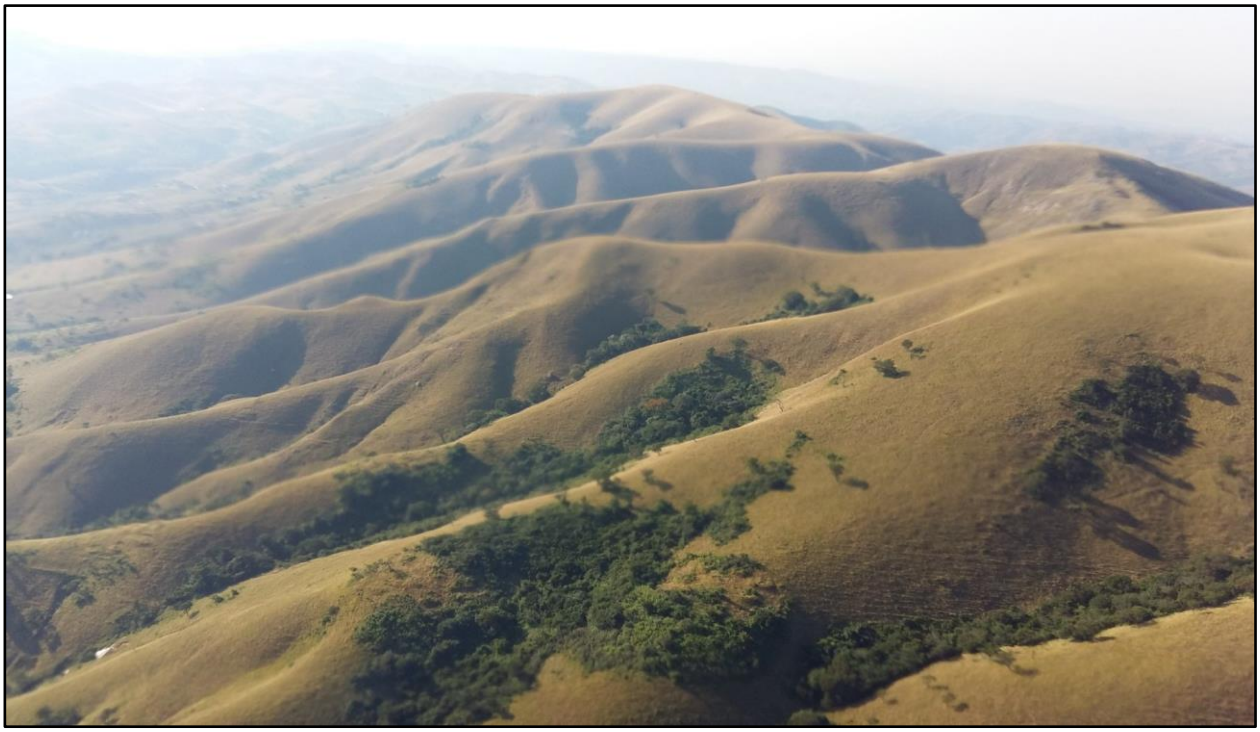
ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED ESKOM INYANINGA SUBSTATION AND INYANINGA – MBEWU 400KV POWERLINE, KWAZULU NATAL PROVINCE:

FAUNA & FLORA SPECIALIST REPORT FOR EIA



PRODUCED FOR NSOVO

ON BEHALF OF ESKOM DISTRIBUTION

BY

SIMON TODD CONSULTING

Simon.Todd@3foxes.co.za

June 2017

CONTENTS

Executive Summary ..... **Error! Bookmark not defined.**

1 Introduction 3

1.1 Scope of Study 3

1.2 Assessment Approach & Philosophy 4

1.3 Relevant Aspects of the Development 7

2 Methodology 8

2.1 Data Sourcing and Review 8

2.2 Site Visit 9

2.3 Sampling Limitations and Assumptions 10

2.4 Sensitivity Mapping & Assessment 10

3 Description of the Affected Environment 11

3.1 Broad-Scale Vegetation Patterns 11

3.2 Listed & Protected Plant Species 21

3.3 Site Description 24

3.4 Critical Biodiversity Areas & Broad Scale Ecological Processes 21

3.5 Faunal Communities 30

3.6 Site Sensitivity Assessment 32

4 Identification & Nature of Impacts 35

4.1 Impact Risk Factors ..... **Error! Bookmark not defined.**

4.2 Construction Phase Impacts ..... **Error! Bookmark not defined.**

4.3 Operational Phase Impacts ..... **Error! Bookmark not defined.**

4.4 Cumulative impacts ..... **Error! Bookmark not defined.**

5 Impact Assessment 37

5.1 Construction Phase Impacts 37

5.2 Operational Phase Impacts 39

5.3 Cumulative Impacts 40

6 Conclusions & Recommendations 41

7 Literature Cited 44

8 Annex 1. List of Plant Species 46

9 Annex 2. List of Mammals 48

10 Annex 3. List of Reptiles 51
11 Annex 3. List of Amphibians 53

1 INTRODUCTION

Eskom Distribution proposes the construction of the Inyaninga 2 x 500 MVA 400/132 kV substation, ±100KM Inyaninga-Mbewu 400kV powerline and associated infrastructure in order to meet growing electricity demand in the area. The proposed project will traverse various farms within the jurisdiction of Ethekwini Metropolitan, Ilembe and Uthungulu District Municipalities in the KwaZulu Natal Province. A full EIA process is required for the development and Nsovo Environmental Consultants has appointed Simon Todd Consulting to contribute the terrestrial biodiversity component of the EIA.

As part of the EIA process, this ecological specialist study details the ecological characteristics of the site and provides an assessment of the likely ecological impacts likely to be associated with the development of the proposed power supply development. Impacts are assessed for the preconstruction, construction, operation, and decommissioning phases of the development. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the development which should be included in the EMPr for the development. The full scope of study is detailed below.

1.1 SCOPE OF STUDY

The scope of the study includes the following activities

- a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project
- a description and evaluation of environmental issues and potential impacts (including using direct, indirect and cumulative impacts) that have been identified
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts
- an indication of the methodology used in determining the significance of potential environmental impacts
- an assessment of the significance of direct indirect and cumulative impacts in terms of the following criteria :
    - the nature of the impact, which shall include a description of what causes the effect, what will be affected and how it will be affected
    - the extent of the impact, indicating whether the impact will be local (limited to the immediate area or site of development), regional, national or international
    - the duration of the impact, indicating whether the lifetime of the impact will be of a short-term duration (0-5 years), medium-term (5- 15 years), long-term (> 15 years, where the impact will cease after the operational life of the activity) or permanent

  - the probability of the impact, describing the likelihood of the impact actually occurring, indicated as improbable (low likelihood) probable (distinct possibility), highly probable (most likely), or definite (Impact will occur regardless of any preventable measures)
  - the severity/beneficial scale indicating whether the impact will be very severe/beneficial (a permanent change which cannot be mitigated/permanent and significant benefit with no real alternative to achieving this benefit) severe/beneficial (long-term impact that could be mitigated/long-term benefit) moderately severe/beneficial (medium- to long-term impact that could be mitigated/ medium- to long-term benefit), slight or have no effect
  - the significance which shall be determined through a synthesis of the characteristics described above and can be assessed as low medium or high
  - the status which will be described as either positive, negative or neutral
  - the degree to which the impact can be reversed
  - the degree to which the impact may cause irreplaceable loss of resources
  - the degree to which the impact can be mitigated

- a description and comparative assessment of all alternatives
- recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Programme (EMPr)
- an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
- a description of any assumptions uncertainties and gaps in knowledge
- an environmental impact statement which contains :
  - a summary of the key findings of the environmental impact assessment;
  - an assessment of the positive and negative implications of the proposed activity;
  - a comparative assessment of the positive and negative implications of identified alternatives

1.2 ASSESSMENT APPROACH & PHILOSOPHY

The assessment will be conducted according to the 2017 amended EIA Regulations as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005).

This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. Critical Biodiversity Areas (as identified by systematic

conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.

- Demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should.

    - In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
    - Avoid degradation of the environment;
    - Avoid jeopardising ecosystem integrity;
    - Pursue the best practicable environmental option by means of integrated environmental management;
    - Protect the environment as the people's common heritage;
    - Control and minimise environmental damage; and
    - Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy:
The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing:

- A description of the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of **pattern**, the following will be identified or described:

Community and ecosystem level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc*).

Species level

- Red Data Book species (giving location if possible using GPS)

- The viability of an estimated population size of the RDB species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)
- The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Fauna

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development.
- Conduct a faunal assessment that can be integrated into the ecological study.
- Describe the existing impacts of current land use as they affect the fauna.
- Clarify species of special concern (SSC) and that are known to be:
    - endemic to the region;
    - that are considered to be of conservational concern;
    - that are in commercial trade (CITES listed species);
    - or, are of cultural significance.
- Provide monitoring requirements as input into the Environmental Management Plan (EMP) for faunal related issues.

Other pattern issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
- The condition of the site in terms of current or previous land uses.

In terms of **process**, the following will be identified or described:

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)
- Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.

- Furthermore, any further studies that may be required during or after the EIA process will be outlined.
- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

1.3 RELEVANT ASPECTS OF THE DEVELOPMENT

The development would consist of the following elements:

- A new substation, which would occupy an area of up 800m x 800m. There are currently four proposed subtatation alternatives being considered.
- Three different power line alternatives are being considered, which are illustrated below.

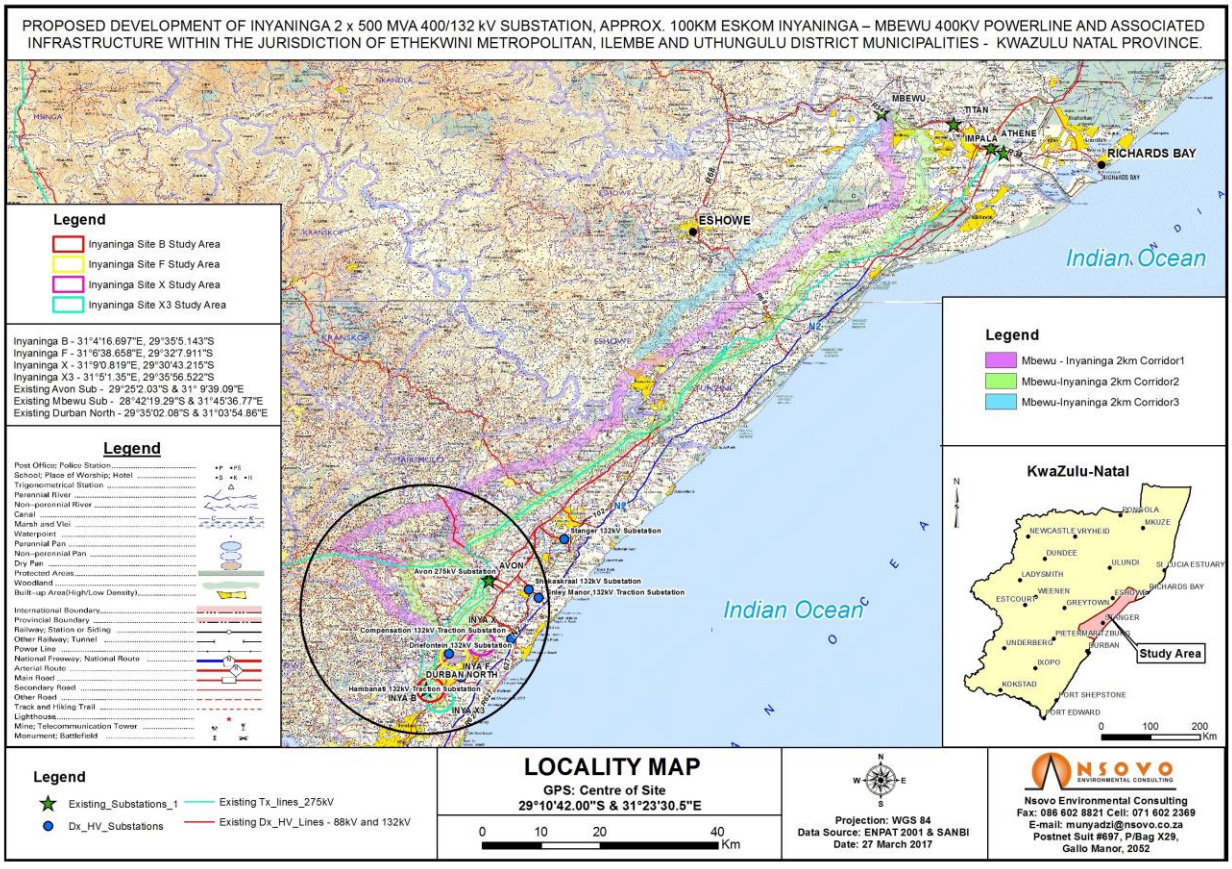


Figure 1. Map of the Inyaninga-Mbweu study area, showing the 4 substation sites and 3 corridor options.

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study includes the following:

Vegetation:

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

- Information on plant and animal species recorded for the Quarter Degree Square (QDS) 2930DD and 2930CD was extracted from the SABIF/SIBIS database hosted by SANBI. This is a considerably larger area than the study area, but this is necessary to ensure a conservative approach given the development's length stretches across the QDSes.
- Critical Biodiversity Areas for the site and surroundings were extracted from the KwaZulu-Natal CBA Map (2016)
- The IUCN conservation status (Table 1) of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2016).
- Threatened Ecosystem data was extracted from the NEM:BA listed ecosystems layer (SANBI 2008).
- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2012) as well as the National List of Protected Ecosytems (2011).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystems Protection Assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (ADU, SANBI's SIBIS and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004), EWT & SANBI (2016) for the South African Red Data List of mammals, and Skinner and Chimimba (2005) for mammals.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 2016 (See Figure 1) and where species have not

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

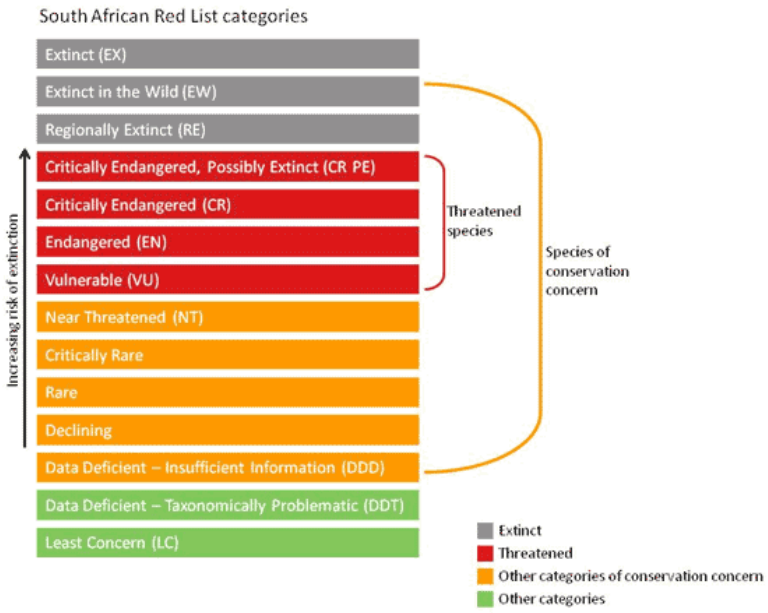


Figure 2. Schematic representation of the South African Red List categories. Taken from http://redlist.sanbi.org/redcat.php

2.2 SITE VISIT

The site was visited in May 2017 during autumn, following a good season with late rains leading to favourable conditions at the time of the site visit. The study area was sampled from the air as well from the ground. The three power line alternatives were flown with a helicopter to gain a better picture of the routes and the major features present across the study area and along each of the proposed routes. Features were mapped onto aerial photography or recorded with a GPS where necessary and photographs taken of relevant features from the air. This was then followed by two days of on the ground field investigation of specific features and areas that warranted additional attention to confirm their sensitivity or better characterise the affected ecosystems. This included visits to sensitive features along the power line routes as well as the substation alternatives to confirm the features present in the vicinity of the selected sites and the potential for secondary impacts such as erosion or disruption of landscape connectivity.

2.3 SAMPLING LIMITATIONS AND ASSUMPTIONS

The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure that the full complement of plant and animal species present are captured. However, this is rarely possible due to time and cost constraints and therefore, the representivity of the species sampled at the time of the site visit should be critically evaluated. The site was however sampled during a favourable season and the combined approach of aerial and on the ground sampling resulted in the study area being well covered and it is not likely that there are any significant features present that were not observed and mapped. The lists of amphibians, reptiles and mammals for the study area are based on those observed in the vicinity of the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach which takes the study limitations into account.

2.4 SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the site was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases. This includes delineating the different habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties, conservation value and the observed presence of species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. Most types of development can proceed within these areas with little ecological impact.
- **Medium**- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. These areas usually comprise the bulk of habitats within an area. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible.

In some situations, areas were also classified between the above categories, such as Medium-High, where it was deemed that an area did not fit well into a certain category but rather fell most appropriately between two sensitivity categories.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 BROAD-SCALE VEGETATION PATTERNS

The study area especially in the south has been heavily impacted by transformation, with the result that all of the substation sites and the majority of the power line corridors in the south at least are within transformed or havily impacted ecosystems, with little of the original remnant vegetation present. As a result, many of the affected vegetation types are actually no longer present within the study area. In addition, as a result of the high level of transformation, most of the affected vegetation are listed under the National List of Threatened Ecosystems (2011). The affected vegetation types are listed below before being described in greater detail thereafter.

The different power line corridors are dominated by the following vegetation types which occupy five or more percent of each cooridor (See also Table 1). The proportion of each corridor occupied by that vegetation type is indicated in brackets:

Corridor Alternative 1

- KwaZulu-Natal Coastal Belt Grassland (46)
- Moist Coast Hinterland Grassland (12)
- Eastern Valley Bushveld (11)
- KwaZulu-Natal Coastal Belt Thornveld (8)
- Zululand Lowveld (8)
- KwaZulu-Natal Sandstone Sourveld (6)

Corridor Alternative 2

- KwaZulu-Natal Coastal Belt Grassland (54)
- Zululand Lowveld (36)
- KwaZulu-Natal Coastal Belt Thornveld (7)
- Scarp Forest (6)

Corridor Alternative 3

- KwaZulu-Natal Coastal Belt Grassland (71)
- KwaZulu-Natal Coastal Belt Thornveld (8)
- KwaZulu-Natal Sandstone Sourveld (6)

Table 1. The extent (km^2) of the different vegetation types within the three corridors alternatives, as well as the associated biome and threat status of each type.

Type	Biome	Status	Total Extent	Alt 1	Alt 2	Alt 3
Subtropical Alluvial Vegetation	Azonal Vegetation	Least Concern	1 122	3.21	0.05	2.46
Subtropical Freshwater Wetlands	Azonal Vegetation	Least Concern	914	0.04	0.00	0.06
Lowveld Riverine Forest	Forests	Vulnerable	185	1.01	0.00	1.01
Northern Coastal Forest	Forests	Critically Endangered	664	0.50	0.00	2.15
Scarp Forest	Forests	Critically Endangered	990	5.82	5.58	0.26
Swamp Forest	Forests	Vulnerable	86	0.00	0.17	0.00
Moist Coast Hinterland Grassland	Grassland	Vulnerable	6 242	43.69	0.00	0.00
KwaZulu-Natal Coastal Belt Grassland	Indian Ocean Coastal Belt	Critically Endangered	4 115	170.17	72.57	283.96
KwaZulu-Natal Coastal Belt Thornveld	Indian Ocean Coastal Belt	Critically Endangered	1 119	30.22	7.15	31.61
Maputaland Coastal Belt	Indian Ocean Coastal Belt	Least Concern	2 211	10.17	0.00	19.09
Eastern Valley Bushveld	Savanna	Least Concern	10 132	41.54	0.00	7.19
KwaZulu-Natal Hinterland Thornveld	Savanna	Critically Endangered	1 525	13.32	0.00	0.00
KwaZulu-Natal Sandstone Sourveld	Savanna	Vulnerable	1 797	20.77	0.00	24.55
Zululand Coastal Thornveld	Savanna	Least Concern	671	0.00	0.00	8.12
Zululand Lowveld	Savanna	Least Concern	8 514	29.31	48.44	17.92
Freshwater Lakes	Waterbodies	Least Concern	590	0.00	0.00	0.33

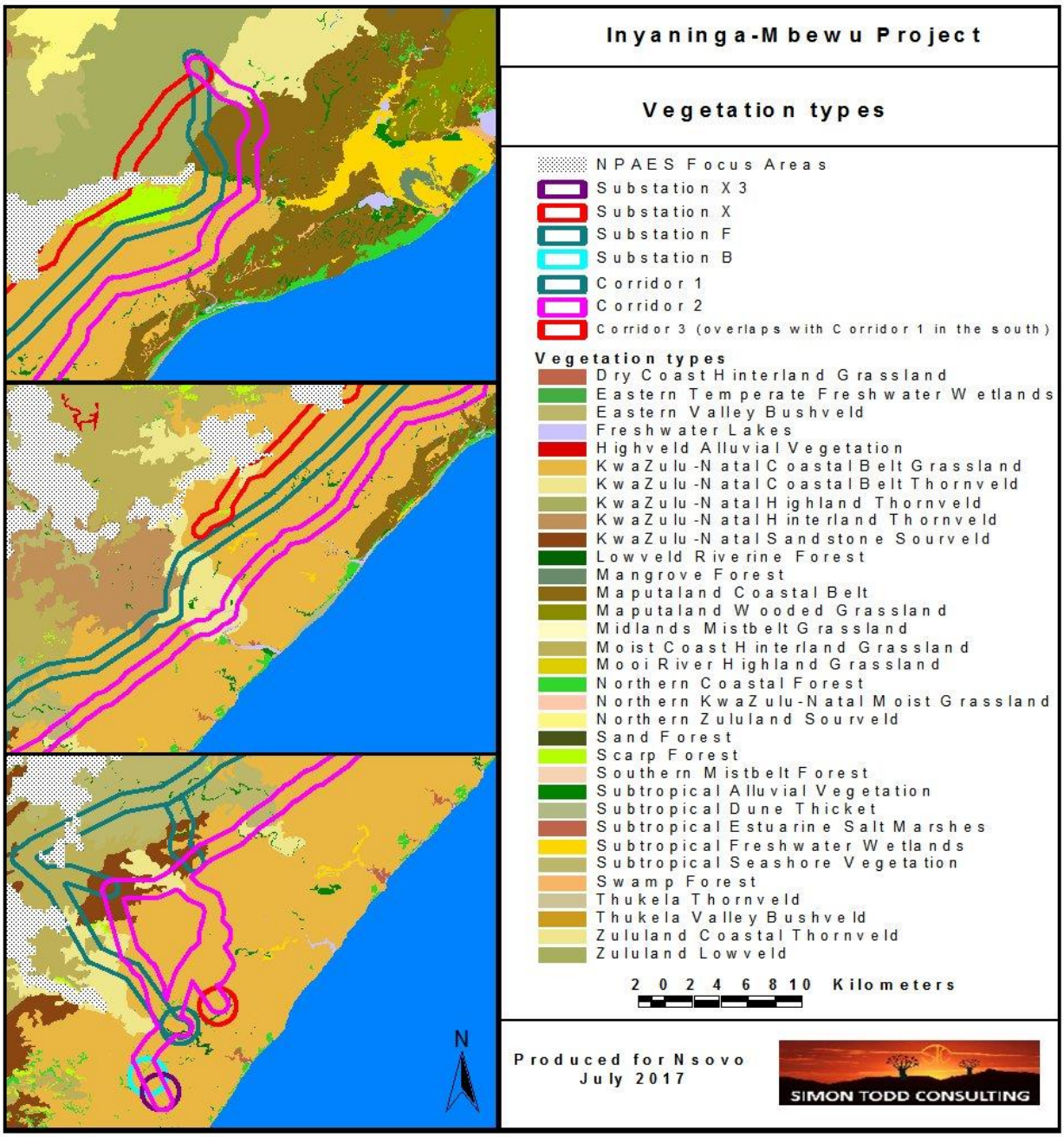


Figure 3. Vegetation map (Mucina and Rutherford 2012) of the Inyaninga-Mbweu study area.

3.1.1 DOMINANT VEGETATION TYPES

The dominant vegetation type across all the corridors is KwaZulu-Natal Coastal Belt Grassland, which occupies almost 60% of the corridors. **KwaZulu-Natal Coastal Belt** consists of VT 1 Coastal Forest and Thornveld (81%), LR 23 Coastal Bushveld–Grassland (62%) and BRG 1 Moist Coast Forest Thorn & Palm Veld (89%) (Camp 1999a, According to Mucina & Rutherford (2006) it is distributed in KwaZulu-Natal Province as a long, and in

places broad, coastal strip along the KwaZulu-Natal coast, from near Mtunzini in the north, via Durban to Margate and just short of Port Edward in the south at an altitude ranging from about 20 to 450 m. It occurs on highly dissected undulating coastal plains and some primary grassland dominated by *Themeda triandra* still occurs in hilly, high-rainfall areas where pressure from natural fire and grazing regimes prevails. At present the KwaZulu-Natal Coastal Belt is affected by an intricate mosaic of very extensive sugarcane fields, timber plantations and coastal holiday resorts, with interspersed secondary *Aristida* grasslands, thickets and patches of coastal thornveld (Mucina & Rutherford 2006).

Important Taxa of this vegetation type include: Graminoids: *Aristida junciformis* subsp. *galpinii* (d), *Digitaria eriantha* (d), *Panicum maximum* (d), *Themeda triandra* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Cymbopogon caesius*, *C. nardus*, *Eragrostis curvula*, *Eulalia villosa*, *Hyparrhenia filipendula*, *Melinis repens*. Herbs: *Berkheya speciosa* subsp. *speciosa* (d), *Cyanotis speciosa* (d), *Senecio glaberrimus* (d), *Alepidea longifolia*, *Centella glabrata*, *Cephalaria oblongifolia*, *Chamaecrista mimosoides*, *Conostomium natalense*, *Crotalaria lanceolata*, *Dissotis canescens*, *Eriosema squarrosum*, *Gerbera ambigua*, *Hebenstretia comosa*, *Helichrysum cymosum* subsp. *cymosum*, *H. pallidum*, *Hibiscus pedunculatus*, *Hybanthus capensis*, *Indigofera hilaris*, *Pentanisia prunelloides* subsp. *latifolia*, *Senecio albanensis*, *S. bupleuroides*, *S. coronatus*, *S. rhyncholaenus*, *Sisyranthus imberbis*, *Stachys aethiopica*, *S. nigricans*, *Vernonia galpinii*, *V. oligocephala*. Geophytic Herbs: *Bulbine asphodeloides*, *Disa polygonoides*, *Hypoxis filiformis*, *Ledebouria floribunda*, *Pachycarpus asperifolius*, *Schizocarphus nervosus*, *Tritonia disticha*. Low Shrubs: *Clutia pulchella*, *Gnidia kraussiana*, *Phyllanthus glaucophyllus*, *Tephrosia polystachya*. Woody Climbers: *Abrus laevigatus*, *Asparagus racemosus*, *Smilax anceps*. Small Trees & Tall Shrubs: *Bridelia micrantha* (d), *Phoenix reclinata* (d), *Syzygium cordatum* (d), *Acacia natalitia*, *Albizia adianthifolia*, *Antidesma venosum*.

Although this vegetation type has been included into the VegMap since the National List of Threatened Ecosystems (2011) was published and it is therefore not listed under this name, the constituent vegetation types and ecosystems are largely classified as Critically Endangered. Only very small part statutorily conserved in Ngoye, Mbumbazi and Vernon Crookes Nature Reserves. About 50% has been transformed for cultivation, by urban sprawl and for road-building. Aliens include *Chromolaena odorata, Lantana camara, Melia azedarach* and *Solanum mauritianum*.

Zululand Lowveld occupies about 10% of the power line corridor alternatives and is confined to the far north of the corridors near the R34. According to Mucina & Rutherford (2006), **Zululand Lowveld** consists of VT 10 Lowveld (71%), LR 26 Natal Lowveld Bushveld (49%), LR 20 Sweet Lowveld Bushveld (12%) and BRG 22 Lowveld (63%) and is distributed in the KwaZulu-Natal Province, Swaziland and Mpumalanga Province. The main extent of this vegetation occurs from around Big Bend south to Mkuze, Hluhluwe, Ulundi to just north of the Ongoye Forest and an isolated patch is found on the Swaziland–Mpumalanga border. It occurs on extensive flat or only slightly undulating landscapes supporting a complex of

various bushveld units ranging from dense thickets of *Dichrostachys cinerea* and *Acacia* species, through park-like savanna with flat-topped *A. tortilis* to tree-dominated woodland with broad-leaved open bushveld with *Sclerocarya birrea* subsp. *caffra* and *A. nigrescens*. The tall grassveld types consist of sparsely scattered solitary trees and shrubs form a mosaic with the typical savanna thornveld, bushveld and thicket

Important Taxa include: Tall Trees: *Acacia burkei* (d), *A. nigrescens* (d), *Sclerocarya birrea* subsp. *caffra* (d). Small Trees: *Acacia tortilis* subsp. *heteracantha* (d), *A. gerrardii*, *A. natalitia*, *A. nilotica*, *A. senegal* var. *rostrata*, *A. welwitschii* subsp. *welwitschii*, *Boscia albitrunca*, *Combretum apiculatum*, *C. molle*, *Ozoroa paniculosa*, *Phoenix reclinata*, *Schotia brachypetala*, *Spirostachys africana*, *Teclea gerrardii*, *Ziziphus mucronata*. Succulent Trees: *Aloe marlothii* subsp. *marlothii*, *Euphorbia grandidens*, *E. ingens*. Tall Shrubs: *Dichrostachys cinerea* (d), *Euclea divinorum* (d), *Coptosperma supra-axillare*, *Crotalaria monteiroi*, *Euclea crispa* subsp. *crispa*, *E. schimperi*, *Galpinia transvaalica*, *Gardenia volkensii*, *Gymnosporia maranguensis*, *G. senegalensis*, *Jatropha zeyheri*, *Lycium acutifolium*, *Olea europaea* subsp. *africana*, *Tarchonanthus parvicapitulatus*, *Tephrosia polystachya*, *Triumfetta pilosa* var. *tomentosa*. Low Shrubs: *Barleria obtusa*, *Crossandra greenstockii*, *Felicia muricata*, *Gymnosporia heterophylla*, *Indigofera trita* subsp. *subulata*, *Justicia flava*, *J. protracta* subsp. *protracta*, *Melhania didyma*, *Orthosiphon serratus*, *Pearsonia sessilifolia*, *Ruellia cordata*, *Sida serratifolia*, *Tetraselago natalensis*. Succulent Shrubs: *Euphorbia grandicornis, E. trichadenia*, *E. vandermerwei*. Soft Shrub: *Pavonia columella*. Herbaceous Climber: *Fockea angustifolia*. Graminoids: *Dactyloctenium australe* (d), *Enteropogon monostachyus* (d), *Eragrostis capensis* (d), *E. curvula* (d), *E. racemosa* (d), *Heteropogon contortus* (d), *Panicum maximum* (d), *Sporobolus pyramidalis* (d), *Themeda triandra* (d), *Aristida bipartita*, *A. congesta*, *Bothriochloa insculpta*, *Chloris mossambicensis*, *Cymbopogon caesius*, *Digitaria natalensis*, *Leptochloa eleusine*, *Panicum deustum*, *Schizachyrium sanguineum*, *Setaria incrassata*, *Sporobolus nitens*, *Trachypogon spicatus*, *Tristachya leucothrix*. Herbs: *Acrotome hispida*, *Argyrolobium rupestre*, *Aspilia mossambicensis*, *Chamaecrista biensis*, *C. mimosoides*, *Corchorus asplenifolius*, *Felicia mossamedensis*, *Gerbera ambigua*, *Helichrysum rugulosum*, *Hibiscus pusillus*, *Kohautia virgata*, *Lotononis eriantha*, *Senecio latifolius*, *Stachys aethiopica*, *Tragia meyeriana*, *Vernonia capensis*. Succulent Herb: *Aloe parvibracteata*. (Mucina & Rutherford 2006.)

This vegetation type is considered **Least Threatened**. Approximately 11% is statutorily conserved mainly in the Hluhluwe-iMfolozi Park and Phongolapoort Nature Reserve. About 26% of the area has been transformed, mostly by cultivation. Erosion is variable from low to high (Mucina & Rutherford 2006).

KwaZulu-Natal Coastal Belt Thornveld is distributed in the southern and central parts of the corridor alternatives in low-lying areas and river valleys. This vegetation type occurs in KwaZulu-Natal Province from near Mandini in the north to Oribi Gorge in the south at an altitude of 30-500 m (Mucina & Rutherford 2012). This vegetation type occurs on steep valley sides and hilly landscape mainly associated with drier larger river valleys in the rain

shadow of the rain-bearing frontal weather systems from the east coast and consists of bushed grassland, bushland and bushland thicket and open woodland. Some of it has been statutorily conserved in Harold Johnson Nature Reserve. This vegetation unit grades into the SVs 6 Eastern Valley Bushveld and SVs 3 KwaZulu-Natal Hinterland Thornveld in the larger river valleys (Mucina & Rutherford 2012).

Eastern Valley Bushveld is confined largely to the south west of Corridor Alternative 1 with a small extent in Alternative 2. Eastern Valley Bushveld consists of VT 23 Valley Bushveld (56%) and LR 5 Valley Thicket (58%) and is distributed in the KwaZulu-Natal and Eastern Cape Provinces along deeply incised valleys of rivers including the lower reaches of the Thukela, Mvoti, Mgeni, Mlazi, Mkhomazi, Mzimkulu, Mzimkulwana, Mtamvuna, Mtentu, Msikaba, Mzimvubu (and its several tributaries), Mthatha, Mbhashe, Shixini, Qhorha and Great Kei (Mucina & Rutherford 2006). It consists of semi-deciduous savanna woodlands in a mosaic with thickets, often succulent and dominated by species of *Euphorbia* and *Aloe*. The steep north-facing slopes are sheltered from the rain and also receive greater amounts of insolation adding to xerophilous conditions on these slopes (Mucina & Rutherford 2006).

Important Taxa include: Tall Trees: *Acacia robusta*, *Sclerocarya birrea* subsp. *caffra*. Small Trees: *Acacia natalitia* (d), *A. nilotica* (d), *Combretum molle* (d), *Spirostachys africana* (d), *Acacia tortilis* subsp. *heteracantha*, *Berchemia zeyheri*, *Boscia albitrunca*, *Brachylaena elliptica*, *Cussonia spicata*, *Dombeya rotundifolia*, *Encephalartos natalensis*, *E. villosus*, *Hippobromus pauciflorus*, *Schotia brachypetala*, *Ziziphus mucronata*. Succulent Trees: *Euphorbia tirucalli* (d), *Aloe marlothii* subsp. *marlothii*, *A. rupestris*, *Euphorbia ingens*, *E. triangularis*. Tall Shrubs: *Dichrostachys cinerea* (d), *Calpurnia aurea*, *Coddia rudis*, *Ehretia rigida* subsp. *rigida*, *Euclea crispa* subsp. *crispa*, *Grewia occidentalis*, *Olea europaea* subsp. *africana*. Succulent Shrubs: *Aloe arborescens*, *Euphorbia grandicornis*, *Kleinia fulgens*. Soft Shrubs: *Hypoestes aristata*, *Peristrophe cernua*. Woody Climber: *Acacia brevispica* subsp. *dregeana*. Herbaceous Climber: *Ischnolepis natalensis*. Graminoids: *Aristida congesta* (d), *Eragrostis curvula* (d), *Hyparrhenia hirta* (d), *Melinis repens* (d), *Panicum maximum* (d), *Themeda triandra* (d), *Cymbopogon pospischilii*, *Eragrostis superba*, *Heteropogon contortus*, *Panicum deustum*, *Sporobolus fimbriatus*, *S. pyramidalis*, *Tristachya leucothrix*, *Urochloa mosambicensis*. Herbs: *Achyranthes aspera*, *Hibiscus pedunculatus*. Geophytic Herb: *Sansevieria hyacinthoides*. Endemic taxa include *Bauhinia natalensis* and *Huernia pendula*.(Mucina & Rutherford 2006).

The vegetation type is considered Least Threatened with a target 25%. Only 0.8% statutorily conserved, mainly in the Luchaba Wildlife Reserve and ca 15% has been transformed mainly by cultivation. According to Mucina & Rutherford (2006), alien plant invasions are a serious threat, with *Chromolaena odorata*, *Lantana camara* and *Caesalpinia decapetala* being most problematic.

KwaZulu-Natal Sandstone Sourveld is confined to the higher-lying areas in the central part of the southern extent of the power line corridor Alternatives 1 and 2. KwaZulu-Natal Sandstone Sourveld occurs on the elevated coastal inland sandstone plateaus from

Mapumulo in the north to St Faiths near Port Shepstone in the south of KwaZulu-Natal, at altitudes of 500-1100m. The vegetation consists of short, species-rich grassland with scattered low shrubs and geoxylic suffrutices. Proteaceae shrubs and trees can be locally common. Important taxa of the Small Trees include *Protea caffra (*d); Tall Shrubs*: Aspalathus chortophila, Gnidia kraussiana*; Low Shrubs: *Acalypha glanduifolia, Agathisanthemum bojeri, Protea simplex; Rhus grandidens*; Graminoid: *Aristida junicformis subsp junciformis* (d),*Trachypogon spicautus* (d), *Tristachya leucothrix* (d); Geophytic herbs: *Asipodoglossum ovalifolium, Brachystelma perditum* (Mucina & Rutherford 2006) This vegetation type is **Vulnerable** and has a conservation target of 25%. Only 0.2% is statutorily conserved and 68% has been transformed for cultivation, plantations, urban development or road building (Mucina & Rutherford 2006).

3.1.2 IMPORTANT & SENSITIVE VEGETATION TYPES

Apart from the above dominant vegetation types, there are numerous other less extensive vegetation types present along the power line corridors including a variety of types which are considered sensitive due to their ecological significance or because of their threat status.

Forests

There are several forest types present within the study area including Scarp Forest, Northern Coastal Forest, Lowveld Riverine Forest and Swamp Forest. All of these units should be considered sensitive and all are listed ecosystems. Of these Scarp Forest is by far the most extensive and is described below and the reader is referred to Mucina and Rutherford (2006) for descriptions of the other less extensive units. **Scarp Forest** is distributed in the Eastern Cape, KwaZulu-Natal and Mpumalanga Provinces and consist of an archipelago of scattered patches spanning southern Mpumalanga (Crocodile River Gorge), the southern part of Lebombo Mountains (KwaZulu-Natal) and reaching nearly as far as Kei River Mouth on the Transkei coast (Mucina & Rutherford 2006). Patches of this forest lie as far as 140 km inland (Mpumalanga), but extend increasingly closer to the sea in a southward direction—in Pondoland, and southern Transkei they occur at the coast or in deep gorges, often associated with krantzes, scarps and coastal platforms (Mucina & Rutherford 2006) and occurs at low altitudes between 50 and 600 m. This vegetation consist of tall (15–25 m), species-rich and structurally diverse, multilayered forests, with well-developed canopy and understorey tree layers, but a poorly developed herb layer. The most conspicuous trees are *Buxus macowanii*, *B. natalensis*, *Drypetes gerrardii*, *Englerophytum natalense*, *Harpephyllum caffrum*, *Heywoodia lucens*, *Memecylon natalense*, *Millettia grandis*, *Oricia bachmannii*, *Philenoptera sutherlandii*, *Rinorea angustifolia*, *Rothmannia globosa* and *Umtiza listeriana* (Mucina & Rutherford 2006). Important Taxa include: Tall Trees: *Buxus natalensis* (d), *Drypetes gerrardii* (d), *Englerophytum natalense* (d), *Harpephyllum caffrum* (d), *Heywoodia lucens* (d); Small Trees: *Buxus macowanii* (d), *Rinorea angustifolia* (d), *Dombeya cymosa*; Herbaceous Climbers: *Flagellaria guineensis, Thunbergia alata*; Tall Shrubs: *Memecylon natalense* (d), *Eugenia natalitia;* Low Shrub: *Stangeria eriopus*; Soft Shrub: *Piper capense;* Herbs: *Begonia dregei*, *B. homonyma*, and

Geophytic Herb: *Clivia miniata*. Endemic Taxa include Tall Trees: *Millettia grandis* (d), *Philenoptera sutherlandii* (d), *Jubaeopsis caffra;* Small Trees: *Alberta magna*, *Albizia suluensis*, *Tarchonanthus trilobus* var. *trilobus*. Woody Climber: *Podranea ricasoliana* (d). Tall Shrubs: *Eugenia simii*, *E. verdoorniae*, *Gymnosporia bachmannii*, *Oxyanthus pyriformis*, *Putterlickia retrospinosa*. Soft Shrubs: *Heterosamara galpinii*, *Metarungia galpinii*. Herbs: *Impatiens flanaganiae*, *Plectranthus oribiensis*, *P. praetermissus*, *Streptocarpus fasciatus*, *S. kentaniensis*, *S. lupatanus*, *S. porphyrostachys*, *S. primulifolius* subsp. *formosus*. Geophytic Herbs: *Clivia robusta* (d), *C. gardenii*. Succulent Herbs: *Plectranthus ernstii.*

More than 20% of Scarp Forest is currently statutorily conserved in nature reserves. Still most of the approximately 70 smaller scarp forests between Durban and Umtamvuna are not protected. Biogeographically (and from the point of view of biodiversity) this is probably the most valuable forest in South Africa housing many endemic species, six endemic genera and one endemic family (Rhynchocalycaceae) of trees and relict occurrences of small populations of *Encephalartos,* suggesting that this vegetation unit is biogeographically ancient (Mucina & Rutherford 2006). The endemism in the herbaceous understorey is also high, particularly in the genera *Plectranthus* and *Streptocarpus*.

Azonal Vegetation Types

The **Subtropical Alluvial Vegetation** type includes Riverine Bush *Salvadora angustifolia* and floodplains, and is distributed in Limpopo, Mpumalanga and KwaZulu-Natal Provinces and in Swaziland. The vegetation type occurs on broad river alluvia and around some river-fed pans in the subtropical regions of eastern South Africa, in particular in the Lowveld, Central Bushveld and in northern KwaZulu-Natal and is fully embedded within the Savanna Biome (Mucina & Rutherford 2006). The flat alluvial riverine terraces support an intricate complex of macrophytic vegetation (channel of flowing rivers and river-fed pans), marginal reed belts (in sheltered oxbows and along very slow-flowing water courses) as well as extensive flooded grasslands, ephemeral herblands and riverine thickets (Mucina & Rutherford 2006).

The Important Taxa of the Riparian thickets include: Small Trees: *Acacia natalitia* (d), *A. robusta* (d), *Boscia foetida* subsp. *rehmanniana* (d), *Combretum erythrophyllum* (d), *Phoenix reclinata* (d), *Salix mucronata* subsp. *woodii* (d), *Ziziphus mucronata* (d), *Acacia luederitzii*, *A. nebrownii*, *A. nigrescens*, *A. tortilis*, *A. xanthophloea*, *Colophospermum mopane*, *Combretum hereroense*, *Philenoptera violacea*, *Pseudoscolopia polyantha* (Pondoland, sharing with Capensis). Tall Shrubs: *Salvadora angustifolia* (d), *Commiphora glandulosa*, *C. pyracanthoides*, *Euclea divinorum*, *Grewia bicolor*, *Gymnosporia senegalensis*. Low Shrubs: *Justicia flava*, *Ocimum canum*. Graminoids: *Eragrostis trichophora* (d), *Panicum maximum* (d), *Setaria incrassata* (d), *Sporobolus ioclados* (d), *Chloris virgata*, *Dactyloctenium aegyptium*, *Enneapogon cenchroides*, *Urochloa mosambicensis*. Herbs: *Commelina benghalensis* (d), *Abutilon austro-africanum*, *Acalypha indica*, *Achyranthes aspera*, *Boerhavia erecta*, *Commicarpus fallacissimus*, *Cucumis zeyheri*, *Heliotropium ovalifolium*, *Lobelia angolensis, Oxygonum sinuatum*, *Pupalia lappacea*, *Ruellia*

patula. Geophytic Herb: *Crinum moorei*. Succulent Herb: *Portulaca quadrifida*. Important taxa of the Reed beds include: Megagraminoids: *Phragmites australis* (d), *P. mauritianus* (d), *Prionium serratum* (only along few rapids in Pondoland). Flooded grasslands & herblands Megagraminoid: *Cyperus immensus*. Graminoids: *Cynodon dactylon* (d), *Cyperus articulatus* (d), *Echinochloa pyramidalis* (d), *Urochloa mosambicensis* (d), *Bolboschoenus glaucus, Chloris mossambicensis*, *C. virgata*, *Cyperus corymbosus*, *C. difformis*, *C. distans*, *C. fastigiatus*, *C. sexangularis*, *Dactyloctenium aegyptium*, *Hemarthria altissima*, *Ischaemum afrum*, *Paspalidium obtusifolium*, *Setaria sphacelata*, *Sporobolus consimilis*, *S. fimbriatus*. Herbs: *Alternanthera sessilis*, *Amaranthus praetermissus*, *Grammatotheca bergiana* (Pondoland), *Marsilea ephippiocarpa, Scutellaria racemosa*. Geophytic Herb: *Trachyandra saltii*. Aquatic Herbs: *Ceratophyllum muricatum*, *Ottelia exserta*. An endemic taxon is the herb: *Crotalaria mollii*.(Mucina & Rutherford 2006.)

According to Mucina & Rutherford 2006) the target for conservation of this vegetation type is 31%. Much of the area has been transformed for cultivation, urban development and road building. Alien woody species commonly occurring in this vegetation types include Syringa *Melia azedarach* and *Chromolaena discolor*. According to Mucina & Rutherford (2006), the major distinction between this type of alluvial vegetation and other alluvia is the presence and importance of subtropical and tropical floristic elements and the pronouncedly subtropical climate.

Subtropical Freshwater Wetlands are distributed in KwaZulu-Natal, Mpumalanga, Gauteng, North-West, Limpopo and Eastern Cape Provinces as well as in Swaziland and are embedded within the Albany Thicket Biome, the Coastal Belt from Transkei as far as Maputaland as well as those of Lowveld and the Central Bushveld regions (Mucina & Rutherford 2006). This vegetation type occurs on flat topography supporting low beds dominated by reeds, sedges and rushes, waterlogged meadows dominated by grasses. It occurs typically along edges of often seasonal pools in aeolian depressions as well as fringing alluvial backwater pans or artificial dams (Mucina & Rutherford 2006).

Important Taxa of the Marshes include: Small Trees: *Hyphaene coriacea* (d), *Phoenix reclinata* (d). Graminoids: *Chloris virgata* (d), *Cynodon dactylon* (d), *Cyperus articulatus* (d), *Dactyloctenium aegyptium* (d), *Diplachne fusca* (d), *Echinochloa pyramidalis* (d), *Fimbristylis obtusifolia* (d), *Hemarthria altissima* (d), *Imperata cylindrica* (d), *Ischaemum arcuatum* (d), *Leersia hexandra* (d), *Pycreus mundii* (d), *Sporobolus nitens* (d), *S. smutsii* (d), *Urochloa stolonifera* (d), *Bolboschoenus glaucus, Courtoisia cyperoides*, *Cyperus alopecuroides*, *C. pectinatus*, *Digitaria natalensis*, *Echinochloa stagnina*, *Eragrostis chapelieri, E. lappula, Eriochloa meyeriana*, *Fimbristylis bisumbellata*, *Fuirena ecklonii*, *Oxycaryum cubense*, *Paspalidium obtusifolium*, *Paspalum commersonii*, *Pycreus pelophilus*, *P. polystachyos*, *Scleria poiformis*, *Sporobolus consimilis*. Herbs: *Pentodon pentandrus* (d), *Persicaria senegalensis* (d), *Burmannia madagascariensis, Centella coriacea*, *Commelina diffusa, Convolvulus mauritanicus*, *Desmodium dregeanum*, *Eclipta prostrata, Epaltes gariepina*, *Eriocaulon abyssinicum*, *Ethulia conyzoides*, *Glinus lotoides*, *Hydrocotyle*

ranunculoides, Ludwigia adscendens subsp. *diffusa*, *L. leptocarpa*, *L. octovalvis*, *L. palustris*, *Neptunia oleracea*, *Persicaria attenuata* subsp. *africana, P. hystricula*, *Rorippa madagascariensis*, *Sium repandum*, *Vahlia capensis*. Geophytic Herbs: *Eulophia angolensis*, *Zeuxine africana*. Succulent Herb: *Salicornia pachystachya*. Semiparasitic Herb: *Buchnera longespicata*. Aquatic Herbs: *Bergia salaria*, *Lagarosiphon crispus*. Important Taxa of the Lakes & ponds include: Graminoid: *Eleocharis dulcis* (forming rafts). Aquatic Herbs: *Azolla pinnata* var. *africana* (d), *Ceratophyllum demersum* (d), *Lemna minor* (d), *Nymphaea nouchali* var. *caerulea* (d), *Pistia stratiotes* (d), *Wolffia arrhiza* (d), *Aponogeton desertorum, A. natalensis, A. rehmannii, Ceratophyllum muricatum*, *Marsilea macrocarpa*, *Najas marina* subsp. *delilei*, *N. pectinata*, *Nymphoides indica* subsp. *occidentalis*, *N. rautanenii*, *Ottelia exserta*, *Potamogeton crispus*, *P. pectinatus*, *P. schweinfurthii*, *Spirodela polyrhiza*, *S. punctata, Trapa natans* var. *bispinosa*. Carnivorous Herbs: *Utricularia gibba* subsp. *exoleta*, *U. inflexa*, *U. subulata*. Geophytic Herb: *Crinum paludosum.* Important Taxa of the Reed & sedge beds Megagraminoids: *Cladium mariscus* subsp. *jamaicense* (d), *Cyperus papyrus* (d), *Phragmites australis* (d), *P. mauritianus* (d), *Schoenoplectus corymbosus* (d), *S. scirpoideus* (d), *Typha capensis* (d). Graminoids: *Cyperus fastigiatus* (d), *C. difformis*, *C. digitatus, C. latifolius*, *C. sexangularis*, *Fuirena ciliaris*. Endemic Taxa include *Cyperus sensilis*, *Crinum campanulatum*, *Isoetes wormaldii* and *Wolffiella denticulata* (Maputaland). (Mucina & Rutherford 2006.)

According to Mucina & Rutherford (2006), the vegetation type is considered Least Threatened, with a target of 24%. Some 40–50% is statutorily conserved in nature reserves. A further 10% enjoys protection in a number of private game farms and other reserves in the Limpopo, Mpumalanga and KwaZulu-Natal Provinces. So far only about 4% has been transformed (largely for cultivation), but the pressure of local grazing and urban sprawl will result in the demise of many subtropical freshwater habitats. Disturbance leads to invasion by alien plants such as *Lantana camara*, *Chromolaena discolor* and *Melia azedarach* (on the edges of wetlands) and aquatic weeds such as *Eichhornia crassipes*, *Pistia stratiotes* and *Salvinia molesta* (in water bodies) (Mucina & Rutherford 2006).

Minor Vegetation Types

Less extensive vegetation types that occur in the study area include Moist Coast Hinterland Grassland and Maputaland Coastal Belt which occupy 2-4% of the corridors, and KwaZulu-Natal Hinterland Thornveld and Zululand Coastal Thornveld which occupy less than 2% of the study area. Moist Coast Hinterland Grassland is restricted to Corridor 1 in the far south west of the study area while Maputaland Coastal Belt occurs in Corridor 1 and Corridor 2 in the far north of the study area. Maputaland Coastal Belt is listed as Least Concern while Moist Coast Hinterland Grassland is listed as Vulnerable. Zululand Coastal Thornveld is restricted to Corridor 2 in the far north of the study area and is classified as Least Concern. Moist Coast Hinterland Grassland occurs only in the southern section of Corridor 1 and is classified as Vulnerable.

Moist Coast Hinterland Grassland is distributed in KwaZulu-Natal and Eastern Cape Provinces, from near Melmoth in the north to near Libode in the south, generally occurring at 450 - 900 m (Mucina & Rutherford 2012). The vegetation occurs on rolling and hilly landscape and consist of dense tall sour grassland dominated by unpalatable Ngongoni grass (*Aristida junciformis*) associated with low species diversity, when in good condition dominated by *Themeda triandra* and *Tristachya leucothrix*. The vegetation is statutorily conserved in the Vernon Crookes and Entumeni Nature Reserves.

Maputaland Coastal Belt occurs in KwaZulu-Natal Province and into southern Mozambique, in a strip up to 35 km broad along the coast of the Indian Ocean stretching from the Mozambique border in the north to Mtunzini in the south. Altitude varies from about 20–120 m. It occupies the flat coastal plain that was originally probably densely forested in places with a wide range of interspersed nonforest plant communities including dry grasslands (which include palm veld where special conditions prevail), hygrophilous grasslands and thicket groups. Today the vegetation landscape is composed of pockets of various forest types (separated into different vegetation units), thickets, primary and secondary grasslands, extensive timber plantations and cane fields.

Zululand Coastal Thornveld is distributed in KwaZulu-Natal Province, immediately west of Mtubatuba (in the north) and Empangeni (in the south) bisected by the iMfolozi River, extending westwards for 10–20 km at an altitude of 40 to 300 m (Mucina & Rutherford 2006). It occurs on gently rolling landscapes supporting wooded grassland dominated by *Themeda triandra*. The bush clumps are a strong feature and are more numerous on deeper soils, with *Phoenix reclinata* and *Gymnosporia senegalensis* usually dominant. These plant communities are species-rich relative to the surrounding vegetation units. They grade into dense *Acacia* woodland on dry slopes and riverine bushland thickets and FOa 1 Lowveld Riverine Forest in valley bottoms (Mucina & Rutherford 2006).

KwaZulu-Natal Hinterland Thornveld is distributed in the KwaZulu-Natal Province in patches scattered immediately above Eastern Valley Bushveld, at altitudes 450–900 m in river valleys of mainly the Mpisi (in the Thukela River catchment), Mvoti, Umgeni (below the Howick Falls), Mlazi, and Lufafa (vicinity of Ixopo) and Mtungwane (tributaries of the Mkomazi) (Mucina & Rutherford 2006). The vegetation is open thornveld dominated by *Acacia* species on undulating plains found on upper margins of river valleys.

3.2 CRITICAL BIODIVERSITY AREAS & BROAD SCALE ECOLOGICAL PROCESSES

Substation Sites:

The KwaZulu-Natal (2016) CBA map for the general area surrounding the substation sites is depicted below in Figure 3. Irreplaceable CBAs occur in small patches associated with remanant indiengous vegetation in three of the substation sites: B, X3 and F (substation F to a greater extent than the latter two sites). Substation F has the Tongati River and a small Priority 1 NFEPA wetland located within its broader area. Substation X3 has a large artificial

wetland within its buffer. However, in general, the substation sites are within highly transformed environments and can be positioned to avoid any impact to important biodiversity features.

Power Line Corridor Alternatives:

Each corridor was assessed as to the extent of CBAs and listed vegetation types within their length (only the area different to/not duplicated by Corridor 1 was assessed for Corridor 3). Corridor 1 has ca 6405 ha (19%) of Irreplaceable CBA areas within its boundaries, whereas Corridors 2 and 3 have ca 4564 ha (12%) and 5702 ha (47%) respectively. In addition, the CBAs within Corridor 2 are much more fragmented than the other corridors which potentially allows for the pylons of the power line to be located within transformed areas to a greater degree than the other corridors. These results clearly indicate that Corridor 2 is the preferred alternative in terms of potential impacts on CBAs.

The majority of the corridors are within listed vegetation types –especially KwaZulu Natal Sandstone Sourveld and Ngoni Veld (which has since been split into Moist and Dry Coast Hinterland Grassland). Corridor 1 contains 11470 ha of listed vegetation (as classified by the Threatened Ecosystems Layer 2011), equating to 34% of its area. Corridor 2, along the coast, contains 6888 ha of listed vegetation (18%) and the short Corridor 3 contains 5863 ha of vegetation that has been listed (48%). It is however not only the extent of listed vegetation per se that is relevant but the nature of the vegetation. Sensitive vegetation types that are of very small extent naturally are more susceptible to impacts. The loss of just a few forest patches such as that of the Scarp Forest and Lowland grasslands (originally 10,000 ha, now only ca 6000ha) could significantly impact the conservation status of these vegetation types. Corridor 1 covers 1481 ha of this vegetation type and this represents a substantial percentage of the grassland area left (24%). This is however very fragmented and it is likely that the power line can be built with minimal impact on this vegetation type as the power line can be routed to avoid most remnant patches or wil be able to span smaller fragments.

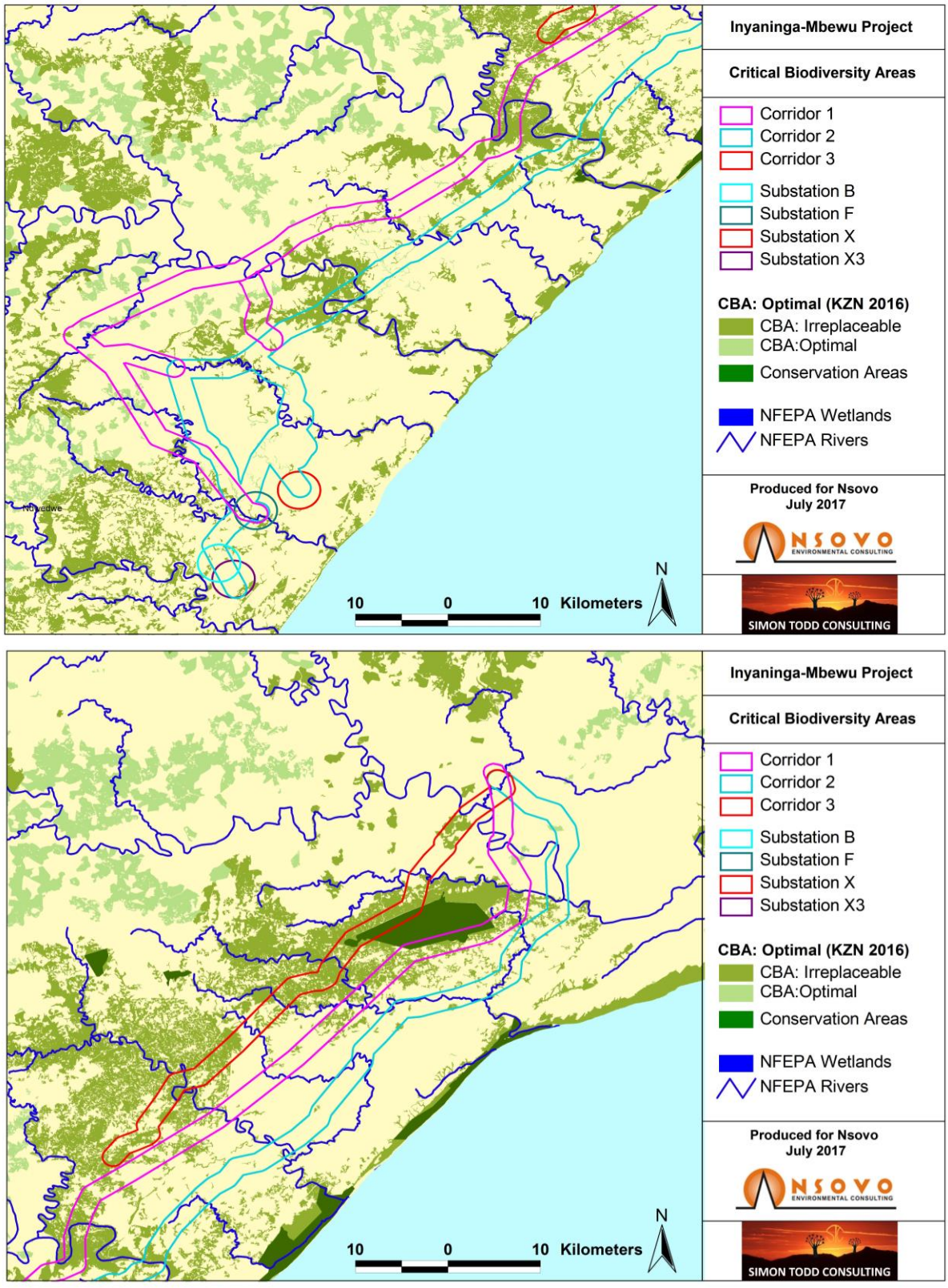


Figure 3. Critical Biodiversity Areas map of the areas within and around the Inyaninga-Mbewu study site, showing the southern extent of the site in the top panel and the northern extent in the lower panel.

3.3 Listed & Protected Plant Species

According to the SANBI SIBIS database, more than 2900 indigenous species have been recorded from the nine quarter degree squares distributed along the power line corridors. This includes 34 species of high conservation concern and an additional 41 of moderate conservation concern (Table 2). Given the highly fragmented nature of the vegetation along the routes, it is clear that impact on SCC can be minimized through avoiding impact to remnant vegetation or forest patches along the routes. The primary determinant of ecological impact associated with the different power line route alternatives is their impact on indigenous vegetation and sensitive habitats and the route with the lowest likely impact on listed intact and sensitive vegetation communities would be the preferred option.

Table 2. Numbers of the species within the different conservation status categories as indicated below, for each QDS across the site; data derived from the SANBI SIBIS database.

Threat Status	Quarter Degree Square									Total
	2831DB	2831DC	2831DD	2930BD	2931AB	2931AC	2931AD	2931BA	2931CA	
CR		1								**1**
CR PE									1	**1**
EN		1	1	3			1			**5**
VU		9	6	8	1	2	1			**25**
Threatened		1	1							**2**
NT	1	5	4	3	1				2	**14**
Rare		1	1							**2**
Declining		7	7			1	3	1	6	**25**
DDD		1								**1**
DDT		2	1		1		4	2		**10**
LC	168	649	577	223	197	102	316	135	450	**2817**
Not Evaluated	1	9	11	1	4	2	4	3	6	**41**
TOTAL	**170**	**686**	**609**	**238**	**204**	**107**	**329**	**141**	**465**	**2949**

3.4 Site Description

The different habitats observed along the power line corridors and at the substation sites are described below. Photographs of the various features are provided and their distribution within the different power line corridors described.

Forests

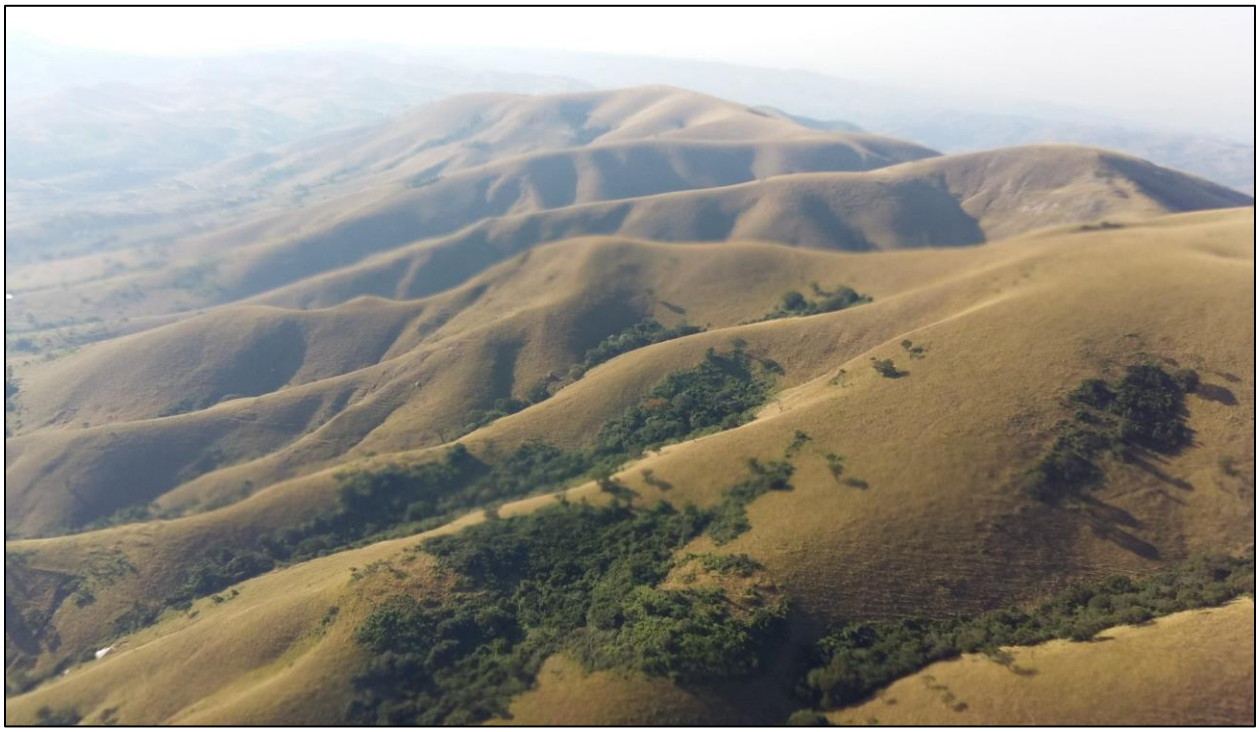
There are numerous forest along all of the power line corridors, these may be Scarp Forests in the uplands, Alluvial Forests along the major drainage systems or Coastal Forests on the coastal lowlands. These are generally highly fragmented and most forest patches are less

than 5ha in extent. Although all forest patches are considered High Sensitivity, there are some patches within the study area that are of particular significance. The Ongoye Forest occurs in the north of the study area and occurs mainly between Corridor 1 and Corridor 3. The Ongoye Forest is considered to be of national significance due to its unique biodiversity and it is also considered to be an important water catchement area. There are numerous rare and significant species present in the Ongoye Forest including trees such as the Giant Umzimbeet, *Millettia sutherlundii*, Forest Mangosteen *Garcinia gerrardii*, Forest Water Berry, *Syzygium gerrardii* and Pondoland Fig *Ficus bizanae* amongst. There are also several cycads present including *Encephalartos ngoyanus* and *Encephalartos villosus*. In terms of fauna, the area is also of significance, the green barbet is endemic to the forest while red duiker and red squirrel are also present. The core of the forest is a formal protected area and should be considerd a no-go area. There are relatively large tracts of the Ongoye Forest Reserve within Corridor 1 and Corridor 3 as well as other large forest patches within these two corridors. The proximity of Corridor 1 and Corridor 3 to the Ongoye Forest and the presence of numerous other forest patches which are generally all classified as Irreplaceable CBAs, raises questions as to the suitablility of these two corridors as viable options.

Looking south along Corridor 3, showing Scarp Forest at the Ongoye Forest Reserve, with KwaZulu-Natal Coastal Belt Grassland in the foreground. This is a very high biodiversity value and Corridor 3 is considered fatally flawed as a result.

Grassland

Although there are areas of intact grassland within all three corridors, this habitat is most conspicuous within Corridor 1 and Corridor 3, inland of Mtunzini. This habitat has high plant diversity and is also home to listed reptiles such as the Large-scaled Grass Lizard *Chamaesaura macrolepis* as well as mammals such as the Oribi *Ourebia ourebi* (Endangered) and Serval *Leptailurus serval* (Near Threatened). These areas are also generally very rugged and considered unsuitable for building power lines as the access roads alone would generate significant amounts of disturbance and erosion.



Intact Coastal Belt Grassland habitat along Corridor 3, with Scarp Forest patches in the valleys. These are some of the most extensive untransformed areas within the study area and should not be disturbed by power line construction as the impacts would be very difficult to mitigate.

Rivers and Wetlands

There are numerous drainage lines along the power line routes, including several major rivers such as the Mvoti, Thukela, Matigulu, Mhtatuzana and Mhlatuze. The vicinity of these major drainage systems has generally been heavily impacted and itshould generally be possible to span these rivers without major impact. It is usually the smaller systems where there may be important wetlands and other features present and where specific avoidance would be necessary to minimize impact these systems. The riparian ecosystems are considered highly sensitive and vulnerable to disturbance and virtually all intact riparian vegetation is either listed of included as part of CBAs.

The Thukela River pictured here along Corridor 2, also traverses Corridor 3. The river is flanked by riparian alluvial vegetation and forest. Specific attention will need to paid to ensure that the power line crosses the larger river courses at favourable locations and does not generate a lot of disturbance in these sensitive areas.

Relatively minor drainage line along Corridor 2 with a large seasonal floodplain and wetland area, with dense riparian vegetation along the banks where it has been allowed to persist.

The Mthatuze River along Corridor 3 in the north of the study area. The vegetation in this part of the study area is generally less impacted than the rest of the study area further to the south.

Transformed Habitats

The majority of the study area in the south consists of areas transformed for sugar cane production or urbanization. In the northern extent of the study area, there are larger tracts of intact habitat present, but there are also extensive 'homelands' with fairly dense rural development and localized transformation. In general the transformed areas are considered low sensitivity and the risk of significant biodiversity impact on these areas is low. The abundance of transformed habitat is significantly higher within Corridor 2 compared to the other two corridors. These habitats should be targeted for pylon positions as much as possible and final impact of the development will, to a large degree, hinge on how successfully this has been achieved.

The southern extent of the study area is dominated by sugarcane farming as illustrated here by the typical habitat at Substation Site F.

Intensively developed landscape north of the Thukela River along Corridor 2, showing the existing Eskom power line as well as the mix of sugarcane and homesteads. There is little intact vegetation remaining this area.

Rural landscape south of the Ongoye Forest within Corridor Alternative 1. The landscape consists of alternating transformed areas associated with homesteads and intact grasslands or forest patches.

3.5 FAUNAL COMMUNITIES

Mammals

According to the MammalMap database, 75 mammal species have been recorded from the area (Annex 2), including several conservation-dependent species such as Elephant, Giraffe and Plains Zebra, which would not be encountered in the study area outside nature or private reserves. Seven species are listed, including the Blue Duiker *Philantomba monticola* (Vulnerable), Serval *Leptailurus serval* (Near Threatened), Common Dasymys *Dasymys incomtus* (Near Threatened), Leopard *Panthera pardus* (Vulnerable), Sclater's Mouse Shrew *Myosorex sclateri* (Vulnerable), the African Striped Weasel *Poecilogale albinucha* (Near Threatened), and the Southern Tree Hyrax *Dendrohyrax arboreus* (Endangered) are species of conservation concern that occur in the wider area. Given the availability of habitats along the different routes, it is either confirmed or likely that all of the above species are found within the power line corridors within areas of suitable habitat.

The Common Dasmys has been recorded from a wide variety of habitats, including forest and savanna habitats, swampland and grasslands but is listed as Near Threatened. The African Striped Weasel is rare to uncommon, with highest densities reached in moist higher rainfall grasslands (Stuart et al. 2015). The Southern Tree Hyrax is a low-density, selective species and there is an inferred continuing decline in the population from forest patch loss

and forest quality degradation, especially along the coast, through agricultural and human settlement expansion (Gaylard et al. 2016). Its natural habitats are temperate forests, subtropical or tropical dry forests, subtropical or tropical moist lowland forests, subtropical or tropical moist montane forests, moist savanna, and rocky areas. The Blue Duiker is under unsustainable levels of threat, largely due to fragmentation of populations, illegal hunting and other anthropogenic influences (McLean et al. 2016). Sclater's Mouseshrew is listed as Near Threatened because its extent of occurrence is probably not much greater than 20,000 km², its area of occupancy is probably not much greater than 2,000 km², and its habitat is in decline (Baxter et al. 2008). It occurs near water in subtropical swamps and coastal forests (Baxter et al. 2008).

As the wider area of the site is transformed, larger mammal species are unlikely to occur in significant numbers in the majority of the footprint. Those areas supporting natural vegetation, such as forest or intact grasslands, which are traversed by the power line or substation, are considered more sensitive. As the intact habitats would be most important for habitat specialist species, the development would have a higher impact on these species if their habitat is significantly transformed. Areas of specific sensitivity for fauna include the Ongoye Forest and surrounding Scarp Forest fragments, the high-lying grassland areas of the interior especially along Corridor 1 and Corridor 3, and the areas of wetlands and drainage systems throughout the study area. However, the footprint of the power line is flexible and within the areas with a high degree of fragmentation, it should be possible to locate the pylons within transformed areas.

Reptiles

According to the ReptileMap database, 60 reptile species have been recorded from the quarter degrees covering the site (Annex 3), which is likely an underestimate as some areas have not been well sampled in the past. Seven species are considered of conservation concern. The uMlalazi Dwarf Chameleon *Bradypodion caeruleogula* (Endangered), has a very limited distribution and occurs in only three forests (Entumeni, Dlinza and Ongoye). Their habitat is impacted and vulnerable to external pressures (Tolley 2017). The Durban Dwarf Burrowing Skink *Scelotes inornatus* (CR) is an endemic and McLean et al. (2016) recognize this species as a flagship species for the region. It occurs in coastal habitat on Berea Red sands from Canelands in the north to Clansthal in the south (Marais 2011, in McLean et al. 2016). This part of the site however very impacted by agriculture and the power line and substation is not likely to affect this species as the footprint in this area is likely to be restricted to transformed habitat. The KwaZulu Dwarf Chameleon *Bradypodion melanocephalum* (VU) is also endemic and has much of its range within the Ethekwini District Municipality, particularly more open habitat near the coast (McLean et al. 2016). The ranges of both species overlap built up areas and are thus susceptible to habitat transformation and degradation. The Green Mamba *Dendroaspis angusticeps* (VU) is considered an indicator of dune forest health and is fairly specialist in its habitat

requirements. This species is rarely found in open terrain and prefers relatively dense, well-shaded vegetation. The Gaboon Adder *Bitis gabonica* (Near Threatened) may occur in the forest patches in the far north of the site, but this is unlikely as it tends to be restricted to coastal dunes.

The Natal Black Snake *Macrelaps microlepidotus* (Near Threatened) prefers lowland forest and coastal bush while the Large-scaled Grass Lizard *Chamaesaura macrolepis* (Near Threatened) prefers grassland, especially rocky, grassy and dry, open, sandy grasslands near the coast and on the Lebombo Mountains (IUCN RedList, retrieved 2017). The Variable Hinged Terrapin *Pelusios rhodesianus* (Vulnerable) inhabits weedy shallow dams and backwaters. All of these species are likely to occur in the study area, but are not likely to significantly affected by any of the power line alternatives as they are habitat specialists and their preferred habitats would tend to be avoided by the development.

In general, the most important habitats in the area for reptiles are likely to be the lowland and upland forest patches, riparian areas and rocky outcrops along mountains and river valleys. The major potential impact of the development on reptiles is likely to be habitat loss or degradation as a result of the development. Impacts on reptiles can be minimized through ensuring that impact on intact vegetation is kept to a minimum.

Amphibians

Forty-three frog species are known from the area, indicating a high amphibian diversity. This includes 4 listed species (Annex 4). The Pickersgill's Reed Frog *Hyperolius pickersgilli* (EN) inhabits densely vegetated, stagnant valley bottom wetlands from the coast to ca. 200 m above sea level (McLean et al. 2016). The Endangered Kloof Frog *Natalobatrachus bonebergi* is under threat due to the degradation of riverine gorge systems (Minter et al. 2004, in McLean et al. 2016) as this habitat is becoming increasingly threatened due to over-exploitation and pollution. Other species of concern include the Spotted Shovel-nosed Frog *Hemisus guttatus* (VU), an endemic that occurs in wooded and open habitat adjacent wetlands, but is extremely difficult to locate due to its fossorial habits (McLean et al. 2016). The Natal Leaf-folding Frog *Afrixalus spinifrons* (VU) is likely to occur at the site as it is relatively tolerant of landuse changes.

As most frogs are associated with wetlands, water bodies and other moist areas such as kloofs and forest patches, direct impacts on frogs are likely to be relatively low as the power lines would specifically avoid these features wherever possible.

3.6 SITE SENSITIVITY ASSESSMENT

The sensitivity map for the study area is illustrated below in Figure 4. Due to the high threat status of the remanant vegetation and irreplaceable nature of most of the CBAs within the study areas, most remnant intact areas are considered to be High sensitivity. In terms of

the three alternative power line routes, Alternative 3 traverses are large proportion of sensitive habitat including the Ongoye Forest and several tracts of rugged terrain consisting mostly of intact grasslands. Due to the sensitivity of the features along this route, it is not preferred and would generate a high impact on biodiversity even with mitigation measures applied. Alternative 1 also traverses a similar range of habitats and as a result is also considered to be relatively unfavourable and would generate high impacts. Alternative 2 is cleary the preferred alternative and with the appropriate mitigation impacts associated with this route could be reduced to an acceptable level. The habitats within Alternative 2 have been most severely impacted by transformation for agriculture and urbanization. As a result, there are few areas of extensive contiguous habitat remaining within the corridor which should facilitate lower impacts as the intact areas can be more easily avoided.

All of the substation sites are within low sensitivity transformed areas and as a result, all four substation alternatives are considered acceptable. No highly significant impacts on terrestrial biodiversity as a result of the substations can be expected.

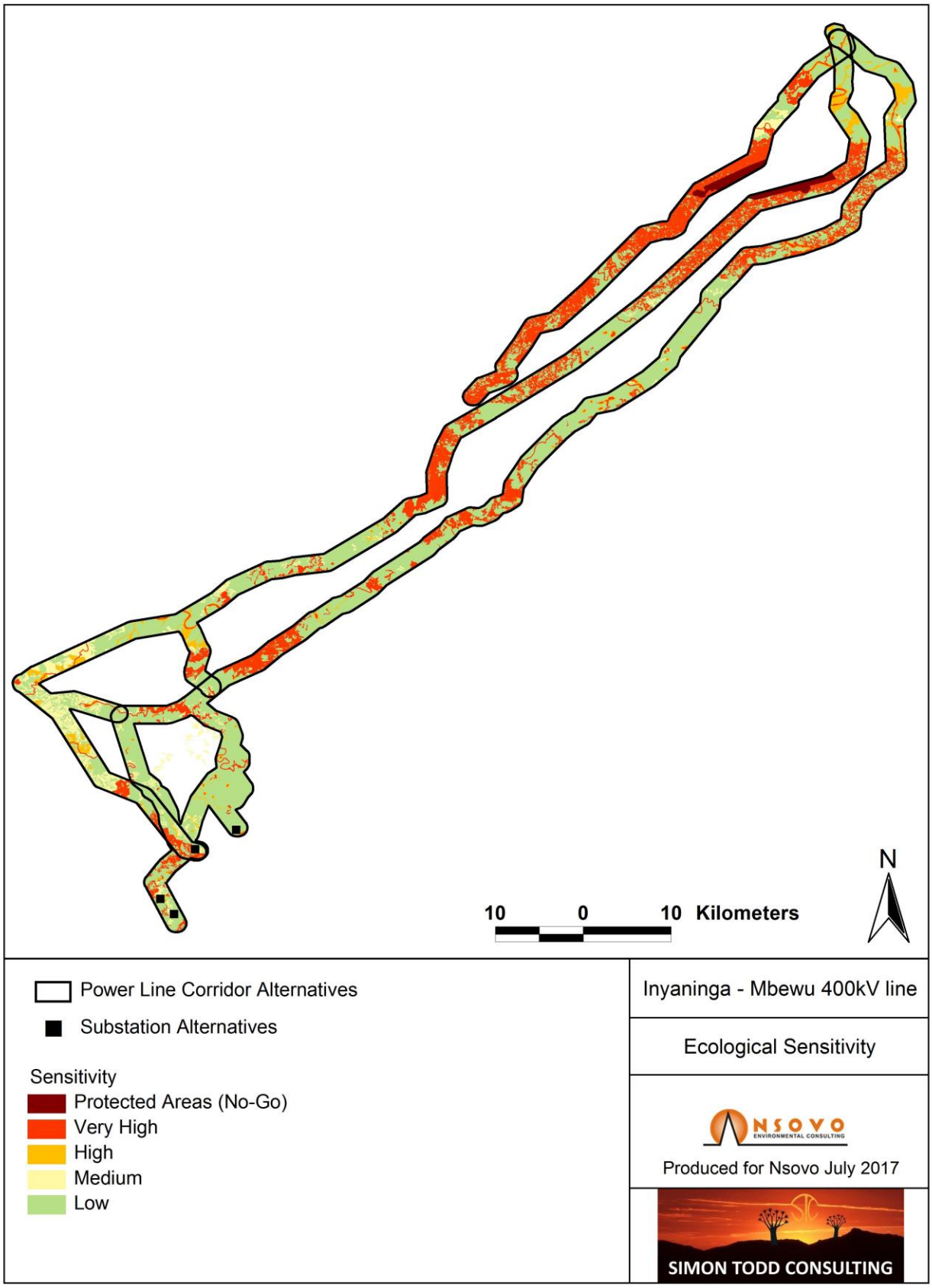


Figure 4. Ecological sensitivity map of the Inyaninga-Mbewu study area.

.

4 IDENTIFICATION & NATURE OF IMPACTS

4.1 CONSTRUCTION PHASE IMPACTS

The likely impacts on the terrestrial ecology of the site resulting from the development of the Inyaninga-Mbewu powerline and substation are identified and discussed below with reference to the characteristics and features of the study area.

Impacts on vegetation and listed or protected plant species

Vegetation clearing for pylons, access roads and other infrastructure would result in loss of currently intact vegetation and potential impact on plant species of conservation concern. Although this impact can be reduced through a preconstruction walk-through, some impact on currently intact areas is inevitable and cannot be entirely avoided.

Direct Faunal Impacts.

Increased levels of noise, pollution, disturbance and human presence during construction of the powerline and substation will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Slower types such as tortoises, snakes and amphibians would be most susceptible and the impact would be largely concentrated to the construction phase when vehicle activity was high. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.

4.2 OPERATIONAL PHASE IMPACTS

Increased Erosion Risk

The large amount of disturbance created during construction would leave some of the areas in the footprint vulnerable to soil erosion. The eroded material may enter streams and rivers and may have significant impact on these systems through siltation of pools and changes in the chemistry and turbidity of the water. As this is a potential impact of the development, it is assessed for the operational phase.

Faunal Impacts

During the operational phase of the development, impacts on fauna are likely to be very low and with standard mitigation and avoidance, no significant impacts on fauna during operation are anticipated. This impact is therefore not assessed for the Operational Phase.

Impact on Critical Biodiversity Areas

The footprint potentially includes areas that have been demarcated as CBAs and the loss of habitat within the CBAs would potentially result in a loss of biodiversity as well as a potential loss in ecosystem function within the CBA, with negative consequences for biodiversity maintenance in the long-term.

4.3 CUMULATIVE IMPACTS

Cumulative impacts on broad-scale ecological processes

Habitat loss due to construction of the power line would result in cumulative impacts on listed vegetation types. This would also increase habitat fragmentation and potentially result in a loss of broad-scale landscape connectivity.

5 ASSESSMENT METHODOLOGY

Assessment & Significance Criteria

Direct, indirect and cumulative impacts of the issues identified in this report are assessed in terms of the following criteria:

- The **nature** which includes a description of what causes the effect what will be affected and how it will be affected.
- The **extent** wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 is assigned as appropriate (with 1 being low and 5 being high):
- The **duration** wherein it is indicated whether:
    - the lifetime of the impact will be of a very short du ration (0- 1 years) - assigned a score of 1.
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2.
    - medium-term (5-15 years) - assigned a score of 3
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5
- The **magnitude** quantified on a scale from 0-10 where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way 8 is high (processes are altered to the extent that they temporarily cease) and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** of occurrence, which shall describe the (likelihood of the impact actually occurring. Probability will be estimated on a scale of 1-5 where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but of low

likelihood) , 3 is probable (distinct possibility) , 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

The **significance** which shall be determined through a syntheses of the characteristics described above and can be assessed as low, medium or high;
and;
the status, which will be described as either positive, negative or neutral.
the degree to which the impact can be reversed.
the degree to which the impact may cause irreplaceable loss of resources.
the degree to which the impact can be mitigated.

The **significance** is calculated by combining the criteria in the following formula:

S = (E + D + M)P
Where
S = significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The significance weightings for each potential impact are as follows:

- **<30** points : **Low** (i.e. where this impact would not have a direct influence on the decision to develop in the area)
- **30-60** points : **Medium** (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
- **>60** points : **High** (i.e. where the impact must have an influence on the decision process to develop in the area).

6 IMPACT ASSESSMENT

6.1 CONSTRUCTION PHASE IMPACTS

Impacts are assessed below for the construction and operational phases of the development.

Impacts on vegetation and protected plant species

Vegetation clearing for powerlines and substations and their service areas will impact on vegetation and species of conservation concern.

Issue	Option	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	

Vegetation Impacts During Construction	Corridor 1	No	Negative	3	4	6	4	52 = Medium
		Yes	Negative	3	4	5	4	48 = Medium
	Corridor 2	No	Negative	3	4	4	4	44 = Medium
		Yes	Negative	2	4	3	3	27 = Low
	Corridor 3	No	Negative	3	4	7	4	56 = Medium
		Yes	Negative	3	4	6	4	52 = Medium
Corrective Actions	• The route should be designed so as to avoid areas of high sensitivity and CBAs. • There should be a preconstruction walk-through of the power line route and substation site to identify species of conservation concern that should be avoided or translocated. • Existing roads and access routes should be used wherever possible.							

Faunal Impacts During Construction

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna resident or utilising the site. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some mammals and reptiles would also be vulnerable to illegal collection or poaching.

Issue	Option	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Fauna Impacts During Construction	Corridor 1	No	Negative	3	1	5	4	36 = Medium
		Yes	Negative	3	1	4	4	32 = Medium
	Corridor 2	No	Negative	2	1	4	4	28 = Low
		Yes	Negative	2	1	3	3	18 = Low
	Corridor 3	No	Negative	3	1	5	4	36 = Medium

		Yes	Negative	3	1	4	4	32 = Medium
Corrective Actions	• Any fauna threatened by construction activities should be removed to safety by the ECO or other suitably qualified person. • Existing roads and access routes should be used wherever possible. • During construction all vehicles should adhere to demarcated tracks or roads and the speed limit should not exceed 40km/h on larger roads and should be 20-30km/h on smaller access tracks. • All construction staff should undergo environmental induction before construction commences in order to raise awareness and reduce potential faunal impacts. • To avoid impacts on amphibians, all spills of hazardous material should be cleared in the appropriate manner according to the nature and identity of the spill and all contaminated soil removed from the site. • Avoid sensitive faunal habitats such as drainage lines and wetlands.							

6.2 OPERATIONAL PHASE IMPACTS

Increased Erosion Risk

Operational phase disturbance may result in large amounts of erosion and silt movement into drainage lines with negative consequences for fauna and flora in these areas. Disturbance along the power line route is likely to increase the vulnerability of the disturbed areas to erosion.

Issue	Option	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Erosion risk during Operation Phase	Corridor 1	No	Negative	3	3	6	4	48 = Medium
		Yes	Negative	2	3	4	4	36 = Medium
	Corridor 2	No	Negative	3	3	4	4	40 = Medium
		Yes	Negative	2	3	4	3	27 = Low
	Corridor 3	No	Negative	3	3	6	4	48 = Medium
		Yes	Negative	2	3	4	4	36 = Medium
Corrective Actions	• Disturbance within or near the drainage lines should be kept to a minimum. No pylons should be located within drainage lines or the adjacent floodplains. • Any roads along slopes should have water diversion structures placed at regular intervals to ensure that they do not capture overland flow and become eroded. • Any erosion problems observed along the power line servitude should be rectified as soon as							

	possible using the appropriate revegetation and erosion control works.

Impact on Critical Biodiversity Areas

The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the country's future ability to meet its conservation targets.

Issue	Option	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Impacts on CBAs	Corridor 1	No	Negative	3	4	6	5	65 = High
		Yes	Negative	3	4	5	3	36 = Medium
	Corridor 2	No	Negative	3	4	4	4	44 = Medium
		Yes	Negative	2	4	3	3	27 = Low
	Corridor 3	No	Negative	3	4	6	5	65 = High
		Yes	Negative	3	4	5	4	48 = Medium
Corrective Actions	• CBAs should be avoided by the final power line route as much as possible, especially where these related to sensitive habitats such as forest or wetlands. • The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas as far as possible. • The options containing the least sensitive vegetation types should be selected.							

6.3 CUMULATIVE IMPACTS

Cumulative impacts on broad-scale ecological processes

Habitat loss due to construction of the power line would result in cumulative impacts on listed vegetation types. This would also increase habitat fragmentation and potentially result in a loss of broad-scale landscape connectivity.

Issue	Option	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Impacts on CBAs	Corridor 1	No	Negative	3	4	4	4	44 = Medium

		Yes	Negative	3	4	3	3	30 = Medium
	Corridor 2	No	Negative	3	4	4	3	33 = Medium
		Yes	Negative	3	4	2	3	27 = Low
	Corridor 3	No	Negative	3	4	4	4	44 = Medium
		Yes	Negative	3	4	3	3	30 = Medium
Corrective Actions	• Avoid development within the High sensitivity parts of the site. • The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas. • Avoid impact to potential corridors such as the riparian corridors associated with the larger drainage lines within the area.							

7 IDENTIFICATION OF PREFERRED ALTERNATIVES

The comparative assessment is provided below.

Key

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
NOT PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Inyaninga-Mbewu Grid Connection

Alternative	Preference	Reasons (incl. potential issues)
SUBSTATION ALTERNATIVES		
Substation Site B	NO PREFERENCE	Located within a transformed environment where impacts on biodiversity would be low and no significant impacts on terrestrial ecosystems can be expected. All four alternatives are considered acceptable and there is not clear preferred alternative.
Substation Site F	NO PREFERENCE	Located within a transformed environment where impacts on biodiversity would be low and no significant impacts on terrestrial ecosystems can be expected. All four alternatives are considered

Alternative	Preference	Reasons (incl. potential issues)
		acceptable and there is not clear preferred alternative.
Substation Site X	NO PREFERENCE	Located within a transformed environment where impacts on biodiversity would be low and no significant impacts on terrestrial ecosystems can be expected. All four alternatives are considered acceptable and there is not clear preferred alternative.
Substation Site X3	NO PREFERENCE	Located within a transformed environment where impacts on biodiversity would be low and no significant impacts on terrestrial ecosystems can be expected. All four alternatives are considered acceptable and there is not clear preferred alternative.
GRID LINE CORRIDOR ALTERNATIVES		
Grid Line Option 1	NOT PREFERRED	Traverses several large tracts of sensitive habitat including rugged grassland and the the Ongoye Forest. Due to the presence of these sensitive habitats, it is not not considered to be a preferred alternative and would generate significantly higher impacts than Alternative 2.
Grid Line Option 2	PREFERRED	This alternative contains the highest proportion of transformed habitat and least extensive areas of intact continguous habitat. As a result it is likely that the power line can be routed most remaining areas of intact habitat and impacts would be the lowest of the three alternatives by some margin.
Grid Line Option 3	NOT PREFERRED	Traverses several critical habitats of national significance and is considered fatally flawed and not a viable alternative as high impacts would remain even after mitigation.

8 CONCLUSIONS & RECOMMENDATIONS

The following recommendations are made with regards to the power line alternatives:

- Power Line Corridor Alternative 3 includes the largest proportion of sensitive habitats of the three alternatives. This includes the Ongoye Forest and several tracts of rugged terrain consisting mostly of intact grasslands. Due to the sensitivity of these features this Alternative would generate a high impact on biodiversity even with

mitigation measures applied. As such, this alternative is considered fatally flawed and not considered to be a viable alternative.

- Power Line Corridor Alternative 1 includes several extensie tracts of high sensitivity habitat including the Ongoye Forest and a large area of rugged Coastal Belt Grassland to the south of the Forest that is also considered highly sensitive. As a result of the presence of these features within the corridor and the difficulty in mitigating impacts through the area of rugged terrain, this alternative is considered Highly Unfavourable for development.
- Power Line Corridor Alternative 2 is the most impacted by the land use and transformation with the result that it has the lowest extent of intact sensitive habitat of the three alternatives. Although there are areas with a relatively high density of sensitive features, the fragmented nature of the landscape means that impacts on intact habitat can be kept to a low level with the appropriate project planning. As a result, it is clear that this is the preferred and the only acceptable alternative for the development.

The substation sites are all located within transformed areas and can be located in areas that would generate very low impacts on biodiversity. The following recommendations are made with regards to the substations:

- Although there are sensitive features in the broad vicinity of some of the substation sites, they are all located within transformed habitat and can be positioned so as to ensure a low impact on biodiversity.
- As a result of the acceptability of all four substation alternatives, there is not a clear preferred alternative in this regard and all four alternatives are considered viable options.

9 LITERATURE CITED

http://www.iucnredlist.org/details/110159014/0. **Chamaesaura macrolepis**

Tolley, K. 2017. *Bradypodion caeruleogula*. The IUCN Red List of Threatened Species 2017: e.T172551A110305774. http://dx.doi.org/10.2305/IUCN.UK.2017-1.RLTS.T172551A110305774.en. Downloaded on **06 July 2017**.

Stuart, C., Stuart, M. & Do Linh San, E. 2015. *Poecilogale albinucha*. The IUCN Red List of Threatened Species 2015: e.T41662A45215258. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T41662A45215258.en. Downloaded on **06 July 2017**.

Baxter, R. 2008. *Myosorex sclateri*. The IUCN Red List of Threatened Species 2008: e.T14114A4393532. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T14114A4393532.en. Downloaded on **06 July 2017**.

Gaylard A, Venter J, Ehlers-Smith Y, Child MF. 2016. A conservation assessment of Dendrohyrax arboreus. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Alexander, G. & Marais, J. 2007. *A Guide to the Reptiles of Southern Africa*. Struik Nature, Cape Town.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. & de Villiers, M. (eds.). 2014. Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. South African National Biodiversity Institute, Pretoria.

Branch W.R. 1998. *Field guide to snakes and other reptiles of southern Africa*. Struik, Cape Town.

Brownlie, S. 2005. Guideline for Involving Biodiversity Specialists in EIA Processes: Edition 1. CSIR Report No ENV-S-C 2005 053 C. Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town. 63 pp.

De Villiers CC, Driver A, Clark B, Euston-Brown DIW, Day EG, Job N, Helme NA, Holmes PM, Brownlie S and Rebelo AB (2005) *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape.* Fynbos Forum and Botanical Society of South Africa, Kirstenbosch.

Du Preez, L. & Carruthers, V. 2009. *A Complete Guide to the Frogs of Southern Africa*. Struik Nature., Cape Town.

McLean, C.T., Ground, L.E., Boon, R.G.C., Roberts, D.C., Govender, N. & McInnes, A. 2016. Durban's Systematic Conservation Assessment. EThekwini Municipality, Environmental Planning and Climate Protection Department, Durban, South Africa.

Minter LR, Burger M, Harrison JA, Braack HH, Bishop PJ & Kloepfer D (eds). 2004. Atlas and Red Data book of the frogs of South Africa, Lesotho and Swaziland. SI/MAB Series no. 9. Smithsonian Institution, Washington, D.C

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

Passmore, N.I. & Carruthers, V.C. 1995. *South African Frogs: A complete guide*. Witwatersrand University Press, Johannesburg. 322 pp.

Skinner, J.D. & Chimimba, C.T. 2005. The mammals of the Southern African Subregion. Cambridge University Press, Cambridge.

10 ANNEX 1. LIST OF PLANT SPECIES

List of listed and protected plant species which are known to occur in the broad vicinity of the Inyaninga-Mbewu site, according to the SANBI SIBIS database.

Family	Species	Threat status	Growth forms
Amaryllidaceae	*Clivia gardenii Hook.*	VU	Geophyte
	Clivia miniata (Lindl.) Regel var. miniata	VU	Geophyte
	Crinum moorei Hook.f.	VU	Geophyte
	Haemanthus deformis Hook.f.	VU	Geophyte, succulent
	Boophone disticha (L.f.) Herb.	Declining	Geophyte, succulent
Apiaceae	*Alepidea peduncularis A.Rich.*	DDT	Herb
Apocynaceae	*Brachystelma pulchellum (Harv.) Schltr.*	NT	Geophyte, succulent
	Brachystelma sandersonii (Oliv.) N.E.Br.	VU	Herb, succulent
Asphodelaceae	*Aloe linearifolia A.Berger*	NT	Herb, succulent
	Aloe thraskii Baker	NT	Shrub, succulent, tree
	Kniphofia littoralis Codd	NT	Herb
	Gasteria croucheri (Hook.f.) Baker subsp. croucheri	VU	Herb, succulent
	Kniphofia pauciflora Baker	CR	Herb
	Aloe cooperi Baker subsp. cooperi	Declining	Herb, succulent
Asteraceae	*Cineraria atriplicifolia DC.*	VU	Herb
Asteraceae	*Helichrysum pannosum DC.*	EN	Herb
Asteraceae	*Senecio exuberans R.A.Dyer*	EN	Herb
Begoniaceae	*Begonia homonyma Steud.*	EN	Herb, succulent
Callitrichaceae	*Callitriche compressa N.E.Br.*	DDT	Herb, hydrophyte
Celastraceae	*Elaeodendron croceum (Thunb.) DC.*	Declining	Tree
Colchicaceae	*Sandersonia aurantiaca Hook.*	Declining	Climber, geophyte, herb
Cucurbitaceae	*Gerrardanthus tomentosus Hook.f.*	VU	Climber, succulent
Cyperaceae	*Cyperus sensilis Baijnath*	NT	Cyperoid, emergent hydrophyte
Cyperaceae	*Fimbristylis aphylla Steud.*	VU	Cyperoid, helophyte, herb
Ericaceae	*Erica pannosa Salisb.*	Rare	Dwarf shrub
Euphorbiaceae	*Euphorbia bupleurifolia Jacq.*	Declining	Dwarf shrub, succulent
Fabaceae	*Crotalaria dura J.M.Wood & M.S.Evans subsp. dura*	NT	Dwarf shrub, herb
Fabaceae	*Argyrolobium longifolium (Meisn.) Walp.*	VU	Dwarf shrub
Geraniaceae	*Geranium ornithopodioides Hilliard & B.L.Burtt*	EN	Herb
Gesneriaceae	*Streptocarpus molweniensis Hilliard subsp. molweni*	VU	Herb, lithophyte
Gunneraceae	*Gunnera perpensa L.*	Declining	Herb, hydrophyte
Hyacinthaceae	*Merwilla plumbea (Lindl.) Speta*	NT	Geophyte
Hyacinthaceae	*Drimia elata Jacq.*	DDT	Geophyte
Hypoxidaceae	*Hypoxis hemerocallidea Fisch., C.A.Mey. & Avé-Lall.*	Declining	Geophyte
Iridaceae	*Watsonia inclinata Goldblatt*	VU	Geophyte, herb
Iridaceae	*Gladiolus cruentus T.Moore*	CR	Geophyte, herb
Lauraceae	*Dahlgrenodendron natalense (J.H.Ross) J.J.M.van d Merwe & A.E.van Wyk*	EN	Tree

Family	Species	Threat status	Growth forms
Malvaceae	*Hermannia sandersonii Harv.*	VU	Dwarf shrub
Meliaceae	*Turraea pulchella (Harms) T.D.Penn.*	VU	Dwarf shrub
Myrsinaceae	*Rapanea melanophloeos (L.) Mez*	Declining	Tree
Myrtaceae	*Eugenia erythrophylla Strey*	NT	Shrub, tree
Myrtaceae	*Eugenia simii Dummer*	VU	Shrub
Orchidaceae	*Cynorkis compacta (Rchb.f.) Rolfe*	VU	Geophyte, herb
Orchidaceae	*Eulophia speciosa (R.Br. ex Lindl.) Bolus*	Declining	Geophyte, herb, succulent
Orchidaceae	*Zeuxine africana Rchb.f.*	EN*	Geophyte, herb
Rhizophoraceae	*Cassipourea gummiflua Tul. var. verticillata (N.E.Br J.Lewis*	VU*	Tree
Rhizophoraceae	*Cassipourea malosana (Baker) Alston*	Declining	Shrub, tree
Santalaceae	*Thesium polygaloides A.W.Hill*	VU	Herb, parasite
Scrophulariaceae	*Zaluzianskya pilosa Hilliard & B.L.Burtt*	DDT	Herb
Stangeriaceae	*Stangeria eriopus (Kunze) Baill.*	VU	Geophyte, herb
Stilbaceae	*Kogelbergia verticillata (Eckl. & Zeyh.) Rourke*	Rare	Dwarf shrub
Vitaceae	*Cyphostemma flaviflorum (Sprague) Desc.*	NT	Climber, succulent
Zamiaceae	*Encephalartos natalensis R.A.Dyer & I.Verd.*	NT	Shrub, tree
Zingiberaceae	*Siphonochilus aethiopicus (Schweinf.) B.L.Burtt*	CR	Geophyte, herb

11 ANNEX 2. LIST OF MAMMALS

List of mammals which have been recorded in the region of the Inyaninga-Mbewu study area.

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Bathyergidae	*Cryptomys*	*hottentotus*	*natalensis*	Southern African Mole-rat	Least Concern	2
Bovidae	*Cephalophus*	*natalensis*		Red Duiker	Least Concern	20
Bovidae	*Philantomba*	*monticola*		Blue Duiker	Vulnerable	26
Bovidae	*Redunca*	*arundinum*		Southern Reedbuck	Least Concern	21
Bovidae	*Sylvicapra*	*grimmia*		Bush Duiker	Least Concern	14
Bovidae	*Tragelaphus*	*strepsiceros*		Greater Kudu	Least Concern	14
Canidae	*Canis*	*adustus*		Side-striped Jackal	Least Concern	1
Canidae	*Canis*	*mesomelas*		Black-backed Jackal	Least Concern	1
Cercopithecidae	*Cercopithecus*	*pygerythrus*	*pygerythrus*	Vervet Monkey	Least Concern	10
Cercopithecidae	*Papio*	*ursinus*		Chacma Baboon	Least Concern	117
Chrysochloridae	*Amblysomus*	*hottentotus*		Hottentot Golden Mole	Least Concern	5
Emballonuridae	*Taphozous*	*mauritianus*		Mauritian Tomb Bat	Least Concern	3
Felidae	*Caracal*	*caracal*		Caracal	Least Concern	1
Felidae	*Leptailurus*	*serval*		Serval	Near Threatened	4
Felidae	*Panthera*	*pardus*		Leopard	Vulnerable	11
Galagidae	*Galago*	*moholi*		Moholi Bushbaby	Least Concern	1
Gliridae	*Graphiurus*	*murinus*		Forest African Dormouse	Least Concern	3
Herpestidae	*Atilax*	*paludinosus*		Marsh Mongoose	Least Concern	6
Herpestidae	*Herpestes*	*ichneumon*		Egyptian Mongoose	Least Concern	1
Herpestidae	*Herpestes*	*sanguineus*		Slender Mongoose	Least Concern	6
Herpestidae	*Ichneumia*	*albicauda*		White-tailed Mongoose	Least Concern	1
Herpestidae	*Mungos*	*mungo*		Banded Mongoose	Least Concern	5
Hipposideridae	*Hipposideros*	*caffer*		Sundevall's Leaf-nosed Bat	Least Concern	2
Hystricidae	*Hystrix*	*africaeaustralis*		Cape Porcupine	Least Concern	3
Leporidae	*Lepus*	*saxatilis*		Scrub Hare	Least Concern	2
Molossidae	*Chaerephon*	*pumilus*		Little Free-tailed Bat	Least Concern	7
Molossidae	*Tadarida*	*aegyptiaca*		Egyptian Free-tailed Bat	Least Concern	1
Muridae	*Aethomys*	*ineptus*		Tete Veld Aethomys	Least Concern	14
Muridae	*Dasymys*	*incomtus*		Common Dasymys	Near Threatened	1
Muridae	*Grammomys*	*dolichurus*		Common Grammomys	Least Concern	2
Muridae	*Lemniscomys*	*rosalia*		Single-Striped Lemniscomys	Least Concern	9
Muridae	*Mastomys*	*coucha*		Southern African Mastomys	Least Concern	2
Muridae	*Mastomys*	*natalensis*		Natal Mastomys	Least Concern	13

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Muridae	*Mus*	*minutoides*		Southern African Pygmy Mouse	Least Concern	12
Muridae	*Otomys*	*angoniensis*		Angoni Vlei Rat	Least Concern	8
Mustelidae	*Aonyx*	*capensis*		African Clawless Otter	Least Concern	4
Mustelidae	*Ictonyx*	*striatus*		Striped Polecat	Least Concern	1
Mustelidae	*Mellivora*	*capensis*		Honey Badger	Least Concern	5
Mustelidae	*Poecilogale*	*albinucha*		African Striped Weasel	Near Threatened	3
Nesomyidae	*Dendromus*	*mystacalis*		Chestnut African Climbing Mouse	Least Concern	1
Nycteridae	*Nycteris*	*thebaica*		Egyptian Slit-faced Bat	Least Concern	3
Orycteropodidae	*Orycteropus*	*afer*		Aardvark	Least Concern	1
Procaviidae	*Dendrohyrax*	*arboreus*		Southern Tree Hyrax	Endangered	2
Procaviidae	*Procavia*	*capensis*		Rock Hyrax	Least Concern	16
Pteropodidae	*Epomophorus*	*wahlbergi*		Epomophorus wahlbergi	Least Concern	1
Soricidae	*Crocidura*	*cyanea*		Reddish-gray Musk Shrew	Least Concern	5
Soricidae	*Crocidura*	*flavescens*		Greater Red Musk Shrew	Least Concern	9
Soricidae	*Crocidura*	*hirta*		Lesser Red Musk Shrew	Least Concern	1
Soricidae	*Myosorex*	*sclateri*		Sclater's Mouse Shrew	Endangered	1
Suidae	*Potamochoerus*	*larvatus*		Bush-pig	Least Concern	1
Suidae	*Potamochoerus*	*porcus*		Red River Hog	Not listed	8
Vespertilionidae	*Myotis*	*welwitschii*		Welwitsch's Myotis	Least Concern	1
Vespertilionidae	*Neoromicia*	*capensis*		Cape Serotine	Least Concern	1
Vespertilionidae	*Neoromicia*	*nanus*		Banana Pipistrelle	Least Concern	5
Vespertilionidae	*Pipistrellus*	*hesperidus*		Dusky Pipistrelle	Least Concern	4
Vespertilionidae	*Scotophilus*	*dinganii*		Yellow-bellied House Bat	Least Concern	2
Vespertilionidae	*Scotophilus*	*viridis*		Green House Bat	Least Concern	1
Viverridae	*Civettictis*	*civetta*		African Civet	Least Concern	1
Viverridae	*Genetta*	*tigrina*		Cape Genet	Least Concern	4
Vespertilionidae	*Myotis*	*welwitschii*		Welwitsch's Myotis	Least Concern	1
Vespertilionidae	*Neoromicia*	*capensis*		Cape Serotine	Least Concern	1
Vespertilionidae	*Neoromicia*	*nanus*		Banana Pipistrelle	Least Concern	5
Vespertilionidae	*Pipistrellus*	*hesperidus*		Dusky Pipistrelle	Least Concern	4
Vespertilionidae	*Scotophilus*	*dinganii*		Yellow-bellied House Bat	Least Concern	2
Vespertilionidae	*Scotophilus*	*viridis*		Green House Bat	Least Concern	1
Viverridae	*Civettictis*	*civetta*		African Civet	Least Concern	1

Conservation-dependent mammal species						
Family	***Genus***	***Species***	***Subspecies***	**Common name**	**Red list category**	**No. records**
Bovidae	*Aepyceros*	*melampus*		Impala	Least Concern	32

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Suidae	*Phacochoerus*	*africanus*		Common Wart-hog	Least Concern	4
Giraffidae	*Giraffa*	*camelopardalis*	*camelopardalis*	Nubian Giraffe	Least Concern	10
Bovidae	*Syncerus*	*caffer*		African Buffalo	Least Concern	1
Bovidae	*Tragelaphus*	*angasii*		Nyala	Least Concern	5
Bovidae	*Tragelaphus*	*scriptus*		Bushbuck	Least Concern	27
Equidae	*Equus*	*quagga*		Plains Zebra	Least Concern	51
Hippopotamidae	*Hippopotamus*	*amphibius*		Common Hippopotamus	Least Concern	13
Bovidae	*Connochaetes*	*taurinus*	*taurinus*	Blue Wildebees	Least Concern	12
Bovidae	*Kobus*	*ellipsiprymnus*	*ellipsiprymnus*	Common Waterbuck	Least Concern	8
Elephantidae	*Loxodonta*	*africana*		African Bush Elephant	Least Concern	7

12 ANNEX 3. LIST OF REPTILES

List of reptiles which are likely to occur in the vicinity of the Inyaninga-Mbewu study area. Conservation status is from Bates et al. (2014).

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Agamidae	*Acanthocercus*	*atricollis*	*atricollis*	Southern Tree Agama	Least Concern	15
Chamaeleonidae	*Bradypodion*	*caeruleogula*		uMlalazi Dwarf Chameleon	Endangered	8
Chamaeleonidae	*Bradypodion*	*melanocephalum*		KwaZulu Dwarf Chameleon	Vulnerable	6
Chamaeleonidae	*Chamaeleo*	*dilepis*	*dilepis*	Common Flap-neck Chameleon	Least Concern	9
Colubridae	*Crotaphopeltis*	*hotamboeia*		Red-lipped Snake	Least Concern	11
Colubridae	*Dasypeltis*	*inornata*		Southern Brown Egg-eater	Least Concern	2
Colubridae	*Dasypeltis*	*scabra*		Rhombic Egg-eater	Least Concern	3
Colubridae	*Dispholidus*	*typus*	*typus*	Boomslang	Least Concern	6
Colubridae	*Philothamnus*	*hoplogaster*		South Eastern Green Snake	Least Concern	1
Colubridae	*Philothamnus*	*natalensis*	*natalensis*	Eastern Natal Green Snake	Least Concern	2
Colubridae	*Philothamnus*	*semivariegatus*		Spotted Bush Snake	Least Concern	17
Colubridae	*Telescopus*	*semiannulatus*	*semiannulatus*	Eastern Tiger Snake	Least Concern	1
Colubridae	*Thelotornis*	*capensis*	*capensis*	Southern Twig Snake	Least Concern	10
Cordylidae	*Chamaesaura*	*macrolepis*		Large-scaled Grass Lizard	Near Threatened	3
Elapidae	*Dendroaspis*	*angusticeps*		Green Mamba	Vulnerable	4
Elapidae	*Dendroaspis*	*polylepis*		Black Mamba	Least Concern	1
Elapidae	*Naja*	*annulifera*		Snouted Cobra	Least Concern	1
Elapidae	*Naja*	*melanoleuca*		Forest Cobra	Least Concern	5
Elapidae	*Naja*	*mossambica*		Mozambique Spitting Cobra	Least Concern	13
Gekkonidae	*Afroedura*	*pondolia*		Pondo Flat Gecko	Least Concern	3
Gekkonidae	*Hemidactylus*	*mabouia*		Common Tropical House Gecko	Least Concern	27
Gekkonidae	*Homopholis*	*wahlbergii*		Wahlberg's Velvet Gecko	Least Concern	1
Gekkonidae	*Lygodactylus*	*capensis*	*capensis*	Common Dwarf Gecko	Least Concern	15
Gekkonidae	*Pachydactylus*	*maculatus*		Spotted Gecko	Least Concern	1
Gerrhosauridae	*Gerrhosaurus*	*flavigularis*		Yellow-throated Plated Lizard	Least Concern	3
Gerrhosauridae	*Tetradactylus*	*africanus*		Eastern Long-tailed Seps	Least Concern	1
Lamprophiidae	*Amblyodipsas*	*concolor*		Natal Purple-glossed Snake	Least Concern	2
Lamprophiidae	*Amblyodipsas*	*polylepis*	*polylepis*	Common Purple-glossed Snake	Least Concern	5
Lamprophiidae	*Aparallactus*	*capensis*		Black-headed Centipede-eater	Least Concern	3
Lamprophiidae	*Atractaspis*	*bibronii*		Bibron's Stiletto Snake	Least Concern	5
Lamprophiidae	*Boaedon*	*capensis*		Brown House Snake	Least Concern	9
Lamprophiidae	*Duberria*	*lutrix*	*lutrix*	South African Slug-eater	Least Concern	2
Lamprophiidae	*Gonionotophis*	*capensis*	*capensis*	Common File Snake	Least Concern	4
Lamprophiidae	*Gonionotophis*	*nyassae*		Black File Snake	Least Concern	2
Lamprophiidae	*Lycodonomorphus*	*inornatus*		Olive House Snake	Least Concern	1
Lamprophiidae	*Lycodonomorphus*	*rufulus*		Brown Water Snake	Least Concern	6
Lamprophiidae	*Lycophidion*	*capense*	*capense*	Cape Wolf Snake	Least Concern	7
Lamprophiidae	*Prosymna*	*stuhlmannii*		East African Shovel-snout	Least Concern	2

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Lamprophiidae	*Psammophis*	*brevirostris*		Short-snouted Grass Snake	Least Concern	6
Lamprophiidae	*Psammophis*	*mossambicus*		Olive Grass Snake	Least Concern	5
Leptotyphlopidae	*Leptotyphlops*	*scutifrons*	*conjunctus*	Eastern Thread Snake	Not listed	2
Leptotyphlopidae	*Leptotyphlops*	*scutifrons*	*scutifrons*	Peters' Thread Snake	Not listed	6
Pelomedusidae	*Pelusios*	*rhodesianus*		Variable Hinged Terrapin	Vulnerable	3
Pythonidae	*Python*	*natalensis*		Southern African Python	Least Concern	2
Scincidae	*Acontias*	*plumbeus*		Giant Legless Skink	Least Concern	9
Scincidae	*Panaspis*	*wahlbergii*		Wahlberg's Snake-eyed Skink	Least Concern	12
Scincidae	*Scelotes*	*inornatus*		Durban Dwarf Burrowing Skink	Critically Endangered	2
Scincidae	*Scelotes*	*mossambicus*		Mozambique Dwarf Burrowing Skink	Least Concern	11
Scincidae	*Trachylepis*	*depressa*		Eastern Coastal Skink	Least Concern	1
Scincidae	*Trachylepis*	*margaritifer*		Rainbow Skink	Least Concern	1
Scincidae	*Trachylepis*	*striata*		Striped Skink	Least Concern	33
Scincidae	*Trachylepis*	*varia*		Variable Skink	Least Concern	15
Testudinidae	*Kinixys*	*natalensis*		Natal Hinged Tortoise	Least Concern	1
Testudinidae	*Kinixys*	*zombensis*		Eastern Hinged Tortoise	Least Concern	1
Typhlopidae	*Afrotyphlops*	*bibronii*		Bibron's Blind Snake	Least Concern	2
Varanidae	*Varanus*	*albigularis*	*albigularis*	Rock Monitor	Least Concern	1
Varanidae	*Varanus*	*niloticus*		Water Monitor	Least Concern	3
Viperidae	*Bitis*	*arietans*	*arietans*	Puff Adder	Least Concern	5
Viperidae	*Bitis*	*gabonica*		Gaboon Adder	Near Threatened	1
Viperidae	*Causus*	*rhombeatus*		Rhombic Night Adder	Least Concern	13
Varanidae	*Varanus*	*albigularis*	*albigularis*	Rock Monitor	Least Concern	1
Varanidae	*Varanus*	*niloticus*		Water Monitor	Least Concern	3
Viperidae	*Bitis*	*arietans*	*arietans*	Puff Adder	Least Concern	5

13 ANNEX 3. LIST OF AMPHIBIANS

List of amphibians which are likely to occur in the vicinity of the Inyaninga-Mbweu study site.

Family	Genus	Species	Common name	Red list category	No. records
Arthroleptidae	*Arthroleptis*	*stenodactylus*	Shovel-footed Squeaker	Least Concern	1
Arthroleptidae	*Arthroleptis*	*wahlbergi*	Bush Squeaker	Least Concern	50
Arthroleptidae	*Leptopelis*	*mossambicus*	Brownbacked Tree Frog	Least Concern	16
Arthroleptidae	*Leptopelis*	*natalensis*	Forest Tree Frog	Least Concern	76
Brevicepitidae	*Breviceps*	*adspersus*	Bushveld Rain Frog	Least Concern	9
Brevicepitidae	*Breviceps*	*mossambicus*	Mozambique Rain Frog	Least Concern	9
Brevicepitidae	*Breviceps*	*sopranus*	Whistling Rain Frog	Data Deficient	1
Bufonidae	*Schismaderma*	*carens*	Red Toad	Least Concern	19
Bufonidae	*Sclerophrys*	*capensis*	Raucous Toad	Least Concern	2
Bufonidae	*Sclerophrys*	*gutturalis*	Guttural Toad	Least Concern	68
Hemisotidae	*Hemisus*	*guttatus*	Spotted Shovel-nosed Frog	Vulnerable	8
Hemisotidae	*Hemisus*	*marmoratus*	Mottled Shovel-nosed Frog	Least Concern	1
Hyperoliidae	*Afrixalus*	*aureus*	Golden Leaf-folding Frog	Least Concern	1
Hyperoliidae	*Afrixalus*	*delicatus*	Delicate Leaf-folding Frog	Least Concern	35
Hyperoliidae	*Afrixalus*	*fornasinii*	Greater Leaf-folding Frog	Least Concern	42
Hyperoliidae	*Afrixalus*	*spinifrons*	Natal Leaf-folding Frog	Vulnerable	8
Hyperoliidae	*Hyperolius*	*argus*	Argus Reed Frog	Least Concern	21
Hyperoliidae	*Hyperolius*	*marmoratus*	Painted Reed Frog	Least Concern	90
Hyperoliidae	*Hyperolius*	*microps*	Sharp-headed Long Reed Frog	Least Concern	4
Hyperoliidae	*Hyperolius*	*pickersgilli*	Pickersgill's Reed Frog	Endangered	23
Hyperoliidae	*Hyperolius*	*pusillus*	Water Lily Frog	Least Concern	34
Hyperoliidae	*Hyperolius*	*semidiscus*	Yellowstriped Reed Frog	Least Concern	6
Hyperoliidae	*Hyperolius*	*tuberilinguis*	Tinker Reed Frog	Least Concern	67
Hyperoliidae	*Kassina*	*maculata*	Redlegged Kassina	Least Concern	14
Hyperoliidae	*Kassina*	*senegalensis*	Bubbling Kassina	Least Concern	12
Microhylidae	*Phrynomantis*	*bifasciatus*	Banded Rubber Frog	Least Concern	5
Phrynobatrachidae	*Phrynobatrachus*	*mababiensis*	Dwarf Puddle Frog	Least Concern	10
Phrynobatrachidae	*Phrynobatrachus*	*natalensis*	Snoring Puddle Frog	Least Concern	31
Pipidae	*Xenopus*	*laevis*	Common Platanna	Least Concern	14
Ptychadenidae	*Ptychadena*	*anchietae*	Plain Grass Frog	Least Concern	13
Ptychadenidae	*Ptychadena*	*mascareniensis*	Mascarene Grass Frog	Least Concern	2
Ptychadenidae	*Ptychadena*	*mossambica*	Broadbanded Grass Frog	Least Concern	1
Ptychadenidae	*Ptychadena*	*oxyrhynchus*	Sharpnosed Grass Frog	Least Concern	19
Ptychadenidae	*Ptychadena*	*porosissima*	Striped Grass Frog	Least Concern	1

Family	Genus	Species	Common name	Red list category	No. records
Pyxicephalidae	*Amietia*	*delalandii*	Delalande's River Frog	Least Concern	34
Pyxicephalidae	*Cacosternum*	*nanum*	Bronze Caco	Least Concern	8
Pyxicephalidae	*Natalobatrachus*	*bonebergi*	Kloof Frog	Endangered	2
Pyxicephalidae	*Pyxicephalus*	*edulis*	African Bull Frog	Least Concern	4
Pyxicephalidae	*Strongylopus*	*fasciatus*	Striped Stream Frog	Least Concern	8
Pyxicephalidae	*Strongylopus*	*grayii*	Clicking Stream Frog	Least Concern	6
Pyxicephalidae	*Tomopterna*	*cryptotis*	Tremelo Sand Frog	Least Concern	2
Pyxicephalidae	*Tomopterna*	*natalensis*	Natal Sand Frog	Least Concern	16
Rhacophoridae	*Chiromantis*	*xerampelina*	Southern Foam Nest Frog	Least Concern	6