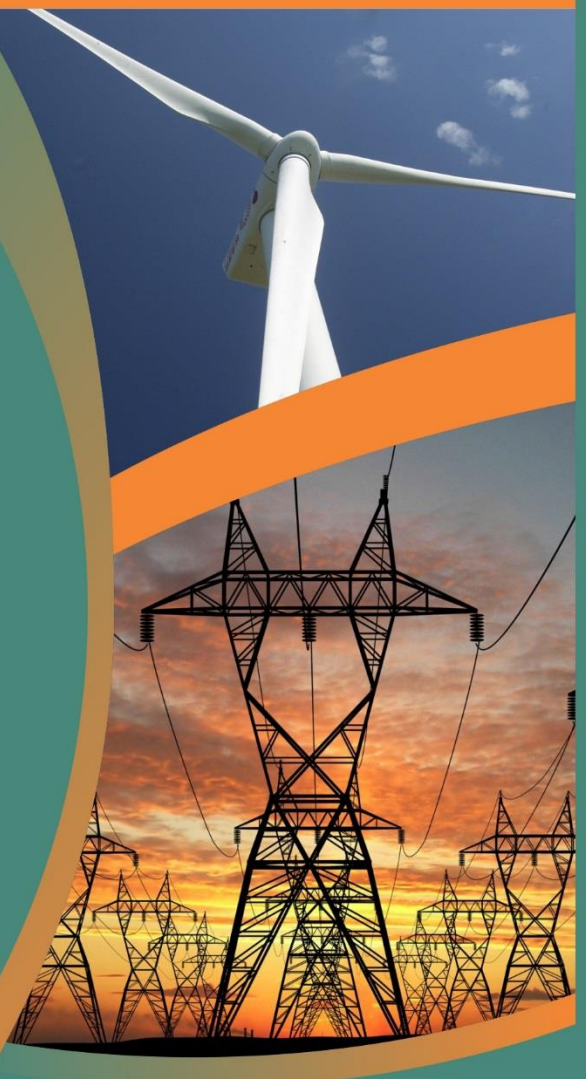
BASIC ASSESSMENT REPORT

Basic Assessment for the Proposed Construction and Operation of Electrical Grid Infrastructure to support the Sutherland, Sutherland 2 and Rietrug Wind Energy Facilities (WEFs), Northern and Western Cape Provinces



APPENDIX D.1: Terrestrial Ecology Impact Assessment

FAUNA & FLORA SPECIALIST STUDY

Basic Assessment Report for the Proposed Grid Connection Infrastructure for the Mainstream Sutherland Wind Energy Facilities

Report prepared for:

CSIR – Environmental Management Services

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Report prepared by:

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Version 1: July 2019

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SPECIALIST EXPERTISE

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Ecological Solutions for People & the Environment

Simon Todd is Director and principal scientist at 3Foxes Biodiversity Solutions and has over 20 years of experience in biodiversity measurement, management and assessment. He holds a MSc, Cum Laude, in Conservation Biology from the University of Cape Town. He has provided specialist ecological input on more than 200 different developments distributed widely across the country. This includes input on the Wind and Solar SEA (REDZ) as well as the Eskom Grid Infrastructure (EGI) SEA and Karoo Shale Gas SEA. He is on the National Vegetation Map Committee as representative of the Nama and Succulent Karoo Biomes. Simon Todd is a recognised ecological expert and is a past chairman of the Arid-Zone Ecology Forum. He is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

A selection of recent work is as follows:

Strategic Environmental Assessments

- Co-Author. Chapter 7 - Biodiversity & Ecosystems - Shale Gas SEA. CSIR 2016.
- Co-Author. Chapter 1 Scenarios and Activities – Shale Gas SEA. CSIR 2016.
- Co-Author – Ecological Chapter – Wind and Solar SEA. CSIR 2014.
- Co-Author – Ecological Chapter – Eskom Grid Infrastructure SEA. CSIR 2015.

Recent Specialist Ecological Studies in the Vicinity of the Current Site

- Esizayo Wind Energy Facility, Roggeveld. WSP 2017.
- Maralla East & Maralla West WEFS, Roggeveld. WSP. 2017.
- Gunstfontein Wind Energy Facility, Sutherland. Savannah Environmental. 2016.
- Brandvalley Wind Energy Facility, Roggeveld. EOH. 2016.
- Kareebosch Wind Energy Facility, Roggeveld. Savannah Environmental 2015.
- Roggeveld Wind Energy Facility. 2013.
- Komsberg East & Komsberg West WEFs. Arcus Consulting. 2016.

SPECIALIST DECLARATION

I, .Simon Todd....., as the appointed independent specialist, in terms of the 2014 EIA Regulations (as amended), hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: 

Name of Specialist: ____Simon Todd_____

Date: ___21 June 2019_____

EXECUTIVE SUMMARY

The project applicant is proposing the development of a 132 kV transmission line, a major transmission substation and 400 kV line within the Renewable Energy Development Zone (REDZ): 2 Komsberg and the Central Power Corridor that was gazetted in February 2018. The purpose of the Terrestrial Ecology Specialist Study is to describe and detail the ecological features of the proposed grid connection, provide an assessment of the ecological sensitivity of the site and identify the likely impacts associated with the development of the grid connection and substation and to provide recommendations or mitigation measures to avoid or reduce potential negative environmental impacts.

The Mainstream Grid Connection, substation and associated infrastructure is located in a potentially sensitive area which includes the Roggeveld Centre of Endemism as well as potential habitat of the Riverine Rabbit and several other listed fauna, some of which can be confirmed present. The footprint of the 132kV section of the line can however be reduced to a low level and sensitive habitats such as the major drainage systems along the route can also largely be avoided. A pre-construction walk-through of the final approved power line route and development footprint is recommended in order to refine the final pylon locations and minimise impacts on SCC and sensitive habitats. The major residual risk factor associated with the 132kV section of the route is likely to be erosion associated with disturbance on the steep mountain slopes the route passes through on the way to the new substation.

The substation site is considered acceptable but not ideal as a location for the substation as it is positioned in an area with low hills and numerous small drainage lines leading off the slopes onto the adjacent plains. A significant amount of earth moving and levelling would be required to prepare the site. However, the vegetation of the affected area is typical of the Gamka Karoo vegetation type and no species of high conservation concern were observed within the development footprint. The 400kV section of the power line traverses the open gravelly plains of the Gamka Karoo to the connection point with the Eskom 400kV lines. The major sensitive feature along this section of the route are the drainage lines with associated floodplains which traverse this area. As the spans between pylons in this area would be large, there are no drainage lines that could not be spanned by the power line. As such, impact on these features can be reduced to a low acceptable level.

A part of the power line route is located within CBAs, which raises the suitability of development within these areas into question. While the development would result in some habitat loss within these areas, the total footprint would amount to a few hectares at most and is not likely to impact the ecological functioning or conservation value of the affected CBAs. The potential for cumulative impacts in the wider Roggeveld area is high as a result of the large number of approved wind energy developments in this area. The current development is however to the east of the main development area and the contribution of the current development to cumulative impact is considered acceptable.

Impact Statement – Mainstream Grid Connection and Associated Infrastructure

The Mainstream grid connection and substation are considered acceptable and would generate low post-mitigation impacts on fauna and flora. There are no specific long-term impacts likely to be associated with the development of the Mainstream Grid Connection and substation that cannot be reduced to a low significance. The contribution of the power line and substation components to cumulative impact in the area would be low and is considered acceptable. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

LIST OF ABBREVIATIONS

BA	Basic Assessment
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
ESA	Ecological Support Area
NC-PAES	Northern Cape Protected Area Expansion Strategy
NFEPA	National Freshwater Ecosystem Priority Assessment
NPAES	National Protected Area Expansion Strategy
SCC	Species of Conservation Concern

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Addressed in the Specialist Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Pg. 1..
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Pg. 2.
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 3
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Sections 1 and 2
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Sections 1 and 2
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 2
g) an identification of any areas to be avoided, including buffers;	Section 3
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 3
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 3
k) any mitigation measures for inclusion in the EMPr;	Section 5
l) any conditions for inclusion in the environmental authorisation;	Section 6
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 5
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 6
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	See Main BA Report
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	See Main BA Report
q) any other information requested by the competent authority.	See Main BA Report
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Not applicable. At the time of compiling this Specialist Assessment Report, the protocols were not yet gazetted for implementation.

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TABLES AND FIGURES

Fauna & Flora Specialist Study

1. INTRODUCTION AND METHODOLOGY

1.1. SCOPE AND OBJECTIVES

The project applicant is proposing the development of a 132 kV transmission line, a major transmission substation and 400 kV line within the Renewable Energy Development Zone (REDZ): 2 Komsberg. The 132 kV line routing proposed as part of this application has been previously assessed as part of the proposed construction of the electrical grid infrastructure for the Sutherland Wind Energy Facility (14/12/16/3/3/1/1816), Rietrug Wind Energy Facility (14/12/16/3/3/1/1815) and Sutherland 2 Wind Energy Facility (14/12/16/3/3/1/1814/AM1). These projects received Environmental Authorisation in February 2018. Within the authorisations, the alternative line routing "1" was submitted as the preferred routing and subsequently approved.

The 132 kV line routing proposed as part of this application was considered as alternative line routing "2". The line routing did not include any environmental fatal flaws and is a technical feasible option to enable the evacuation of the electricity generated by the abovementioned Wind Energy Facilities into the National Grid.

The purpose of the Terrestrial Ecology Basic Assessment Report is to describe and detail the ecological features of the proposed grid connection, provide an assessment of the ecological sensitivity of the site and identify the likely impacts associated with the development of the grid connection and substation. A site visit as well as a desktop review of the available ecological information for the area was conducted in order to identify and characterise the ecological features of the site. Potential impacts are assessed for the grid connection and associated infrastructure, for the pre-construction, construction, operation, and decommissioning phases of the development. A variety of avoidance and mitigation measures associated with each identified potential impact are recommended to reduce the likely impact of the development, which should be included in the Environmental Management Programme (EMPr) for the development. The full scope of study is detailed below.

1.2. TERMS OF REFERENCE

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 (incl. 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; and
    - 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 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; and
    - a comparative assessment of the positive and negative implications of identified alternatives.

General Considerations:

- Disclose any gaps in information or assumptions made.
- Identify recommendations for mitigatory measures to minimise impacts.
- Outline additional management guidelines.
- Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the EMPr for faunal related issues.

A description of the potential impacts of the development and recommended mitigation measures are to be provided, which will be separated into the following project phases:

- Pre-construction
- Construction
- Operational Phase
- Decommissioning Phase

2. APPROACH AND METHODOLOGY

2.1. ASSESSMENT PHILOSOPHY & RATIONALE

This assessment is conducted according to the 2017 EIA Regulations (Government Notice Regulation 326) in terms of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA), as well as 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 (RDB) 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 EMPr 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 BA 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.

2.2. SITE VISITS & FIELD ASSESSMENT

The site was visited on the 17th of June 2019. During the site visit, the different biodiversity features, habitat, and landscape units present in the study area were identified, mapped and characterised in the field. Specific features visible on the satellite imagery of the site were also marked for field inspection and were verified and assessed during the site visit. Walk-through-surveys were conducted within representative areas across the different habitat units identified and all plant and animal species observed were recorded. This included a full walk-through survey of the substation footprint area.

2.3. ASSUMPTIONS AND LIMITATIONS

The current study consisted of a detailed field assessment as well as a desktop study, which serves to significantly reduce the limitations and assumptions required for the study. For the current assessment, there had been some autumn and early winter rains and which resulted in a good response of the vegetation with a well-developed annual and forb component. Due to the favourable conditions, there are few limitations with regards to the timing or results of the vegetation assessment. The species lists obtained for the site are therefore considered comprehensive and reliable.

In terms of fauna, the major limitation associated with the project is the narrow sampling window. Many fauna are difficult to observe in the field and their potential presence at the site is evaluated based on the literature and available databases as well as previous experience in the area. Many remote areas have not been well-sampled with the result that the species lists derived for the area form the literature do not always adequately reflect the actual fauna present at the site. In order to reduce this limitation, and ensure a conservative approach, the species lists derived for the site from the literature were obtained from an area significantly larger than the study site and are likely to include a much wider array of species than actually occur at the site. This is a cautious and conservative approach which takes the study limitations into account.

2.3.1. Source of Information

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

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina & Rutherford 2006 and 2012 Powrie update) as well as the National List of Threatened Ecosystems (2011), where relevant.
- Information on plant species recorded for the broad area around the site was extracted from the SANBI POSA database hosted by SANBI. The species list was derived from a considerably larger area than the study site, but this is necessary to ensure a conservative approach as well as counter the fact that the site itself or the immediate area has not been well sampled in the past.
- The IUCN conservation status 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 (2019).

Ecosystem

- Critical Biodiversity Areas (CBAs) were extracted from the Western Cape Biodiversity Spatial Plan (2017) for the Laingsburg District as well as the Northern Cape Critical Biodiversity Areas (Oosthuysen & Holness 2016).

- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas 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 Animal Demography Unit (ADU) Virtual Museum spatial database (http://vmus.adu.org.za/).
- 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.
- Apart from the literature sources, additional information on fauna was extracted from the ADU web portal http://vmus.adu.org.za
- 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 mammals is based on the IUCN Red List Categories (EWT/SANBI 2016), while reptiles are based on the South African Reptile Conservation Assessment (Bates et al. 2013) and amphibians on Minter et al. (2004) as well as the IUCN (2018).

2.4. DESCRIPTION OF PROJECT ASPECTS RELEVANT TO TERRESTRIAL ECOLOGICAL IMPACTS

The project consists of a 132 kV transmission line, a major transmission substation and 400 kV line. The 132 kV line would have a generally low terrestrial impact as the footprint of each pylon would be relatively small. However, the line also traverses several steep areas where the risk of erosion damage would be high and specific measures to limit erosion potential would need to be implemented. The transmission substation has a relatively small total footprint but would result in a high local impact as the entire substation footprint would need to be cleared and leveled. The final section of the power line to link the substation to the Eskom grid would be a 400kV line which would have a significantly bigger footprint per pylon but as this section of the line would only be 4km and the spacing of the pylons would be more than for the 132kV line, the overall footprint would also be small. In addition, the 400kV power line route is relatively flat and as such, the risk of secondary impact from erosion would be low. Overall, the major source of impact from the development for fauna and flora would predominantly be habitat loss and disturbance associated with the construction phase of the development. Scope for long-term impact associated with the operational phase of the development would be relatively low and provided that mitigation in the construction phase is effectively applied, there would be little scope for interaction or long term impact associated with the power line and substation infrastructure.

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1. NATIONAL VEGETATION TYPES

According to the national vegetation map, there are three vegetation types along the grid connection (Figure 1). The initial section on the plateau towards the wind farm is classified as Roggeveld Shale Renosterveld, the central section of the 132kV line is Central Mountains Shale Renosterveld and the final section of 132kV line as well as the substation and 400kV line fall within the Gamka Karoo vegetation type.

Roggeveld Shale Renosterveld occurs in the Northern and Western Cape and occupies the majority of the Roggeveld from the edge of the Western edge of the Great Escarpment mostly above the Tanqua Basin, reaching as far east as the higher-lying areas of the Teekloof Pass south of Fraserburg along the northwest summit plateaus of the Nuweveldberge. It occupies undulating, slightly sloping plateau landscapes, with low hills and broad shallow valleys supporting mainly moderately tall shrublands dominated by renosterbos with a rich geophytic flora in the wetter and rocky habitats. It occurs mostly on mudrocks and sandstones of the Adelaide Subgroup. The land types present are mostly Fc and Da. Mucina & Rutherford (2006) list 12 endemic species for this vegetation type, which is a large number given that the total extent of the vegetation type is only 2917 km^2.

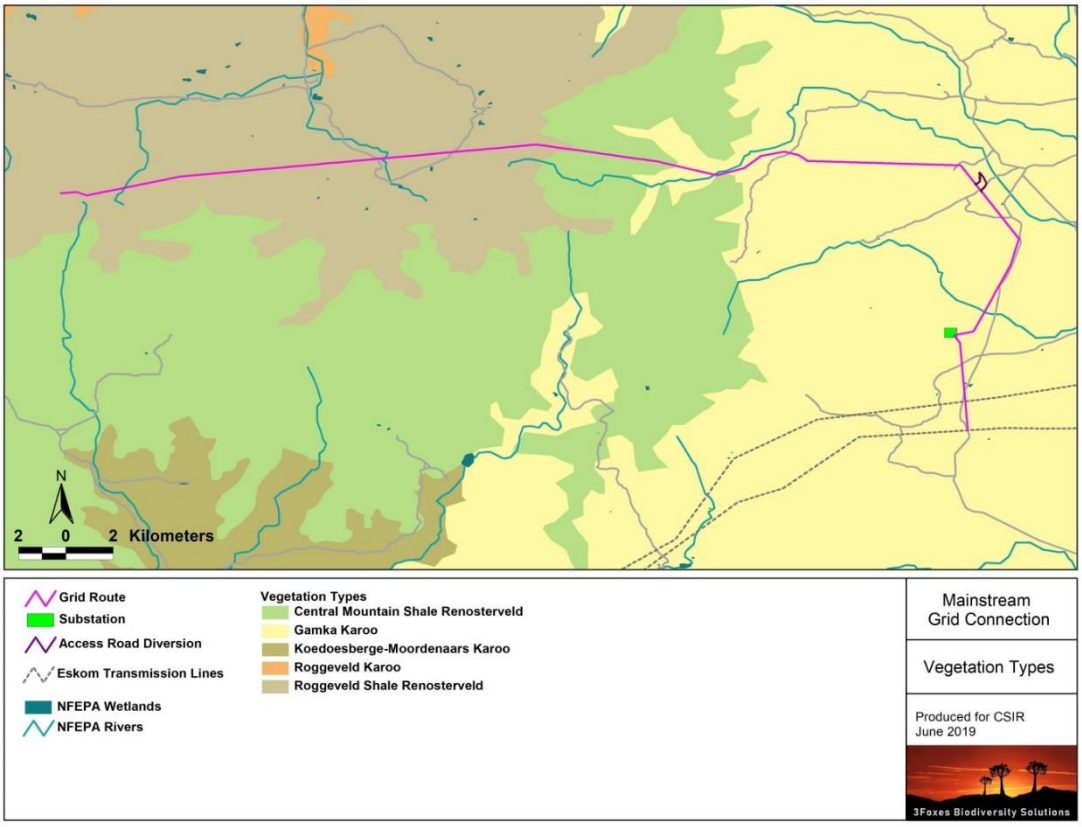

Figure 1. Vegetation map of the grid connection, including the substation site and the 400kV section to the existing Eskom Grid.

According to Mucina & Rutherford (2006) Central Mountain Shale Renosterveld occurs in the Western and Northern Cape on the southern and southeastern slopes of the Klein Roggeveldberge and Komsberg below the Komsberg section of the Great Escarpment as well as farther east below Besemgoedberg and Suurkop and in the west in the Karookop area. It is associated with clayey soils overlying Adelaide Subgroup mudstones and subordinate sandstones with landtypes mostly lb and Fc. Although this vegetation type is classified as Least Threatened, it has a very limited extent of 1 236km^2 and is not formally conserved anywhere. Levels of transformation are however low and it is considered to be about 99% intact. Although no endemic species are known to occur within this vegetation type, little is known about this Renosterveld type and it has been poorly sampled. Experience from other projects in the area indicate that this should be considered to be a relatively sensitive vegetation type with a relatively high abundance of species of conservation.

The Gamka Karoo vegetation type has a total extent of 20 324 km^2 and occurs in the large basin bounded by the Nuweveld Mountains in the north and northwest and the Swartberg and adjacent Cape Fold Mountains in the south. Gamka Karoo is classified as Least Threatened and less than 1% has been transformed (Mucina & Rutherford 2006). The vegetation type is however poorly protected as less than 2% falls within formal protected areas compared to the target of 16%. Gamka Karoo is characterised by irregular to slightly undulating plains covered in dwarf spiny shrubland dominated by karoo dwarf shrubs, with occasional low trees. Dense stands of perennial bunchgrasses cover broad sandy bottomlands. Geology consists of mudstones and sandstones of the Beaufort Group with some Ecca shales supporting very shallow and stony soils of the Glenrosa and Mispah forms, typical of the Fc land type. It is regarded as one of the most arid units of the Nama-Karoo Biome, with rainfall varying from 100mm in some areas in the rain shadow of the Cape Fold Mountains to about 240mm against the great escarpment.

3.2. SITE DESCRIPTION

The various major infrastructure components associated with the development are illustrated below. The focus is on the new components that were not previously assessed as part of the previous application associated with the 132kV section of the power line. As such, the major focus is the 400kV section of power line and the substation.

Figure 2. Looking towards the Eskom 400kV power line where the current planned 400kV lines would link into the existing line. Typical and dominant species include *Stipagrostis ciliata, Eriocephalus ericoides, Eriocephalus eximus, Lycium prunus-spinosa, Gazania lichtensteinii, Searsia burchellii, Pentzia incana, Cenchrus ciliaris, Garuleum bipinantum, Zygophyllum retrofractum, Acanthopsis disperma*.

Figure 3. Looking south from the substation site along the alignment of the 400kV line, showing the extensive gravel plains of the Gamka Karoo.

Figure 4. Looking north from the substation site along the approach of the 132kV line, showing the extensive open plains of the Gamka Karoo vegetation type which characterises this area.

Figure 5. Looking south over the substation site from near the northern boundary of the site.

Figure 6. Looking south along the final section of the 132kV line, with the Eskom 400kV lines in the distance.

Figure 7. The larger drainage lines of the site are typically fringed by trees such as *Acacia karoo* and *Searsia lancea*, fringed with grasses and tall shrubs such as *Stipagrostis namaquensis*, *Diospyros lycioides*, *Cenchrus ciliaris*, *Salsola aplylla* and *Lycium prunus-spinosa*.

3.3. CRITICAL BIODIVERSITY AREAS

The Critical Biodiversity Areas map for the study area is depicted below in Figure 8 and is composed of the 2017 Northern Cape CBA map and the 2017 Western Cape BSP for the Laingsburg municipality. There are some short sections of the power line route within the Western Cape that are CBA 1 associated with water courses. Within the Northern Cape, a large part of the route is either CBA 1 or CBA 2. Development within CBAs can have negative impacts on biodiversity pattern and process and is generally considered undesirable. The footprint within the CBAs would however be low and the ecological functioning of the CBAs would not be compromised by the development. Overall the impact of the development on CBAs and broad-scale ecological processes would be low and no major impacts on ecological processes would occur.

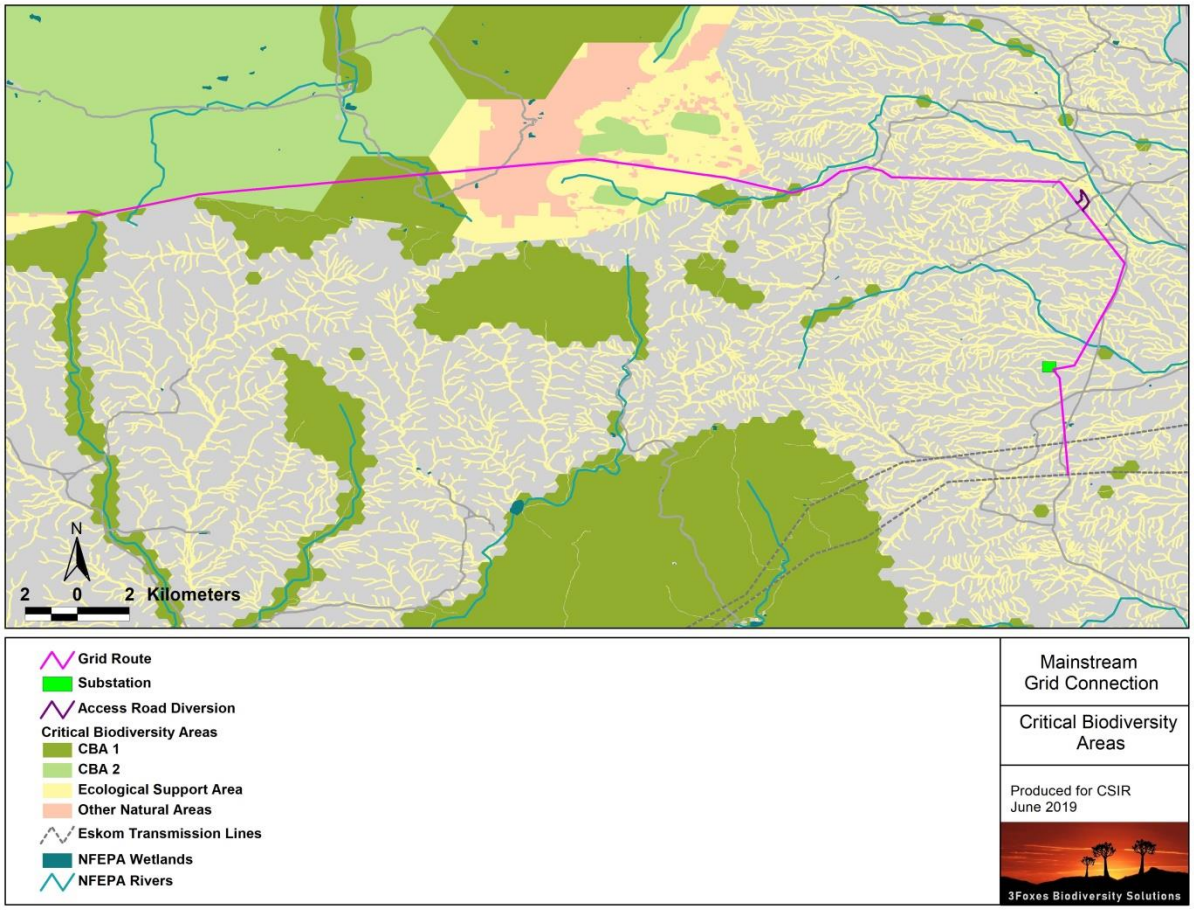

Figure 8. Critical Biodiversity Areas for the study area, which is based on the CBA map for the Northern Cape and the Western Cape BSP for the Laingsburg District.

3.4. FAUNAL COMMUNITIES

Mammals

The substation and power line route is likely to have moderate to relatively high overall mammalian species richness given the range of habitats traversed by the line. The site falls within or near the edge of the distribution range of at least 44 terrestrial mammals. Due to differences in vegetation, rainfall and other climatic variables, there is also likely to be a relatively large differentiation of the species associated with the plateau and rugged uplands compared to those present within the lower-lying Gamka Karoo around the substation site. The ridges, hills and plateaus of the Roggeveld provide suitable habitat for species which require or prefer rocky habitats such as Cape Rock Elephant Shrew *Elephantulus edwardii*, Hewitt's Red Rock Hare *Pronolagus saundersiae*, Namaqua Rock Mouse *Micaelamys namaquensis* and Rock Hyrax *Procavia capensis*. Larger species commonly observed on the plateau include Grey Rhebok *Pelea capreolus* (NT) and Klipspringer *Oreotragus oreotragus*. The introduced Fallow Deer, *Dama dama* is also common in the Roggeveld and is likely to occur in the high-lying parts of the site along the 132kV line. The lowlands towards the substation site are likely to contain an abundance of species associated with lowland habitats including drainage lines and floodplains, including Brants's Whistling Rat *Parotomys brantsii*, the Bush Vlei Rat *Otomys unisulcatus*, Steenbok *Raphicerus campestris*, Hairy-footed Gerbil *Gerbillurus paeba* and Common Duiker *Sylvicapra grimmia*.

Listed species which may occur in the affected area includes the Black-footed Cat *Felis nigripes* (VU), Leopard *Panthera pardus* (VU), Grey Rhebok *Pelea capreolus* (NT) and Riverine Rabbit *Bunolagus monticularis* (CR). The Grey Rhebok is confirmed present in the area and is common along the plateau areas affected by the 132kV line. There would be a small extent of habitat loss for this species at the site as a result of the development as well as some construction and operational phase disturbance. However, this would be a very small area that would not compromise the local population to any degree and as this species would still be able to use the site, a long-term significant impact is not likely. As Leopard occur at a very low density with large home ranges, the development would not significantly impact the extent of available habitat for this species, which is unlikely to be present within the development target areas on a regular basis. The Black-footed Cat has a broad distribution across South Africa and while it may occur in the area, the area is not known to be of any significance for this species. The relatively limited footprint of the development is not likely to compromise the local or regional populations of this species, if it is present at all. The Riverine Rabbit is a potential concern given the high level of conservation concern associated with this species. However, the substation site is not within suitable habitat, while the larger drainage lines along the132kV section of the power line are potentially suitable as habitat, but the footprint within these areas would be minimal as the power line would be able to span these features and there are not likely to be any pylons within the drainage features themselves. As such, a significant impact on the Riverine Rabbit is not likely to occur as a result of the development as this is not considered to represent a major concern associated with the development.

Reptiles

According to the distribution maps available in the literature, as many as 52 reptiles could occur within the assessed powerline corridor or in the general vicinity of the site. However, according to the records within the SARCA database, only 45 have actually been recorded in the area. This represents a relatively high total, which can be ascribed to the wide range of habitats available in the affected area. In terms of species of conservation concern, the only listed species recorded in the area is the Karoo Padloper *Homopus boulengeri* which is listed as Near Threatened.

Species observed in the area during the site visit or on other visits to the area include Karoo Tent Tortoise *Psammobates tentorius tentorius*, Angulate Tortoise *Chersina angulata*, Puff Adder *Bitis arietans*, Karoo Girdled Lizard *Cordylus polyzonus*, Southern Rock Agama *Agama atra*, Cape Skink *Mabuya capensis*, Variegated Skink *Trachylepis variegata*, Common Sand Lizard *Pedioplanis lineoocellata pulchella* and Cape Cobra *Naja nivea*. Although there are a variety of different habitats present, the generally intact nature of the area means that most habitats have associated reptiles. Habitats of higher potential sensitivity include drainage lines and vleis and the rocky bluffs and cliffs of the site. In terms of impacts of the development on reptiles, the major impact is likely to come from disturbance during the construction phase which would be transient and localised and consequently of low long-term consequence.

Figure 9. The Karoo Tent Tortoise *Psammobates tentorius tentorius* is common in the areas of Gamka Karoo near to the substation.

Amphibians

Although nine amphibians have been recorded from the area, the actual number present within the affected area is likely to be much lower as there is not natural perennial water along the power line route and substation site. All of the species recorded in the area are widespread

species of low conservation concern. Within the uplands species such the Cape River Frog *Amietia fuscigula* is present along the larger drainage lines in pools and in the farm dams on the plateau. Species such as Karoo Caco *Cacosternum karooicum*, Karoo Toad *Vandijkophrynus gariepensis* and Cape Sand Frog *Tomopterna delalandii* are less dependent on water and are likely to be more widespread across the area. Given the aridity or unsuitable steep nature of large sections of the power line route, the most important parts of the site for amphibians are the vicinity of the larger drainage lines and the wetlands and pans of the higher-lying plateau area.

Erosion would be a primary risk factor for amphibians associated with the development, as this would impact water quality and amphibian habitat. During the construction phase, pollution, particularly from petrochemicals would also be a potential risk factor. With the appropriate mitigation, these risks can however be reduced to a low level.

3.5. CUMULATIVE IMPACTS

The cluster of renewable energy project applications currently registered with the Department of Environmental Affairs (DEA) within a 50 km radius around the proposed development are included in APPENDIX E of this report.

Although there is a lot of development impact from wind farm development in the Roggeveld, this is to the west of the current development area. Development pressure in the current area is generally low and the affected environment is still overwhelmingly intact. The contribution of the current development would be about 18ha for the substation and about 10ha for the power line. This is seen as an insignificant contribution to transformation in the area given the intact nature of the landscape and the current low development pressure within the affected area. Overall, cumulative impacts associated with the development are seen as being of low significance and considered to be acceptable from an ecological perspective.

3.6. ECOLOGICAL SENSITIVITY

The ecological sensitivity map for the grid connection route and substation site is illustrated below. The majority of the route traverses open plains on the escarpment or on the lower elevation plains of the Gamka Karoo below. The plains are generally considered to represent low sensitivity areas with a relatively low abundance of species of conservation concern. The main areas of sensitivity along the power line route would be the numerous drainage lines that the power line and access road must traverse as well as several areas of steep slopes that the line and road must negotiate. In some cases, such as the section where the road deviates from the line, such minor deviations between the road and the line are required as the line can span steep sections of rugged terrain, whereas the access road should preferably take less steep routes and avoid areas where the risk of erosion would be very high. The deviation is considered acceptable and runs between the higher sensitivity drainage line and the steeper parts of the adjacent slope. In terms of the power line itself, the span between pylons can usually be extended quite far in

rugged terrain, with the result that the overall footprint within these more sensitive areas can be reduced to a low level. Provided that measures to reduce secondary impact such as erosion are implemented, then risk through these areas can be reduced to an acceptable level. The impact on the line on fauna would largely be restricted to the construction phase and associated with disturbance during construction. During the operational phase, impacts on fauna would be very low. The substation site is not particularly flat and would require a large amount of earth-moving to level the site. As such, it is not considered to represent an ideal site for the substation, but as the area is considered largely moderate sensitivity and no particularly high value species or ecosystems are present within the footprint, it is considered acceptable and of moderate local impact.

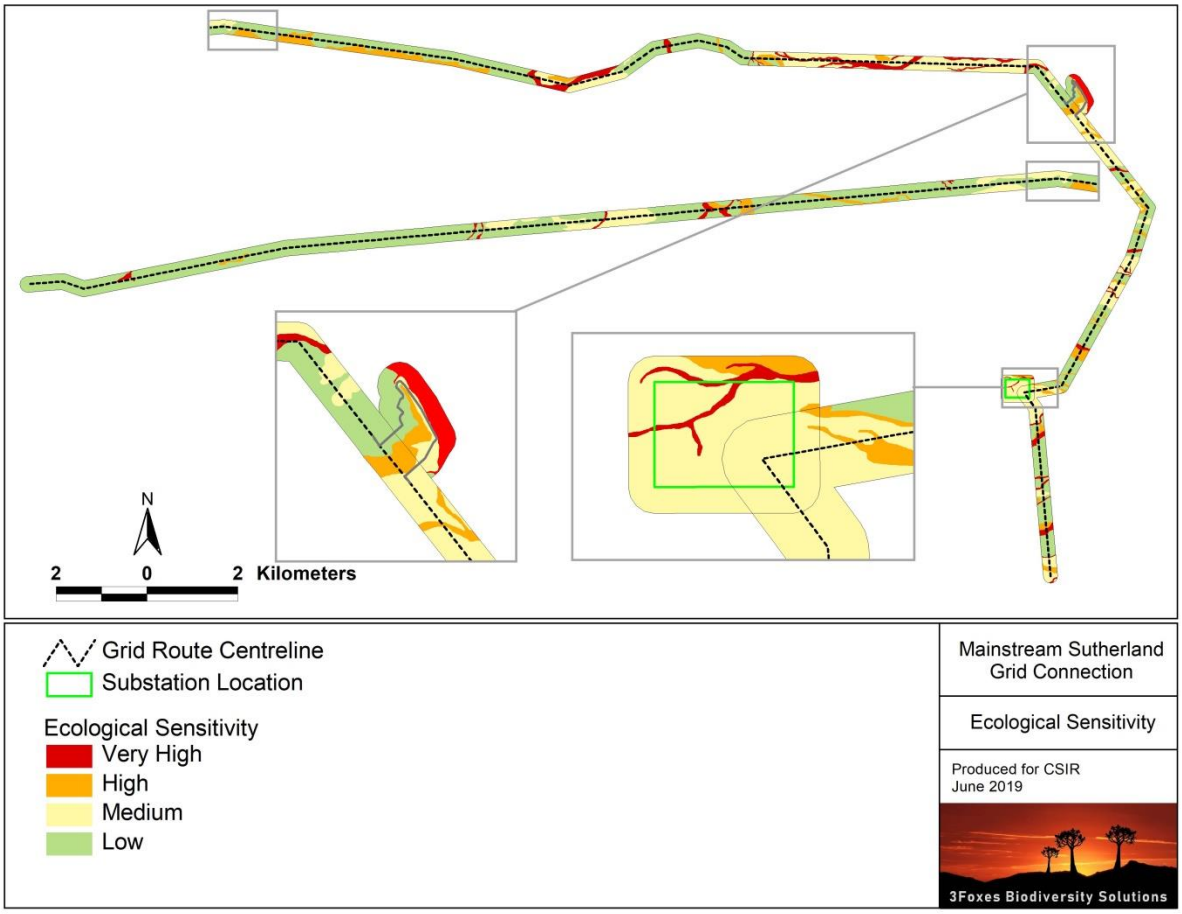

Figure 10. Ecological sensitivity map for the grid connection route and substation site.

4. APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

A clearing and translocation permit would be required from CapeNature before construction commences. A pre-construction walk-through would be required to inform the permit application. In addition, if there are any nationally protected trees within the development footprint a destruction permit from DAFF would also be required. No nationally protected trees were observed within the development footprint and the presence of any such trees in the area is highly unlikely.

4.1. ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

The ecological impacts associated with the development of the power line and substation and associated infrastructure are assessed below for the construction, operation and decommissioning phases of the development.

4.2. CONSTRUCTION PHASE IMPACTS

Impacts on vegetation and protected plant species

A variety of protected species occur along the route and within the substation site and would be impacted as a result of the development. Vegetation clearing during construction will lead to the loss of currently intact habitat within the development footprint and is an inevitable consequence of the development. As this impact is certain to occur it is assessed for the construction phase as this is when the impact will occur, although the consequences will persist for a long time after construction.

Aspect/Activity	**Clearing of vegetation for infrastructure**
Type of impact	Direct
Potential Impact	Clearing of vegetation for construction will result in habitat loss and potential impact on plant SCC
Impact Significance (Pre-Mitigation)	Moderate
Mitigation Required	• Minimise development of infrastructure within identified Very High sensitivity areas. • Pre-construction walk-through of the development footprint to locate and identify protected species within the development footprint. All relevant clearing or translocation permits must be obtained before construction starts. • Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. • Environmental Control Officer (ECO) to provide supervision and oversight of vegetation clearing activities. • All cleared areas that are not under hard infrastructure will need to be rehabilitated with locally occurring species.

Aspect/Activity	Clearing of vegetation for infrastructure
	• All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area. • Temporary lay-down areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.
Impact Significance (Post-Mitigation)	Moderate

Direct faunal impacts

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. 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.

Aspect/Activity	Habitat destruction and general construction activity
Type of impact	Direct
Potential Impact	Clearing of vegetation for construction will result in habitat loss and impact on faunal SCC
Impact Significance (Pre-Mitigation)	Moderate
Mitigation Required	• Minimise the development footprint within areas of high fauna importance such as rocky outcrops and drainage lines. • Search and rescue for reptiles and other vulnerable species during construction, before areas are cleared. • Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer. • All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • If trenches need to be dug for electrical cabling or other purpose, these should not be left open for extended periods of time as fauna may fall in and become

Aspect/Activity	Habitat destruction and general construction activity
	trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench. • No electrical fencing to be constructed within 30 cm of the ground as tortoises become stuck against such fences and are electrocuted. • Limit access to the site and ensure that construction staff and machinery remain within the demarcated construction areas during the construction phase. • Environmental induction for all staff and contractors on-site.
Impact Significance (Post-Mitigation)	Low

Impacts on CBAs and future conservation options

The power line traverses several areas of CBA 1 and CBA 2. This would result in some habitat loss as well as potentially affect specific features of conservation concern within the CBAs. The total footprint in these areas would however be low and this is not likely to significantly impact the ecological functioning or conservation value of the affected CBAs.

Aspect/Activity	Habitat loss within CBAs
Type of impact	Direct
Potential Impact	Clearing of vegetation for construction will result in habitat loss within CBAs
Impact Significance (Pre-Mitigation)	Moderate
Mitigation Required	• Minimise the development footprint within the areas of CBA as much as possible and ensure that any disturbed areas are rehabilitated after construction. • The final location of the pylons should be checked in the field before construction during the final walk-through of the power line to ensure that these are positioned so as to minimise the impact of the power line of species and habitats of conservation concern.
Impact Significance (Post-Mitigation)	Low

4.3. OPERATIONAL PHASE IMPACTS

Potential impact on Fauna due to Operation

Operational activities will create some disturbance that may deter some sensitive fauna from the area. Species which rely on hearing for predator avoidance or communication may be particularly susceptible although most animals are able to make some behavioral adjustments to compensate for increased background noise levels. This is a low-level continuous impact which could have significant cumulative impact on sensitive species.

Aspect/Activity	**Maintenance and Operational activities**
Type of impact	Direct
Potential Impact	Impact on fauna due to disturbance
Impact Significance (Pre-Mitigation)	Low
Mitigation Required	• No electrical fencing within 30cm of the ground as tortoises become stuck against such fences and are electrocuted. • Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. • If any parts of the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs) as far as possible, which do not attract insects. • All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.
Impact Significance (Post-Mitigation)	Low

Potential increase in soil erosion in the post-construction period

The soil disturbance created during construction will leave the affected areas vulnerable to erosion for some years into the operational phase. Disturbed areas which are not within the footprint should be rehabilitated with indigenous species sourced from the local environment, while access roads should be checked regularly for erosion damage as many parts of the power line route are in steep areas where the risk of erosion is high.

Aspect/Activity	**Disturbance created during construction**
Type of impact	Direct
Potential Impact	Increased soil erosion during operation due to construction phase disturbance
Impact Significance (Pre-Mitigation)	Low

Aspect/Activity	Disturbance created during construction
Mitigation Required	• Use of geotextiles and other active rehabilitation measures during and after construction to limit soil loss and movement at the site. • There should be regular (at least annual) monitoring for erosion throughout the operational period and any problems detected should be addressed through the implementation of erosion control measures. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • All disturbed and cleared areas should be revegetated with indigenous perennial shrubs, grasses and succulents from the local area.
Impact Significance (Post-Mitigation)	Low

4.4. DECOMMISSIONING PHASE

Potential impact on Fauna due to Decommissioning Activities

Increased levels of noise, pollution, disturbance and human presence during decommissioning will be detrimental to fauna. Sensitive and shy fauna would move away from the area during the decommissioning as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the activities and might be killed. This would however be transient and restricted to the period when heavy machinery was operational on site and in the long-term the habitat would be restored for faunal access and use.

Aspect/Activity	Decommissioning activities
Type of impact	Direct
Potential Impact	Impact on fauna due to decommissioning phase disturbance
Impact Significance (Pre-Mitigation)	Low
Mitigation Required	• Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.

Aspect/Activity	Decommissioning activities
	• All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. • No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. • All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan, and as per the agreements with the land owners concerned. • All cleared and disturbed areas should be rehabilitated with locally occurring perennial species.
Impact Significance (Post-Mitigation)	Low

Potential increase in soil erosion as a result of decommissioning phase activities

The removal and clearing of the site infrastructure would create some soil disturbance which would leave these areas vulnerable to erosion. The disturbed areas should be rehabilitated at decommissioning with indigenous species sourced from the local environment to reduce this risk.

Aspect/Activity	Decommissioning phase activities
Type of impact	Direct
Potential Impact	Increased soil erosion due to decommissioning phase disturbance
Impact Significance (Pre-Mitigation)	Low
Mitigation Required	• Use of geotextiles and other active rehabilitation measures during and after decommissioning to limit soil loss and movement at the site. • There should be regular monitoring for erosion for at least 5 years after decommissioning by the applicant or appointed entity to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • All disturbed and cleared areas should be revegetated

Aspect/Activity	Decommissioning phase activities
	with indigenous perennial shrubs, grasses and succulents from the local area.
Impact Significance (Post-Mitigation)	Low

Potential increase alien plant invasion as a result of decommissioning phase activities

The removal and clearing of the site infrastructure would create some soil disturbance which would leave these areas vulnerable to alien plant invasion from species such as *Prosopis*. Follow-up monitoring and clearing would be required to reduce and mitigate this risk.

Aspect/Activity	Decommissioning phase activities
Type of impact	Direct
Potential Impact	Increased alien plant invasion due to decommissioning phase disturbance
Impact Significance (Pre-Mitigation)	Low
Mitigation Required	• Alien management plan to be implemented during the decommissioning phase of the development, which makes provision for regular alien clearing and monitoring for at least 5 years after decommissioning. • Active rehabilitation and revegetation of previously disturbed areas with indigenous species selected from the local environment. • Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after decommissioning activities are complete to encourage natural regeneration of the local indigenous species. • Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned. • Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning or until alien invasives are no longer a problem. • Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.
Impact Significance (Post-Mitigation)	Low

4.5. CUMULATIVE IMPACTS

There are several other renewable energy developments in the wider Roggeveld area and along with the current development, these would potentially generate significant cumulative impacts on habitat loss and fragmentation with negative consequences for broad-scale ecological processes such as dispersal and climate change resilience. These projects are however restricted to the Roggeveld areas to the west of the current site and the majority of the footprint of the current development would be within the Gamka Karoo where current levels of cumulative impact as a result of renewable energy development or electrical transmission infrastructure is currently still very low. The total contribution of the current development is estimated at approximately 28 ha and this is not considered highly significant in context of the surrounding landscape.

Aspect/Activity	**Presence and operation of the development**
Type of impact	Indirect
Potential Impact	Cumulative impact due to habitat loss and fragmentation
Impact Significance (Pre-Mitigation)	Low
Mitigation Required	• Minimise the development footprint as far as possible and ensure that the management plans for the development are optimally implemented during the operational phase of the development to ensure that the indirect impacts associated with the development are kept to a minimum.
Impact Significance (Post-Mitigation)	Low

5. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAM

An Environmental Management Programme (EMPr) provides a link between the predicted impacts and mitigation measures recommended within the BA and the implementation and operational activities of a project. As the construction and operation of the Mainstream grid connection infrastructure may impact the environment, activities that pose a threat should be managed and mitigated so that unnecessary or preventable environmental impacts do not result. The primary objective of the EMPr is to detail actions required to address the impacts identified in the BA during the establishment, operation and rehabilitation of the proposed infrastructure.

Below are the ecologically-orientated measures that should be implemented as part of the EMPr for the grid connection infrastructure to reduce the significance or extent of the assessed impacts. The measures below do not exactly match with the impacts that have been identified, as certain mitigation measures, such as limiting the loss of vegetation may be effective at combating several different impacts, such as erosion, faunal impact etc.

Impact	**Mitigation/Management Objectives**	**Mitigation/Management Actions**	**Monitoring**		
			Methodology	***Frequency***	***Responsibility***
A. DESIGN PHASE					
A.1. TERRESTRIAL ECOLOGY IMPACTS					
Potential impact on terrestrial ecology as a result of the proposed Mainstream Grid Connection and associated infrastructure.	Avoid or minimize impacts on terrestrial ecology.	▪ Ensure that the design of the power line takes the sensitivity mapping of the ecological specialist into account to avoid and reduce impacts on Species and habitats of Conservation Concern, most particularly the larger drainage systems along the power line route which are potential habitat of the Riverine Rabbit.	▪ Ensure that this is taken into consideration during the planning and design phase. ▪ Pre-construction walk-through of the final power line route, with micrositing of the final pylon positions where necessary.	▪ During design cycle and before construction commences.	▪ Project Developer and Appointed Ecology Specialist

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
B. CONSTRUCTION PHASE					
B.1. TERRESTRIAL ECOLOGY IMPACTS					
Habitat Loss and impact on plant SCC as a result of construction activities	Small footprint and low impact on terrestrial environment. Low impact on protected plant species.	▪ Pre-construction walk-through of substation, power line route and access road footprints to identify protected species and obtain information to inform a pre-construction Search and Rescue operation. ▪ Obtain relevant permits from the Department of Agriculture, Forestry and Fisheries (DAFF), DENC and CapeNature prior to any construction activities at the site. ▪ Affected individuals of selected (i.e. those that are of high conservation value or which have a high probability of surviving translocation) protected species which cannot be avoided should be translocated to a safe area on the site prior to construction. This does not include woody species that cannot be translocated and where these are protected by DAFF a permit for their destruction would be required. ▪ Erosion control measures should be implemented in areas where slopes	▪ Pre-construction walk-through of substation, power line route and access road footprints to identify protected species and obtain information to inform a pre-construction Search and Rescue operation. ▪ Obtain clearing and translocation permits from the relevant authorities. ▪ ECO to monitor construction to ensure that: ▪ Vegetation is cleared only within essential areas. ▪ Erosion risk is maintained at an acceptable level through flow regulation structures where appropriate and the maintenance of	▪ Before construction	▪ Project Developer and Appointed Ecology Specialist

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		have been disturbed. ▪ Revegetation of cleared areas or monitoring to ensure that recovery is taking place. ▪ Alien plant clearing where necessary.	plant cover wherever possible.		
Faunal Impacts due to construction activities	Limit and reduce faunal impact during construction.	▪ Environmental induction for all construction staff. ▪ ECO to monitor and enforce ban on hunting, collecting etc. of all plants and animals or their products. ▪ Any fauna encountered during construction should be removed to safety by the ECO or other suitably qualified person, or allowed to passively vacate the area. ▪ All vehicles to adhere to low speed limits (40km/h max) on the site, to reduce risk of faunal collisions as well as reduce dust. ▪ All night-lighting should use low-UV type lights (such as most LEDs), which do not attract insects. The lights should also be of types which are directed downward and do not result in large amounts of light pollution.	▪ ECO to monitor site clearing and staff activities on-site. ▪ Weekly and monthly reporting of activities, offences and remedial actions.	▪ Daily during construction when site clearing is taking place.	▪ ECO and Subcontractors.

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
C. OPERATIONAL PHASE					
C.1. TERRESTRIAL ECOLOGY IMPACTS					
Ecological impact of operation and maintenance of the power line and substation	Reduce the long-term operational impact of the development	▪ Vegetation control where required should be by manual clearing and herbicides should not be used except to control alien plants in the prescribed manner. ▪ Annual monitoring for alien plant species - with follow up clearing as needed – or as per the frequency stated in the alien invasive management plan to be developed for the final project development corridor. ▪ Annual site inspection for erosion or water flow regulation problems – with follow up remedial action where problems are identified.	▪ Annual surveys for erosion along the power line for erosion and alien species presence. ▪ Follow-up remedial action where required to address problems identified. ▪ Records of problems and actions taken.	▪ Annual monitoring ▪ Annual or more frequent control actions.	▪ Management
D. DECOMMISSIONING PHASE					
D.1. TERRESTRIAL ECOLOGY IMPACTS					
Ecological impact of decommissioning of the power line and substation	Reduce the post-commissioning impact of the development	▪ Annual post-decommissioning monitoring for alien plant species - with follow up clearing as needed – or as per the frequency stated in the alien invasive management plan for the	▪ Annual surveys for erosion at the substation site and along the power line for erosion and alien species presence.	▪ Annual monitoring for at least 5 years after decommissionin	▪ Management

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		development. ▪ Annual post-decommissioning site inspection for erosion or water flow regulation problems – with follow up remedial action where problems are identified.	▪ Follow-up remedial action where required to address problems identified. ▪ Records of problems and actions taken.	g ▪ Annual or more frequent control actions for at least 5 years after decommissioning	

6. CONCLUSION AND RECOMMENDATIONS

The Mainstream Grid Connection, substation and associated infrastructure is located in a potentially sensitive area which includes the Roggeveld Centre of Endemism as well as potential habitat of the Riverine Rabbit and several other listed fauna, some of which can be confirmed present. The footprint of the 132kV section of the line can however be reduced to a small area and sensitive habitats such as the major drainage systems along the route can also largely be avoided. A pre-construction walk-through of the final approved power line route and development footprint is recommended in order to refine the final pylon locations and minimise impacts on SCC and sensitive habitats. The major residual risk factor associated with the 132kV section of the route is likely to be erosion associated with disturbance on the steep mountain slopes the route passes through on the way to the new substation. The substation site is considered acceptable but not ideal as a location for the substation as it is positioned in an area with low hills and numerous small drainage lines leading off the slopes onto the adjacent plains. A significant amount of earth moving and levelling would be required to prepare the site. However, the vegetation of the affected area is typical of the Gamka Karoo vegetation type and no species of high conservation concern were observed within the development footprint. The 400kV section of the power line traverses the open gravelly plains of the Gamka Karoo to the connection point with the Eskom 400kV lines. The major sensitive feature along this section of the route are the drainage lines with associated floodplains which traverse this area. As the spans between pylons in this area would be large, there are no drainage lines that could not be spanned by the power line. As such, impact on these features can be reduced to a low acceptable level.

A part of the power line route is located within CBAs, which raises the suitability of development within these areas into question. While the development would result in some habitat loss within these areas, the total footprint would amount to a few hectares at most and is not likely to impact the ecological functioning or conservation value of the affected CBAs. The potential for cumulative impacts in the wider Roggeveld area is high as a result of the large number of approved wind energy developments in this area. The current development is however to the east of the main development area and the contribution of the current development to cumulative impact is considered acceptable.

Impact Statement – Mainstream Grid Connection and Associated Infrastructure

The Mainstream grid connection and substation are considered acceptable and would generate low post-mitigation impacts on fauna and flora. There are no specific long-term impacts likely to be associated with the development of the Mainstream Grid Connection and substation that cannot be reduced to a low significance. The contribution of the power line and substation components to cumulative impact in the area would be low and is considered acceptable. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

7. REFERENCES

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8. APPENDICES

Appendix A. Impact Assessment Tables

Table 1. Terrestrial Ecology Impact assessment summary table for the Construction Phase

Impact pathway	Nature of potential impact/risk	Status[1]	Extent[2]	Duration[3]	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
CONSTRUCTION PHASE															
Direct Impacts															
Vegetation clearing for infrastructure and site establishment	Habitat loss and impact on plant SCC	Negative	Local	Long-term	Substantial	Very likely	Low	Low	Moderate	No	Yes	• Minimise development of infrastructure within identified Very High sensitivity areas. • Pre-construction walk-through of the development footprint to locate and identify protected species within the development footprint. All relevant clearing or translocation permits must be obtained before construction starts. • Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. • Environmental Control Officer (ECO) to provide	Moderate	3	High

[1] Status: Positive (+) ; Negative (-)
[2] Site; Local (<10 km); Regional (<100); National; International
[3] Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 years); Long-term (project duration); Permanent (beyond project decommissioning)

Impact pathway	Nature of potential impact/risk	Status[1]	Extent[2]	Duration[3]	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
												supervision and oversight of vegetation clearing activities. • All cleared areas that are not under hard infrastructure will need to be rehabilitated with locally occurring species. • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area. • Temporary lay-down areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.			
Vegetation clearing and disturbance for infrastructure and site establishment	Impact on fauna due to habitat loss and disturbance	Negative	Local	Long-term	Substantial	Very likely	High	Low	Moderate	No	Yes	• Minimise the development footprint within areas of high fauna importance such as rocky outcrops and drainage lines. • Search and rescue for reptiles and other vulnerable species during construction, before areas are cleared. • Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer. • All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental	Low	4	High

Impact pathway	Nature of potential impact/risk	Status[1]	Extent[2]	Duration[3]	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
												chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • If trenches need to be dug for electrical cabling or other purpose, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench. • No electrical fencing to be constructed within 30cm of the ground as tortoises become stuck against such fences and are electrocuted. • Limit access to the site and ensure that construction staff and machinery remain within the demarcated construction areas during the construction phase. • Environmental induction for all staff and contractors on-site.			
Vegetation clearing and disturbance for infrastructure and site establishment within CBAs	Habitat loss and disturbance within Critical Biodiversity Areas	Negative	Local	Long-term	Substantial	Very likely	High	Low	Moderate	No	Yes	• Minimise the development footprint within the areas of CBA as much as possible and ensure that any disturbed areas are rehabilitated after construction. • The final location of the pylons should be checked in the field before construction during the final walk-through of the power line to ensure that these are positioned to minimise the impact of the power line on species and habitats of conservation concern.	Low	4	High

Table 2. Impact assessment summary table for the Operational Phase

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
OPERATIONAL PHASE															
Direct Impacts															
Site maintenance and operational activities	Impact on fauna due to disturbance	Negative	Local	Long-term	Moderate	Very likely	High	Low	Low	Yes	Yes	• No electrical fencing within 30cm of the ground as tortoises become stuck against such fences and are electrocuted. • Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. • If any parts of the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs) as far as possible, which do not attract insects. • All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.	Low	4	High
Site establishment and maintenance activities	Increase in soil erosion	Negative	Local	Long-term	Moderate	Very likely	Moderate	Low	Low	Yes	Yes	• Use of geotextiles and other active rehabilitation measures during and after construction to limit soil loss and movement at the site. • There should be regular (at least annual) monitoring for erosion throughout the operational period and any problems detected should be addressed through the implementation of erosion control measures. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion	Low	4	High

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
												control structures and revegetation techniques. • All disturbed and cleared areas should be revegetated with indigenous perennial shrubs, grasses and succulents from the local area.			

Table 3. Impact assessment summary table for the Decommissioning Phase

Impact pathway	Nature of potential impact/risk	Status[4]	Extent[5]	Duration[6]	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
DECOMMISSIONING PHASE															
Direct Impacts															
Disturbance during Decommissioning	Impact on fauna due to decommissioning phase disturbance	Negative	Local	Short-term	Moderate	Very likely	High	Low	Low	No	Yes	• Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. • No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. • All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and	Low	4	High

[4] Status: Positive (+) ; Negative (-)
[5] Site; Local (<10 km); Regional (<100); National; International
[6] Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 years); Long-term (project duration); Permanent (beyond project decommissioning)

Impact pathway	Nature of potential impact/risk	Status[4]	Extent[5]	Duration[6]	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
												impact, however, this should be in accordance with the facilities' decommissioning and recycling plan, and as per the agreements with the land owners concerned. • All cleared and disturbed areas should be rehabilitated with locally occurring perennial species.			
Decommissioning Phase disturbance	Increase in soil erosion	Negative	Local	Long-term	Moderate	Very likely	Moderate	Low	Low	Yes	Yes	• Use of geotextiles and other active rehabilitation measures during and after construction to limit soil loss and movement at the site. • There should be regular monitoring for erosion for at least 5 years after decommissioning by the applicant or appointed entity to ensure that no erosion problems develop as a result of the disturbance, and if they do, to immediately implement erosion control measures. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • All disturbed and cleared areas should be revegetated with indigenous perennial shrubs, grasses and succulents from the local area.	Low	4	High
Decommissioning Phase disturbance	Increase in alien plant invasion	Negative	Local	Long-term	Moderate	Very likely	Moderate	Low	Low	Yes	Yes	• Alien management plan to be implemented during the decommissioning phase of the development, which makes provision for regular alien clearing and monitoring for at least 5 years after decommissioning. • Active rehabilitation and	Low	4	High

Impact pathway	Nature of potential impact/risk	Status[4]	Extent[5]	Duration[6]	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
												revegetation of previously disturbed areas with indigenous species selected from the local environment. • Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after decommissioning activities are complete to encourage natural regeneration of the local indigenous species. • Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned. • Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning or until alien invasives are no longer a problem. • Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.			

Table 4. Cumulative impact assessment summary table

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
CUMULATIVE IMPACTS															
Cumulative development impact in the wider area	Increased habitat fragmentation for fauna and a decrease in conservation value and future conservation options for the affected areas	Negative	Regional	Long-term	Moderate	Very likely	High	Low	Low	No	Yes	• Minimise the development footprint as far as possible and ensure that the management plans for the development are optimally implemented during the operational phase of the development to ensure that the indirect impacts associated with the development are kept to a minimum.	Low	4	High

Appendix B. List of Mammals

List of Mammals know from the broad study area, based on the MammalMap Database (http://vmus.adu.org.za) as at June 2019.

Family	Scientific name	Common name	Red list	Number of Records
Bathyergidae	*Cryptomys hottentotus*	Southern African Mole-rat	Least Concern (2016)	9
Bovidae	*Antidorcas marsupialis*	Springbok	Least Concern (2016)	5
Bovidae	*Oreotragus oreotragus*	Klipspringer	Least Concern (2016)	1
Bovidae	*Pelea capreolus*	Vaal Rhebok	Near Threatened (2016)	8
Bovidae	*Raphicerus campestris*	Steenbok	Least Concern (2016)	12
Bovidae	*Sylvicapra grimmia*	Bush Duiker	Least Concern (2016)	2
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	Least Concern (2016)	3
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern (2016)	12
Canidae	*Otocyon megalotis*	Bat-eared Fox	Least Concern (2016)	5
Canidae	*Vulpes chama*	Cape Fox	Least Concern (2016)	1
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	Least Concern (2016)	4
Cercopithecidae	*Papio ursinus*	Chacma Baboon	Least Concern (2016)	8
Chrysochloridae	*Amblysomus corriae*	Fynbos Golden Mole	Near Threatened (2016)	1
Felidae	*Caracal caracal*	Caracal	Least Concern (2016)	16
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable (2016)	1
Felidae	*Felis silvestris*	Wildcat	Least Concern (2016)	1
Felidae	*Panthera pardus*	Leopard	Vulnerable (2016)	9
Gliridae	*Graphiurus (Graphiurus) ocularis*	Spectacled African Dormouse	Least Concern	1
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	Least Concern (2016)	1
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	Least Concern (2016)	4
Herpestidae	*Herpestes pulverulentus*	Cape Gray Mongoose	Least Concern (2016)	9
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	Least Concern	1
Leporidae	*Bunolagus monticularis*	Riverine Rabbit	Critically Endangered (2016)	126
Leporidae	*Lepus capensis*	Cape Hare	Least Concern	1
Leporidae	*Lepus saxatilis*	Scrub Hare	Least Concern	3
Macroscelididae	*Elephantulus edwardii*	Cape Elephant Shrew	Least Concern (2016)	6
Macroscelididae	*Elephantulus rupestris*	Western Rock Elephant Shrew	Least Concern (2016)	6
Macroscelididae	*Macroscelides proboscideus*	Short-eared Elephant Shrew	Least Concern (2016)	7
Muridae	*Acomys (Subacomys) subspinosus*	Cape Spiny Mouse	Least Concern	2
Muridae	*Aethomys granti*	Grant's Rock Mouse	Least Concern	19
Muridae	*Aethomys namaquensis*	Namaqua Rock Mouse	Least Concern	38
Muridae	*Desmodillus auricularis*	Cape Short-tailed Gerbil	Least Concern (2016)	4
Muridae	*Gerbilliscus paeba*	Paeba Hairy-footed Gerbil	Least Concern (2016)	12

Muridae	*Micaelamys granti*	Grant's Micaelamys	Least Concern (2016)	19
Muridae	*Otomys irroratus*	Southern African Vlei Rat	Least Concern (2016)	2
Muridae	*Otomys unisulcatus*	Karoo Bush Rat	Least Concern (2016)	6
Muridae	*Parotomys brantsii*	Brants's Whistling Rat	Least Concern (2016)	3
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Grass Rat	Least Concern (2016)	20
Mustelidae	*Aonyx capensis*	African Clawless Otter	Near Threatened (2016)	1
Mustelidae	*Ictonyx striatus*	Striped Polecat	Least Concern (2016)	3
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	Near Threatened (2016)	1
Nesomyidae	*Dendromus melanotis*	Gray African Climbing Mouse	Least Concern (2016)	4
Nesomyidae	*Saccostomus campestris*	Southern African Pouched Mouse	Least Concern (2016)	1
Nesomyidae	*Steatomys krebsii*	Kreb's African Fat Mouse	Least Concern (2016)	1
Orycteropodidae	*Orycteropus afer*	Aardvark	Least Concern (2016)	3
Procaviidae	*Procavia capensis*	Cape Rock Hyrax	Least Concern (2016)	17
Soricidae	*Crocidura cyanea*	Reddish-gray Musk Shrew	Least Concern (2016)	11
Soricidae	*Myosorex varius*	Forest Shrew	Least Concern (2016)	15
Viverridae	*Genetta tigrina*	Cape Genet (Cape Large-spotted Genet)	Least Concern (2016)	2

Appendix C. List of Reptiles

List of Reptiles known from the study area, based on records from the ReptileMap database (June 2019). Conservation status is from Bates et al. 2013.

Family	Scientific name	Common name	Red list	Number of Records
Agamidae	*Agama atra*	Southern Rock Agama	Least Concern	9
Agamidae	*Agama hispida*	Spiny Ground Agama	Least Concern	1
Chamaeleonidae	*Bradypodion gutturale*	Little Karoo Dwarf Chameleon	Least Concern	1
Chamaeleonidae	*Chamaeleo namaquensis*	Namaqua Chameleon	Least Concern	1
Colubridae	*Dipsina multimaculata*	Dwarf Beaked Snake	Least Concern	1
Cordylidae	*Cordylus cloetei*	Cloete's Girdled Lizard	Least Concern	1
Cordylidae	*Cordylus minor*	Western Dwarf Girdled Lizard	Least Concern	1
Cordylidae	*Karusasaurus polyzonus*	Karoo Girdled Lizard	Least Concern	9
Cordylidae	*Pseudocordylus microlepidotus namaquensis*	Nuweveldberg Crag Lizard	Least Concern	2
Elapidae	*Aspidelaps lubricus lubricus*	Coral Shield Cobra	Least Concern	2
Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern	2
Elapidae	*Naja nivea*	Cape Cobra	Least Concern	3
Gekkonidae	*Chondrodactylus angulifer angulifer*	Common Giant Ground Gecko	Least Concern	1
Gekkonidae	*Chondrodactylus bibronii*	Bibron's Gecko	Least Concern	4
Gekkonidae	*Goggia lineata*	Northern Striped Pygmy Gecko	Least Concern	1
Gekkonidae	*Pachydactylus capensis*	Cape Gecko	Least Concern	2
Gekkonidae	*Pachydactylus geitje*	Ocellated Gecko	Least Concern	2
Gekkonidae	*Pachydactylus kladaroderma*	Thin-skinned Gecko	Least Concern	4
Gekkonidae	*Pachydactylus mariquensis*	Marico Gecko	Least Concern	1
Gekkonidae	*Pachydactylus oculatus*	Golden Spotted Gecko	Least Concern	4
Gekkonidae	*Pachydactylus purcelli*	Purcell's Gecko	Least Concern	4
Gekkonidae	*Pachydactylus weberi*	Weber's Gecko	Least Concern	1
Gerrhosauridae	*Tetradactylus tetradactylus*	Cape Long-tailed Seps	Least Concern	1
Lacertidae	*Meroles suborbitalis*	Spotted Desert Lizard	Least Concern	1
Lacertidae	*Nucras tessellata*	Western Sandveld Lizard	Least Concern	1
Lacertidae	*Pedioplanis burchelli*	Burchell's Sand Lizard	Least Concern	3
Lacertidae	*Pedioplanis lineoocellata pulchella*	Common Sand Lizard	Least Concern	5
Lacertidae	*Pedioplanis namaquensis*	Namaqua Sand Lizard	Least Concern	2
Lamprophiidae	*Boaedon capensis*	Brown House Snake	Least Concern	2
Lamprophiidae	*Lamprophis guttatus*	Spotted House Snake	Least Concern	1
Lamprophiidae	*Prosymna sundevallii*	Sundevall's Shovel-snout	Least Concern	1
Lamprophiidae	*Psammophis crucifer*	Cross-marked Grass Snake	Least Concern	1
Lamprophiidae	*Psammophis notostictus*	Karoo Sand Snake	Least Concern	3

Lamprophiidae	*Pseudaspis cana*	Mole Snake	Least Concern	1
Scincidae	*Trachylepis sulcata sulcata*	Western Rock Skink	Least Concern	4
Scincidae	*Trachylepis variegata*	Variegated Skink	Least Concern	5
Testudinidae	*Chersina angulata*	Angulate Tortoise	Least Concern	2
Testudinidae	*Chersobius boulengeri*	Karoo Padloper	Near Threatened	3
Testudinidae	*Homopus femoralis*	Greater Padloper	Least Concern	3
Testudinidae	*Psammobates tentorius tentorius*	Karoo Tent Tortoise	Least Concern	8
Testudinidae	*Psammobates tentorius verroxii*	Verrox's Tent Tortoise	Least Concern	1
Typhlopidae	*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake	Least Concern	1
Viperidae	*Bitis arietans arietans*	Puff Adder	Least Concern	3

Appendix D. List of Frogs

List of Amphibians known from the study area, based on records from the FrogMap database (June 2019). Conservation status is from Minter et al. 2004.

Family	Scientific name	Common name	Red list category	Number of records
Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern	1
Bufonidae	*Vandijkophrynus gariepensis gariepensis*	Karoo Toad (subsp. gariepensis)		52
Pipidae	*Xenopus laevis*	Common Platanna	Least Concern	26
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	Least Concern	71
Pyxicephalidae	*Amietia poyntoni*	Poynton's River Frog	Least Concern	1
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern	5
Pyxicephalidae	*Cacosternum karooicum*	Karoo Caco	Least Concern	5
Pyxicephalidae	*Tomopterna delalandii*	Cape Sand Frog	Least Concern	19
Pyxicephalidae	*Tomopterna tandyi*	Tandy's Sand Frog	Least Concern	6

Appendix E. Projects for Cumulative Assessment

List of other renewable energy projects known from the broader area around the site. Not all of these are in the same environment as the current project and not all projects would ultimately be built.