

# GOURIKWA-BLANCO-DROERIVIER 400kV TRANSMISSION POWER LINE AND SUBSTATION UPGRADE.

## DESKTOP FAUNAL STUDY

Prepared for:



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## EXECUTIVE SUMMARY

A desktop faunal study for the Gourikwa-Blanco-Droerivier 400kV Power line and Substations upgrade was conducted. The project entails the construction of a 50 km long 400 kV power line from the Gourikwa Substation at Mossel Bay to the Blanco Substation at George, and the construction of a 200 km long 400 kV power line from Blanco Substation to the Droerivier Substation at Beaufort West in the Western Cape Province.

To give insight into the faunal components of the project area, a desktop faunal assessment using the available spatial planning tools was conducted by identifying protected areas and areas of conservation concern within the greater project area. Identified areas include:

- Formal Protected Areas (NBA, 2011),
- Critical Biodiversity Areas,
- Wetlands and Rivers (NFEPA).

These were mapped to spatially reference and relate these areas to the proposed alternative power line routes. Priority faunal areas for amphibians, reptiles and mammals were identified and mapped using the Succulent Karoo Ecosystem Programme (SKEP) expert map database. Within the project area, four mammal priority areas, two reptile priority areas, and one amphibian priority area were identified. The current alternative route options cross three of these priority areas.

According to historical records, 95 species of reptile, 25 species of frog and toad, and 94 species of mammals have distribution ranges which include or are part of the project area (ADU, 2015; IUCN, 2015). Of the 95 species of reptile, the Dwarf Karoo Girdled Lizard (*Cordylus aridus*) is listed as Endangered, the FitzSimons' Long-tailed Seps (*Tetradactylus fitzsimonsi*) as Vulnerable, and the Braack's Pygmy Gecko (*Goggia braacki*) and Karoo Padloper (*Homopus boulengeri*) as Near Threatened on the SA Red Data List. Four species appear on Appendix II of CITES. All lizards and tortoises are listed as a schedule II species on the PNCO list for the Western and Eastern Cape Provinces.

Of the 25 species of frog and toad likely to occur within the project area, only the Endangered Knysna Leaf-Folding Frog (*Afrixalus knysnae*) is listed on the SA Red List (ADU, 2015). However, all frogs and toads are listed as schedule 2 species on the PNCO list and will therefore require permits for their removal.

The Critically Endangered Riverine Rabbit (*Bunolagus monticularis*), the Endangered Black Rhinoceros (*Diceros bicornis*), the Protected Honey Badger (*Mellivora capensis*), and the Vulnerable Leopard (*Panthera pardus*) mammal species have distributions that coincide with the project area and are TOPS species on the National Environmental Management: Biodiversity Act (NEMBA). Additionally, 11 species are listed on the IUCN Red Data List under varying statuses. The Critically Endangered Riverine Rabbit (*Bunolagus monticularis*) is one of the most endangered mammals in the world, with only around 250 living adults remaining in the wild. According to IUCN (2015) an isolated subpopulation occurs in the northern section of the project area. Due to the species conservation status, it is highly recommended that the distribution range of this subpopulation is surveyed.

The desktop study identified the following areas as highly sensitive from a faunal perspective:

- Process areas such as perennial rivers, pristine wetlands and wetland clusters identified by NFEPA that are important for amphibian habitat and ecosystem functioning;
- Succulent Karoo Ecosystem Programme (SKEP) identified hotspots for amphibians, reptiles and mammals; and
- Formal Protected Areas.

Areas that contain globally identified SCC such as the Riverine Rabbit (*Bunolagus monticularis*) and the Knysna Leaf-Folding Frog (*Afrixalus knysnae*), as well as areas with a high species

abundance and richness should also be considered highly sensitive. However, due to deviations in distribution ranges across the mapping tools, it is not certain if these species will be affected by the proposed alternative powerline routes. Ground truthing the distribution ranges of these species and spatially referencing them to the alternative power line routes could mitigate against potential destruction of critical supporting habitat.

Based on the available spatial planning tools and species distribution data, it is recommended that the B-D alternative 1 is the preferred route option for the Blanco to Droerivier section of the proposed power line. However, this recommendation is subject to establishing the known distribution range of the subpopulation of Riverine Rabbit in the northern section. It is also suggested that the route be re-aligned to avoid the SKEP reptile priority area north of the Swartberg Mountains. If chosen, on ground surveying of 'sensitive' areas should take place along the route to accommodate adjustments to the alignment (e.g. avoiding rocky outcrops and habitats suitable for SCC).

The alternative routes from the Blanco to Gourikwa section cross many wetlands and rivers which are highly sensitive, especially from an amphibian perspective. It is not within the scope of this study to recommend one of these alternatives until accuracy is increased through field surveys. A herpetological and wetland health survey would allow for a more accurate recommendation of a preferred route to be made. From a faunal perspective, it can be recommended that the preferred route should avoid, where possible, pristine wetlands, wetland clusters and sensitive areas of rivers.

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## **1. INTRODUCTION**

### **1.1. Project description and locality**

EOH Coastal & Environmental Services has been contracted by Envirolution Consulting to conduct a desktop faunal study for the Gourikwa-Blanco-Droerivier 400kV Power line and Substations upgrade.

The project entails the construction of a 50 km long 400 kV power line from the Gourikwa Substation at Mossel Bay to the Blanco Substation at George (Figure 1-1), and the construction of a 200km long 400kV power line from Blanco Substation to the Droerivier Substation at Beaufort West in the Western Cape Province (Figure 1-2). The alternative routes that are investigated for the latter section are located in the Eastern Cape Province.

The corridor to be investigated for the proposed power lines is 1 km wide, with a servitude of 62 m. However, the desktop investigation will focus on a larger area to incorporate potential alignment changes following specialist recommendations during the scoping phase of the EIA. Following desktop findings, site investigations for the study area will be more confined and concentrate on the preferred route, after which details regarding the number, tower design and other support infrastructures associated with the power line will be finalised. Based on similar projects, the following types of towers are being considered for this project:

- Compact cross rope suspension tower
- Cross rope suspension tower
- Guyed-V suspension tower
- Self-supporting suspension tower
- Self-supporting strain tower; or
- Guyed strain structures.

### **1.2. Objectives and Terms of Reference**

The following objectives have been defined for the desktop study:

- To provide a general description of the terrestrial vertebrate fauna of the project area and adjacent areas;
- To review the fauna likely to occur in the project area for the presence of Species of Conservation Concern (SCC);
- To assess the habitat associations of the faunal components, and;
- To provide guidance on the alternative routes based on the resident fauna and their associated habitats.

### **1.3. Assumptions and Limitations**

This report is based on currently available information and, as a result, the following limitations and assumptions are implicit:

- The report is based on a project description taken from design specifications for the proposed power line that have not yet been finalised, and which are likely to undergo a number of iterations and refinements before they can be regarded as definitive;
- Descriptions of the fauna are based on available literature and databases; and
- Only reptiles, amphibians and mammals will be described in this report. Birds are investigated in a separate avi-faunal study.



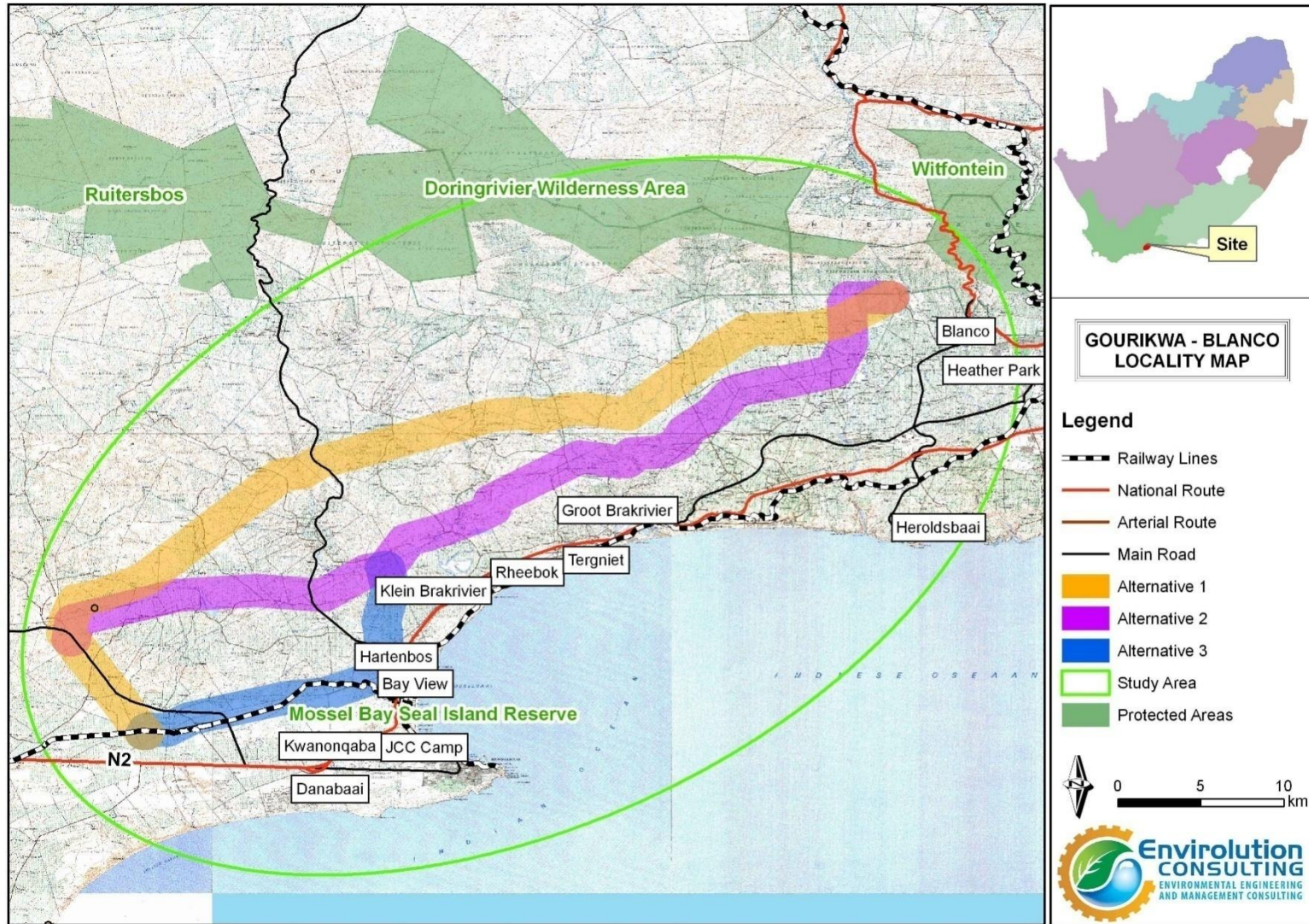


Figure 1-1: Map of the proposed 400kV power line alternatives and study area from the Gourikwa to Blanco substations



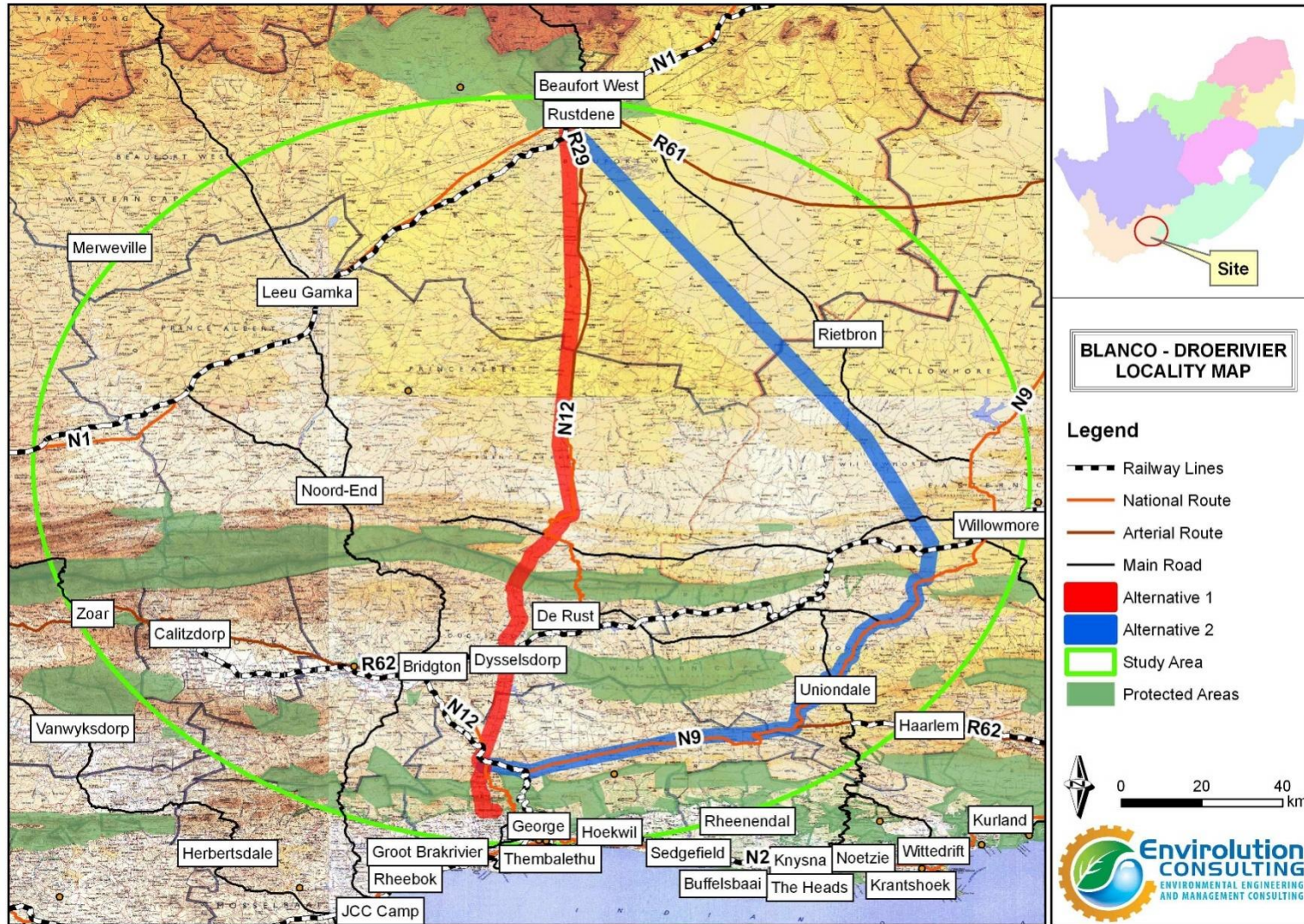


Figure 1-2: Map of the proposed 400kV power line alternatives and study area from Blanco to Droerivier Substations

## **2. APPROACH**

### **2.1. Protected Areas**

In order to give insight into the faunal components of the project area, the desktop faunal assessment used spatial planning tools to identify protected areas and areas of conservation concern within the greater project area. Protected and conserved areas are likely to provide habitat refuge for a great diversity and richness of faunal species, as well as maintain ecological functioning. Therefore, these areas have been identified as areas of concern from a faunal perspective. In addition, ecological corridors that support faunal movements have been identified

Protected Areas within the project area were identified using the National Biodiversity Assessment (NBA) 2011, which is based on the ecosystem protection level which is critical to identify current levels of protection of habitats and biodiversity. The NBA (2011) works in correlation with the National Protect Areas Expansion Strategy (NPAES) to help identify where future conservation efforts should be focused.

### **2.2. Critical Biodiversity Areas**

Critical Biodiversity Areas (CBAs) are areas which play an important role for the protection and sustainability of biodiversity, which includes important locations for biodiversity features or rare species (Holness and Bradshaw, 2012). Municipal CBA maps were consulted for the sections of the project area which fall within the Western Cape, and the provincial CBA mapping database was investigated for the areas within the Eastern Cape.

CBAs offer guidance to achieve the desired land-use management objectives, highlighting areas which need to be i) maintained, ii) rehabilitated, iii) or managed to prevent further degradation, in order to achieve desired ecological functioning. Functioning ecological systems provide the necessary ecological integrity required to provide habitats which offer protection and refuge for many faunal species.

### **2.3. Wetlands and Rivers**

The National Freshwater Ecosystem Priority Areas (NFEPAs) spatial planning tool was used to identify wetlands and rivers within the project area. It was assumed that these would be areas associated with amphibians. The identification of perennial rivers and healthy wetlands aids in identifying potential preferred habitats and sensitive areas for amphibians.

### **2.4. Identified Faunal Hotspots**

The Succulent Karoo Ecosystem Programme (SKEP) maps centres of endemism and species richness, unique habitats and key areas for maintenance of biological processes (SKEP, 2002). A comprehensive spatial map was compiled by experts in their respective taxonomic fields. The SKEP database was consulted to identify key areas or hotspots for reptile, amphibian and mammal groups within the project area.

### **2.5. Faunal Species of the Project Area**

A literature review was conducted to establish a list of the terrestrial vertebrate fauna which may occur within the project area. 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 and spatial planning tool sources consulted included:

- Amphibians – Channing (2001), Du Preez & Carruthers (2009), Frost (2014), IUCN (2014),

- Frog Atlas (Animal Demographic Unit);
- Reptiles – Branch (1998, 2008), Bauer & Branch (2001), Bauer *et al.* (2006a,b), IUCN (2014), Reptile Atlas (Animal Demographic Unit); and
- Mammals –Stuart & Stuart (2001), IUCN (2014), Mammal Atlas (Animal Demographic Unit).

### 2.3.1 Species of Conservation Concern

Species that are afforded special protection, notably those that are protected by NEMA. Endangered and Protected Fauna in the 1974 Provincial Nature Conservation Ordinance (PNCO), South African Red List of South African (SA Red Data List), and the IUCN Red List.

Species of Conservation Concern (SCC) in terms of the project area are defined as:

- **Threatened species:**

Species listed as threatened in the revised South African Red Data Books (amphibians - du Preez and Carruthers, 2009, Minter et al 2004, Measey 2011; reptiles - Bates et al. 2014, Branch 2014); and/or

- Species included in other international lists (e.g., 2015 IUCN Red List of Threatened Animals). 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 now, 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 1 or 2 of the Convention of International Trade in Endangered Species (CITES).
- **Endemic species:** Species endemic to the Eastern and Western Cape and/or South Africa (amphibians, du Preez & Carruthers, 2009; reptiles, Bates et al 2014; mammals, IUCN 2014; NEMBA (2004), PNCO, 1974).

### 2.6. Sensitive Areas

Based on literature reviews and available desktop spatial planning tools, a sensitivity map was developed by identifying areas of high, medium and low faunal sensitivity. A conservative approach was used until a ground truthing survey has been conducted to determine the accuracy of the sensitivities described.



### 3. PROTECTED AREAS

The National Biodiversity Assessment (2011) identifies Protected Areas based on the ecosystem protection level which is critical to identify current levels of protection of habitats and biodiversity. The NBA (2011) categorizes protected areas into Formal A and Formal B categories, depending on their level of protection. Table 3-1 highlights the categorisation of protected areas relevant to this project.

The NBA (2011) works in correlation with the National Protected Areas Expansion Strategy (NPAES) to help identify where future conservation efforts should be focused. South Africa's protected area network currently falls short of sustaining biodiversity and ecological processes. In this context, the goal of the National Protected Area Expansion Strategy (NPAES) is to achieve cost effective protected area expansion for ecological sustainability and adaptation to climate change (BGIS, 2007).

The NPAES sets targets for protected area expansion, provides maps of the most important areas for expansion, and makes recommendations on mechanisms these areas. It deals with land-based and marine protected areas across all of South Africa's territory. Focus areas for land-based protected area expansions are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence. These areas are suitable for the creation or expansion of large protected areas (BGIS, 2007).

The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy 2008 (NPAES). They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES (BGIS, 2007).

Figure 3-1 illustrates the Formal Protected and NPAES Areas within the greater project area. The Formal Protected Areas which are directly affected by the alternative power line routes are commented on in Table 3-1.

**Table 3-1: Protected Areas which are affected by the proposed powerline alternatives**

Route	Comment
B-D Alternative 1	This line crosses the Grootswartberg Mountain Catchment Area (Formal B) and the Groot Swartberg Nature Reserve (Formal A) protected areas in the Swartberg Mountains. The line crosses the Ruitersbos Nature Reserve and Doringrivier Wildernis Area (both Formal A protected areas) as it moves south from the Little Karoo through the Outeniqua Mountains.
B-D Alternative 2	This line crosses the most eastern section of the Swartberg-Oos Mountain Catchment Area (Formal B), and is located along the northern boundary of the Witfontein Nature Reserve (Formal A) protected area in the Outeniqua Mountain range.
G-B Alternative 1	All three alternatives for the Gourikwa-Blanco section of the do not cross/influence any NPAES or protected areas.
G-B Alternative 2	
G-B Alternative 3	





Figure 3-1: Formal Protected and NPAES Areas within the project area



## 4. CRITICAL BIODIVERSITY AREAS (CBAs)

Critical Biodiversity Areas (CBAs) involve fine-scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities. CBA maps provide information on biodiversity to decision makers to help guide developments.

Critical Biodiversity Areas serve to advise developmental planning procedures to protect areas of critical biodiversity value and their supporting areas against negative impacts. Therefore, the aim of the CBA is to ensure responsible land-use and planning for the best possible long-term benefits and to promote the integrated management of natural resources (Holnes and Bradshaw, 2010).

Ecological Support Areas are supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. These may include areas that are degraded or even transformed, if these areas still play an important role in supporting CBAs (e.g. heavily invaded riparian strips or farmland within a coastal corridor) (Holnes and Bradshaw, 2010).

CBAs incorporate (i) areas that need to be safeguarded in order to meet national biodiversity thresholds; (ii) areas required to ensure the continued existence and functioning of species and ecosystems, including the delivery of ecosystem services; and/or (iii) important locations for biodiversity features or rare species (Holnes and Bradshaw, 2010). Although CBAs are defined using a vast range of ecological factors, faunal species rarity, richness and diversity form key criteria for the three above mentioned points. Furthermore, CBAs aim to maintain or improve the condition of landscapes, which contributes to improved ecological function, enhancing the habitat provision which will sustainably accommodate a rich and diverse faunal component.

CBAs are mapped at varying spatial scales (e.g. municipality, district or provincial) depending on the region. Data extracted from various sources within the SANBI Biodiversity GIS database were used to create a map illustrating the CBAs, Protected Areas and Ecological Support Areas of the proposed project area (Figure 4-1). The following CBA maps were used;

- Garden Route Critical Biodiversity Areas and Ecological Support Areas (Garden Route Initiative; SANParks);
- Little Karoo CBAs and ESAs (DEADP);
- Central Karoo CBAs and ESAs (Central Karoo District Municipality);
- Mossel Bay CBAs, CESAs (Critical Ecological Support Areas), and OESAs (Other Ecological Support Areas (CapeNature, C.A.P.E. Fine-Scale Biodiversity Planning Project));
- Hessequa CBAs, CESAs, and OESAs (CapeNature, C.A.P.E. Fine-Scale Biodiversity Planning Project);
- Eastern Cape Biodiversity Conservation Plan (Department of Economic Development, Environmental Affairs and Tourism)

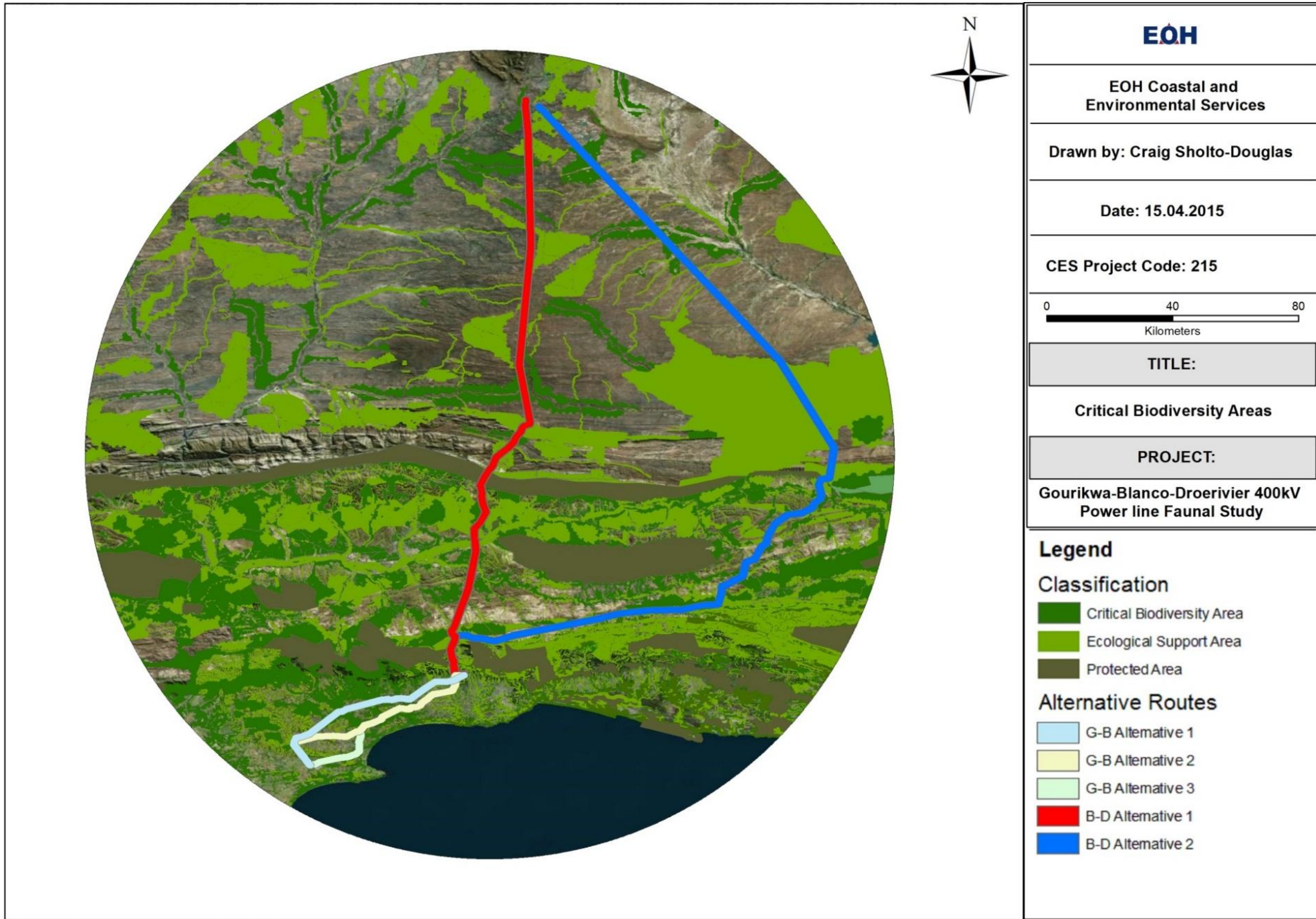
The above mentioned Biodiversity Frameworks and CBAs integrate key biodiversity information relevant to land-use. This was used to determine the location of critical biodiversity areas within the project area (Figure 4-1). A description of the desired management objectives are presented in Table 4-1.

**Table 4-1: CBA Map Categories**

<b>CBA Map Category</b>	<b>Desired Management Objective</b>	<b>Suggested Land Use</b>
Protected Area Critical Biodiversity Areas (CBA)	Maintain Natural Land. Rehabilitate degraded to natural or near natural. Manage for no further degradation.	Conservation
Ecological Support Area (ESAs)	Maintain ecological processes.	Conservation Game farming Communal livestock
No Natural Areas	Sustainable development and management within general rural land-use principles. Favoured areas for development.	Commercial livestock Dry land cropping Irrigated cropping Dairy farming Timber Settlement

As can be seen in Figure 4-1, all of the proposed alternatives cross through many CBAs and ESAs within the project area. Relatively speaking, B-D Alternative 2 crosses the least CBAs, but does extend through many ESAs. All three proposed alternative routes from the Gourikwa to Blanco substations cross numerous CBAs and ESAs.





Map Source: X:\PROJECTS\MEDIUM\Envirolution Faunal Specialist Sudy (215) CSD  
**Figure 4-1: Critical Biodiversity Areas within the project area**

## 5. WETLANDS AND RIVERS

The NFEPA project aims to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation. Freshwater Ecosystem Priority Areas (FEPAs) are strategic spatial priorities for conserving freshwater ecosystems and supporting sustainable use of water resources. FEPAs are often tributaries and wetlands that support hard-working large rivers, and are an essential part of an equitable and sustainable water resource strategy. FEPAs need to stay in a good condition to manage and conserve freshwater ecosystems, and to protect water resources for human use. This does not mean that FEPAs need to be fenced off from human use, but rather that they should be supported by good planning, decision-making and management to ensure that human use does not impact on the condition of the ecosystem.

Since amphibians are generally associated with wetlands and rivers, the NFEPA spatial planning tool was used to identify wetlands and rivers within the project area and in so doing this to identify potential sensitive areas for amphibians.

Figure 5-1 illustrates these potentially sensitive areas for amphibians. Wetland conditions classified as category AB and category C are generally considered to be in a natural or good condition, or only slightly modified. These wetlands are likely to provide suitable habitat for a high diversity and richness of amphibian species.

Wetland clusters are groups of wetlands embedded in a relatively natural landscape. This allows for important ecological processes such as migration of frogs between wetlands (BGIS, 2007). In many areas of the country, wetland clusters no longer exist because the surrounding land has become too fragmented by human impacts. However, two regions within the project area (Figure 5-1 inserts) have significant groupings of wetland clusters and should be considered highly sensitive amphibian areas.

Wetland conditions classified as DEF, Z1, Z2, or Z3 are generally considered to be heavily to critically modified, and are therefore considered to be less sensitive from an amphibian perspective. However, the ground truthing survey will need to confirm this.

Figure 5-1 also illustrates the perennial rivers which occur within the project area. These areas are also likely to provide habitat for amphibian populations, as well as providing an integrated network for species movement and migration.

Table 5-1 comments on the likelihood of each alternative affecting the various wetlands and rivers, and hence amphibians within the project area.

**Table 5-1: Likely effects of the alternative powerline routes on wetlands and rivers**

Route	Comment
B-D Alternative 1	Alternative 1 avoids major wetlands and wetland clusters. Although the route crosses many perennial rivers south of the Swartberg, these rivers are all large and generally fast flowing. Therefore, it is unlikely that over-head power lines crossing the river will have a significant impact on amphibians.
B-D Alternative 2	This route crosses many pristine wetlands and wetland clusters according to NFEPA, which provide suitable habitat for amphibians. This alternative option is likely to have a significant impact on amphibians.
G-B Alternative 1	This alternative crosses many rivers, wetlands, and wetlands clusters identified by NFEPA. These areas provide habitats suitable for a variety of amphibian species and are vital to maintain ecosystem functioning. Of the three Gourikwa-Blanco alternatives, this one crosses the most perennial rivers due to its proximity to the escarpment. However, these rivers are likely to be fast flowing and less habitable for amphibian species than the lower reaches of the rivers, which would be crossed by the other alternative routes. Alternative 1 will also cross the most natural/pristine wetlands of the alternative routes.
G-B Alternative 2	Alternative 2 will transect more areas identified as wetland clusters than alternative 1. This route will also cross many perennial rivers. Generally, the wetlands classified outside of wetland clusters are in a less natural condition than the other 2 alternatives. However, this alternative has many habitats suitable for a variety of amphibian species.
G-B Alternative 3	This alternative crosses one NFEPA identified wetland clusters and one perennial river. Many of the wetlands in this area are considered degraded. It is more likely that this alternative can avoid pristine wetlands and perennial rivers than the other two alternatives.



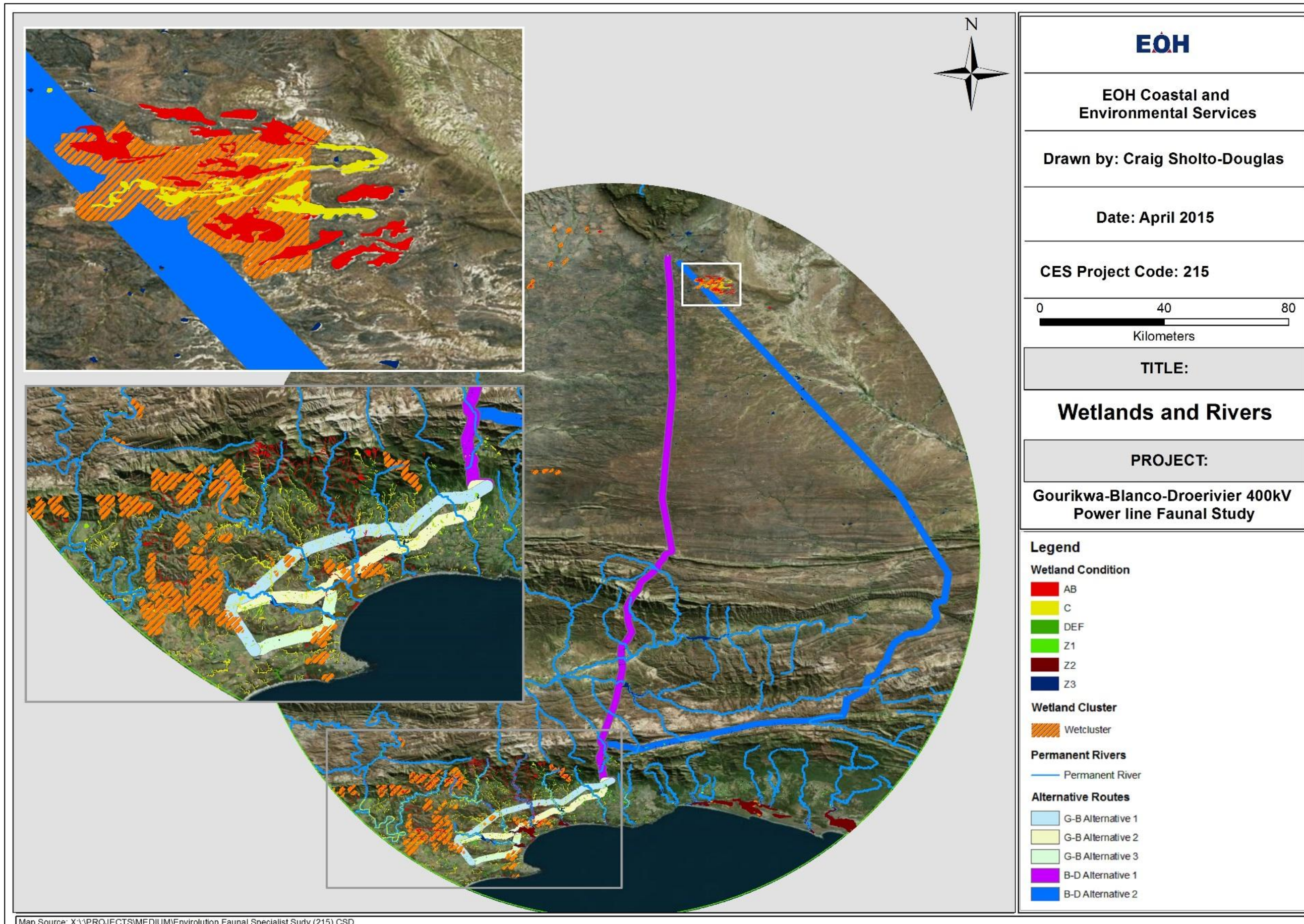


Figure 5-1: NFEPA Wetlands, Wetland Clusters, and Rivers within the project area



## 6. FAUNAL HOTSPOTS

The Succulent Karoo Ecosystem Programme (SKEP) is a long term, multi-stakeholder bioregional conservation and development programme. SKEP began as a bi-national initiative between Namibia and South Africa, with the aim of defining a way to conserve this ecosystem, and to develop conservation as a land-use rather than instead of land-use.

This approach is encapsulated in the SKEP Twenty Year Strategy developed in 2001/2002, based on the following broad vision: "The people of the Succulent Karoo take ownership of and enjoy their unique living landscape in a way that maintains biodiversity and improves livelihoods now and into perpetuity."

As part of the Biodiversity Programme, SKEP involved experts in different taxonomic groups mapped centres of endemism and species richness, unique habitats and key areas for maintenance of biological processes (BGIS, 2007). A comprehensive spatial picture of the area was compiled by experts in their respective fields. Expert mapping was developed for the following taxonomic groups (BGIS, 2007); Amphibians; birds; fish; invertebrates; plants; reptiles; and small mammals.

SKEP maps were used to identify amphibian, reptile and mammal hotspots within the project area. The geographic location of these hotspots is illustrated in Figure 6-1. Comments on how these hotspots will be affected by the proposed alternative routes can be seen in Table 6-1.

**Table 6-1: Proposed alternative routes likely influence on SKEP expert priority areas**

Route	Comment
B-D Alternative 1	The northern extreme of this proposed alternative borders on the southern tip of one of the Karoo SKEP mammal priority areas. Moving south, just before the Swartberg Mountains, this alternative bisects a SKEP reptile priority area. The route passes west of another SKEP mammal priority area in the Little Karoo area.
B-D Alternative 2	Like B-D Alternative 1, B-D Alternative 2 starts just below the Karoo SKEP mammal priority area. Moving south, the proposed route crosses a large SKEP amphibian priority area before heading south-east around the Swartberg Mountains. The route runs along the Outeniqua Mountain Range south of the SKEP mammal priority area in the Little Karoo.
G-B Alternative 1	All three proposed alternative routes from Gourikwa to Blanco do not cross or pass close to any SKEP identified priority areas.
G-B Alternative 2	
G-B Alternative 3	





Map Source: X:\PROJECTS\MEDIUM\Envirolution Faunal Specialist Study (215) CSD

Figure 6-1: SKEP Map of the project area

## 7. FAUNAL SPECIES AND HABITATS

### 7.1. Introduction

The faunal richness of the project area is explained largely by the transitional nature of its location, where western temperate species blend with eastern subtropical ones (Cowling & Peirce, 2009).

Due to the high aridity in the northern parts of the project area, faunal diversity is relatively low, particularly for aquatic species and large herbivores. However, many desert-adapted reptiles are endemic or near-endemic to the region.

Much of the historical large mammal fauna in the region was greatly reduced or even extirpated during the 19th-20th century, although some have subsequently been re-introduced into Private Game Reserves and Protect Parks within the study area.

According to historical records, 95 species of reptile, 26 species of frog and toad, and 99 species of mammals have distribution ranges which include or are part of the project area (ADU, 2015; IUCN, 2015).

### 7.2. Reptiles

#### 7.2.1 Regional Overview of Reptiles

Reptiles are one of the most diverse and adaptive terrestrial vertebrate groups in the world. However, nineteen percent of all reptile species are currently threatened with extinction (Böhm *et al.* 2013), with the main threats being habitat destruction, invasive alien species and illegal pet trade. The same trends exist for South African reptiles, with 22% being threatened (Branch 2014).

South Africa has one of the highest reptile diversities in the world, and the highest in Africa, with the highest diversity occurring in the more arid parts of the country (Branch, 1998). Of the 435 reptile species recorded from South Africa (Bates *et al.* 2014), the Eastern Cape is home to 133 which include 21 snakes, 27 lizards and eight chelonians (tortoises and turtles). The majority of these are found in Mesic Succulent Thicket and riverine habitats. The Western Cape is home to 142 reptiles which include 42 snakes, 33 lizards and eight Chamaeleonidae (chameleon) species. Most of the Western Cape species are found in Fynbos habitats.

#### 7.2.2 Reptile SCC

Consultation of historical records (Animal Demography Unit Reptile Atlas, IUCN Database) indicates that 95 species of reptiles are likely to have distribution ranges that overlap with the project area. Of these, one is listed as **Endangered**, one as **Vulnerable**, and two as **Near Threatened** on the SA Red Data List. All three Girdled Lizard species (*Cordylus spp.*) and the one Rock Monitor species (*Varanus albigularis*) appear on Appendix II of CITES. All lizards and tortoises are listed as a schedule II species on the PNCO list for the Western and Eastern Cape Provinces, and will therefore require permits for their removal. See Appendix A-1 for a full species list of reptile species which may occur within the project area.

**Table 7-1: Reptiles of conservation concern likely to be found within the project area.**

Family	Scientific name	Common name	SA Red data list	CITES	PNCO
CORDYLIDAE	<i>Cordylus aridus</i>	Dwarf Karoo Girdled Lizard	Endangered (SARCA 2014)	Appendix II	Schedule II



CORDYLIDAE	<i>Cordylus cordylus</i>	Cape Girdled Lizard	Least Concern (SARCA 2014)	Appendix II	Schedule II
CORDYLIDAE	<i>Cordylus jonesii</i>	Jones' Girdled Lizard	Least Concern (SARCA 2014)	Appendix II	Schedule II
GEKKONIDAE	<i>Goggia braacki</i>	Braack's Pygmy Gecko	Near Threatened (SARCA 2014)	-	Schedule II
TESTUDINIDAE	<i>Homopus boulengeri</i>	Karoo Padloper	Near Threatened (SARCA 2014)	-	Schedule II
GERRHOSAURIDAE	<i>Tetradactylus fitzsimonsi</i>	FitzSimons' Long-tailed Seps	Vulnerable (SARCA 2014)	-	Schedule II
VARANIDAE	<i>Varanus albigularis</i>	Rock Monitor	Least Concern (SARCA 2014)	Appendix II	Schedule II

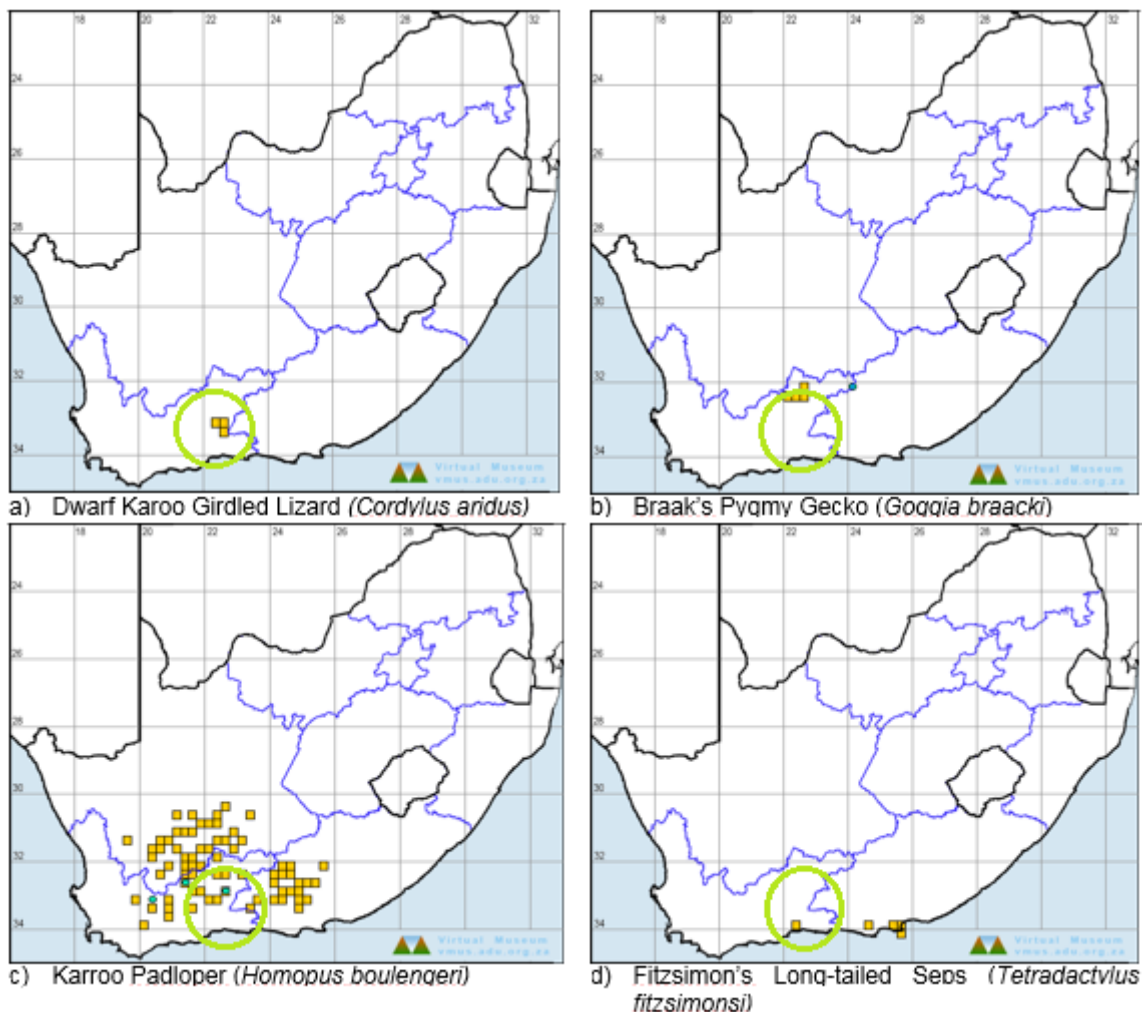
The **Dwarf Karoo Girdled Lizard** (*Cordylus aridus*) is listed as Endangered as it has a restricted range of approximately 4,200 km<sup>2</sup>, and has only been found at two locations in the southern Karoo (Plate 7-1a). It is also harvested from the wild for the pet trade (IUCN, 2014). This species is known to inhabit rocky karroid vegetation (Adolphs, 2010).

**The Braak's Pygmy Gecko** (*Goggia braacki*) has a distribution that coincides with the northern boundary of the project area. The species inhabits rocky outcrops and escarpments in the Beaufort West region of the Karoo. Its distribution range is limited to this area (Plate 7-1b).

The species distribution of the **Karoo Padloper** (*Homopus boulengeri*) is fairly wide spread, with recordings as far as the central Northern Cape Province (Plate 7-1c). The species has been recorded in various succulent and desert shrubland habitats. The Karoo Padloper is often found close to rocky outcrops which they use to seek shelter. Succulent Karoo plants and flowers form the majority of the species diet.

**Fitzsimon's Long-tailed Seps** (*Tetradactylus fitzsimonsi*) is a subspecies of *Tetradactylus africanus* which is divided into *T. a. africanus* and *T. a. fitzsimonsi* (IUCN, 2014). *T. a. fitzsimonsi* is listed as Vulnerable due to its patchy, very limited distribution. Recordings of the species confine it to coastal fynbos in the Algoa Bay area, with an isolated population within the project area (Plate 7-1d).





**Plate 7-1: Coverage maps of the reptilian Species of Conservation Concern which occur within the project area ([http://vmus.adu.org.za/vm\\_sp\\_summary.php](http://vmus.adu.org.za/vm_sp_summary.php)). Green circle represents the project area.**

### 7.3. Amphibians

#### 7.3.1 Regional Overview of Amphibians

Amphibians are an important and often neglected component of terrestrial vertebrate faunas. Currently amphibians are of increasing scientific concern as global reports of declining amphibian populations continue to appear (Phillips 1994; Frost 2012). Although there is no consensus on a single cause for this phenomenon, there is general agreement that the declines in many areas, even in pristine protected parks, are significant and do not represent simple cyclic events (Brand, 2015). Climate, centres of origin and range restrictions are the three main factors that determine species distribution.

Frogs have been aptly called bio-indicator species, whose abundance and diversity is a poignant reflection of the general health and well-being of aquatic ecosystems (Branch, 2015). They are important components of wetland systems, particularly ephemeral systems from which fish are either excluded or are of minor importance. In these habitats, they are dominant predators of invertebrates.

Amphibians are well represented in sub-Saharan Africa, from which approximately 600 species have been recorded (Frost 2014). Southern Africa has a rich diversity of amphibians, comprising 160 species (Du Preez & Carruthers 2009). The eastern coast of South Africa has the highest amphibian diversity and endemism in the country (Alexander and Marais, 2010).

### 7.3.2 Frog SCC

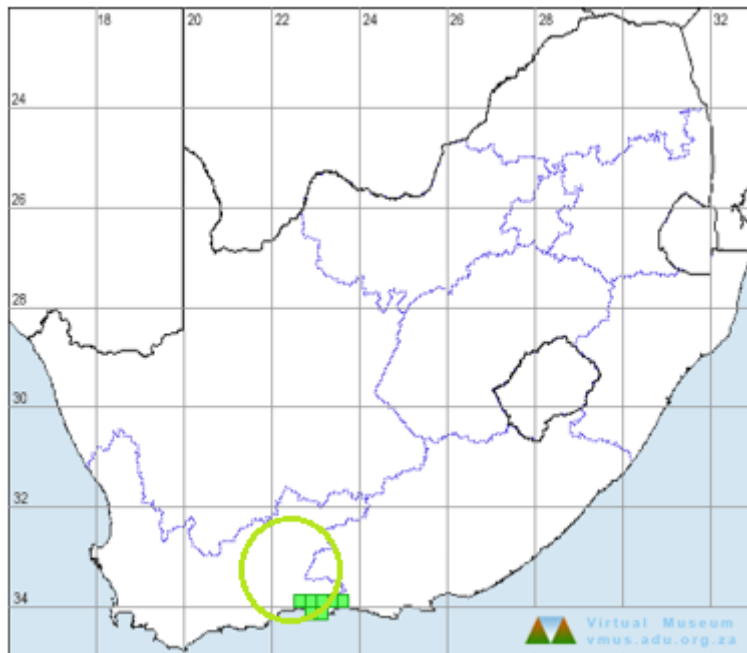
According to historical records, 25 species of frog and toad are likely to occur in the project area (see Appendix A-2 for full species list). Of these 25 species, only the **Endangered** Knysna Leaf-Folding Frog (*Afrixalus knysnae*) is listed on the SA Red List (ADU, 2015). However, all frogs and toads are listed as schedule 2 species on the PNCO list and will therefore require permits for their removal.

### 7.3.3 Knysna Leaf-Folding Frog

The Knysna Leaf-Folding Frog (*Afrixalus knysnae*) is listed as **Endangered**, as its Extent of Occurrence is restricted to 1,756 km<sup>2</sup>, its distribution is severely fragmented, and the quality of its habitat, area of occupancy, number of locations and number of mature individuals is continually declining (IUCN, 2014).

According to the IUCN Database (2014), the Knysna Leaf-Folding Frog ranks amongst the species highest in the need for conservation orientated research within South African threatened frogs. Furthermore, IUCN highlights the need to identify management areas, describe breeding phenology and to identify direct threats to the species. According to IUCN (2014), the Area of Occupancy of the species needs to be calculated as well as an assessment of the health of all known sites.

The Knysna Leaf-Folding Frog lives in a coastal mosaic of vegetation types, including mountain fynbos heathland, and forest. It breeds in small dams and shallow semi-permanent water with much emergent vegetation and even in well vegetated ornamental garden ponds (IUCN, 2015). Although none of the proposed alternative routes directly cross any of these vegetation types, B-D Alternative 2 does pass through mountain fynbos vegetation types similar to those described above. The species 'known' occurrence also overlaps the south eastern corner of the project area (Plate 7-3) according to the IUCN Red List database (2015). Only Alternative 2 of the Blanco-Droerivier section is likely to overlap or pass close to the species known distribution. Ground truthing of the area would be required to establish if the alternative route would cross habitats that are suitable or contain the species.



**Plate 7-3: Distribution of the Knysna Banana Frog (*Afrixalus knysnae*)**  
([http://vmus.adu.org.za/vm\\_sp\\_summary.php](http://vmus.adu.org.za/vm_sp_summary.php))

## 7.4. Mammals

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 variation in vegetation and habitat types would provide suitable conditions for many small mammals such rodents, monkeys and small predatory mammals. According to historical records, 94 mammal species have distribution ranges that coincide with the project area (IUCN, 2014; ADU, 2014).

### 7.4.1 Mammal SCC

One **Critically Endangered**, one **Endangered**, one **Protected**, and one **Vulnerable** mammal species have distributions that coincide with the project area and are listed on National Environmental Management: Biodiversity Act (NEMBA). NEMBA identifies species that have a high conservation value or national importance that require national protection (DEAT 2007). Additionally, 11 species are listed on the IUCN Red Data List under varying statuses (Table 7-2). For a full list of mammal species with distributions which include the project area, please see appendix A-3.

- **Table 7-2: Mammals of conservation concern likely to be found within the project area.**

Scientific Name	Common Name	IUCN	NEMBA	CITES	PNCO
<i>Amblysomus corriae</i>	Fynbos Golden Mole	NT	-	-	
<i>Bunolagus monticularis</i>	Bushman Hare, Riverine Rabbit	CR	Critically endangered	-	Schedule 1
<i>Ceratotherium simum</i>	White Rhinoceros	NT	-	Appendix II	Schedule 1
<i>Chlorotalpa duthieae</i>	Duthie's Golden Mole	VU	-	-	-
<i>Diceros bicornis</i>	Black Rhinoceros, Hook-lipped Rhinoceros	CR	Endangered	Appendix I	Schedule 1
<i>Equus zebra</i>	Cape Mountain Zebra	VU	-	Appendix II	Schedule 1
<i>Felis nigripes</i>	Black-footed Cat, Small-spotted Cat	VU	-	Appendix I	Schedule 2
<i>Hyaena brunnea</i>	Brown Hyaena	NT	-	-	Schedule 2
<i>Mellivora capensis</i>	Honey Badger	-	Protected		Schedule 2
<i>Myosorex longicaudatus</i>	Long-tailed Forest Shrew	VU	-	-	Schedule 2
<i>Mystromys albicaudatus</i>	White-tailed mouse	EN	-	-	-
<i>Panthera pardus</i>	Leopard	NT	Vulnerable	Appendix I	Schedule 2

Although the Honey Badger (*Mellivora capensis*) is not protected by IUCN, it is a protected by NEMBA within South Africa due to threats from habitat loss and hunting pressures. The project is unlikely to significantly influence the species as it is found in a wide range of habitats and altitudinal tolerances. Honey Badgers are opportunistic, generalized carnivores, and feed on a range of prey items varying in size from small insect larvae to the young of ungulates. Certain habitats within the project area are suitable for Honey Badgers.

The vulnerable White Rhinoceros (*Ceratotherium simum*), and Critically Endangered Black Rhinoceros (*Diceros bicornis*) are both likely to occur within the project area according to historical records and current species distribution spatial tools. However, due to the current state of poaching within South Africa these species will only be found within protected areas and game reserves where they can be monitored. No free roaming rhinoceros species are expected to be found within the project area.

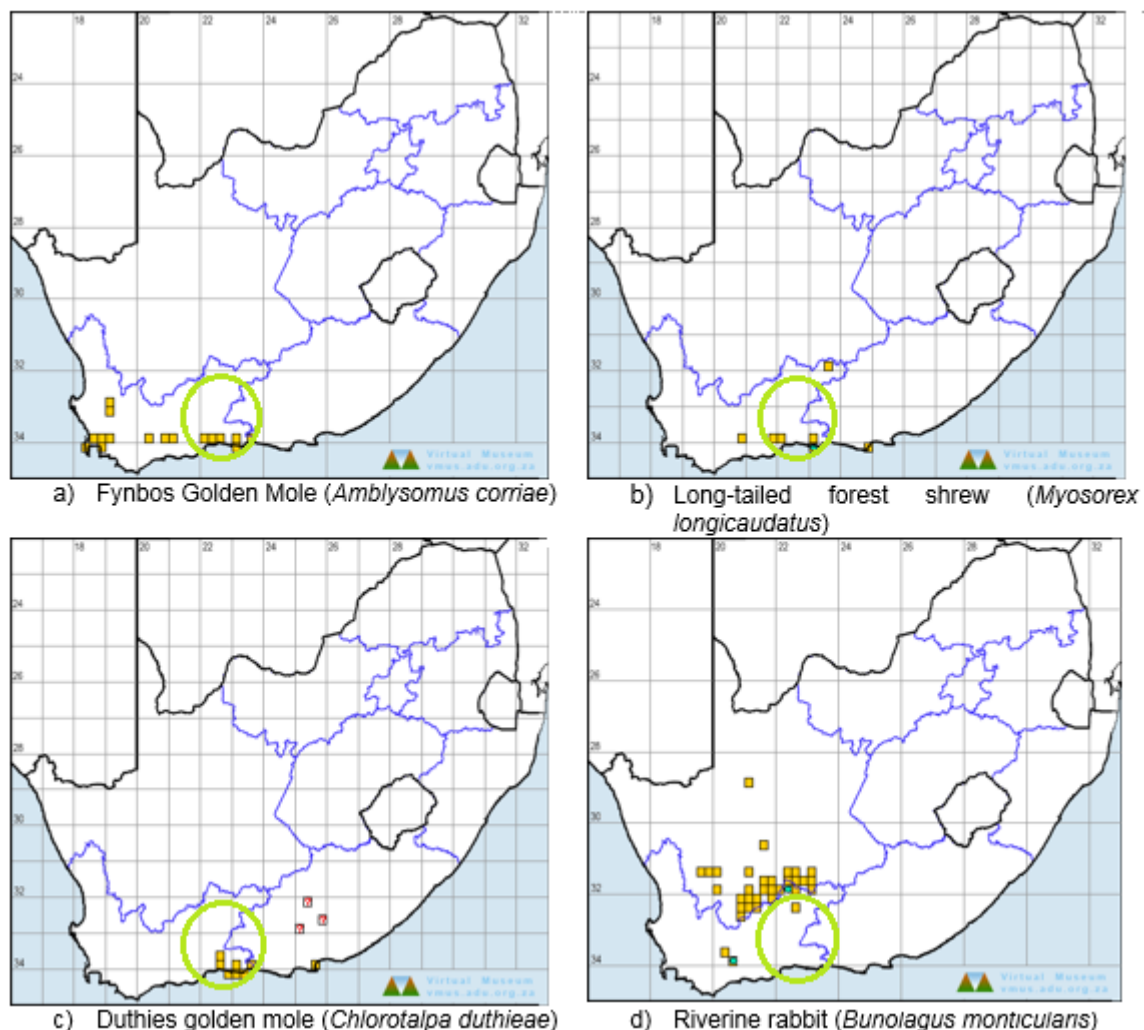
The Vulnerable Cape Mountain Zebra (*Equus zebra*) has a distribution range including the project area. Surviving natural populations of Cape Mountain Zebra occur only in Mountain Zebra National Park, Gamka Mountain Reserve, and the Kamanassie mountains. The Gamka mountain reserve and the Kamanassie Mountains are both found within the greater project area. Populations have been reintroduced to various parts of their former range, including Karoo National Park and Baviaanskloof Wilderness Area within the project area. Mountain Zebra inhabit rugged, broken mountainous and escarpment areas up to around 2,000 m, and require access to a diversity of grass species and perennial water sources (Penzhorn in press cited in IUCN, 2014).

Although the Small Spotted Cat (also referred to as the Black-footed Cat) is globally Vulnerable, it is no longer protected by NEMBA as it has a vast distribution range and occurs in many habitats. It is a specialist of open, short grass areas with an abundance of small rodents and ground-roosting birds (Brand, 2015). It inhabits dry, open savanna, grasslands and Karoo semi-desert with sparse shrub and tree cover. Habitats suitable to this species are found within the project area.

The Brown Hyaena (*Hyaena brunnea*) is an endemic, widespread species within southern Africa, except for a marginal extension into the arid parts of south-western Angola. In recent years the species has been recorded in Gansbaai and Bredasdorp in the Western Cape, suggesting that the species could also be found in the project area. It is believed that the Brown Hyaena is recolonizing areas following the historical removal of the species in the area due to hunting (Hofer and Mills 1998a). It is found in dry areas along the coast, semi-desert, open scrub and open woodland savanna, favouring rocky, mountainous areas with cover (IUCN, 2014) having the ability to survive close to urban areas. Brown Hyaena are mainly scavengers, but supplement their diets with wild fruits, insects, birds' eggs and the occasional small animal which is killed; their impact on domestic livestock is usually small (Mills 1998; in press). However, outside protected areas, the Brown Hyaena may come into conflict with humans, and they are often shot, poisoned, trapped and hunted with dogs in predator eradication or control programmes, or inadvertently killed in non-selective control programmes (Mills 1998). Although the project area has many habitats suitable for the species, due to historical events described it is unlikely to find an abundance of this species within the project area. It is possible that individuals may visit the project area on occasion.

Leopards (*Panthera pardus*) have habitat tolerances including mountain habitats, coastal scrub, shrubland, semi-desert and desert (IUCN), all of which are found within the project area. Included in their diets are more than 90 species of sub-Saharan Africa fauna, ranging from arthropods to large antelope (Ray *et al.*, 2005). The distribution range of the species is becoming patchy due to predatory control programmes as well as habitat loss. Leopards have been found to occur within the project area (pers. comm. Warwick Zondag).

#### 7.4.2 Mammals of SCC which have distributions which are restricted to the project area and surrounding habitats.



**Plate 7-4: Coverage maps of mammal Species of Conservation Concern**

The Fynbos Golden Mole (*Amblysomus corriae*) is endemic to South Africa. Its natural habitats are fynbos, Mediterranean shrubland vegetation, temperate forests, subtropical or tropical moist lowland forests, moist savanna, temperate shrubland, temperate grassland, subtropical or tropical dry lowland grassland, sandy shores, arable land, pasture land, plantations, rural gardens, urban areas, and introduced vegetation (IUCN, 2104). This species is close to qualifying for Vulnerable (under criterion B), as it is known from a restricted area (only 15 localities, less than 25,000 km<sup>2</sup>), including areas within the project area (Plate 7-4a). Habitat alteration and loss has occurred historically throughout the range of this species, as a result of agriculture, forestry and urbanization, but it seems to adapt well to transformed habitats providing that the intensity of disturbance is not too intense (IUCN, 2014). Along the eastern coast of the Western Cape, however, tourism developments and increasingly intensive agricultural practices could lead to fragmentation and the isolation of some populations (IUCN, 2014). It is highly likely that the species will occur within the project area.

The Long-Tailed Forest Shrew's (*Myosorex longicaudatus*) natural habitats are Mediterranean-type shrubby vegetation and swamps (IUCN, 2014). It is found in forests, forests edges, fynbos and boggy grassland as the species requires a moist microhabitat. These habitats are found within the project area. It is listed as Vulnerable because its area of occupancy is less than 2,000 km<sup>2</sup>, its distribution is severely fragmented, and there is continuing decline projected in the extent and

quality of its habitat (IUCN, 2014). It is restricted to pristine primary habitat that has not been degraded. Populations of *M. longicaudatus* have been found within the proposed project area (Plate 7-4b).

Duthie's Golden Mole (*Chlorotalpa duthieae*) is an endemic resident, with natural habitats including subtropical or tropical moist lowland forests, moist savanna, temperate grassland, arable land, pastureland, plantations, rural gardens, urban areas, and introduced vegetation (IUCN, 2014). The species is known from only six localities, and the maximum range area is less than 5,000 km<sup>2</sup> (IUCN, 2014). Although it occurs in several protected areas within the project area (Plate 7-4c), populations outside these areas are threatened by habitat loss mainly due to coastal housing and tourism developments (IUCN, 2014). Hence, the Duthie's Golden Mole is listed as Vulnerable.

According to IUCN (2014), the Riverine Rabbit (*Bunolagus monticularis*) is one of the most endangered mammals in the world, with only around 250 living adults remaining in the wild. No subpopulation is estimated to contain more than 50 individuals, and these subpopulations appear to be isolated due to anthropogenic barriers that prevent dispersal. An isolated subpopulation occurs within the project area (Plate 7-4d). Due to the species conservation status, it is highly recommended that the distribution range of this subpopulation is surveyed. Subpopulations appear to be isolated from each other by jackal-proof fencing and severe land transformation through agricultural practices (Collins et al. 2004). The species inhabits dense riparian growth along the seasonal rivers in the central Karoo, and within shrubland in the Nama-Karoo (IUCN, 2014). The habitat is usually highly fragmented and transformed.

## 8. SENSITIVITY

### 8.1. Site sensitivity

Using the available spatial planning tools and species distributions of SCC, a sensitivity map was developed to identify areas of high, medium and low sensitivity (Figure 8-1). It is important to note that these sensitivities are based on literature reviews and available desktop spatial planning tools. For this reason a conservative approach has been used until a ground truthing survey can be conducted to determine the accuracy of the sensitivities described.

For example, rocky outcrops and mountainous habitats cannot accurately be described at a desktop level, and are therefore not included in the sensitivity analysis. Although these areas are not included in the map, steep slopes and rocky areas in the project areas are of HIGH sensitivity. They are difficult to rehabilitate and are easily affected by changes in land use, with erosion being an important impact factor. In addition these areas support key reptile habitats, such as the Dwarf Karoo Girdled Lizard (*Cordylus aridus*), Braak's Pygmy Gecko (*Goggia braacki*), and Karoo Padloper (*Homopus boulengeri*) which are all listed as SCC. These areas need to be identified and explored during field surveys, and where feasible, construction should avoid these areas.

Areas that contain globally identified SCC such as the Riverine Rabbit (*Bunolagus monticularis*) and the Knysna Leaf-Folding Frog (*Afrixalus knysnae*) are not included in the sensitivity map as deviations in their distribution ranges were found across the mapping tools used for this desktop study. It is HIGHLY RECOMMENDED that potential habitats and distribution ranges of both species are researched and ground truthed within the project area. Construction of the power lines should not occur in areas which could potentially affect either species, especially the Riverine Rabbit due to its conservation status.

Identified areas of **high sensitivity** include:

- Process areas such as perennial rivers, pristine wetlands and wetland clusters identified by NFEPA that are important for amphibian habitat and ecosystem functioning;
- Succulent Karoo Ecosystem Programme (SKEP) identified hotspots for amphibians, reptiles and mammals; and
- Formal Protected Areas.

Areas of **medium sensitivity** include:

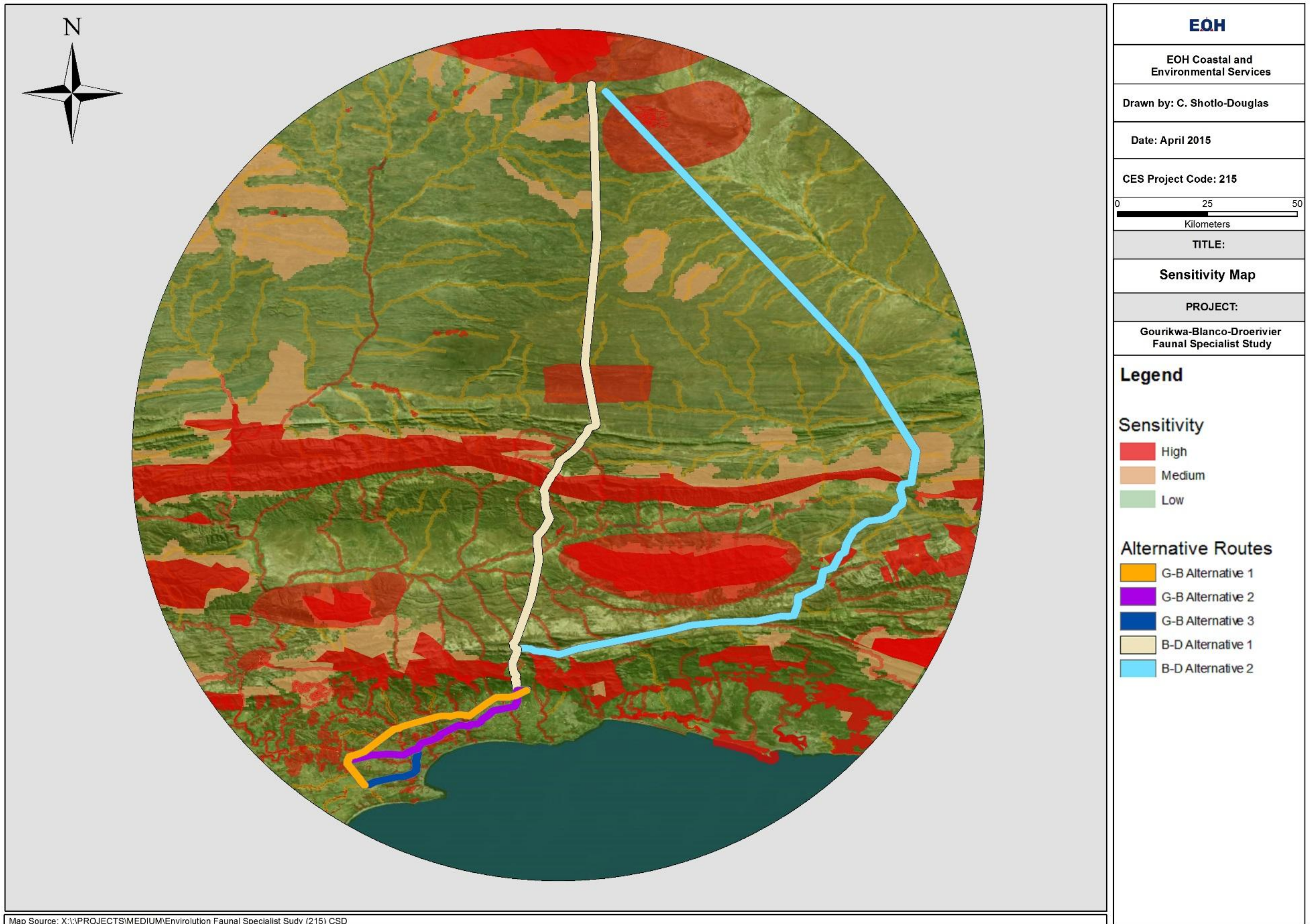
- Areas identified by the National Protect Areas Expansion Strategy (NPAES);
- Wetlands according to NFEPA which are not pristine; and
- Non-perennial rivers.

Areas of **low sensitivity** include:

- Areas that are highly impacted by current land use and provide little value to the ecosystem; and
- Highly degraded areas that are unlikely to harbour any SCC

A map overlaying the NBA (2011), NPAES, NFEPA, and SKEP available spatial planning tools has been created to identify areas of high, moderate and low sensitivity. This map has been created as a guide to identify the preferred route for the field survey.





Map Source: X:\PROJECTS\MEDIUM\Envirolution Faunal Specialist Study (215) CSD

Figure 8-1: Sensitivity map of the project area



## 9. CONCLUSIONS AND RECOMMENDATIONS

### 9.1. Greater Project Area

Consultation of historical records and species distribution data indicates a vast diversity of reptile, amphibian and mammal species are likely to be found in a variety of habitats within the greater project area. Furthermore, all discussed faunal groups contain SCC which are likely to be found within the project area. Some of these species are restricted to isolated patches (most amphibian and reptile SCC), whilst others are widespread throughout the project area (most mammals of SCC). It is difficult to assess the potential impacts on the faunal groups and SCC within the greater project area due to the size of the area. However, insight and recommendations for each of the proposed alternatives is given below.

### 9.2. Blanco-Droerivier Alternatives

The two proposed alternative routes from Blanco to Droerivier both cross regions of the Nama-Karoo, the Swartberg Mountains, the Little Karoo, and the Outeniqua Mountains before joining at the Blanco Substation north of George in the Western Cape Province.

#### 9.2.1 *Alternative 1*

Alternative 1 extends mostly through arid areas with limited habitats for amphibians, as it avoids major wetlands and SKEP identified Amphibian Hotspots/Priority Areas. Although the route crosses many perennial rivers south of the Swartberg, these rivers are all large and generally fast flowing. Therefore, it is unlikely that over-head power lines crossing the river will have a significant impact on amphibians. However, the route does cross through a reptile Priority Area identified by SKEP, and is also likely to have habitats suitable to the above mentioned reptiles of SCC. Furthermore, the route will also pass through habitats suitable for the Critically Endangered Riverine Rabbit (*Bunolagus monticularis*). Alternative 1 also crosses through a Formally Protected Area and several Critical Biodiversity Areas.

#### ***Recommendations if chosen***

Manipulate the power line alignment to avoid rocky outcrops and steep mountainous areas to mitigate against impacting on reptiles and reptiles of SCC. During field visits, riparian areas which provide habitat for the Critically Endangered Riverine Rabbit within the species distribution range should be identified (if present) and avoided where possible. Areas where the proposed power line crosses Critical Biodiversity Areas and Protected Areas should be surveyed to determine impacts on the fauna prior to the completion of the Environmental Impact Assessment.

#### 9.2.2 *Alternative 2*

Alternative 2 extends into the Eastern Cape, navigating around the Formal Protected Areas of the Swartberg region. The majority of the alternative route is likely to have little impact on reptiles as it avoids SKEP identified priority reptile areas, and avoids most rocky and mountainous areas. However, the Outeniqua range section of the proposed alternative route is likely to provide habitat for a high diversity of reptile species. The route crosses priority areas for amphibians according to SKEP, as well as many pristine wetlands and wetland clusters according to NFEPA, which provide suitable habitat for amphibians. This alternative route also runs along the recorded distribution range of the Knysna Leaf-Folding Frog, which ranks amongst the species highest in the need for conservation according to IUCN (2014). This alternative option is likely to have a significant impact on amphibians. The route will also pass through habitats suitable for the Critically Endangered Riverine Rabbit (*Bunolagus monticularis*) in the northern parts of the project area. The alternative avoids crossing any Formally Protected Area but it does cut across several Critical Biodiversity Areas.

### **Recommendations if chosen**

To avoid potential high impacts on amphibians and amphibian SCC, it is suggested that the proposed route be re-aligned in the northern section of the project area to avoid the amphibian priority areas defined by SKEP (Figure 5-3). If chosen, it is strongly recommended that a survey of the section along the Outeniqua Range is carried out to determine the likelihood of the Knysna Leaf-Folding Frog occurring within the proposed alternative corridor. During field visits, riparian areas which provide habitat for the Riverine Rabbit within the species distribution range should be identified and avoided where possible. Areas where the proposed power line transects Critical Biodiversity Areas should be surveyed to determine impacts on the fauna prior to the completion of the Environmental Impact Assessment.

### **9.3. Blanco-Gourikwa Alternatives**

The proposed alternatives for the section between Blanco and Gourikwa cross many rivers, wetlands, and wetlands clusters identified by NFEPA. These areas provide habitats suitable for a variety of amphibian species and are vital to maintain ecosystem functioning. All three alternatives also transect municipally identified CBAs. However, none of the proposed alternatives transect any Protected Areas or SKEP identified Priority Areas/Hotspots.

Alternative 1 runs closer to the escarpment and would transect more CBAs than the other alternative routes. Alternative 1 would also cross the most perennial rivers due to its proximity to the escarpment. However, these rivers are likely to be fast flowing and less habitable for amphibian species than the lower reaches of the rivers, which would be crossed by the other alternative routes. Alternative 1 will also cross the most natural wetlands of the alternative routes, however, alternative 2 will transect a larger area of NFEPA identified wetland clusters, which are critical for amphibian species.

Due to the high sensitivity of the area due to the vast amount of wetlands and rivers, all alternatives are likely to affect faunal habitats and species, particularly amphibians. On ground specialist surveys will be required to make informed decisions on the risks associated with each alternative, particularly from an amphibian perspective.

### **9.4. Recommendations**

Based on the available spatial planning tools and species distribution data, the B-D alternative 1 is the preferred route for the Blanco to Droerivier section of the proposed power line. However, this recommendation is subject to establishing the known distribution range of the subpopulation of Riverine Rabbit in the northern section. It is also suggested that the route be re-aligned to avoid the SKEP reptile priority area north of the Swartberg Mountains. If chosen, on ground surveying of 'sensitive' areas should take place along the route to accommodate adjustments to the alignment (e.g. avoiding rocky outcrops and habitats suitable for SCC).

As explained in the previous section, the alternative routes from the Blanco to Gourikwa section all cross many wetlands and rivers which are highly sensitive, especially from an amphibian perspective. It is not within the scope of this study to recommend one of these alternatives until accuracy is increased through field surveys. However, from a faunal perspective, it can be recommended that the preferred route should be chosen based on avoidance (where possible) of pristine wetlands, wetland clusters and sensitive areas of rivers. It is suggested that a herpetological and wetland health survey is carried out in this area to allow for an accurate recommendation of a preferred route.

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**TABLE A-1: REPTILE SPECIES WITH A DISTRIBUTION RANGE INCLUDING THE PROJECT AREA**

Family	Scientific name	Common name	Red list category	CITES	PNCO
AGAMIDAE	<i>Agama aculeate aculeata</i>	Common Ground Agama	Least Concern (SARCA 2014)	-	Schedule II
AGAMIDAE	<i>Agama atra</i>	Southern Rock Agama	Least Concern (SARCA 2014)	-	Schedule II
ATRACTASPIDIDAE	<i>Homoroselaps lacteus</i>	Spotted Harlequin Snake	Least Concern (SARCA 2014)	-	-
CHAMAELEONIDAE	<i>Bradypodion atromontanum</i>	Swartberg Dwarf Chameleon	Least Concern (SARCA 2014)	-	-
CHAMAELEONIDAE	<i>Bradypodion damaranum</i>	Knysna Dwarf Chameleon	Least Concern (SARCA 2014)	-	-
CHAMAELEONIDAE	<i>Bradypodion gutturale</i>	Little Karoo Dwarf Chameleon	Least Concern (SARCA 2014)	-	-
CHAMAELEONIDAE	<i>Bradypodion ventrale</i>	Eastern Cape Dwarf Chameleon	Least Concern (SARCA 2014)	-	-
CHAMAELEONIDAE	<i>Chamaeleon amaquensis</i>	Namaqua Chameleon	Least Concern (SARCA 2014)	-	-
COLUBRIDAE	<i>Amplorhinus multimaculatus</i>	Many-spotted Snake	Least Concern (SARCA 2014)	-	-
COLUBRIDAE	<i>Boaedon capensis</i>	Brown House Snake	Least Concern (SARCA 2014)	-	-
COLUBRIDAE	<i>Crotaphopeltis hotamboeia</i>	Red-lipped Snake	Least Concern (SARCA 2014)	-	-
COLUBRIDAE	<i>Dasypeltis scabra</i>	Rhombic Egg-eater	Least Concern (SARCA 2014)	-	Schedule II
COLUBRIDAE	<i>Dipsina multimaculata</i>	Dwarf Beaked Snake	Least Concern (SARCA 2014)	-	-
COLUBRIDAE	<i>Dispholidus typustypus</i>	Boomslang	Least Concern (SARCA 2014)	-	-
COLUBRIDAE	<i>Duberria lutrix lutrix</i>	South African Slug-eater	Least Concern (SARCA 2014)	-	Schedule II
COLUBRIDAE	<i>Lamprophis aurora</i>	Aurora House Snake	Least Concern (SARCA 2014)	-	Schedule II

COLUBRIDAE	<i>Lamprophis fuscus</i>	Yellow-bellied House Snake	Least Concern (SARCA 2014)	-	Schedule II
COLUBRIDAE	<i>Lamprophis guttatus</i>	Spotted House Snake	Least Concern (SARCA 2014)	-	Schedule II
COLUBRIDAE	<i>Lycodonomorphus inornatus</i>	Olive House Snake	Least Concern (SARCA 2014)	-	Schedule II
COLUBRIDAE	<i>Lycodonomorphus rufulus</i>	Brown Water Snake	Least Concern (SARCA 2014)	-	Schedule II
COLUBRIDAE	<i>Lycophidion capense capense</i>	Cape Wolf Snake	Least Concern (SARCA 2014)	-	Schedule II
COLUBRIDAE	<i>Philothamnus hoplogaster</i>	South Eastern Green Snake	Least Concern (SARCA 2014)	-	Schedule II
COLUBRIDAE	<i>Philothamnus natalensisoccidentalis</i>	Western Natal Green Snake	Least Concern (SARCA 2014)	-	Schedule II
COLUBRIDAE	<i>Prosymna sundevallii</i>	Sundevall's Shovel-snout	Least Concern (SARCA 2014)	-	Schedule II
COLUBRIDAE	<i>Psammophis crucifer</i>	Cross-marked Grass Snake	Least Concern (SARCA 2014)	-	-
COLUBRIDAE	<i>Psammophis notostictus</i>	Karoo Sand Snake	Least Concern (SARCA 2014)	-	-
COLUBRIDAE	<i>Psammophylax rhombeatus rhombeatus</i>	Spotted Grass Snake	Least Concern (SARCA 2014)	-	-
COLUBRIDAE	<i>Pseudaspis cana</i>	Mole Snake	Least Concern (SARCA 2014)	-	Schedule II
CORDYLIDAE	<i>Chamaesaura anguinaanguina</i>	Cape Grass Lizard	Least Concern (SARCA 2014)	-	Schedule II
CORDYLIDAE	<i>Cordylus cordylus</i>	Cape Girdled Lizard	Least Concern (SARCA 2014)	Appendix II	Schedule II
CORDYLIDAE	<i>Cordylus jonesii</i>	Jones' Girdled Lizard	Least Concern (SARCA 2014)	Appendix II	Schedule II
CORDYLIDAE	<i>Hemicordylus capensis</i>	Graceful Crag Lizard	Least Concern (SARCA 2014)	-	Schedule II
CORDYLIDAE	<i>Karusasaurus polyzonus</i>	Karoo Girdled Lizard	Least Concern (SARCA 2014)	-	Schedule II
CORDYLIDAE	<i>Ninurta coeruleopunctatus</i>	Blue-spotted Girdled Lizard	Least Concern (SARCA 2014)	-	Schedule II

CORDYLIDAE	<i>Pseudocordylus microlepidotus microlepidotus</i>	Cape Crag Lizard	Least Concern (SARCA 2014)	-	Schedule II
CORDYLIDAE	<i>Pseudocordylus microlepidotus namaquensis</i>	Nuweveldberg Crag Lizard	Least Concern (SARCA 2014)	-	Schedule II
CORDYLIDAE	<i>Cordylus aridus</i>	Dwarf Karoo Girdled Lizard	<b>Endangered (SARCA 2014)</b>	-	Schedule II
ELAPIDAE	<i>Hemachatus haemachatus</i>	Rinkhals	Least Concern (SARCA 2014)	-	-
ELAPIDAE	<i>Hydrophis platurus</i>	Yellow-bellied Sea Snake	Least Concern (SARCA 2014)	-	-
ELAPIDAE	<i>Naja nivea</i>	Cape Cobra	Least Concern (SARCA 2014)	-	-
ELAPIDAE	<i>Aspidelaps lubricuslubricus</i>	Coral Shield Cobra	Not listed	-	-
GEKKONIDAE	<i>Afrogecko porphyreus</i>	Marbled Leaf-toed Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Chondrodactylus angulifer angulifer</i>	Common Giant Ground Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Chondrodactylus bibronii</i>	Bibron's Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Goggia hewitti</i>	Hewitt's Pygmy Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Goggia lineata</i>	Striped Pygmy Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Hemidactylus mabouia</i>	Common Tropical House Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Pachydactyluscapensis</i>	Cape Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Pachydactylus geitje</i>	Ocellated Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Pachydactylus kladaroderma</i>	Thin-skinned Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Pachydactylus latirostris</i>	Quartz Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Pachydactylus maculatus</i>	Spotted Gecko	Least Concern (SARCA 2014)	-	Schedule II

GEKKONIDAE	<i>Pachydactylus mariquensis</i>	Marico Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Pachydactylus oculatus</i>	Golden Spotted Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Pachydactylus purcelli</i>	Purcell's Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Ptenopusgarrulusmaculatus</i>	Spotted Barking Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Ramigekko swartbergensis</i>	Swartberg Leaf-toed Gecko	Least Concern (SARCA 2014)	-	Schedule II
GEKKONIDAE	<i>Goggia braacki</i>	Braack's Pygmy Gecko	<b>Near Threatened (SARCA 2014)</b>	-	Schedule II
GERRHOSAURIDAE	<i>Cordylosaurus subtessellatus</i>	Dwarf Plated Lizard	Least Concern (SARCA 2014)	-	Schedule II
GERRHOSAURIDAE	<i>Gerrhosaurus flavigularis</i>	Yellow-throated Plated Lizard	Least Concern (SARCA 2014)	-	Schedule II
GERRHOSAURIDAE	<i>Gerrhosaurus typicus</i>	Karoo Plated Lizard	Least Concern (SARCA 2014)	-	Schedule II
GERRHOSAURIDAE	<i>Tetradactylus seps</i>	Short-legged Seps	Least Concern (SARCA 2014)	-	Schedule II
GERRHOSAURIDAE	<i>Tetradactylus tetradactylus</i>	Cape Long-tailed Seps	Least Concern (SARCA 2014)	-	Schedule II
GERRHOSAURIDAE	<i>Tetradactylus fitzsimonsi</i>	FitzSimons' Long-tailed Seps	<b>Vulnerable (SARCA 2014)</b>	-	Schedule II
LACERTIDAE	<i>Meroles suborbitalis</i>	Spotted Desert Lizard	Least Concern (SARCA 2014)	-	Schedule II
LACERTIDAE	<i>Nucras lalandii</i>	Delalande's Sandveld Lizard	Least Concern (SARCA 2014)	-	Schedule II
LACERTIDAE	<i>Nucras livida</i>	Karoo Sandveld Lizard	Least Concern (SARCA 2014)	-	Schedule II
LACERTIDAE	<i>Nucras tessellata</i>	Western Sandveld Lizard	Least Concern (SARCA 2014)	-	Schedule II
LACERTIDAE	<i>Pedioplanis burchelli</i>	Burchell's Sand Lizard	Least Concern (SARCA 2014)	-	Schedule II
LACERTIDAE	<i>Pedioplanis laticeps</i>	Karoo Sand Lizard	Least Concern (SARCA 2014)	-	Schedule II



LACERTIDAE	<i>Pedioplanis lineoocella tapulchella</i>	Common Sand Lizard	Least Concern (SARCA 2014)	-	Schedule II
LACERTIDAE	<i>Pedioplanis namaquensis</i>	Namaqua Sand Lizard	Least Concern (SARCA 2014)	-	Schedule II
LACERTIDAE	<i>Tropidosaura gularis</i>	Cape Mountain Lizard	Least Concern (SARCA 2014)	-	Schedule II
LACERTIDAE	<i>Tropidosaura montanamontana</i>	Common Mountain Lizard	Not listed	-	Schedule II
LEPTOTYPHLOPIDAE	<i>Leptotyphlops nigricans</i>	Black Thread Snake	Least Concern (SARCA 2014)	-	-
PELOMEDUSIDAE	<i>Pelomedusa subrufa</i>	Central Marsh Terrapin	Least Concern (SARCA 2014)	-	Schedule II
SCINCIDAE	<i>Acontias meleagris</i>	Cape Legless Skink	Least Concern (SARCA 2014)	-	Schedule II
SCINCIDAE	<i>Scelotes bipes</i>	Silvery Dwarf Burrowing Skink	Least Concern (SARCA 2014)	-	Schedule II
SCINCIDAE	<i>Scelotes caffer</i>	Cape Dwarf Burrowing Skink	Least Concern (SARCA 2014)	-	Schedule II
SCINCIDAE	<i>Trachylepis capensis</i>	Cape Skink	Least Concern (SARCA 2014)	-	Schedule II
SCINCIDAE	<i>Trachylepis homalocephala</i>	Red-sided Skink	Least Concern (SARCA 2014)	-	Schedule II
SCINCIDAE	<i>Trachylepis occidentalis</i>	Western Three-striped Skink	Least Concern (SARCA 2014)	-	Schedule II
SCINCIDAE	<i>Trachylepis sulcata sulcata</i>	Western Rock Skink	Least Concern (SARCA 2014)	-	Schedule II
SCINCIDAE	<i>Trachylepis variegata</i>	Variiegated Skink	Least Concern (SARCA 2014)	-	Schedule II
TESTUDINIDAE	<i>Chersina angulata</i>	Angulate Tortoise	Least Concern (SARCA 2014)	-	Schedule II
TESTUDINIDAE	<i>Homopus areolatus</i>	Parrot-beaked Tortoise	Least Concern (SARCA 2014)	-	Schedule II
TESTUDINIDAE	<i>Homopus femoralis</i>	Greater Padloper	Least Concern (SARCA 2014)	-	Schedule II
TESTUDINIDAE	<i>Stigmochelys pardalis</i>	Leopard Tortoise	Least Concern (SARCA 2014)	-	Schedule II

TESTUDINIDAE	<i>Homopus boulengeri</i>	Karoo Padloper	<b>Near Threatened (SARCA 2014)</b>	-	Schedule II
TESTUDINIDAE	<i>Psammobates tentorius</i>	Karoo Tent Tortoise	Not listed	-	Schedule II
TESTUDINIDAE	<i>Psammobates tentorius verroxii</i>	Verrox's Tent Tortoise	Not listed	-	Schedule II
TYPHLOPIDAE	<i>Rhinotyphlops lalandei</i>	Delalande's Beaked Blind Snake	Least Concern (SARCA 2014)	-	-
VARANIDAE	<i>Varanus albigularis bigularis</i>	Rock Monitor	Least Concern (SARCA 2014)	Appendix II	Schedule II
VIPERIDAE	<i>Bitis arietans arietans</i>	Puff Adder	Least Concern (SARCA 2014)	-	-
VIPERIDAE	<i>Causus rhombeatus</i>	Rhombic Night Adder	Least Concern (SARCA 2014)	-	-

**TABLE A-2: AMPHIBIAN SPECIES WITH A DISTRIBUTION RANGE INCLUDING THE PROJECT AREA**

Family	Scientific name	Common names	Red List status	PNCO
BREVICIPITIDAE	<i>Breviceps fuscus</i>	Black Rain Frog	LC	Schedule II
BREVICIPITIDAE	<i>Breviceps montanus</i>	Mountain Rain Frog	LC	Schedule II
BUFONIDAE	<i>Amietophrynus rangeri</i>	Rangers Toad	LC	Schedule II
BUFONIDAE	<i>Capensibufo tradouwi</i>	Tradouw's Mountain Toad	LC	Schedule II
BUFONIDAE	<i>Poyntonophrynus vertebralis</i>		LC	Schedule II
BUFONIDAE	<i>Vandijkophrynus angusticeps</i>	Sand Toad	LC	Schedule II
BUFONIDAE	<i>Vandijkophrynus gariensis</i>	Karoo Toad	LC	Schedule II
HELEOPHRYNIDAE	<i>Heleophryn eregis</i>	Royal Ghost Frog	LC	Schedule II
HYPEROLIIDAE	<i>Afrixalus knysnae</i>	Knysna Leaf-Folding Frog	<b>EN</b>	Schedule II
HYPEROLIIDAE	<i>Hyperolius horstockii</i>		LC	Schedule II
HYPEROLIIDAE	<i>Hyperolius marmoratus</i>	Marbled Reed Frog, Painted Reed Frog	LC	Schedule II
HYPEROLIIDAE	<i>Semnodactylus wealii</i>	Weale's Running Frog	LC	Schedule II
PIPIDAE	<i>Xenopus laevis</i>	African Clawed Frog, Clawed Toad, Common Clawed Frog, Common Clawed Toad, Common Platanna, Platanna	LC	Schedule II
PYXICEPHALIDAE	<i>Amietia angolensis</i>	Angola River Frog, Common River Frog	LC	Schedule II
PYXICEPHALIDAE	<i>Amietia fuscigula</i>	Cape River Frog	LC	Schedule II
PYXICEPHALIDAE	<i>Amietia vandijki</i>		LC	Schedule II

PYXICEPHALIDAE	<i>Cacosternum boettgeri</i>	Boettgers Dainty Frog, Common Caco	LC	Schedule II
PYXICEPHALIDAE	<i>Cacosternum karoicum</i>	Karoo Dainty Frog	LC	Schedule II
PYXICEPHALIDAE	<i>Cacosternum nanum</i>	Bronze Caco, Bronze Dainty Frog	LC	Schedule II
PYXICEPHALIDAE	<i>Pyxicephalus adspersus</i>	African Bullfrog	LC	Schedule II
PYXICEPHALIDAE	<i>Strongylopus bonaespei</i>	Banded Stream Frog	LC	Schedule II
PYXICEPHALIDAE	<i>Strongylopus fasciatus</i>	Striped Stream Frog	LC	Schedule II
PYXICEPHALIDAE	<i>Strongylopus grayii</i>	Gray's Stream Frog	LC	Schedule II
PYXICEPHALIDAE	<i>Tomopterna delalandii</i>	Delalande's Sand Frog	LC	Schedule II
PYXICEPHALIDAE	<i>Tomopterna tandyi</i>	Tandy's Sand Frog	LC	Schedule II

**TABLE A-3: MAMMAL SPECIES WITH A DISTRIBUTION RANGE INCLUDING THE PROJECT AREA**

Family	Scientific name	Common names (Eng)	Red List status	PNCO
BATHYERGIDAE	<i>Bathyergus suillus</i>	Cape Dune Mole Rat	LC	-
BATHYERGIDAE	<i>Cryptomys hottentotus</i>	African Mole Rat	LC	-
BATHYERGIDAE	<i>Georychus capensis</i>	Cape Mole Rat	LC	-
BOVIDAE	<i>Alcelaphus buselaphus</i>	Hartebeest, Swayne's Hartebeest	LC	Schedule II
BOVIDAE	<i>Antidorcas marsupialis</i>	Springbok	LC	Schedule II
BOVIDAE	<i>Damaliscus pygargus</i>	Blesbok/bontebok, Bontebok	LC	Schedule II
BOVIDAE	<i>Oreotragus oreotragus</i>	Klipspringer, Western Klipspringer	LC	Schedule II
BOVIDAE	<i>Oryx gazella</i>	Gemsbok	LC	-
BOVIDAE	<i>Pelea capreolus</i>	Common Rhebok	LC	Schedule II
BOVIDAE	<i>Philantomba monticola</i>	Blue Duiker	LC	Schedule II
BOVIDAE	<i>Raphicerus campestris</i>	Steenbok	LC	Schedule II
BOVIDAE	<i>Raphicerus melanotis</i>	Cape Grysbok	LC	Schedule II
BOVIDAE	<i>Redunca fulvorufula</i>	Mountain Reedbuck	LC	Schedule II
BOVIDAE	<i>Sylvicapra grimmia</i>	Common Duiker, Grey Duiker	LC	Schedule II
BOVIDAE	<i>Syncerus caffer</i>	African Buffalo	LC	Schedule II
BOVIDAE	<i>Tragelaphus oryx</i>	Common Eland, Eland	LC	Schedule II
BOVIDAE	<i>Tragelaphus scriptus</i>	Bushbuck	LC	Schedule II
BOVIDAE	<i>Tragelaphus strepsiceros</i>	Greater Kudu	LC	Schedule II
CANIDAE	<i>Canis mesomelas</i>	Black-backed Jackal, Chacal À Chabraque, Silver-backed Jackal	LC	-
CANIDAE	<i>Otocyon megalotis</i>	Bat-eared Fox	LC	Schedule II

CANIDAE	<i>Vulpes chama</i>	Cape Fox, Silver Fox, Silver Jackal	LC	Schedule II
CERCOPITHECIDAE	<i>Chlorocebus pygerythrus</i>	Vervet	LC	-
CERCOPITHECIDAE	<i>Papio ursinus</i>	Chacma Baboon	LC	-
CHRYSOCHLORIDAE	<i>Chlorotalpa sclateri</i>	Sclater's Golden Mole	LC	-
CHRYSOCHLORIDAE	<i>Amblyso muscorriae</i>	Fynbos Golden Mole	NT	-
CHRYSOCHLORIDAE	<i>Chlorotalpa duthieae</i>	Duthie's Golden Mole	VU	-
EQUIDAE	<i>Equus zebra</i>	Hartmann's Mountain Zebra, Mountain Zebra	VU	Schedule 1
FELIDAE	<i>Caracal caracal</i>	African Caracal, Asian Caracal, Caracal, Desert Lynx	LC	-
FELIDAE	<i>Felis silvestris</i>	Wildcat, Wild Cat	LC	-
FELIDAE	<i>Leptailurus serval</i>	Serval	LC	Schedule II
FELIDAE	<i>Panthera pardus</i>	Leopard	NT	Schedule II
FELIDAE	<i>Felis nigripes</i>	Black-footed Cat, Small-spotted Cat	VU	Schedule II
GLIRIDAE	<i>Graphiurus murinus</i>	Woodland Dormouse	LC	-
GLIRIDAE	<i>Graphiurus ocularis</i>	Namtap, Spectacled Dormouse	LC	-
HERPESTIDAE	<i>Atilax paludinosus</i>	Marsh Mongoose, Water Mongoose	LC	-
HERPESTIDAE	<i>Cynictis penicillata</i>	Yellow Mongoose	LC	-
HERPESTIDAE	<i>Herpestes ichneumon</i>	Egyptian Mongoose	LC	-
HERPESTIDAE	<i>Herpestes pulverulentus</i>	Cape Grey Mongoose	LC	-
HERPESTIDAE	<i>Suricata suricatta</i>	Meerkat, Slender-tailed	LC	-
HYAENIDAE	<i>Proteles cristata</i>	Aardwolf	LC	Schedule II
HYAENIDAE	<i>Hyaena brunnea</i>	Brown Hyaena	NT	Schedule II

HYSTRICIDAE	<i>Hystrix africaeaustralis</i>	Cape Porcupine	LC	-
LEPORIDAE	<i>Bunolagus monticularis</i>	Bushman Hare, Riverine Rabbit	CR	Schedule 1
LEPORIDAE	<i>Lepus capensis</i>	Arabian Hare, Brown Hare, Cape Hare, Desert Hare	LC	-
LEPORIDAE	<i>Lepus saxatilis</i>	Savannah Hare, Scrub Hare	LC	-
LEPORIDAE	<i>Pronolagus saundersiae</i>	Hewitt's Red Rock Hare	LC	-
MACROSCOLIDIDAE	<i>Elephantulus pilicaudus</i>	Karoo Rock Elephant-shrew, Karoo Rock Sengi	DD	Schedule II
MACROSCOLIDIDAE	<i>Elephantulus edwardii</i>	Cape Elephant Shrew, Cape Rock Elephant Shrew, Cape Sengi	LC	Schedule II
MACROSCOLIDIDAE	<i>Elephantulus rupestris</i>	Western Rock Elephant Shrew, Western Rock Sengi	LC	Schedule II
MACROSCOLIDIDAE	<i>Macroscelides proboscideus</i>	Round-eared Elephant Shrew, Round-eared Sengi, Short-eared Elephant Shrew	LC	Schedule II
MURIDAE	<i>Acomys subspinosus</i>	Cape Spiny Mouse	LC	-
MURIDAE	<i>Aethomys granti</i>	Grant's Rock Mouse, Grant's Rock Rat	LC	-
MURIDAE	<i>Aethomys namaquensis</i>	Namaqua Rock Rat	LC	-
MURIDAE	<i>Dasymys incomtus</i>	African Marsh Rat, Common Dasymys	LC	-
MURIDAE	<i>Desmodillus auricularis</i>	Cape Short-eared Gerbil	LC	-
MURIDAE	<i>Gerbilliscus afra</i>	Cape Gerbil	LC	-
MURIDAE	<i>Gerbilliscus afra</i>	Cape Gerbil	LC	-

MURIDAE	<i>Gerbillurus paeba</i>	Hairy-footed Gerbil, Pigmy Gerbil	LC	-
MURIDAE	<i>Mastomys coucha</i>	Southern African Mastomys, Southern Multimammate Mouse	LC	-
MURIDAE	<i>Mus minutoides</i>	Pygmy Mouse	LC	-
MURIDAE	<i>Mus musculus</i>	House Mouse	LC	-
MURIDAE	<i>Myomyscus verreauxii</i>	Verreaux's Mouse, Verreaux's White-footed Rat	LC	-
MURIDAE	<i>Otomys irroratus</i>	Southern African Vlei Rat, Vlei Rat	LC	-
MURIDAE	<i>Otomys saundersiae</i>	Saunder's Vlei Rat	LC	-
MURIDAE	<i>Otomys unisulcatus</i>	Bush Vlei Rat, Karoo Bush Rat	LC	-
MURIDAE	<i>Parotomys brantsii</i>	Brants's Whistling Rat, Brants' Whistling Rat	LC	-
MURIDAE	<i>Parotomys littledalei</i>	Littledale's Whistling Rat	LC	-
MURIDAE	<i>Rattus rattus</i>	Black Rat, House Rat, Roof Rat, Ship Rat	LC	-
MURIDAE	<i>Rhabdomys pumilio</i>	Four-striped Grass Mouse, Four-striped Grass Rat	LC	-
MUSTELIDAE	<i>Aonyx capensis</i>	African Clawless Otter, Cape Clawless Otter	LC	-
MUSTELIDAE	<i>Ictonyx striatus</i>	Striped Polecat, Striped Weasel, Zorilla	LC	-
MUSTELIDAE	<i>Mellivora capensis</i>	Honey Badger	LC	Schedule II
MUSTELIDAE	<i>Poecilogale albinucha</i>	African Striped Weasel	LC	-
NESOMYIDAE	<i>Mystromys albicaudatus</i>	White-tailed Mouse, White-tailed Rat	EN	-



NESOMYIDAE	<i>Dendromus melanotis</i>	Gray African Climbing Mouse, Gray Glimbing Mouse	LC	-
NESOMYIDAE	<i>Dendromus mesomelas</i>	Brant's Climbing Mouse	LC	-
NESOMYIDAE	<i>Malacothrix typica</i>	Gerbil Mouse	LC	-
NESOMYIDAE	<i>Petromys cuscollinus</i>	Pygmy Rock Mouse	LC	-
NESOMYIDAE	<i>Saccostomus campestris</i>	Pouched Mouse, Southern African Pouched Mouse	LC	-
NYCTERIDAE	<i>Nycteris thebaica</i>	Egyptian Slit-faced Bat	LC	Schedule II
ORYCTEROPODIDAE	<i>Orycteropus afer</i>	Aardvark, Antbear	LC	Schedule II
PROCAVIIDAE	<i>Procavia capensis</i>	Rock Dassie, Rock Hyrax	LC	-
RHINOCEROTIDAE	<i>Diceros bicornis</i>	Black Rhinoceros, Hook-lipped Rhinoceros	CR	Schedule 1
RHINOCEROTIDAE	<i>Ceratotherium simum</i>	Northern White Rhinoceros, Square-lipped Rhinoceros, White Rhinoceros	NT	Schedule 1
RHINOLOPHIDAE	<i>Rhinolophus clivus</i>	Geoffroy's Horseshoe Bat	NT	Schedule II
SORICIDAE	<i>Crocidura cyanea</i>	Reddish-gray Musk Shrew	LC	-
SORICIDAE	<i>Crocidura flavescens</i>	Greater Red Musk Shrew	LC	-
SORICIDAE	<i>Myosorex varius</i>	Forest Shrew	LC	-
SORICIDAE	<i>Suncus varilla</i>	Lesser Dwarf Shrew	LC	-
SORICIDAE	<i>Myosorex longicaudatus</i>	Long-tailed Forest Shrew	VU	-
SUIDAE	<i>Potamochoerus larvatus</i>	Bushpig	LC	-
VESPERTILIONIDAE	<i>Pipistrellus capensis</i>	Cape Serotine	LC	-
VESPERTILIONIDAE	<i>Pipistrellus hesperidus</i>		LC	-

VIVERRIDAE	<i>Genetta genetta</i>	Common Genet, Common Genet, Genet	Ibiza Genet, Ibiza	LC	-
VIVERRIDAE	<i>Genetta tigrina</i>	Blotched Large-spotted Large-spotted South African spotted Genet	Genet, Cape Genet, Genet, Large-	LC	-

**ASSESSMENT TABLES DROERIVIER - BLANCO**

Loss of faunal habitat and ecological structure		
<p><b>Nature:</b> The construction phase and operational phase of the power line development will result in the loss of faunal habitats within the area. This impact relates to the complete removal or partial destruction/disturbance of existing vegetation by machinery and workers, impacting directly on the ecological condition of natural vegetation and habitat availability. These activities will have an impact on foraging and breeding ecology of faunal species. Loss of vegetation generally affects nutrient cycles, removes the organic litter layer and results in habitat fragmentation and destruction of wildlife corridors. Both alternatives 1 &amp; 2 intersect vegetation types that are regarded as sensitive, or that influence the breeding and feeding of fauna. The impact is similar for both alternative, but due to the additional length of Alternative 2, the impact may be more than for Alternative 1.</p>		
CONSTRUCTION PHASE		
Rating of Impacts	Without mitigation	With mitigation
<b>Probability</b>	Definite (5)	Definite (5)
<b>Duration</b>	Short Duration (2)	Short Duration (2)
<b>Extent</b>	Limited to Local Area (2)	Limited to Local Area (2)
<b>Magnitude</b>	High (8)	Moderate (6)
<b>Significance</b>	<b>60 (high)</b>	<b>50 (moderate)</b>
<b>Status (positive or negative)</b>	Negative	Negative
OPERATIONAL PHASE		
<b>Probability</b>	Probable (3)	Improbable (2)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Extent</b>	Limited to Site (1)	Limited to Site (1)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>36 (moderate)</b>	<b>20 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Moderate	High
<b>Irreplaceable loss of resources?</b>	Low	Low
<b>Can impacts be mitigated?</b>	Yes	
<b>NO GO Option</b>	A No Go Option will not result in the loss of faunal habitats or ecology in the area.	
<p><b>Mitigation:</b></p> <ul style="list-style-type: none"> <li>• All construction and maintenance activities must be carried out according to the generally accepted environmental best practice and the temporal and spatial footprint of the development must be kept to a minimum.</li> <li>• The boundaries of the development footprint areas are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area.</li> <li>• Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which will affect faunal habitats adjacent to the development area, need to be strictly managed.</li> <li>• Any natural areas beyond the development footprint, which have been affected by the construction activities, must be rehabilitated using indigenous plant species.</li> <li>• Education and awareness campaigns on faunal species and their habitat are recommended to help increase awareness, respect and responsibility towards the environment for all staff and contractors.</li> </ul>		
<p><b>Cumulative impacts:</b> Expected to be minimal. The habitat is however already largely transformed and fragmented due to the adjacent activities and the site is not a unique habitat within the landscape. It is not envisaged that any Red Data species will be displaced by the habitat transformation that will take place as a result of the construction and operation of the proposed development. The impact on smaller, non-Red Data species that are potentially breeding in the area will be local in extent, in that it will not have a significant effect on regional or national populations.</p>		
<p><b>Residual Risks:</b> None anticipated provided that the mitigation measures are implemented correctly and rehabilitation of the site is undertaken.</p>		

### Direct impact on faunal communities

**Nature:** Activities involving the clearing/harvesting of natural vegetation will result in the loss of faunal species. Faunal diversity within the study area has been negatively impacted as a result of historic and on-going disturbances associated with agriculture and housing developments. . **Based on the available spatial planning tools and species distribution data, it is recommended that the B-D alternative 1 is the preferred route option for the Blanco to Droerivier section of the proposed power line.** However, this recommendation is subject to establishing the known distribution range of the subpopulation of Riverine Rabbit in the northern section. It is also suggested that the route be re-aligned to avoid the SKEP reptile priority area north of the Swartberg Mountains. If chosen, on ground surveying of 'sensitive' areas should take place along the route to accommodate adjustments to the alignment (e.g. avoiding rocky outcrops and habitats suitable for SCC).

#### CONSTRUCTION PHASE

Rating of Impacts	Without mitigation	With mitigation
<b>Probability</b>	Definite (5)	Definite (5)
<b>Duration</b>	Short Duration (2)	Short Duration (2)
<b>Extent</b>	Limited to the Local Area (2)	Limited to the Local Area (2)
<b>Magnitude</b>	High (8)	Moderate (6)
<b>Significance</b>	<b>60 (high)</b>	<b>50 (moderate)</b>
<b>Status (positive or negative)</b>	Negative	Negative

#### OPERATIONAL PHASE

<b>Probability</b>	Highly Probable (4)	Probable (3)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Extent</b>	Limited to the Local Area (2)	Limited to Site (1)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>52 (moderate)</b>	<b>30 (moderate)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Moderate
<b>Irreplaceable loss of resources?</b>	Moderate	Low
<b>Can impacts be mitigated?</b>	Yes	
<b>NO GO Option</b>	A No Go Option will not change the status quo of faunal communities within the area.	

#### **Mitigation:**

- It is recommended that a speed limit of 30km/h is implemented on all roads running through the study area during all phases in order to minimise risk to fauna from vehicles.
- No trapping or hunting of fauna is to take place. Access control must be implemented to ensure that no illegal trapping or poaching takes place.
- Should any Red Data faunal species be noted within the development footprint areas, these species must be relocated to similar habitat within the vacant land to the west of the development area with the assistance of a suitably qualified ecologist.
- Any fauna directly threatened by the construction activities must be removed to a safe location by the ECO or qualified Ecologist.
- All staff and contractors must undergo an environmental induction course held by the ECO as well as faunal education and awareness programmes.

**Cumulative impacts:** Expected to be moderate to minimal, should the recommended mitigation measures not be adequately implemented. During the operational phase, a further loss of faunal diversity and ecological integrity will occur due to the increase in human activity and potential poaching.

**Residual Risks:** None anticipated provided that the mitigation measures are implemented correctly and rehabilitation of the site is undertaken.

### Impact of disturbance and noise pollution on fauna

**Nature:** Disturbance created by noise-pollution associated with workers and construction activities can affect local wildlife utilising adjacent habitats, particularly mammalian species. This is likely to be short-lived during the construction phase but will continue to have an impact during the operational life span of the development. The disturbance and noise impact is similar for both alternatives, but due to the additional length of Alternative 2, the impact may be more than for Alternative 1.

#### CONSTRUCTION PHASE

Rating of Impacts	Without mitigation	With mitigation
<b>Probability</b>	Definite (5)	Highly Probable (4)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Extent</b>	Limited to Site (1)	Limited to Site (1)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>60 (high)</b>	<b>40 (moderate)</b>
<b>Status (positive or negative)</b>	Negative	Negative

#### OPERATIONAL PHASE

<b>Probability</b>	Probable (3)	Improbable (2)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Extent</b>	Limited to Site (1)	Limited to Site (1)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>36 (moderate)</b>	<b>20 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Moderate
<b>Irreplaceable loss of resources?</b>	Moderate	Low
<b>Can impacts be mitigated?</b>	Yes	
<b>NO GO Option</b>	A No Go Option will not result in additional noise and disturbance in the area.	

**Mitigation:**

- Strict control must be maintained over all activities during construction, in line with an approved Construction EMPr.
- Any Red Data species identified in this report observed to be roosting and/or breeding in the vicinity, the ECO must be notified.

**Cumulative impacts:** Species at Nature Reserves and mountainous areas along the power line development route may experience high levels of disturbance. Species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational phases.

**Residual Risks:** None anticipated provided that the mitigation measures are implemented correctly and rehabilitation of the site is undertaken.

## ASSESSMENT TABLES GOURIKWA - BLANCO

Loss of faunal habitat and ecological structure		
<p><b>Nature:</b> The construction phase and operational phase of the power line development will result in the loss of faunal habitats within the area. This impact relates to the complete removal or partial destruction/disturbance of existing vegetation by machinery and workers, impacting directly on the ecological condition of natural vegetation and habitat availability. These activities will have an impact on foraging and breeding ecology of faunal species. Loss of vegetation generally affects nutrient cycles, removes the organic litter layer and results in habitat fragmentation and destruction of wildlife corridors. Alternatives 1,2 and 3 intersect vegetation types that are regarded as sensitive, or that influence the breeding and feeding of fauna. Private Game and other Natural Reserve areas (e.g. Gondwana and Nyaru along Alternative 1) should be avoided if possible, and if avoidance is not possible, careful placement of towers will be required.</p>		
CONSTRUCTION PHASE		
Rating of Impacts	Without mitigation	With mitigation
<b>Probability</b>	Definite (5)	Definite (5)
<b>Duration</b>	Short Duration (2)	Short Duration (2)
<b>Extent</b>	Limited to Local Area (2)	Limited to Local Area (2)
<b>Magnitude</b>	High (8)	Moderate (5)
<b>Significance</b>	<b>60 (high)</b>	<b>45 (medium)</b>
Alternative 1	60 (high)	40 (medium)
Alternative 2	55 (high)	36 (medium)
Alternative 3	60 (high)	45 (medium)
<b>Status (positive or negative)</b>	Negative	Negative
OPERATIONAL PHASE		
<b>Probability</b>	Probable (3)	Improbable (2)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Extent</b>	Limited to Site (1)	Limited to Site (1)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>36 (medium)</b>	<b>20 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Moderate	High
<b>Irreplaceable loss of resources?</b>	Low	Low
<b>Can impacts be mitigated?</b>	Yes	
<b>No Go Alternative</b>	The no-go option would prevent Loss of faunal habitat and ecological structure	

**Mitigation:**

- All construction and maintenance activities must be carried out according to the generally accepted environmental best practice and the temporal and spatial footprint of the development must be kept to a minimum.
- The boundaries of the development footprint areas are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area.
- Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which will affect faunal habitats adjacent to the development area, need to be strictly managed.
- Any natural areas beyond the development footprint, which have been affected by the construction activities, must be rehabilitated using indigenous plant species.
- Education and awareness campaigns on faunal species and their habitat are recommended to help increase awareness, respect and responsibility towards the environment for all staff and contractors.

**Cumulative impacts:** Expected to be minimal. The habitat is however already largely transformed and fragmented due to the adjacent mining activities and the site is not a unique habitat within the landscape. It is not envisaged that any Red Data species will be displaced by the habitat transformation that will take place as a result of the construction and operation of the proposed development. The impact on smaller, non-Red Data species that are potentially breeding in the area will be local in extent, in that it will not have a significant effect on regional or national populations.

**Residual Risks:** None anticipated provided that the mitigation measures are implemented correctly and rehabilitation of the site is undertaken.

### Direct impact on faunal communities

**Nature:** Activities involving the clearing/harvesting of natural vegetation will result in the loss of faunal species. Faunal diversity within the study area has been negatively impacted as a result of historic and on-going disturbances associated with agriculture and housing developments. The impact is similar for all alternatives, but due to the occurrence of natural protection areas (Game Reserves) in the vicinity of **Alternative 1, the impact will be more significant in sections of this alternative than for instance the first 20km of Alternative 3 that is proposed along existing roads and railway line and adjacent to an industrial area.**

#### CONSTRUCTION PHASE

Rating of Impacts	Without mitigation	With mitigation
<b>Probability</b>	Definite (5)	Probable (3)
<b>Duration</b>	Short Duration (2)	Short Duration (2)
<b>Extent</b>	Limited to the Local Area (2)	Limited to the Local Area (2)
<b>Magnitude</b>	High (8)	Moderate (6)
<b>Significance</b>	<b>60 (high)</b>	<b>30 (medium)</b>
<i>Alternative 1</i>	60 (medium)	30 (medium)
<i>Alternative 2</i>	33 (medium)	20 (low)
<i>Alternative 3</i>	50 (medium)	20 (low)
<b>Status (positive or negative)</b>	Negative	Negative

#### OPERATIONAL PHASE

<b>Probability</b>	Highly Probable (4)	Probable (3)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Extent</b>	Limited to the Local Area (2)	Limited to Site (1)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>52 (medium)</b>	<b>30 (medium)</b>

<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Moderate
<b>Irreplaceable loss of resources?</b>	Moderate	Low
<b>Can impacts be mitigated?</b>	Yes	
<b>No Go Alternative</b>	The no-go option would prevent impact on faunal species and habitat	
<b>Mitigation:</b>		
<ul style="list-style-type: none"> <li>• It is recommended that a speed limit of 30km/h is implemented on all roads running through the study area during all phases in order to minimise risk to fauna from vehicles.</li> <li>• No trapping or hunting of fauna is to take place. Access control must be implemented to ensure that no illegal trapping or poaching takes place.</li> <li>• Should any Red Data faunal species be noted within the development footprint areas, these species must be relocated to similar habitat within the vacant land to the west of the development area with the assistance of a suitably qualified ecologist</li> <li>• Any fauna directly threatened by the construction activities must be removed to a safe location by the ECO or qualified Ecologist.</li> <li>• All staff and contractors must undergo an environmental induction course held by the ECO as well as faunal education and awareness programmes.</li> </ul>		
<b>Cumulative impacts:</b> Expected to be moderate to minimal, should the recommended mitigation measures not be adequately implemented. The habitat is however already largely transformed and fragmented due to the adjacent mining activities and the site is not a unique habitat within the landscape. It is not envisaged that any Red data species will be present on the site and thus directly impacted as a result of the development. During the operational phase, a further loss of faunal diversity and ecological integrity will occur due to the increase in human activity and potential poaching.		
<b>Residual Risks:</b> None anticipated provided that the mitigation measures are implemented correctly and rehabilitation of the site is undertaken.		

### Impact of disturbance and noise pollution on fauna

**Nature:** Disturbance created by noise-pollution associated with workers and construction activities can affect local wildlife utilising adjacent habitats, particularly mammalian species. This is likely to be short-lived during the construction phase but will continue to have an impact during the operational life span of the development. The disturbance and noise impact is similar for all three the alternatives, and valid during construction and maintenance of the line. Noise impact is measured in terms of ambient noise, for instance if the habitat is located close to industries, roads or noisy activities it will be less significant.

#### CONSTRUCTION PHASE

Rating of Impacts	Without mitigation	With mitigation
<b>Probability</b>	Definite (5)	Highly Probable (4)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Extent</b>	Limited to Site (1)	Limited to Site (1)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>60 (high)</b>	<b>40 (medium)</b>
Alternative 1	60 (high)	36 (medium)
Alternative 2	55 (high)	36 (medium)
Alternative 3	60 (high)	40 (medium)
<b>Status (positive or negative)</b>	Negative	Negative



OPERATIONAL PHASE		
<b>Probability</b>	Probable (3)	Improbable (2)
<b>Duration</b>	Permanent (5)	Permanent (5)
<b>Extent</b>	Limited to Site (1)	Limited to Site (1)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>36 (medium)</b>	<b>20 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Moderate
<b>Irreplaceable loss of resources?</b>	Moderate	Low
<b>Can impacts be mitigated?</b>	Yes	
<b>No Go Alternative</b>	The no-go option would prevent disturbance of fauna due to dust and noise pollution	
<p><b>Mitigation:</b></p> <ul style="list-style-type: none"> <li>• Strict control must be maintained over all activities during construction, in line with an approved Construction EMPr.</li> <li>• Any Red Data species identified in this report observed to be roosting and/or breeding in the vicinity, the ECO must be notified.</li> </ul>		
<p><b>Cumulative impacts:</b> Species at Nature Reserves and mountainous areas along the power line development route may experience high levels of disturbance. Species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational phases.</p>		
<p><b>Residual Risks:</b> None anticipated provided that the mitigation measures are implemented correctly and rehabilitation of the site is undertaken.</p>		