The environmental significance of this unmitigated impact will be HIGH NEGATIVE. This will be reduced to MODERATE NEGATIVE if mitigation measures are implemented.

No-Go Option:

If no development was to occur on the site the overall impact would be positive. The current land use in the southern portion of the project site favours the re-establishment of Species of Conservation Concern.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Permanent	Study Area	Severe	Definite	HIGH-
With Mitigation	Permanent	Study Area	Moderate	Probable	MODERATE-
No-Go					
Without mitigation	Long term	Study area	Moderate	Probable	**LOW +**

Impact 7: Loss of animal species of conservation concern

Cause and Comment

There are a number of species of conservation concern according to the IUCN, NEM:BA and CITES which have a habitat distribution that falls within the study area, thus it is expected that even though they were not observed during the site visit they may occur in the area. This includes species such as *Bradypodion taeniabronchum (*Elandsberg dwarf chameleon*)*, *Bradypodion ventral* (Eastern Cape dwarf *chameleon), Panthera pardus* (Leopard), *Mellivora capensis* (Honey Badger) and Vulpes *chama* (Cape Fox). This development is likely to affect these species of conservation concern:

- Due to suitable habitat (grassy and shale fynbos) observed onsite for the Elandsberg dwarf chameleon and Eastern Cape dwarf chameleon (Plate 1.2) it is expected that these species occur on the project area.
- The leopard is expected to be affected by the proposed development as this area forms part of its habitat and any impact may negatively affect the leopard population that is said to occur in the area (Jeanine McManus pers. comm.; 2013).

Mitigation and management

Mitigation measures include the following:

- It is recommended that if any fencing is to be erected the fences must have enough space between wires for small animals to move across them uninhibited.
- Workers must also be educated on conservation and must not be allowed to trap or poach animals on site.
- The construction site must be monitored for animal traps and evidence of poaching.
- Avoid clearing or damaging pristine habitats.
- Curtail unnecessary night driving on roads.
- Restrict construction activities to post-dawn and pre-dusk.
- Construction must be undertaken in the shortest time practical.
- Educate construction and staff about the necessity of protecting animal species such as reptiles (especially snakes and chameleons) and other animal species found in the area
- Undertake habitat clearance during the dry season when reptiles/amphibians are not breeding.
- Protect abiotic habitats, such as termite mounds and rocky outcrops, which shelter many reptiles.

Significance statement

Project:

The loss of animal Species of Conservation Concern will definitely occur and will have a severe, Long Term impact. The environmental significance of this unmitigated impact will be HIGH NEGATIVE. This will be reduced to MODERATE NEGATIVE if mitigation measures are implemented.

No-Go Option:

If no development was to occur on the site the overall impact would be positive. The current land use in the southern section of the project site favours habitat availability for species of conservation concern.

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long Term	Study Area	Severe	Probable	HIGH-
With Mitigation	Long Term	Study Area	Moderate	Probable	MODERATE-
No-Go					
Without mitigation	Long term	Study area	Beneficial	Probable	**MODERATE+**

Impact 8: Loss of Biodiversity

Cause and Comment

Loss of biodiversity will occur as a result of the loss of some of the vegetation on site during construction. Species other than species of conservation concern will be affected; both floral and faunal.

Mitigation and management

Mitigation measures include the following:

- An area within the site that can be set aside for conservation and actively managed as a corridor area would be ideal to mitigate loss of biodiversity.
- It is recommended that as much as possible of the high sensitivity areas be set aside as conservation areas and be managed as such by the land owners and developers.

Significance statement

Project:

The loss of Species of Biodiversity will definitely occur and will have a Moderate, Permanent impact. The environmental significance of this unmitigated impact will be HIGH NEGATIVE. This will be reduced to MODERATE NEGATIVE if mitigation measures are implemented.

No-Go Option:

If no development was to occur on the site the overall impact would be positive. The current land use in the southern section of the project site favours the re-establishment of indigenous flora and fauna.

Impact	Effect			Risk or Likelihood	Total Score
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction phase					
Without mitigation	Permanent	Study area	Moderate	Definite	**HIGH -**
With mitigation	Permanent	Study area	Slight	Definite	**MODERATE -**
No-Go					
Without mitigation	Long term	Regional	Moderate beneficial	Probable	**LOW +**

ISSUE 3: Disruption of ecosystem function and process

Cause and comment

The habitats that exist in the project area, together with those of the surrounding area that are linked, form part of a functional ecosystem. Destruction or modification of habitats causes disruption of ecosystem function, and threatens the interplay of processes that ensure environmental health and the survival of individual species. This issue deals with a collection of complex ecological impacts that are almost impossible to predict with certainty, but which are nonetheless important.

In general, fragmentation is one of the most important impacts on vegetation, especially when this creates barriers in previously continuous vegetation, causing a reduction in the gene pool and a decrease in species richness and diversity. In terms of current land use, this impact occurs when large areas of vegetation are overgrazed.

The removal of existing vegetation creates 'open' habitats that will inevitably be colonised by pioneer plant and animal species. While this is part of a natural process of regeneration, which would ultimately lead to the re-establishment of a secondary vegetation cover, it also favours the establishment of undesirable species in the area. Once established, these species are typically very difficult to eradicate and may then pose a threat to the neighbouring ecosystem. This impact is likely to be exacerbated by careless management of the site and its facilities, e.g. inadequate monitoring. Many such species are, however, remarkably tenacious once they have become established.

Impact 9: Fragmentation of communities and edge effects

Cause and Comment

The placement of turbines in areas of high sensitivity and the construction of roads could result in the landscape being fragmented, thus there is a possibility that viable animal and plant populations may be split or cut off from one another. In areas where there was already evidence of fragmentation the construction of these turbines could result in the conditions becoming worse. This impact is unlikely as turbines are placed in an area of moderate sensitivity and there were no signs of fragmentation.

Mitigation and management

Mitigation measures include the following*:*

- It is important to make sure all fences have wide enough mesh to let small animals through;
- Vegetation clearing should be kept to a minimum;
- Vegetation clearing for access roads should be minimal and should not occur on areas with high sensitivity;
- Areas marked as high sensitivity (e.g Shale fynbos) should also be conserved as part of an ecological corridor and clearing in these areas should be avoided.

Significance statement

Project:

Fragmentation of communities and edge effects is probable and will have a Moderate, Long Term impact. The environmental significance of this unmitigated impact will be MODERATE NEGATIVE. This will be reduced to LOW NEGATIVE if mitigation measures are implemented.

No-Go Option:

If no development was to occur on the site the overall impact would be positive since the vegetation and faunal habitats in the project area, specifically the southern section, is in good condition.

Impact	Effect			Risk or Likelihood	Total Score
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction phase					
Without mitigation	Long term	Study Area	Moderate	Probable	**MODERATE -**
With mitigation	Long term	Study area	Slight	May Occur	**LOW-**
No-Go					
Without mitigation	Long term	Study area	Slight Beneficial	Probable	**LOW +**

Impact 10: Dust generation

Cause and Comment

The construction of the proposed Wind Energy facility will result in increased amounts of dust being generated due to the increased traffic on the gravel roads. Dust will block the plants stomata reducing their ability to photosynthesise and respire.

Mitigation and management

Mitigation measures include the following:

- Vegetation clearing should be limited to non-windy months in order to reduce exposure of loose surface material to wind erosion;
- The area of disturbance must be kept to a minimum at all times and no unnecessary clearing of vegetation, digging or scraping should occur;
- The number of vehicles travelling on site should be minimised and speed levels should be controlled;
- Roads should be watered down during high wind and dry weather conditions.
- Road speeds in sensitive regions e.g. near wetlands, across drainage lines, and during extreme dry climatic conditions, should be limited to curtail dust production; and
- Vehicle speed should be limited to the lowest possible, and should not exceed 50km/h.

Significance statement

Project:

Fragmentation of communities and edge effects will definitely occur and will have a Moderate, Short Term impact. The environmental significance of this unmitigated impact will be MODERATE NEGATIVE. This will be reduced to LOW NEGATIVE if mitigation measures are implemented.

No-Go Option:

If no development was to occur on the site the overall impact would be positive since the vegetation in the project area, specifically the southern section, is in good condition and the existing vegetation currently functions to reduce dust levels in the project area.

Construction phase					
Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Short Term	Study Area	Moderate	Definite	MODERATE-
With Mitigation	Short Term	Study Area	Slight	May occur	LOW-
No-Go					
Without mitigation	Long term	Study area	Moderate beneficial	Probable	**LOW +**

7.1.2 Impacts Associated with the Operation Phase

I*mpact 11: Invasion of alien species*

Cause and Comment

As with all building operations, the introduction of alien and invader species is inevitable; with environmental disturbance comes the influx of aliens. Alien invader species need to be consistently managed over the entire operation phase of the project.

Mitigation and management

Mitigation measures include the following:

- Active management of alien species throughout both the construction and operation phases;
- Removal of existing alien species on site must be undertaken;
- Rehabilitation plan must be implemented; and
- Alien Invasive Control Programme must be implemented.

Significance statement

Project:

The introduction of alien invasive species will definitely occur and will have a Moderate, Permanent impact. The environmental significance of this unmitigated impact will be MODERATE NEGATIVE. This will be reduced to LOW POSITIVE if mitigation measures are implemented.

No-Go Option:

If no development was to occur on the site the overall impact would be low negative since the existing alien invasive species will continue to increase in numbers in the project area.

Invasion of alien species					
Impact	Effect			Risk or Likelihood	Total Score
	Temporal Scale	Spatial Scale	Severity of Impact		
Operation phase					
Without mitigation	Permanent	Study area	Moderate	Probable	**MOD -**
With mitigation	Short Term	Localised	Moderately beneficial	Probable	**LOW+**
No-Go					
Without mitigation	Permanent	Study area	Moderate	Definite	**LOW-**

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 Current status

The vegetation on the study site is mostly in a moderate condition primarily due to previous grazing, disturbance due to recent fires and the presence of a few alien invasive plant species on site. However, since the change in land use from livestock to game farming the vegetation has been allowed to recover and is intact in the high lying areas.

The most important and long term impact is likely to be the introduction and infestation of alien plant species. This should be managed effectively to prevent huge impacts on the study area. Areas of high sensitivity should be avoided, and areas of moderate sensitivity should be avoided where feasible. Where possible it is recommended that areas within the study site be set aside for conservation allowing the vegetation to reach its natural state, free of alien infestation.

8.2 Comparison of impacts

The impacts associated with the wind energy facility with and without mitigation measures have been assessed. In addition, the no-go alternative has also been assessed. Due to the very nature of a project of this type, it is suspected that many of the impacts will be reduced with effective management of the site as well as the utilization of rehabilitation after construction. It is essential that areas of high sensitivity are avoided where feasible. Any extra land needed for the construction phase of the development that will not be used during the operation phase of the development should be rehabilitated after construction is completed. For the plant species of conservation concern, it is recommended that these species are identified and rescued before construction commences and placed in a nursery to be use in the rehabilitation of laydown and construction areas that will not be required during the operational phase.

Overall, the impacts of the overall development will be negative, mainly due to a loss of vegetation. This loss of vegetation is also important for fauna as it constitutes habitat loss. Positive impacts include the active management of the alien vegetation on the site.

The no go alternative, which is the scenario if the development did not occur and the project area was left to continue as it currently is, indicates that a number of impacts would be considered to be beneficial. This is due to the southern portion of the project area having intact vegetation that is in relatively good condition with a high number of species of conservation concern present.

Table 7-1: Summary table of all eleven impacts identified in the Inyanda Wind Energy Project.

Impacts	Without mitigation	With Mitigation	No-Go
Impact 1: Loss of Grassy Fynbos	MODERATE-	MODERATE-	MODERATE +
Impact 2: Loss of Shale Fynbos	HIGH-	HIGH-	MODERATE +
Impact 3: Loss of Renosterveld	MODERATE-	LOW--	LOW -
Impact 4: Loss of Thicket	MODERATE-	LOW-	LOW -
Impact 5: Loss of Albany Alluvial Vegetation	LOW-	LOW-	MODERATE +
Impact 6: Loss of plant SCC	HIGH -	MODERATE-	LOW +
Impact 7: Loss of animal SCC	HIGH -	MODERATE-	MODERATE+
Impact 8: Loss of Biodiversity	HIGH -	MODERATE-	LOW +
Impact 9: Fragmentation of vegetation and edge effects	MODERATE-	LOW-	LOW +
Impact 10: Dust generation	MODERATE-	LOW-	LOW +
Impact 11: Invasion of alien species	MODERATE-	LOW+	LOW-

8.3 Plant removal\rehabilitation

It is recommended that a botanist/ecologist is on site to determine if any of the species of special concern or protected species occurs where the turbines and associated infrastructure are positioned. Before the clearing of the site is authorised, the appropriate permission must be obtained from the relevant department should any species of special concern need to be removed or replanted. These permits may be subject to certain conditions, for example allowing various nurseries to collect plants before vegetation clearance commences; the removal of certain species for rehabilitation purposes, etc.

The plants can also be removed and placed in a nursery for use for rehabilitation purposes. If a species is identified for relocation, individuals of the species will need to be located within the proposed site, before vegetation clearing commences, and carefully uprooted and removed by a skilled horticulturist. Prior to removal, however, suitable relocation areas need to be identified, either within the site or in other disturbed areas on the property. Individual plants that cannot be relocated at the time of removal should be moved to the nursery.

It should be noted that many critical SCC are plants that will not be able to be successfully uprooted and replanted at all (Phillipson, 2002), or at best may have a low survival rate. In all cases the species will require very careful treatment to give them the best chances of survival, and specialist horticultural knowledge will be needed.

8.4 Invasion of alien species

Any form of disturbance to the natural vegetation provides a gateway for alien species to invade the site of disturbance. In this regard, it is recommended that a strict monitoring plan be implemented to prevent the additional spread and the continued removal of alien species such as *Acacia mearnsii* and *Cuscuta campestris* which are already present on site.

8.5 Operational phase recommendations

The following operational phase management measures are recommended:

- Continued monitoring of the site for potential alien invasion, especially of plant species already
- Maintenance of areas set aside within the site for conservation to make sure these are not being impacted further in any way.

9. REFERENCES

Alexander, G. And Marais, J. 2010. *A Guide to Reptiles of Southern Africa*. Struik Nature, Cape Town. Animal Demography Unit, Department Of Zoology, University Of Cape Town. 2012. *Summary Data Of The Frogs Of South Africa, Lesotho And Swaziland.* Downloaded From: Http://Adu.Org.Za/Frog_Atlas.Php; Accessed On 2/02/2013.

Barnes, K.N. (ed.), 2000. *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland.*

Berliner D, Desmet P and Hayes R (2007). Eastern Cape Biodiversity Conservation Plan Handbook. Department Of Water Affairs And Forestry Project No 2005-012, King Williams Town. Isbn: 978-0-620-39423-9.

Boshoff, A.F. 2008. The Baviaanskloof Mega-Reserve: From Concept to Implementation. Teru Report. 58: 1-54.

Branch, W.R. 1988. *Terrestrial Reptiles and Amphibians. In: A Field Guide To The Eastern Cape Coast,* R. A. Lubke, F. W. Gess And M. N. Bruton (Eds.), Grahamstown Centre For The Wildlife Soc. S. Afr., 251-264.

Buckle, J.D. 1989. Inleiding agtergrond tot die werkswinkel oor die Kouga-Baviaanskloof Bewaaringsgebied. In: Kerley, G.I.H. & Els, L.M. (eds). The Kouga-Baviaanskloof Complex: Conservation Status and Management.

Cape Nature and Environmental Conservation Ordinance (1997). Ordinance No. 19 of 1974, Schedule 4, 11–18.

Dewey and LeBoeuf LLP, 2009. Client Alert – South Africa‟s REFIT Programme Starts to Take Shape. Dewey and LeBoeuf LLP, NewYork.

Du Preez, L. And Carruthers, V. 2009. *A Complete Guide To Frogs Of Southern Africa*. Struik Nature, Cape Town

Erlank, W. 2010. *An Evaluation of the Feasibility of Obtaining Payment for Ecosystem Services for the Baviaanskloof Nature Reserve*. Master's Thesis, Rhodes University.

Integrated Development Plan (IDP): 2007-2012. 2007. Sundays River Valley Municipality, Province of the Eastern Cape.

List of Threatened Species. IUCN Species Survival Commission, Cambridge Available: http://www.iucnredlist.org/ (Accessed 05/02/2013).

IUCN (2012). Red List of Threatened Species. IUCN Species Survival Commission, Cambridge Available: http://www.iucnredlist.org/ (Accessed 05/06/2014).

Kunz TH, Arnett EB, Erickson WP, Hoar AR, Johnson GD, Larkin RP, Strickland MD, Thusher RW and Tuttle MD. (2007). *Ecological Impacts of wind energy development on bats: questions, research needs, and hypotheses*. Frontiers in Ecology and the Environment. 5(6): 315 – 324.

Lubke, R.A., 1998. The Coastal Environment. In: Field Guide to the Eastern and Southern Cape Coasts. Eds: Lubke, R.A. and de Moor, I. The University of Cape Town Press. ISBN: 1-919713-03-4.

McManus, J. 2013. PhD candidate, Pers. comm. 20 May 2013.

Mucina, L. & Rutherford, M.C. (eds) 2006. *The vegetation of South Africa, Lesotho and Swaziland.* Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Pierce, S. M. and Mader, A. D. 2006. *The STEP Handbook. Integrating the natural environment into land use decisions at the municipal level: towards sustainable development. Centre for African Conservation Ecology (ACE)*. Report Number 47 (Second Edition). Nelson Mandela Metropolitan University, South Africa.

Pierce, S.M.; Cowling, R.M.; Knight, A.T.; Lombard, A.T.; Rouget, M and Wolf, T. 2005. *Systematic conservation planning products for land-use planning: Interpretation for implementation*. Biological Conservation.125: 441-458

Republic of South Africa. 2007. *Department of Environmental Affairs and Development Planning: Sustainable Energy Strategy for the Western Cape. Pretoria*: Government Printers.

Republic of South Africa. 2012. *White Paper on Renewable Energy. Pretoria*: Government Printers.

SIBIS 2013 (Acessed on 05/06/2014)

Stuart C. & Stuart T. Field Guide to Mammals of Southern Africa, 2007, Random House

APPENDIX A: CONSERVATION TOOL CATEGORIES

IUCN

The International Union for Conservation of Nature (IUCN) is recognized globally as one of the most comprehensive and objective approaches for evaluating the conservation status of plant and animal species. The IUCN aims to provide information and analyses on the status, trends and threats to species in order to inform and take action for the conservation of biodiversity. Below is a diagram of IUCN categories ranked according to status. Table 1-1 provides an explanation of each category.

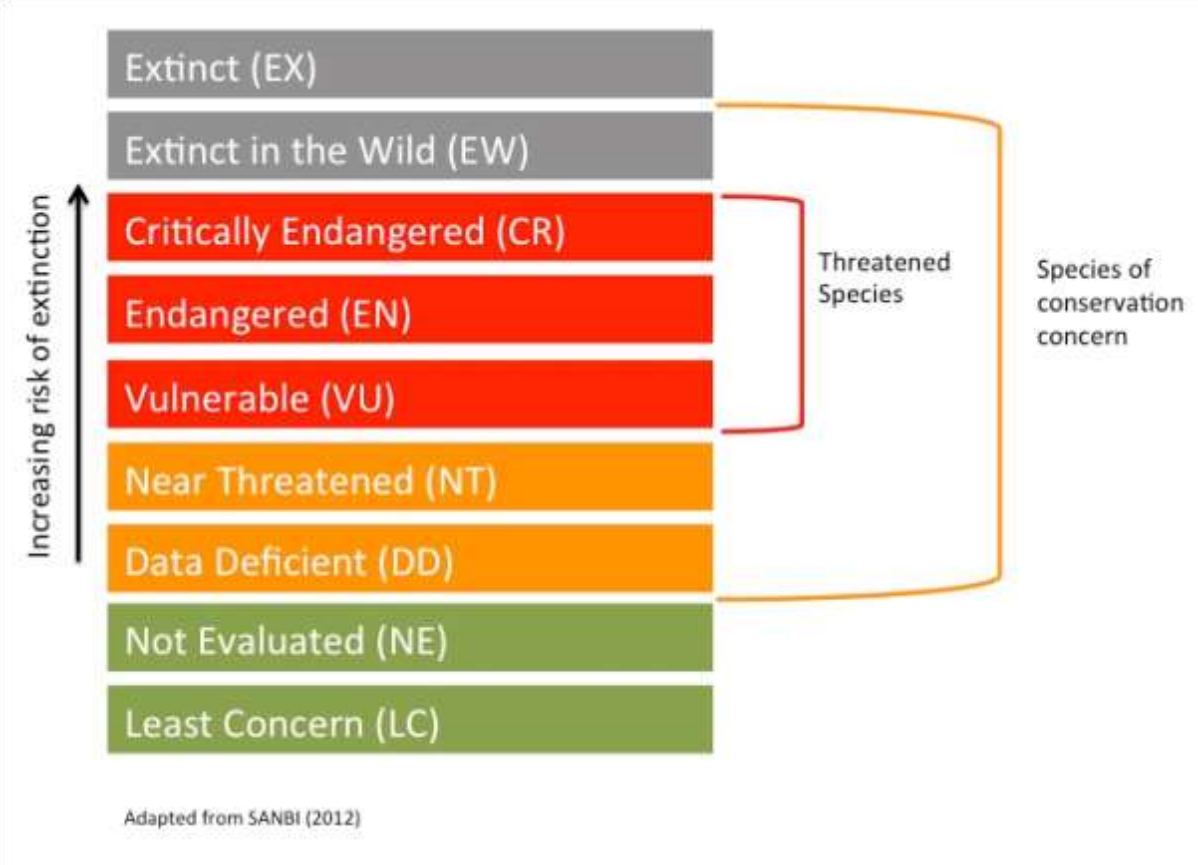

Table A-1: IUCN Red Data List Categories

EXTINCT (EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died
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 naturalised population (or populations) well outside the past range. A taxon is presumed extinct in the wild if exhaustive surveys in its known habitat in its historical range have failed to record an individual.
CRITICALLY ENDANGERED (CR)	A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future. .
ENDANGERED (EN)	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.
VULNERABLE (VU)	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.
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, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
DATA DEFICIENT (DD)	A taxon is Data Deficient when there is inadequate information to make an assessment based on its distribution and population status.

NOT EVALUATED (NE)	A taxon is Not Evaluated when it is has not yet been assessed against the criteria
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.

NEMBA

The National Environmental Management: Biodiversity Act (No. 10 of 2004), (NEMBA) aims to establish national norms and standards for the management of biodiversity across all sectors and by different management authorities.

Chapter 4, Part 2 of the Biodiversity Act provides for listing of species as threatened or protected. If a species is listed as threatened, it must be further classified as critically endangered, endangered or vulnerable. The Act defines these classes as follows:

Table A-2: NEMBA classes and explanations

Critically endangered species	Any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
Endangered species	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 species	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 will include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Endangered and Protected Flora in the 1974 Provincial Nature Conservation Ordinance (PNCO):
The Provincial Nature Conservation Ordinance (PNCO) protects the endangered and protected flora outside of protected areas. Species classified as Schedule 3 are endangered species. Species classified as schedule 4 are protected species. A permit is required for the removal or destruction of species on the PNCO list.

1976 List of Protected Trees (Government Gazette No. 9542 Schedule A) in the 1998 National Forest Act (NFA):
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, unless a permit has been acquired.

South African Red Data List
The South African Red List of South African plants uses the internationally recognised IUCN Red List Categories and Criteria to measure a species risk of extinction. Since the Red List of South African plants is used widely for conservation practices throughout South Africa, this list has been modified to identify species that are at low risk of extinction but of high conservation importance.

Table A-3: South African Red Data List Categories (SANBI, 2012)

EXTINCT (EX)	A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
EXTINCT IN THE WILD (EW)	A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
REGIONALLY EXTINCT (RE)	A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
CRITICALLY ENDANGERED, POSSIBLY EXTINCT (CR PE)	Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
CRITICALLY ENDANGERED (CR)	A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
ENDANGERED (EN)	A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
VULNERABLE (VU)	A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
NEAR THREATENED (NT)	A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.
CRITICALLY RARE	A species is Critically Rare when it is known to occur at a single site, but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
RARE	A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria.
RARE DECLINING	A species is Declining when it does not meet or nearly meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.
LEAST CONCERN	A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
DATA DEFICIENT – INSUFFICIENT INFORMATION (DDD)	A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required and that future research could show that a threatened classification is appropriate.
DATA DEFICIENT – TAXONOMICALLY PROBLEMATIC (DDT)	A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
NOT EVALUATED (NE)	A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous

	plants, and therefore all species are assessed and given a national Red List status. However, some species included in Plants of southern Africa: an online checklist, are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

APPENDIX B: FAUNAL SPECIES CHECKLISTS

Table B-1: An inventory of the amphibians and reptiles likely to occur in the project area.

Genus	Species	Subspecies	Common Name	IUCN Status #
AMPHIBIANS				
BUFONIDAE				
Amietophrynus	*rangeri*		Raucous toad	LC
Vandijkophrynus	*gariepensis*	*gariepensis*	Karoo toad	LC
BREVICEPTIDAE				
Brevicpes	*adspersus*	*pentheri*	Southern Rain Frog	LC
HYPEROLIIDAE				
Hyperolius	*marmoratus*	*verrucossus*	Painted reed frog	LC
Kassina	*senegalensis*		Bubbling kassina	LC
Semnodactylus	*wealii*		Rattling frog	LC
PIPIDAE				
Xenopus	*laevis*	*laevis*	Common platanna	LC
PYXICEPHALIDAE				
Amietia	*fuscigula*		Cape river frog*	LC
Amietia	*queketti*		Common river frog	LC
Cacosternum	*boettgeri*		Boettger's caco	LC
Cacosternum	*nanum*		Bronze caco	LC
Strongylopus	*grayii*		Clicking stream frog*	LC
Tomopterna	*tandyi*		Tandy's sand frog	LC
REPTILES				
ORDER: SQUAMATA				
TYPHLOPIDAE				
Rhinotyphlops	*lalandei*		Delalande beaked blind snake	LC
LEPTOTYPHLOPIDAE				
Leptotyphlops	*nigricans*		Black thread snake	LC
COLUBRIDAE				
Crotaphopeltis	*hotamboeia*		Herald snake	LC
Dasypeltis	*scabra*		Rhombic egg eater	LC
Dispholidus	*typus*	*typus*	Boomslang	LC
Philothamnus	*semivariegatus*		Spotted bush snake	LC
Philothamnus	*natalensis*	*occidentalis*	Eastern natal green snake	LC
ELAPIDAE				
Naja	*nivea*		Cape cobra	LC
Aspidelaps	*lubricus*	*lubricus*	Coral shield cobra	LC
Hemachantus	*haemachatus*		Rinkhals	LC
LAMPROPHIDAE				
Amplorhinus	*multimaculatus*		Many-spotted snake	LC
Aparallactus	*capensis*		Black-headed centipede-eater	LC
Boaedon	*capensis*		Brown house snake	LC
Duberria	*lutrix*		Common slug eater	LC
Homoroselaps	*lacteus*		Spotted harlequin snake	LC

Lamprophis	*guttatus*		Spotted house snake	LC
Lamprophis	*aurora*		Aurora house snake	LC
Lamprophis	*fuscus*		Yellow-bellied house snake	LC
Lycodonomorphus	*inornatus*		Olive house snake	LC
Lycodonomorphus	*rufulus*		Brown water snake	LC
Lycophidion	*capense*	*capesnse*	Cape wolf snake	LC
Psammophis	*crucifer*		Cross-marked grass snake	LC
Psammophis	*notostictus*		Karoo whip snake	LC
Psammophylax	*rhombeatus*	*rhombeatus*	Rhombic skaapsteker	LC
Pseudaspis	*cana*		Mole snake	LC
Prosymna	*sundevallii*		Sundevall's shovel-snout	LC
VIPERIDAE				
Bitis	*arietans*	*arietans*	Puff adder	LC
Bitis	*atropos*		Berg adder	LC
Causus	*rhombeatus*		Rhombic night adder	LC
AGAMIDAE				
Agama	*atra*		Southern rock agama	LC
BRADYPODION				
Bradypodion	*taeniabronchum*		Elandsberg dwarf chameleon	ED
Bradypodion	*ventrale*		Eastern Cape dwarf chameleon	LC
VARANIDAE				
Varanus	*niloticus*		Water monitor	LC
Varanus	*albigularis*	*albigularis*	Rock monitor	LC
SCINCIDAE				
Acontias	*meleagris*	*meleagris*	Cape legless skink	LC
Acontias	*gracilicauda*		Thin-tailed legless skink	LC
Acontias	*lineicauda*		Algoa legless skink	LC
Acontias	*orientalis*		Eastern Cape legless skink	LC
Trachylepis	*capensis*		Cape skink	LC
Trachylepis	*sulcata*		Western rock skink	LC
Trachylepis	*homalocephala*		Red-sided skink	LC
Trachylepis	*varia*		Variable skink	LC
Trachylepis	*variegata*		Variegated skink	LC
Scelotes	*anguineus*		Algoa dwarf burrowing skink	LC
Scelotes	*caffer*		Cape Dwarf Burrowing Skink	LC
CORDYLIDAE				
Chamaesaura	*anguina*	*anguina*	Cape grass lizard	LC
Cordylus	*cordylus*		Cape girdled lizard	LC
Karusasaurus	*polyzonus*		Karoo girdled lizard	LC
Pseudocordylus	*microlepidotus*	*microlepidotus*	Cape crag lizard	LC
GERRHOSAURIDAE				
Tetradactylus	*seps*		Short-legged seps	LC
GEKKONIDAE				
Afroedura	*sp "Kouga"*		Baviaanskloof flat gecko	LC
Chondrodactylus	*bibronii*		Bibron's gecko	LC
Pachydactylus	*maculatus*		Spotted thick-toed gecko*	LC
Goggia	*essexi*		Essex's leaf-toed gecko	LC
LACERTIDAE				

Nucras	*lalandii*		Delande's sandveld lizard	LC
Pedioplanis	*burchellii*		Burchell's sand lizard	LC
Pedioplanis	*lineoocellata*	*pulchella*	Spotted sand lizard	LC
Pedioplanis	*namaquensis*		Namaqua sand lizard	LC
Tropidosaura	*gularis*		Cape mountain lizard	LC
Tropidosaura	*montana*	*rangeri*	Common mountain lizard*	LC
ORDER: TESTUDINES				
CHELONIDAE				
Stigmohelylus	*pardalis*		Leopard tortoise	LC
Chersina	*angulata*		Angulate tortoise	LC
Homopus	*areolatus*		Parrot-beaked dwarf tortoise	LC
Psammobates	*tentorius*		Tent tortoise	LC
PELOMEDUSIDAE				
Pelomedusa	*subrufa*		Marsh terrapin	LC

**Specimens observed during the one day site visit*

[#] *The IUCN Red List categories are: NE = Not Evaluated, Ed = Endangered, DD = Data Deficient and LC = Least Concern.*

APPENDIX C: FLORAL SPECIES CHECKLIST

Family	Scientific Name
FABACEAE	*Acacia karoo*
FABACEAE	*Acacia mearnsii*
RUTACEAE	*Agathosma apiculata*
RUTACEAE	*Agathosma gonaquensis*
RUTACEAE	*Agathosma ovata*
RUTACEAE	*Agathosma puberula*
RUTACEAE	*Agathosma unicarpellata*
ASPHODELACEAE	*Aloe ferox*
RUBIACEAE	*Anthospermum aethiopicum*
RUBIACEAE	*Anthospermum herbaceum*
ICACINACEAE	*Apodytes dimidiata*
ASTERACEAE	*Arctotis arctoides*
POACEAE	*Aristida diffusa*
POACEAE	*Aristida junciformis subsp. galpinii*
FABACEAE	*Aspalathus spinosa*
ASPARAGACEAE	*Asparagus racemosus*
ASTERACEAE	*Athanasia pinnata*
SALVADORACEAE	*Azima tetracantha*
ASTERACEAE	*Berkheya angustifolia*
ASTERACEAE	*Berkheya carduoides*
ASTERACEAE	*Berkheya decurrent*
BRUNIACEAE	*Berzelia commutata*
IRIDACEAE	*Bobartia orientalis*
POACEAE	*Brachiaria serrata*
Brachylaena	*Brachylaena ilicifolia*
ASTERACEAE	*Brachylaena ilicifolia*
MESEMBRYANTHEMACEAE	*Carpobrotus edulis*
ACANTHACEAE	*Chaetacanthus setiger*
ACANTHACEAE	*Chrysanthemoides monilifera*
ROSACEAE	*Cliffortia ilicifolia*
EUPHORBIACEAE	*Clutia dregeana*
EUPHORBIACEAE	*Clutia ericoides*
EUPHORBIACEAE	*Clutia laxa*
SANTALACEAE	*Colpoon compressum*
ASTERACEAE	*Corymbium africanum*
CRASSULACEAE	*Cotyledon orbiculata*
CRASSULACEAE	*Crassula lycopodioides (Crassula muscosa L. var. polpodacea)*
CRASSULACEAE	*Crassula nudicaulis var nudicaulis*
ASTERACEAE	*Cullumia decurrens*
CONVOLVULACEAE	*Cuscuta campestris*
ARALIACEAE	*Cussonia spicata*

ARALIACEAE	*Cussonia spicata*
POACEAE	*Cymbopogon plurinodis (Cymbopogon pospischilii)*
POACEAE	*Cynodon dactylon*
CARYOPHYLLACEAE	*Dianthus zeyheri subsp. Natalensis*
SCROPHULARIACEAE	*Diascia capsularis*
EBENACEAE	*Diospyros dichrophylla*
EBENACEAE	*Diospyros pallens*
EBENACEAE	*Diospyros scabrida*
EBENACEAE	*Diospyros villosa*
EBENACEAE	*Diospyros whyteana*
ASTERACEAE	*Disparago ericoides*
SAPINDACEAE	*Dodonaea angustifolia*
BORAGINACEAE	*Ehretia rigida*
POACEAE	*Ehrharta calycina*
POACEAE	*Ehrharta villosa*
RESTIONACEAE	*Elegia vaginulata*
ASTERACEAE	*Elytropappus rhinocerotis*
ZAMIACEAE	*Encephalartos longifolius*
POACEAE	*Eragrostis capensis*
POACEAE	*Eragrostis chloromelas*
POACEAE	*Eragrostis curvula*
POACEAE	*Eragrostis racemosa*
ERICACEAE	*Erica cerinthoides*
ERICACEAE	*Erica cf chamissonis*
ERICACEAE	*Erica cf copiosa*
ERICACEAE	*Erica imbricata*
EBENACEAE	*Euclea schimperi*
EBENACEAE	*Euclea undulata*
POACEAE	*Eulalia villosa*
ASTERACEAE	*Euryops adgoensis*
ASTERACEAE	*Euryops brachypodus*
ASTERACEAE	*Euryops munitus*
ASTERACEAE	*Felicia filifolia*
CYPERACEAE	*Ficinia gracilis*
ASTERACEAE	*Gazania krebsiana*
IRIDACEAE	*Geissorhiza heterostyla*
ASTERACEAE	*Gerbera viridifolia*
AIZOACEAE	*Glottiphyllum sp.*
THYMELAEACEAE	*Gnida coriacea*
CELASTRACEAE	*Gymnosporia polyacantha*
POACEAE	*Harpochloa falx*
ASTERACEAE	*Helichrysum anomalum*
ASTERACEAE	*Helichrysum anomalum*
ASTERACEAE	*helichrysum cf. aureonitens*
ASTERACEAE	*Helichrysum cymosum*

ASTERACEAE	*Helichrysum herbaceum*
ASTERACEAE	*Helichrysum nudifolium*
ASTERACEAE	*Helichrysum odoratissimum*
ASTERACEAE	*Helichrysum subglomeratum*
ASTERACEAE	*Helichrysum teretifolium*
POACEAE	*Helictotrichon hirtulum*
MALVACEAE	*Hermannia filifolia*
POACEAE	*Heteropogon contortus*
MALVACEAE	*Hibiscus aethiopicus*
HYPOXIDACEAE	*Hypoxis hemerocallidea*
SCROPHULARIACEAE	*Jamesbrittenia foliolosa*
ASPHODELACEAE	*Kniphofia triangularis*
MESEMBRYANTHEMACEAE	*Lampranthus spectabilis*
LAMIACEAE	*Leonotis Leonurus*
PROTEACEAE	*Leucadendron salignum*
PROTEACEAE	*Leucospermum cuneiforme*
BORAGINACEAE	*Lithospermum papillosum*
LOBELIACEAE	*Lobelia tomentosa*
FABACEAE	*Lotononis cf glabra*
FABACEAE	*Lotononis decumbens subsp decumbens*
ANACARDIACEAE	*Loxostylis alata*
CELASTRACEAE	*Maytenus heterophylla (Gymnosporia sp.)*
ASTERACEAE	*Metalasia densa*
ASTERACEAE	*Metalasia muricata*
ASTERACEAE	*Metalasia pungens*
MONTINIACEAE	*Montinia caryophyllacea*
MYRICACEAE	*Morella brevifolia*
POLYGALACEAE	*Muraltia alopecuroides*
POLYGALACEAE	*Muraltia ericaefolia*
POLYGALACEAE	*Muraltia juniperifolia*
MYRSINACEAE	*Myrsine africana*
SCROPHULARIACEAE	*Nemesia floribunda*
OLEACEAE	*Olea europaea subsp. Africana*
OLEACEAE	*Olea europaea subsp. Africana*
ASTERACEAE	*Osteospermum caulescens*
ASTERACEAE	*Osteospermum junceum*
THYMELAEACEAE	*Passerina obtusifolia*
GERANIACEAE	*Pelargonium reniforme*
POACEAE	*Phragmites australis*
RHAMNACEAE	*Phylica axillaris*
RHAMNACEAE	*Phylica Buxifolia*
FABACEAE	*Podalyria burchellii*
POLYGALACEAE	*polygala cf. myrtifolia*
POLYGALACEAE	*Polygala fruticosa*

POLYGALACEAE	*Polygala hottentotta*
PROTEACEAE	*Protea foliosa*
PROTEACEAE	*Protea lanuginosa subs. Intermedia*
PROTEACEAE	*Protea mundii*
PROTEACEAE	*Protea nerifolia*
PROTEACEAE	*Protea nitida*
PTAEROXYLACEAE	*Ptaeroxylon obliquum*
ASTERACEAE	*Pteronia teretifolia*
RESTIONACEAE	*Restio sejunctus*
RESTIONACEAE	*Restio triticeus*
VITACEAE	*Rhoicissus digitata*
VITACEAE	*Rhoicissus tridentata subsp. Cuneifolia*
ANACARDIACEAE	*Rhus crenata*
ANACARDIACEAE	*Rhus incisa*
ANACARDIACEAE	*Rhus incisa*
ANACARDIACEAE	*Rhus longispina*
ANACARDIACEAE	*Rhus longispina*
ANACARDIACEAE	*Rhus pallens*
ANACARDIACEAE	*Rhus rosmarifolius*
AIZOACEAE	*Ruschia orientalis*
SALICACEAE	*Salix mucronata*
DIPSACACEAE	*Scabiosa columbaria*
SCHIZAEACEAE	*Schizaea pectinata*
FABACEAE	*Schotia afra var. afra*
FABACEAE	*Schotia afra var. afra*
SCROPHULARIACEAE	*Selago corymbosa*
SCROPHULARIACEAE	*Selago myrtifolia*
ASTERACEAE	*Senecio burchelli*
ASTERACEAE	*Senecio inaquidens*
ASTERACEAE	*Senecio lineatus*
ASTERACEAE	*Senecio ruwenzoriensis*
ASTERACEAE	*Senecio speciosus*
ASTERACEAE	*Seriphium plumosum (Stoebe vulgaris)*
SAPOTACEAE	*Sideroxylon inerme*
POACEAE	*Sporobolus africanus*
LAMIACEAE	*Stachys scabrida*
THYMELAEACEAE	*Struthiola argentea*
FABACEAE	*Tephrosia capensis*
CYPERACEAE	*Tetraria bromoides*
RESTIONACEAE	*Thamnochortus glaber*
POACEAE	*Themeda triandra*
SANTALACEAE	*Thesium costatum*
SANTALACEAE	*Thesium squarrosum*
SANTALACEAE	*Thesium strictum*
POACEAE	*Tristachya rehmannii*

ASTERACEAE	*Vernonia capensis*
CAMPANULACEAE	*Wahlenbergia huttonii*
CAMPANULACEAE	*Wahlenbergia nodosa*