ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED VRYHEID GRID STRENGTHENING

PROJECT:

FAUNA & FLORA SPECIALIST REPORT FOR EIA

PRODUCED FOR NSOVO

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BY

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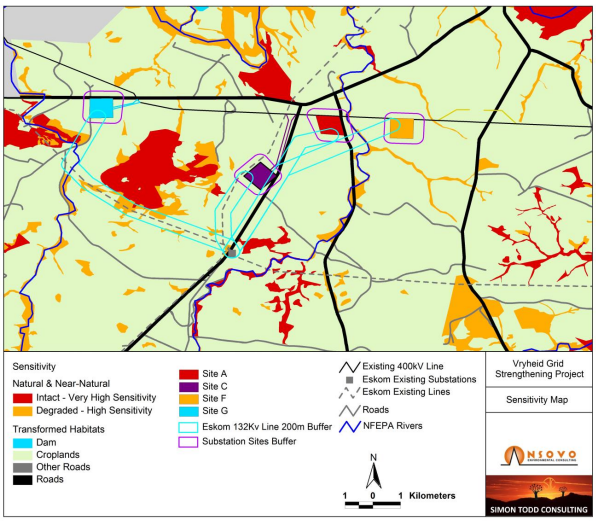
CONTENTS

Executive Summary 2
1 Introduction 4
1.1 Scope of Study 4
1.2 Assessment Approach & Philosophy 5
1.3 Relevant Aspects of the Development 8
2 Methodology 9
2.1 Data Sourcing and Review 9
2.2 Site Visit 10
2.3 Sampling Limitations and Assumptions 10
2.4 Sensitivity Mapping & Assessment 11
3 Description of the Affected Environment 11
3.1 Broad-Scale Vegetation Patterns 11
3.2 Listed & Protected Plant Species 13
3.3 Site Description 14
3.4 Critical Biodiversity Areas & Broad Scale Ecological Processes 16
3.5 Faunal Communities 16
3.6 Site Sensitivity Assessment 18
4 Identification & Nature of Impacts 19
4.1 Impact Risk Factors 19
4.2 Construction Phase Impacts 20
4.3 Operational Phase Impacts 20
4.4 Cumulative impacts 20
5 Impact Assessment 21
5.1 Construction Phase Impacts 21
5.2 Operational Phase Impacts 21
5.3 Cumulative Impacts 22
6 Conclusions & Recommendations 23
7 Literature Cited 24
ANNEX 1. LIST OF PLANT SPECIES 25
ANNEX 2. LIST OF MAMMALS 28
ANNEX 3. LIST OF REPTILES 30
ANNEX 3. LIST OF AMPHIBIANS 31

EXECUTIVE SUMMARY

Eskom Distribution proposes the upgrading of the Vryheid substation near Swellendam in order to strengthen the capacity and reliability of the distribution grid in the area in order to meet growing demand in the area. The upgrade requires a new distribution substation and loop-in loop-out line from the existing 400 kV line. 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 required assessment process, this ecological specialist study details the ecological characteristics of the site and provides an assessment of the ecological impacts likely to be associated with the development of the substation and associated infrastructure.

A desktop study of the available ecological information and a field assessment were conducted to identify and characterize the ecological features of the site and identify potential sensitivities. An ecological sensitivity map for the site was developed, which is depicted below. All of the sites assessed in the EIA phase are however within transformed areas.



The broader Vryheid study site contains some features of very high sensitivity including several Critically Endangered vegetation types. Further habitat loss within these ecosystems would be considered a fatal flaw of the development. Sites affecting intact vegetation have however been screening out in the scoping phase and all the sites assessed here are within transformed areas with no intact vegetation remaining.

In terms of the identification of the preferred alternative, Sites C and G are not adjacent to the 400kV line and would require loop-in loop-out lines to connect to the line, which potentially increases their impact, although for Option C the total length of lines is still relatively short compared to the other options. The 132kV line between Site G and Vryheid substation would need to traverse some sensitive areas and as any additional impact on intact vegetation in the area is highly undesirable, this is not considered to be a preferred alternative.

Site A, Site C and Site F are considered acceptable alternatives with low potential impacts on the terrestrial environment. As site A is fairly close to the Kluitjieskraal River, Site F and Site C are considered the overall preferred alternatives, with Site C likely to generate the lowest overall impacts due to the proximity of the lines and substation to existing lines and roads and the lack of any sensitive features within the development footprint.

With the application of the suggested mitigation measures, the impacts associated with the substation and grid connection development would be low and of a local nature only. Since the development footprint can be restricted to transformed habitat, it would not contribute significantly to cumulative impacts on fauna and flora.

1 INTRODUCTION

Eskom Holdings SOC Limited proposes the upgrading of the Vryheid substation near Swellendam in order to strengthen the capacity and reliability of the distribution grid in the area in order to meet growing demand in the area. The project consists of a new 400/132 kV substation that will link in to the existing 400 kV Bacchus – Proteus Transmission Line and includes a double circuit powerline linking between the Vryheid Substation and the new substation and extension of the Vryheid substation busbar and additional feeder bays. 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. The Scoping report for the study has been accepted by DEA and the current study is for the EIA phase of the development.

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 upgrades. 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 2014 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 600m x 600m (360 000m^2) or 36ha. The substation would only take up a portion of the site.
- Although seven different location alternatives were included in the scoping phase, three of these were eliminated and the current assessment will consider the remaining four sites.
- Each option requires a loop-in, loop-out line from the 400kV line, up to 3.5km long.

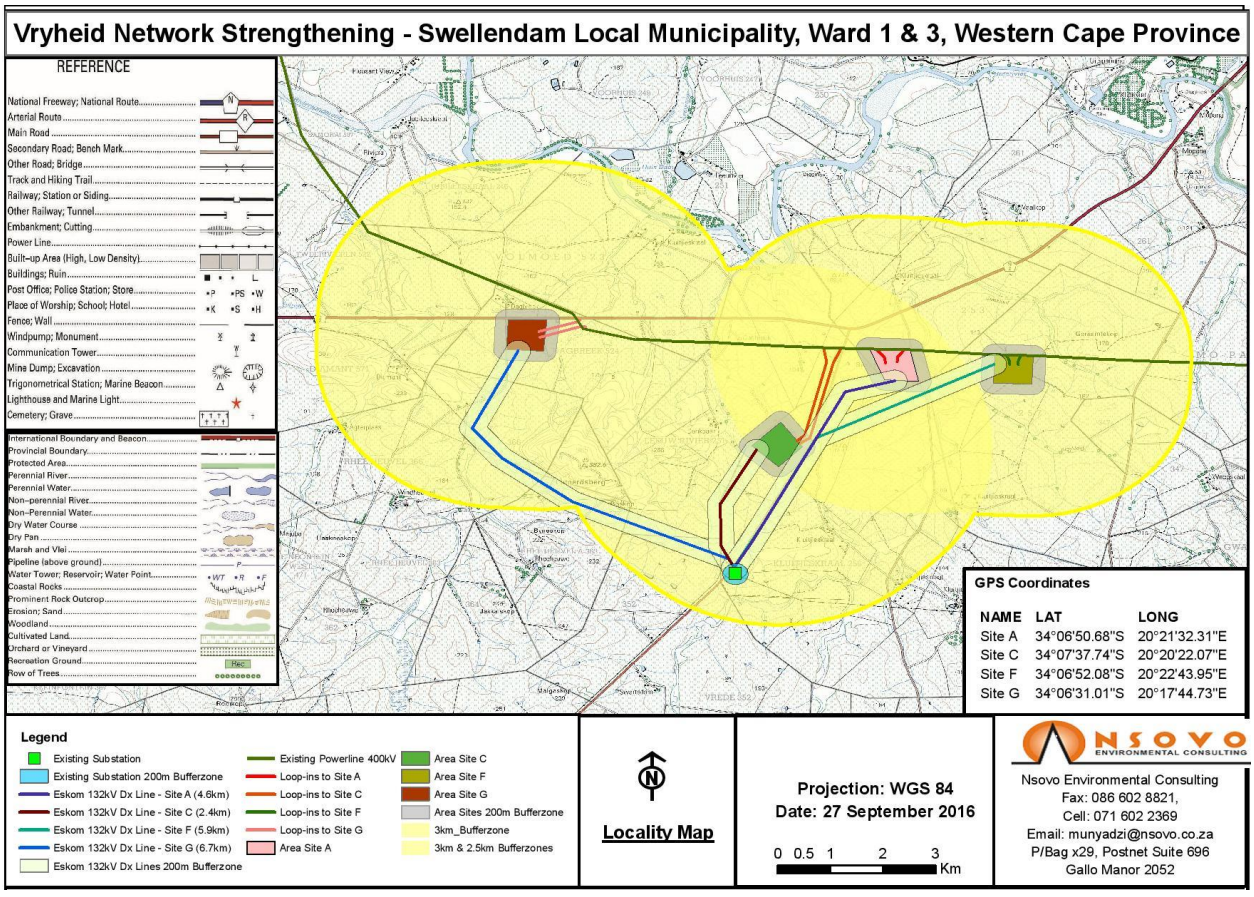


Figure 1. Map of the Vryheid study area, showing the four substation alternatives considered in the study with their loop-in loop-out lines from the existing Eskom Vryheid substation.

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) 3420AB 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 as well as counter the fact that the site itself has probably not been well sampled in the past.
- Critical Biodiversity Areas for the site and surroundings were extracted from the Overberg CBA Map (Holness & Bradshaw 2010)
- 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 2006) 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) 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.

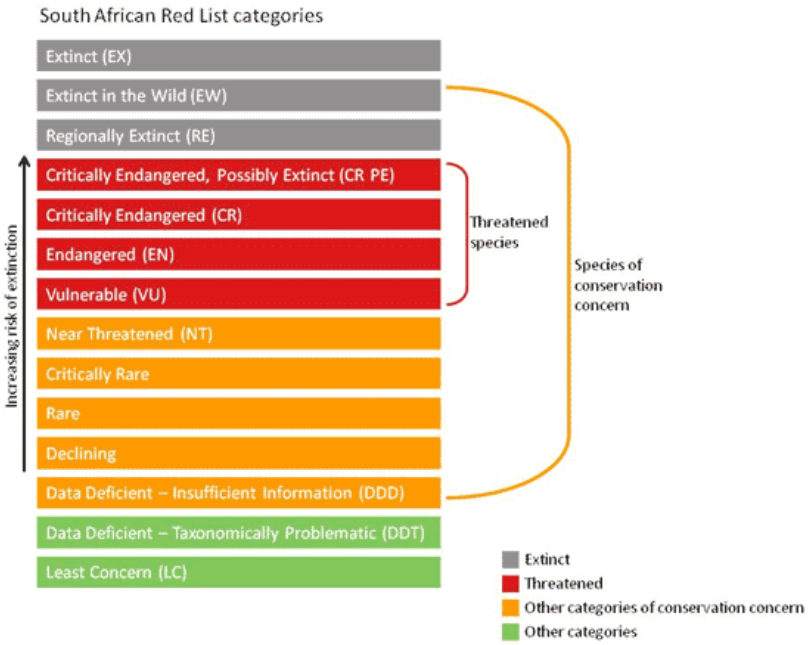


Figure 2. Schematic representation of the South African Red List categories. Taken from http://redlist.sanbi.org/redcat.php

2.2 Site Visit

The site was visited in June 2016 during the early wet spring season as well as in peak wet season in September 2016. The condition of each site was verified in the field and any sensitive features in the area or along the power line were identified and mapped if necessary. Due to the high levels of transformation in the area, ecological patterns are very clear and there are few limitations associated with the site visits.

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 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, as well as the implications of the high levels of

transformation for faunal presence. 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

According to the national vegetation map, the only vegetation type would be impacted by the development (Figure 2) would be Eastern Rûens Shale Renosterveld.

The Eastern Rûens Shale Renosterveld is distributed in the Western Cape, from Bredasdorp and the area of the Breede River near Swellendam, between the coastal limestone belt in the south and vegetation types of the southern foothills of the Langeberg to the Goukou River at Riversdale (Mucina & Rutherford 2006). Eastern Rûens Shale Renosterveld, is represented by a moderately tall grassy shrubland dominated by renosterbos, although *Themeda* grasslands also occur in some areas. It is largely associated with the Fb, Fc and Db land types. It is listed as *Critically Endangered* as only 14% remains and less than 1% is conserved. It is known to harbor 49 red data species and 15 endemic species. It occurs on moderately undulating hills and plains and the vegetation consists of cupressoid and small-leaved low to moderately tall grassy shrubland, dominated by renosterbos (Mucina & Rutherford 2006). It's classified as *Critically Endangered* and over 80% of the area has been transformed by croplands. Only patches on the steepest slopes remain. As such any further loss of this vegetation type is high undesirable and would constitute a high impact.

Although the listed ecosystems layer shows some occasional pixels of intact vegetation, here is no remnant vegetation within any of the other alternatives. These fragments are made up of pioneer vegetation and invader shrubs along road verges or along fences and is not intact renosterveld. There is a large amount of transformed habitat in the area and as a result, there is no need for the substation to impact intact vegetation and there is ample space available in the area to ensure that it generates a low impact on the receiving environment.

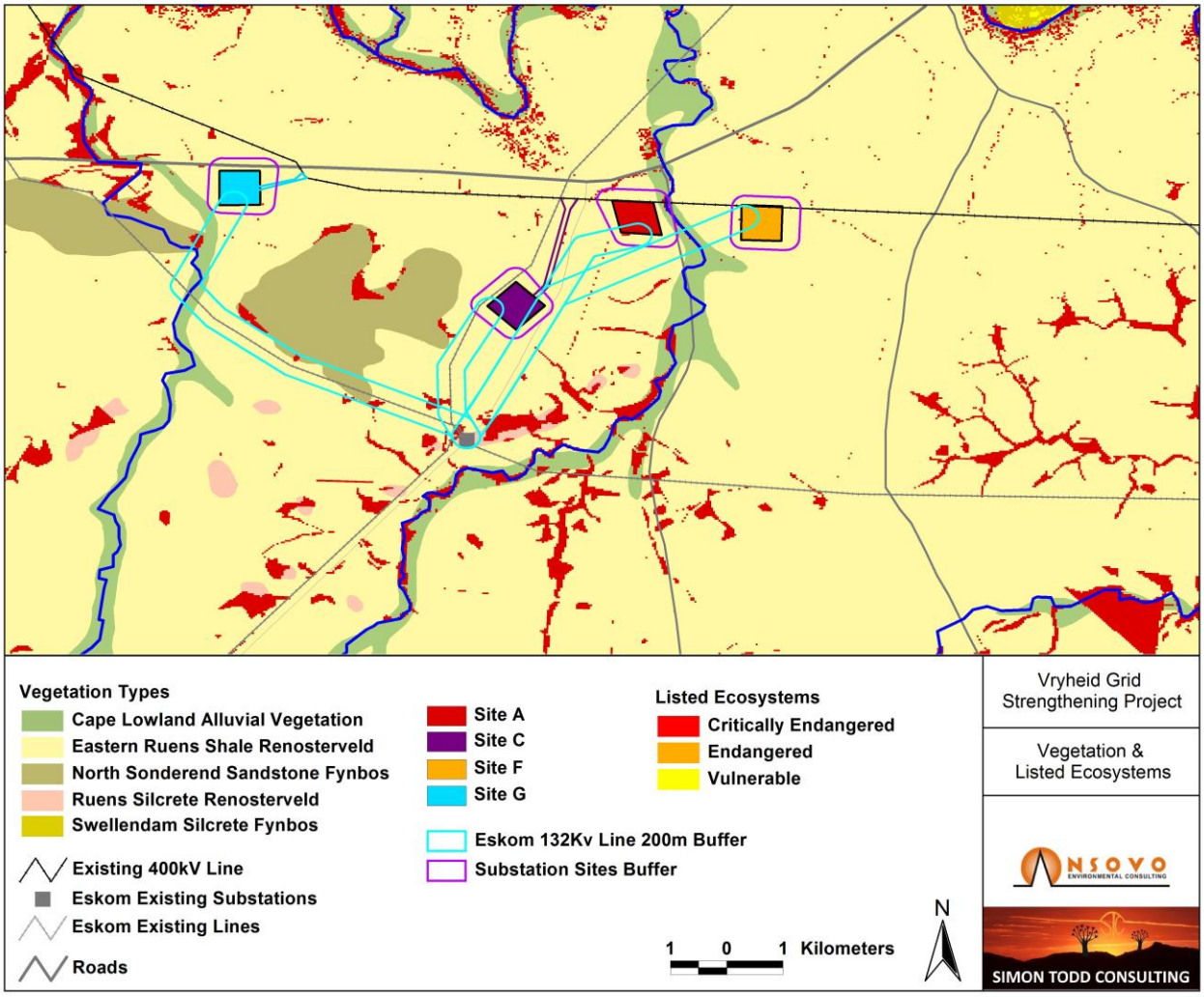


Figure 2. Vegetation map (Mucina and Rutherford 2006) of the Vryheid study area, showing the remaining extent of listed ecosystems as well. None of the alternatives considered have any remaining intact vegetation.

3.2 Listed & Protected Plant Species

According to the SANBI SIBIS database, more than 1000 indigenous species have been recorded from the quarter degree square containing the site. This includes 71 species of high conservation concern, illustrating the high diversity of the area as well as the high threat status faced by many species in the area. These results from the high level of transformation the area has experienced and the small population sizes and localized distributions that many species have been reduced to. As such, any additional impact to the intact remnants in the area are likely to impact listed species and any further loss of intact vegetation in the area is highly undesirable.

Table 1. Numbers of the species within the different conservation status categories as indicated below, data derived from the SANBI SIBIS database.

Status/ IUCN Red List Category	No. Species

Critically Endangered (CR)	**5**
Endangered (EN)	**31**
Vulnerable (VU)	**35**
Near Threatened (NT)	**27**
Rare	**9**
Declining	**6**
Data Deficient - Insufficient Information (DDD)	**2**
Data Deficient - Taxonomically Problematic (DDT)	**11**
Least Concern	**1006**
Total	**1131**

3.3 Site Description

Site A, showing the transformed nature of the site with no intact remaining vegetation.

Site C, is located on actively cultivated wheat fields and there is no natural vegetation remaining.

Looking down the 400kV line towards Site F, in the middle distance.

3.4 CRITICAL BIODIVERSITY AREAS & BROAD SCALE ECOLOGICAL PROCESSES

The CBA map for the general area surrounding the site is depicted below in Figure 3. The CBA map corresponds closely with the remaining vegetation in the area and all remnant fragments have been classified as CBAs on account of the very high threat status of the remaining vegetation and the high biodiversity value of these areas. None of the sites are within CBAs and the development of the substation is not likely to impact on intact habitat or CBAs in the area.

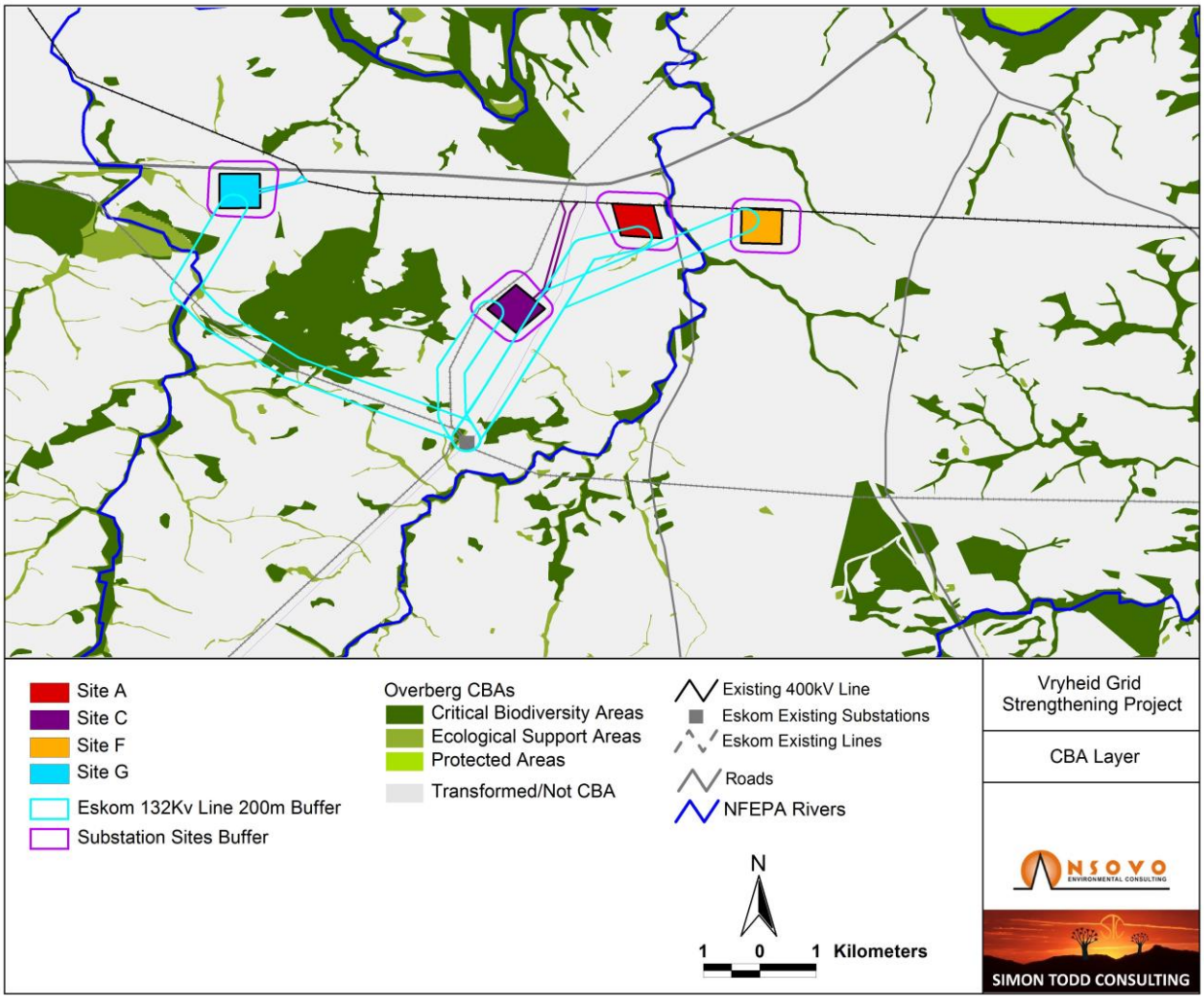


Figure 3. Critical Biodiversity Areas map of the area sound the Vryheid study site.

3.5 FAUNAL COMMUNITIES

Mammals

According to the Mammal Map database, only 35 mammals have been recorded from the area, including several conservation dependent species such as Cape Mountain Zebra and Bontebok which would not be encountered in the study area. Given the high level of transformation the area has experienced, this relatively low total is not surprising. Three

species of conservation concern occur in the wider area, the White-tailed Mouse *Mystromys albicaudatus* (Endangered), Leopard *Panthera pardus* (Near Threatened) and the Honey Badger *Mellivora capensis* (SA RDB Endangered). Given the high level of transformation and intensive agriculture in the area, it is highly unlikely that the Leopard occurs at the site, but both the White-tailed Mouse and Honey Badger potentially occur in the area, but would be unlikely to frequent the transformed areas much as prey is too low or disturbance too high in these areas.

In the wider area, as many 50 mammal species may occur, but as the affected area is highly transformed, few of these would actually be present within the affected areas. Larger mammals observed to be present at the local area include Grey Rhebok *Pelea capreolus*, Steenbok *Raphicerus campestris*, Common Duiker *Sylvicapra grimmia*, Porcupine *Hystrix africaeaustralis* and Aardvark *Orycteropus afer*. Smaller mammals observed include Namaqua Rock Mouse *Aethomys namaquensis*, Bush Vlei Rat *Otomys unisulcatus*, Scrub Hare *Lepus saxatilis*, Cape Gerbil *Gerbilliscus afra*, Cape Grey Mongoose *Herpestes pulverulentus* and Marsh Mongoose *Atilax paludinosus*. As the intact habitats would be most important for these species, the development would have a low impact on these species as the loss of intact habitat would be very negligible.

Reptiles

According to the ReptileMap database, only 9 reptile species have been recorded from the quarter degree covering the site. Despite the high level of transformation in the area, this is an underestimate of the reptile richness of the area and according to the literature, as many as 35 reptile species may occur at the site. This is however still a comparatively low total suggesting that the site has a relatively depauperate reptile assemblage. Based on distribution maps and habitat requirements, the composition of the reptile fauna is likely to comprise 2 tortoises, 1 terrapin, 16 snakes, 14 lizards and skinks and 2 geckos. There are no listed species which are known to occur in the area. Species observed in the immediate area include the Cape Girdled Lizard *Cordylus cordylus* which is associated with rocky outcrops, the Angulate Tortoise *Chersina angulata*, Brown House Snake *Lamprophis capensis* and Cape Skink *Mabuya capensis* all of which occur within intact remnants. The most important habitats in the area for reptiles are likely to be rocky outcrops for lizards as well as the densely vegetated lowlands and areas around the drainage lines for snakes. As the development should be restricted to the transformed areas, the impact on reptiles would be low.

Amphibians

Fourteen frog species are known from the area, but this does not include any listed species and only a small proportion of these would be likely to occur within the affected area. The transformed areas are likely to be of very low important for frogs and frogs would only be impacted within intact areas through impact to their habitat through erosion or siltation and pollution due to runoff from the development during construction or operation.

3.6 SITE SENSITIVITY ASSESSMENT

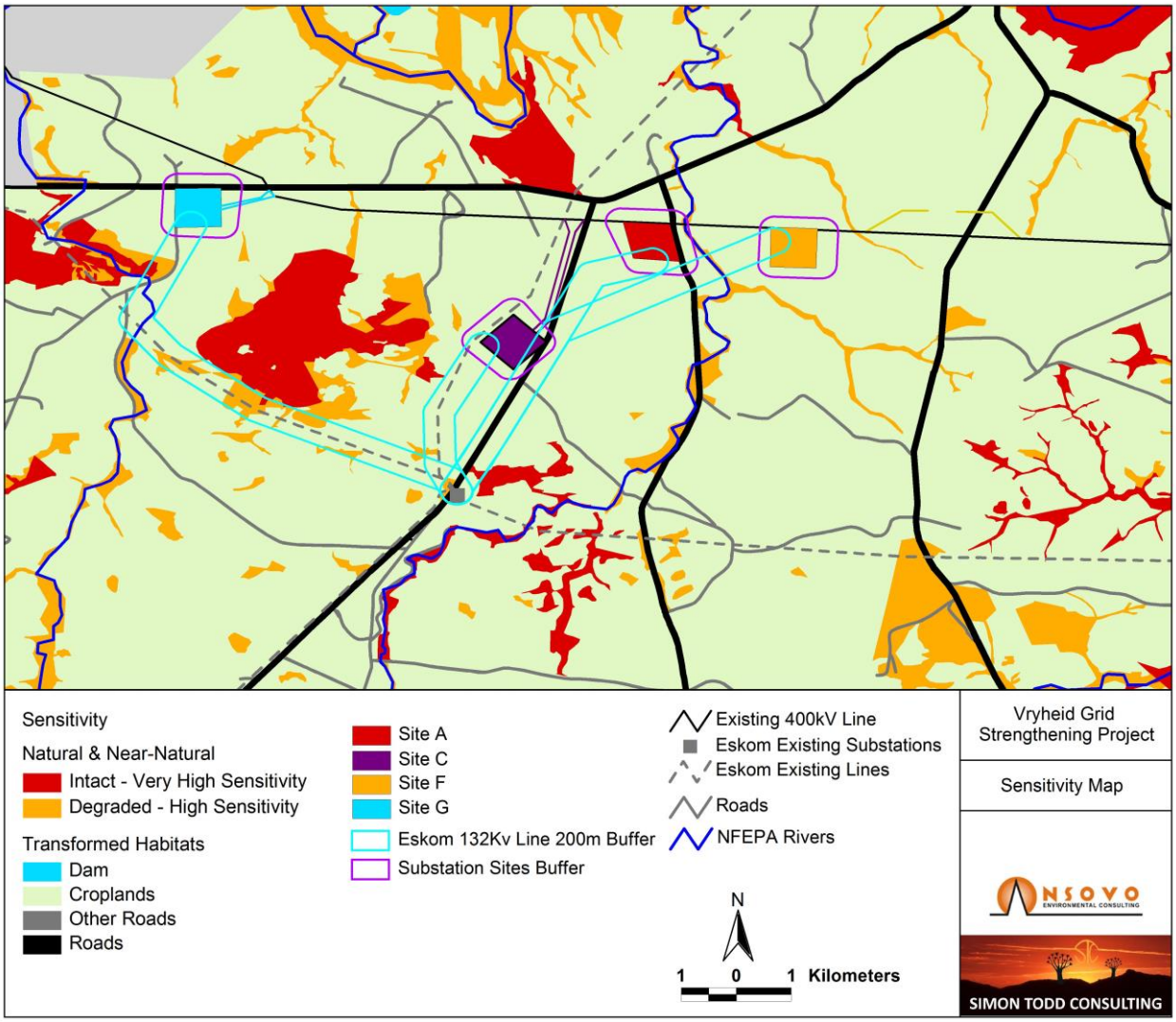


Figure 4. Ecological sensitivity map of the Vryheid study area, based on the transformation layer for the area.

The ecological sensitivity map of the site is depicted in Figure 4 above. All of the sites are within transformed habitat considered to be low sensitivity. The main difference between the sites is the fact that Sites C and G are not adjacent to the 400kV line and would require loop-in loop-out lines to connect to the 400kV line, although for Option C the total length of lines is still relatively short compared to the other options. The 132kV line between Site G and Vryheid substation would need to traverse some sensitive areas and as any additional impact on intact vegetation in the area is highly undesirable, this is not considered to be a preferred alternative. As a result, Site A, Site C and Site F are considered acceptable alternatives with low potential impacts. As site A is fairly close to the Kluitjieskraal River, Site F and Site C are considered the overall preferred alternatives, with Site C likely to generate the lowest overall impacts due to the proximity of the lines and substation to existing lines and roads and the lack of any sensitive features within the development footprint.

4 IDENTIFICATION & NATURE OF IMPACTS

4.1 IMPACT RISK FACTORS

Potential ecological impacts resulting from the development of the Vryheid substation and grid strengthening would stem from a variety of different activities and risk factors associated with the preconstruction, construction and operational phases of the project potentially including the following:

Construction Phase

- Vegetation clearing for access roads, laydown areas, linking lines and the substation site itself may impact intact vegetation.
- Increased erosion risk would occur due to the loss of plant cover and soil disturbance created during the construction phase. Some of the site options are steep and risk of erosion would be high. This may impact downstream riparian and wetland habitats if a lot of silt enters the drainage systems.
- Presence and operation of construction machinery on site. This will create a physical impact as well as generate noise, pollution and other forms of disturbance at the site.
- Increased human presence can lead to poaching, illegal plant harvesting and other forms of disturbance such as fire.

Operational Phase

- The operation of the facility will generate some noise and disturbance which may impact some fauna.
- The presence of the facility may disrupt the connectivity of the landscape for some species which may impact their ability to disperse or maintain gene flow between subpopulations.
- The facility will require management and if this is not done appropriately, it could impact adjacent intact areas through impacts such as erosion, alien plant invasion and contamination from pollutants, herbicides or pesticides.

Cumulative Impacts

- The development would contribute to the cumulative fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations.

The above impacts would be likely to result in the following impacts which are described briefly below and assessed for each phase of the development as appropriate thereafter:

4.2 CONSTRUCTION PHASE IMPACTS

The likely impacts on the terrestrial ecology of the site resulting from the development of the Vryheid substation and loop in and loop out lines are identified and discussed below with reference to the characteristics and features of the site.

Impacts on vegetation and listed or protected plant species

As none of the sites are within intact vegetation, this is not considered a likely impact of the development and is not assessed in this study for the alternatives being considered.

Direct Faunal Impacts.

Increased levels of noise, pollution, disturbance and human presence during construction 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. Although faunal diversity within the transformed habitats would be low, some fauna are likely to be present and may be impacted. This impact will therefore be assessed for the development.

4.3 OPERATIONAL PHASE IMPACTS

Increased Erosion Risk

The large amount of disturbance created during construction would leave the site vulnerable to soil erosion, especially on some of the steeper sites such as Site C. The eroded material may enter streams and rivers at the site 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.

4.4 CUMULATIVE IMPACTS

Cumulative impacts on broad-scale ecological processes

The presence of the substation and daily activity at the site may deter certain species from the area, resulting in a loss in broad-scale landscape connectivity. The extent of

this impact is likely to be low given the transformed nature of the landscape. At a more regional scale, the potential cumulative development of Wind Farms associated with the Renewable Energy Development Zone (REDZ) in the area are also of significance as these would also contribute towards the disruption of landscape connectivity.

5 IMPACT ASSESSMENT

5.1 CONSTRUCTION PHASE IMPACTS

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	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Faunal Impacts During Construction	No	Negative	1	1	4	4	24 = Low
	Yes	Negative	1	1	3	2	15 = Low
Corrective Actions	• Any active faunal burrows within the development footprint should be located and marked before construction and avoided until the occupant animals can be excluded or have moved away due to the nearby construction activities. • 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. • Where necessary, dust suppression should be used to reduce dust impacts on surrounding areas. • 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						

5.2 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	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Erosion Impacts	No	Negative	1	2	4	3	21 = Low
	Yes	Negative	1	1	3	2	10 = Low
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.						

5.3 CUMULATIVE IMPACTS

Cumulative impacts on broad-scale ecological processes

The presence of the substation and daily activity at the site may deter certain species from the area, resulting in a loss in broad-scale landscape connectivity, especially in conjunction with other development in the area such as renewable energy.

Issue	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Ecosystem Degradation	No	Negative	1	2	3	3	18 = Low
	Yes	Negative	1	2	2	3	15 = Low
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. • An Open Space Management plan should be developed for the site, which should include management of biodiversity within the affected areas, as well as that in the adjacent rangeland. • Avoid impact to potential corridors such as the riparian corridors associated with the larger drainage lines within the area.						

6 CONCLUSIONS & RECOMMENDATIONS

The broader Vryheid study site contains some features of very high sensitivity including several Critically Endangered vegetation types. Further habitat loss within these ecosystems would be considered a fatal flaw of the development. Sites affecting intact vegetation have however been screening out in the scoping phase and all the sites assessed here are within transformed areas with no intact vegetation remaining.

In terms of the identification of the preferred alternative, Sites C and G are not adjacent to the 400kV line and would require loop-in loop-out lines to connect to the line, which potentially increases their impact, although for Option C the total length of lines is still relatively short compared to the other options. The 132kV line between Site G and Vryheid substation would need to traverse some sensitive areas and as any additional impact on intact vegetation in the area is highly undesirable, this is not considered to be a preferred alternative.

Site A, Site C and Site F are considered acceptable alternatives with low potential impacts on the terrestrial environment. As site A is fairly close to the Kluitjieskraal River, Site F and Site C are considered the overall preferred alternatives, with Site C likely to generate the lowest overall impacts due to the proximity of the lines and substation to existing lines and roads and the lack of any sensitive features within the development footprint.

Since the development footprint is located within transformed habitat, it does not contribute significantly to cumulative impacts on fauna and flora. With the application of the suggested mitigation measures, the impacts associated with the substation and grid connection development would be low and of a local nature only. As such, there are no reasons to oppose the development from the terrestrial ecological point of view.

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ANNEX 1. LIST OF PLANT SPECIES

List of listed and protected plant species which are known to occur in the broad vicinity of the Vryheid Grid strengthening site, according to the SANBI SIBIS database. The main purpose of this table is to illustrate the high numbers of listed species in the area, but as the sites are all within active croplands, none of these species would be impacted by the development.

Family Name	Species Name	IUCN Threat Status
AMARYLLIDACEAE	*Cyrtanthus leptosiphon*	CR
	Cyrtanthus odorus	EN
ANACARDIACEAE	*Loxostylis alata*	Declining
ASPHODELACEAE	*Haworthia attenuata var. attenuata*	EN
	Haworthia floribunda var. major	EN
	Haworthia variegata var. variegata	EN
	Aloe brevifolia var. brevifolia	VU
	Haworthia venosa subsp. venosa	VU
ASTERACEAE	*Pteronia beckeoides*	DDD
	Senecio rehmannii	DDT
	Osteospermum pterigoideum	EN
	Senecio verbascifolius	EN
	Stoebe rugulosa	EN
	Gnaphalium declinatum	NT
	Helichrysum cochleariforme	NT
	Helichrysum marifolium	Rare
	Osteospermum hispidum var. hispidum	Thr*
	Athanasia oocephala	VU
	Metalasia galpinii	VU
	Othonna ciliata	VU
	Relhania garnotii	VU
BORAGINACEAE	*Lobostemon daltonii*	EN
BRASSICACEAE	*Heliophila linearis var. reticulata*	VU
CAMPANULACEAE	*Roella bryoides*	DDT
CELASTRACEAE	*Elaeodendron croceum*	Declining
CRASSULACEAE	*Adromischus mammillaris*	EN
	Crassula bergioides	NT
	Crassula simulans	VU
ERICACEAE	*Erica prolata*	EN
	Erica podophylla	Rare
	Erica filamentosa	VU
	Podalyria reticulata	DDT
	Aspalathus burchelliana	EN
	Aspalathus grobleri	EN
	Aspalathus smithii	EN
	Lebeckia plukenetiana	EN
	Otholobium pungens	EN
	Podalyria argentea	EN
	Aspalathus incompta	NT
	Podalyria sericea	NT
	Psoralea asarina	NT
	Aspalathus acanthophylla	VU
	Aspalathus campestris	VU
	Aspalathus lebeckioides	VU
	Aspalathus obtusata	VU
	Aspalathus recurva	VU
	Aspalathus steudeliana	VU
	Aspalathus zeyheri	VU
GENTIANACEAE	*Sebaea rara*	NT
HYACINTHACEAE	*Drimia altissima*	Declining
	Lachenalia nervosa	EN
	Lachenalia physocaulos	EN
	Lachenalia contaminata	NT
HYPOXIDACEAE	*Pauridia minuta*	NT
IRIDACEAE	*Moraea minima*	CR
	Watsonia humilis	CR
	Babiana patula	Declining
	Moraea kamiesensis	EN
	Aristea simplex	NT

	Babiana fragrans	NT
	Babiana stricta	NT
	Geissorhiza foliosa	NT
	Gladiolus emiliae	NT
	Gladiolus teretifolius	NT
	Watsonia aletroides	NT
	Gladiolus crispulatus	Rare
	Aristea cistiflora	VU
	Freesia fergusoniae	VU
	Geissorhiza nana	VU
	Gladiolus bilineatus	VU
	Gladiolus engysiphon	VU
LAURACEAE	*Ocotea bullata*	EN
MESEMBRYANTHEMACEAE	*Delosperma neethlingiae*	DDT
	Drosanthemum vandermerwei	DDT
	Lampranthus laetus	DDT
	Lampranthus perreptans	DDT
	Drosanthemum lavisii	EN
	Gibbaeum haaglenii	EN
	Lampranthus scaber	EN
	Cephalophyllum diversiphyllum	NT
	Drosanthemum hispifolium	VU
	Drosanthemum striatum	VU
	Glottiphyllum linguiforme	VU
MYRSINACEAE	*Rapanea melanophloeos*	Declining
ORCHIDACEAE	*Holothrix pilosa*	NT
	Satyrium carneum	NT
	Disa aurata	Rare
OXALIDACEAE	*Oxalis pardalis*	DDT
	Oxalis strigosa	EN
	Oxalis pendulifolia	VU
PENAEACEAE	*Sonderothamnus speciosus*	Rare
	Stylapterus ericifolius	Rare
POLYGALACEAE	*Muraltia stipulacea*	DDD
	Muraltia pappeana	NT
PRIONIACEAE	*Prionium serratum*	Declining
PROTEACEAE	*Leucadendron levisanus*	CR
	Mimetes splendidus	EN
	Protea decurrens	EN
	Serruria fucifolia	EN
	Leucadendron tinctum	NT
	Leucospermum gracile	NT
	Protea scabra	NT
	Serruria fasciflora	NT
	Leucadendron linifolium	VU
	Protea aspera	VU
	Protea burchellii	VU
	Protea longifolia	VU
	Protea restionifolia	VU
	Protea scolymocephala	VU
RHAMNACEAE	*Phylica velutina*	NT
	Phylica harveyi	VU
ROSACEAE	*Cliffortia grandifolia var. grandifolia*	Rare
	Cliffortia ruscifolia var. purpurea	Rare
	Cliffortia monophylla	VU
RUTACEAE	*Diosma aristata*	CR
	Acmadenia laxa	EN
	Agathosma minuta	EN
	Diosma fallax	EN
	Euchaetis albertiniana	EN
	Agathosma foetidissima	NT
	Agathosma linifolia	Rare
	Agathosma microcarpa	VU
	Diosma passerinoides	VU
SANTALACEAE	*Thesium frisea var. frisea*	DDT
SCROPHULARIACEAE	*Nemesia lucida*	DDT
	Phyllopodium capillare	NT
THYMELAEACEAE	*Gnidia strigillosa*	DDT

ANNEX 2. LIST OF MAMMALS

List of mammals which have been recorded in the region of the Vryheid Grid strengthening site. Few of these species would actually occur at the site due to the high degree of transformation the area and the sites themselves have experienced.

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Bathyergidae	*Bathyergus*	*suillus*		Cape Dune Mole-rat	Least Concern	2
Bathyergidae	*Cryptomys*	*hottentotus*		Southern African Mole-rat	Least Concern	2
Bovidae	*Alcelaphus*	*caama*		Red Hartebeest	Least Concern	1
Bovidae	*Antidorcas*	*marsupialis*		Springbok	Least Concern	2
Bovidae	*Damaliscus*	*pygargus*	*pygargus*	Bontebok	Vulnerable	5
Bovidae	*Pelea*	*capreolus*		Vaal Rhebok	Least Concern	2
Bovidae	*Raphicerus*	*campestris*		Steenbok	Least Concern	2
Bovidae	*Raphicerus*	*melanotis*		Cape Grysbok	Least Concern	2
Bovidae	*Tragelaphus*	*scriptus*		Bushbuck	Least Concern	2
Canidae	*Otocyon*	*megalotis*		Bat-eared Fox	Least Concern	3
Canidae	*Vulpes*	*chama*		Cape Fox	Least Concern	2
Equidae	*Equus*	*zebra*	*zebra*	Cape Mountain Zebra	Vulnerable	2
Felidae	*Caracal*	*caracal*		Caracal	Least Concern	2
Felidae	*Felis*	*silvestris*		Wildcat	Least Concern	4
Felidae	*Panthera*	*pardus*		Leopard	Least Concern	1
Herpestidae	*Cynictis*	*penicillata*		Yellow Mongoose	Least Concern	1
Herpestidae	*Herpestes*	*ichneumon*		Egyptian Mongoose	Least Concern	2
Herpestidae	*Herpestes*	*pulverulentus*		Cape Gray Mongoose	Least Concern	1
Hystricidae	*Hystrix*	*africaeaustralis*		Cape Porcupine	Least Concern	2
Leporidae	*Lepus*	*saxatilis*		Scrub Hare	Least Concern	2
Muridae	*Aethomys*	*namaquensis*		Namaqua Rock Mouse	Least Concern	2
Muridae	*Gerbilliscus*	*afra*		Cape Gerbil	Least Concern	2
Muridae	*Mus*	*minutoides*		Southern African Pygmy Mouse	Least Concern	2
Muridae	*Myomyscus*	*verreauxi*		Verreaux's Mouse	Least Concern	2
Muridae	*Otomys*	*irroratus*		Southern African Vlei Rat	Least Concern	2
Muridae	*Rhabdomys*	*pumilio*		Xeric Four-striped Grass Rat	Least Concern	2
Mustelidae	*Aonyx*	*capensis*		African Clawless Otter	Least Concern	2
Mustelidae	*Ictonyx*	*striatus*		Striped Polecat	Least Concern	2
Mustelidae	*Poecilogale*	*albinucha*		African Striped Weasel	Data deficient	1
Nesomyidae	*Dendromus*	*melanotis*		Gray African Climbing Mouse	Least Concern	2

Procaviidae	*Procavia*	*capensis*	Rock Hyrax	Least Concern	2
Rhinolophidae	*Rhinolophus*	*clivosus*	Geoffroy's Horseshoe Bat	Near Threatened	1
Soricidae	*Myosorex*	*varius*	Forest Shrew	Data Deficient	2
Vespertilionidae	*Neoromicia*	*capensis*	Cape Serotine	Least Concern	1
Viverridae	*Genetta*	*genetta*	Common Genet	Least Concern	3

ANNEX 3. LIST OF REPTILES

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

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Colubridae	*Boaedon*	*capensis*		Brown House Snake	Least Concern (SARCA 2014)	1
Colubridae	*Crotaphopeltis*	*hotamboeia*		Red-lipped Snake	Least Concern (SARCA 2014)	1
Colubridae	*Philothamnus*	*natalensis*	*occidentalis*	Western Natal Green Snake	Least Concern (SARCA 2014)	1
Cordylidae	*Cordylus*	*cordylus*		Cape Girdled Lizard	Least Concern (SARCA 2014)	2
Gekkonidae	*Afrogecko*	*porphyreus*		Marbled Leaf-toed Gecko	Least Concern (SARCA 2014)	1
Gekkonidae	*Pachydactylus*	*geitje*		Ocellated Gecko	Least Concern (SARCA 2014)	2
Testudinidae	*Chersina*	*angulata*		Angulate Tortoise	Least Concern (SARCA 2014)	8
Testudinidae	*Homopus*	*areolatus*		Parrot-beaked Tortoise	Least Concern (SARCA 2014)	2
Typhlopidae	*Rhinotyphlops*	*lalandei*		Delalande's Beaked Blind Snake	Least Concern (SARCA 2014)	1

ANNEX 3. LIST OF AMPHIBIANS

List of amphibians which are likely to occur in the vicinity of the Vryheid Grid Strengthening study site.

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Brevicepitidae	*Breviceps*	*fuscus*		Plain Rain Frog	Least Concern	2
Brevicepitidae	*Breviceps*	*montanus*		Cape Mountain Rain Frog	Least Concern	4
Bufonidae	*Amietophrynus*	*rangeri*		Raucous Toad	Least Concern	16
Hyperoliidae	*Hyperolius*	*horstockii*		Arum Lily Frog	Least Concern	4
Hyperoliidae	*Hyperolius*	*marmoratus*		Painted Reed Frog	Least Concern	2
Hyperoliidae	*Semnodactylus*	*wealii*		Rattling Frog	Least Concern	6
Pipidae	*Xenopus*	*laevis*		Common Platanna	Least Concern	4
Pyxicephalidae	*Amietia*	*fuscigula*		Cape River Frog	Least Concern	4
Pyxicephalidae	*Cacosternum*	*boettgeri*		Common Caco	Least Concern	12
Pyxicephalidae	*Cacosternum*	*nanum*		Bronze Caco	Least Concern	6
Pyxicephalidae	*Strongylopus*	*bonaespei*		Banded Stream Frog	Least Concern	1
Pyxicephalidae	*Strongylopus*	*fasciatus*		Striped Stream Frog	Least Concern	17
Pyxicephalidae	*Strongylopus*	*grayii*		Clicking Stream Frog	Least Concern	19
Pyxicephalidae	*Tomopterna*	*delalandii*		Cape Sand Frog	Least Concern	1