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Proposed Construction of the Oya 132kV Power Line near Matjiesfontein, Western and Northern Cape Provinces

Ecology Impact Assessment Report – Basic Assessment

Report Prepared by: **Dr D.B.Hoare**
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OYA ENERGY (PTY) LTD

EXECUTIVE SUMMARY

This report provides details of the results of the ecology BA study, based on a desktop assessment of the study area, mapping from aerial imagery, two reconnaissance site visits, and a detailed walk-through survey of the entire footprint of the proposed project. The study area is located on various farm portions that are situated approximately 52 km northwest of Matjiesfontein, located mostly in the Western Cape Province, but also partially within the Northern Cape Province.

The first section of the report provides an outline of the Terms of Reference for the study, Limitations, Assumptions and Uncertainties, a list of acronyms, abbreviations and a short glossary, and a table indicating compliance with Appendix 6 of the National Environmental Management Act (NEMA) Environmental Impact Assessment (IA) Regulations, 2014 as amended.

The following section provides an outline of the methodology used to undertake the ecology assessment. This includes the approach taken to assess the sensitivity of the site and a summary of the background information used to undertake the assessment. Background information includes electronic databases with species information, Red Data Lists, published field guides and National and Provincial legislation, specifically regulations with published lists of species and/or ecosystems.

The next section is a technical description of the project and a description of layout alternatives.

The next section of the report provides details on legislation that applies to development of the site with respect to the ecological receiving environment. There are various acts that limit development or require permits before development can proceed. The most important of these are permits required in terms of protected species that could potentially occur on site, including the National Environmental Management: Biodiversity Act, the Cape Nature and Environmental Conservation Ordinance 19 of 1974 and the Northern Cape Nature Conservation Act No. 9 of 2009.

The next section provides a description of the ecological receiving environment, including details on the location of the site, the regional vegetation patterns, local habitat patterns occurring on site, lists of plant and animal species of concern that are likely to occur there and a list of species that were observed on site during the site visits. Details of this section are summarised as follows:

1. The study area is situated in an area with gently to moderately sloping topography, with occasional steeply sloping areas. Habitat on site is in a largely natural state and is in a remote and rural environment. There is very little transformation or degradation on site.
2. There are four regional vegetation types occurring in the general area, Central Mountain Shale Renosterveld, Koedoesberge-Moordenaars Karoo, Tanqua Wash Riviere, and Tanqua Karoo. All four vegetation types are listed in the scientific literature as Least Threatened and none are listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).
3. Much of the habitat in the Tanqua Wash Riviere part of the southern part of the study area, as well as patches in the northern part of the study area is mapped as "Critical Biodiversity Area

1" (CBA1) in the Provincial Conservation Plan, and all drainage areas on site are mapped as "Ecological Support Area" (ESA). The remaining natural vegetation on site is mapped as Other Natural Areas. The proposed footprint of the infrastructure crosses CBA1 areas in the southern part of the site, as well as a very small segment in the northern end.

4. The vegetation on site was found to be a succulent dwarf shrubland that resembles the description for the major regional vegetation types, but with local variation dependent on topography and drainage. A map of natural habitats of the study area was produced by mapping from aerial imagery and verifying in the field.
5. There is one plant species protected according to the National Environmental Management: Biodiversity Act (Act No 10. Of 2004) (NEM:BA) that has a geographical distribution that includes the site, but it was not seen anywhere on site within the footprint of the proposed infrastructure. This is *Hoodia gordonii*. This is a widespread species that is not restricted to the site but found throughout dryer parts of South Africa.
6. There are a number of plant species occurring on site that are protected according to the Cape Nature and Environmental Conservation Ordinance 19 of 1974. None of these are of conservation concern, but a permit is required from the Provincial authorities to remove them where vegetation clearing is required. These are listed in the text in the body of this report.
7. There are no protected tree species that are likely to occur in the study area.
8. A total of 56 mammal species have a geographical distribution that includes the general study area in which the site is found. Of the species currently listed as threatened or protected (see Appendix 5 for list of protected species), the following are considered to have a medium probability of occurring on site, based on habitat suitability: Honey Badger (Near Threatened), Black-footed Cat (Vulnerable), Leopard (Vulnerable, protected), Cape Fox (protected) and Grey Rhebok (Near Threatened). Given the nature of the proposed project and the fact that many of the species of concern are relatively mobile, few threatened, near threatened or protected mammal species are likely to be significantly negatively impacted by activities on the site.
9. The site is not a known area for the distribution of the Riverine Rabbit, which occurs primarily on the Roggeveld Plateaux to the north. There is also a southern population within the Cape mountains, but no records in the quarter degree grid of the current project, nor surrounding areas. It was assessed as unlikely that this species would occur on site.
10. The site contains habitat that is suitable for a small number of frog species, although none are listed or protected species.
11. A total of 74 reptile species have a geographical distribution that includes the general study area in which the site is found. Two reptile species of conservation concern could potentially occur in the study area, as follows: the Karoo Dwarf Tortoise (Near Threatened), and the Armadillo Girdled Lizard (protected).
12. A sensitivity map of the site was produced that identifies areas of high sensitivity. This includes watercourses and their associated riparian vegetation, rocky outcrops, and areas mapped as Critical Biodiversity Areas, especially CBA1 areas (mostly excluded from the development footprint). Other areas that were not mapped but considered to be sensitive are any steep slopes, as well as some localised quartz patches.

The section of the report following the above identifies a number of potential impacts for the proposed project, including direct and indirect impacts for the construction, operation and decommissioning phases of the project, as well as cumulative impacts taken together with similar projects in the region. These are described and discussed. For each potential impact, possible mitigation measures are

provided for managing potential impacts related to this project. The most significant impacts associated with the project are related to natural habitat loss through direct clearing, as well as through potential degradation from effects such as increased invasion by alien invasive plant species.

The report concludes that there are some sensitivities on site related to natural habitat and to individual species, but that these can be minimised or avoided with the application of appropriate mitigation or management measures. There will be residual impacts, primarily on natural habitat, but the amount of habitat that will be lost to the project is insignificant compared to the area in hectares of the regional vegetation type that occurs on site and therefore the residual impacts are considered acceptable, on condition local sensitivities of biodiversity importance are avoided. On this basis, it is recommended that the project be authorised.

The report includes a comprehensive list of Appendices containing lists of species and species of concern with a geographical distribution that includes the site as well as lists of species protected according to National legislation.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of 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;	Pages 18-19
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Pages 7-8
c) an indication of the scope of, and the purpose for which, the report was prepared;	Pages 17-18
(cA) an indication of the quality and age of base data used for the specialist report;	Pages 19-23
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Page 34
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Page 23
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Pages 19-23
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;	Page 58
g) an identification of any areas to be avoided, including buffers;	Page 58
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;	Page 58
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Page 7
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Pages 60-93

k) any mitigation measures for inclusion in the EMPr;	Pages 94-96
l) any conditions for inclusion in the environmental authorisation;	Pages 94-96
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Page 96
n) a reasoned opinion- <ul style="list-style-type: none"> i. (as to) whether the proposed activity, activities or portions thereof should be authorised; <ul style="list-style-type: none"> (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; 	Page 101 Pages 94-96
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	EAP
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	EAP
q) any other information requested by the competent authority.	EAP
2) Where a government notice <i>gazetted</i> 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.	



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Proposed Development of the 132kV Oya Power Line near Matjiesfontein, Western and Northern Cape Provinces

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

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Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

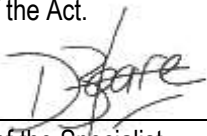
SPECIALIST INFORMATION

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DECLARATION BY THE SPECIALIST

I, _____ Dr David Hoare _____, declare that –

- I act as the independent specialist in this application;
- I will 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;
- 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 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;
- all the particulars furnished by me in this form 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

David Hoare Consulting (Pty) Ltd

Name of Company:

9 November 2020

Date:

UNDERTAKING UNDER OATH/ AFFIRMATION

I, ___ Dr David Hoare _____, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.



Signature of the Specialist

David Hoare Consulting (Pty) Ltd

Name of Company

9 November 2020

Date

Signature of the Commissioner of Oaths

Date

OYA ENERGY (PTY) LTD

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Glossary of Terms

Definitions	
Alternative	Alternatives can refer to any of the following but are not limited to: alternative sites for development, alternative projects for a particular site, alternative site layouts, alternative designs, alternative processes and alternative materials.
Biodiversity	The diversity of genes, species and ecosystems, and the ecological and evolutionary processes that maintain that diversity.
Biodiversity offset	Conservation measures designed to remedy the residual negative impacts of development on biodiversity and ecological infrastructure, once the first three levels of the mitigation hierarchy have been explicitly considered (i.e. to avoid, minimize and rehabilitate / restore impacts). Offsets are the last resort form of mitigation, only to be implemented if nothing else can mitigate the impact.
Biodiversity priority areas	Features in the landscape that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services. These are identified using a systematic spatial biodiversity planning process and include the following categories: Protected Areas, Critically Endangered and Endangered ecosystems, Critical Biodiversity Areas, Ecological Support Areas, and Focus Areas for land-based Protected Area expansion.
Category 1a Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the act, as a species that must be combatted or eradicated. These species are contained in Notice 3 of the AIS list, which is referred to as the National List of Invasive Species. Landowners are obliged to take immediate steps to control Category 1a species.
Category 1b Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the act, as species that must be controlled or 'contained'. These species are contained in Notice 3 of the AIS list, which is referred to as the National List of Invasive Species. However, where an Invasive Species Management Programme has been developed for a Category 1b species, then landowners are obliged to "control" the species in accordance with the requirements of that programme.
Category 2 Listed Invasive Species	Species which require a permit to carry out a restricted activity e.g. cultivation within an area specified in the Notice or an area specified in the permit, as the case may be. Category 2 includes plant species that have economic, recreational, aesthetic or other valued properties, notwithstanding their invasiveness. It is important to note that a Category 2 species that falls outside the demarcated area specified in the permit, becomes a Category 1b invasive species. Permit-holders must take all the necessary steps to prevent the escape and spread of the species.
Category 3 Listed Invasive Species	A species listed by notice in terms of section 70(1)(a) of the act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of the act, as specified in the notice. Category 3 species are less-transforming invasive species which are regulated by activity. The principal focus with these species is to ensure that they are not introduced, sold or transported. However, Category 3 plant species are automatically Category 1b species within riparian and wetland areas.
CBA Maps	A map of Critical Biodiversity Areas and Ecological Support Areas based on a systematic biodiversity plan.
Connectivity	The spatial continuity of a habitat or land cover type across a landscape.
Corridor	A relatively narrow strip of a particular type of vegetation that differs from the areas adjacent on both sides.
Critical Biodiversity Areas	Areas required to meet biodiversity targets of representivity and persistence for ecosystems, species and ecological processes, determined by a systematic conservation plan. They may be terrestrial or aquatic and are mostly in a good ecological state. These areas need to be maintained in a natural or near-natural state, and a loss or degradation must be avoided. If these areas were to be modified, biodiversity targets could not be met.
Cumulative impact	Past, current and reasonably foreseeable future impacts of an activity, considered together with the impact of the proposed activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.
Ecological condition	An assessment of the extent to which the composition, structure and function of an area or biodiversity feature has been modified from a reference condition of natural.
Ecological infrastructure	Naturally, functioning ecosystems that generate or deliver valuable ecosystem services, e.g. mountain catchment areas, wetlands, and soils.
Ecological process	The functions and processes that operate to maintain and generate biodiversity.
Ecological Support Areas	An area that must be maintained in at least fair ecological condition in order to support the ecological functioning of a CBA or protected area, or to generate or deliver ecosystem services, or to meet remaining biodiversity targets for ecosystem types or species when it is not possible or necessary to meet them in natural or near natural

	areas. It is one of five broad categories on a CBA map, and a subset of biodiversity priority areas.
Ecosystem resilience	The ability of an ecosystem to maintain its functions (biological, chemical, and physical) in the face of disturbance or to recover from external pressures.
Ecosystem threshold	The tipping point where ongoing disturbance or change results in an irreversible change in its composition, structure and functioning. Surpassing ecosystem thresholds diminishes the quality and quantity of ecosystem services provided, rapidly reduces the ability of the ecosystem to sustain life, and results in less resilient ecosystems.
Ecosystem services	The benefits that people obtain from ecosystems, including provisioning services (such as food and water), regulating services (such as flood control), cultural services (such as recreational benefits), and supporting services (such as nutrient cycling, carbon storage) that maintain the conditions for life on Earth.
Edge	The portion of an ecosystem or cover type near its perimeter, and within which environmental conditions may differ from interior locations in the ecosystem.
Endemic	Restricted or exclusive to a particular geographic area and occurring nowhere else. Endemism refers to the occurrence of endemic species.
Exempted Alien Species	An alien species that is not regulated in terms of this statutory framework - as defined in Notice 2 of the AIS List.
Forbs	Herbaceous plants with soft leaves and non-woody stems.
Fragmentation	The breaking up of a habitat or cover type into smaller, disconnected parcels, often associated with, but not equivalent to, habitat loss.
Geophyte	Perennial plants having underground perennating organs, such as bulbs, corms or tubers.
Global Hotspot	An area characterised by high levels of biodiversity and endemism, and that faces significant threats to that biodiversity.
Habitat	The area of an environment occupied by a species or group of species, due to the particular set of environmental conditions that prevail there.
Habitat loss	Conversion of natural habitat in an ecosystem to a land use or land cover class that results in irreversible change to the composition, structure and functional characteristics of the ecosystem concerned.
Keystone species	A species that has a disproportionately large effect on its environment relative to its abundance.
Prohibited Alien Species	An alien species listed by notice by the Minister, in respect of which a permit may not be issued as contemplated in section 67(1) of the act. These species are contained in Notice 4 of the AIS List, which is referred to as the List of Prohibited Alien Species.
Mitigate	The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.
"No-Go" option	The "no-go" development alternative option assumes the site remains in its current state, i.e. there is no construction of an energy facility and associated infrastructure in the proposed project area.
Patch	A surface area that differs from its surroundings in nature or appearance.
Red List	A publication that provides information on the conservation and threat status of species, based on scientific conservation assessments.
Rehabilitation	Less than full restoration of an ecosystem to its predisturbance condition.
Restoration	To return a site to an approximation of its condition before alteration.
Riparian	The land adjacent to a river or stream that is, at least periodically, influenced by flooding.
Runoff	Non-channelized surface water flow.
Succulent	Plants that have some parts that are more than normally thickened and fleshy, usually to retain water in arid climates or soil conditions.
Species of special / conservation concern	Species that have particular ecological, economic or cultural significance, including but not limited to threatened species.
Systematic biodiversity conservation planning	Scientific methodology for determining areas of biodiversity importance involving: mapping biodiversity features (such as ecosystems, species, spatial components of ecological processes); mapping a range of information related to these biodiversity features and their condition (such as patterns of land and resource use, existing protected areas); setting quantitative targets for biodiversity features, analysing the information using GIS; and developing maps that show spatial biodiversity priorities. Systematic biodiversity planning is often called 'systematic conservation planning' in the scientific literature.
Threatened ecosystems	An ecosystem that has been classified as Critically Endangered, Endangered or Vulnerable, based on analysis of ecosystem threat status. A threatened ecosystem has lost, or is losing, vital aspects of its structure, composition or function. The Biodiversity

	Act makes provision for the Minister or Environmental Affairs, or a provincial MEC of Environmental Affairs, to publish a list of threatened ecosystems.
Threatened species	A species that has been classified as Critically Endangered, Endangered or Vulnerable, based on a conservation assessment using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.

List of Abbreviations

AIS	Alien and Invasive species
BA	Basic Assessment
CBA	Critical Biodiversity Area
CBD	Convention on Biological Diversity
CEPF	Critical Ecosystem Partnership Fund
CFR	Cape Floristic Region
CITES	Convention on the International Trade in Endangered Species of Wild Fauna and Flora
DAFF	Department of Agriculture, Forestry and Fisheries
DEFF	Department of Environment, Forest and Fisheries
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
ESA	Ecological Support Area
GIS	Geographical Information System
I&AP	Interested and Affected Party
IEM	Integrated Environmental Management
IUCN	International Union for the Conservation of Nature
NBA	National Biodiversity Assessment
NBSAP	National Biodiversity Strategy Action Plan
NC	Northern Cape province
NCNCA	Northern Cape Nature Conservation Act
NDP	National Development Plan
NEM:BA	National Environmental Management: Biodiversity Act
NEMA	National Environmental Management Act
NPAES	National Protected Area Expansion Strategy
ONA	Other Natural Areas
PA	Protected Area
PV	Photovoltaic
REDZ	Renewable Energy Development Zone
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SCC	Species of conservation concern
SEA	Strategic Environmental Assessment
SKEP	Succulent Karoo Ecosystem Plan
ToPS	Threatened and Protected Species
ToR	Terms of Reference
WEF	Wind Energy Facility
%	Percentage
MW	Megawatt
kV	Kilovolt
cm	Centimetres
m	Metres
km	Kilometres

OYA ENERGY (PTY) LTD

1. INTRODUCTION

Oya Energy (Pty) Ltd, (hereafter referred to as "Oya Energy") is proposing to construct a 132 kilovolt (kV) overhead power line and substations near Matjiesfontein in the Western and Northern Cape Provinces (hereafter referred to as the "proposed development"). The overall objective of the proposed development is to feed the electricity generated by the proposed Oya Energy Facility (part of separate on-going EIA process under DEFF Ref No.: 14/12/16/3/3/2/2009) as well as potentially the other adjacent energy developments into the national grid. The grid connection and substations (this application) require a separate EA, in order to allow the EA to be handed over to Eskom.

The entire extent of the proposed 132kV overhead power line is located within one the Strategic Transmission Corridors as defined and in terms of the procedures laid out in Government Notice (GN) No. 113¹, namely the Central Corridor. The proposed overhead power line and substation project will therefore be subject to a basic Assessment (BA) process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) (as amended) and Appendix 1 of the Environmental Impact Assessment (EIA) Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. The competent authority for this BA is the national Department of Environment, Forestry and Fisheries (DEFF). Specialist studies have been commissioned to assess and verify the OHL under the new Gazetted specialist protocols².

David Hoare Consulting (Pty) Ltd has been appointed by SiVEST (PTY) Ltd, on behalf of Oya Energy (Pty) Ltd to undertake the assessment of the proposed 132 kilovolt (kV) overhead power line.

1.1 Scope and Objectives

Assess the impacts associated with the proposed 132 kilovolt (kV) overhead power line.

1.2 Terms of Reference

- Describe the terrestrial ecology features of the project area, with focus on features that are potentially impacted by the proposed project. The description should include the major habitat forms within the study site, giving due consideration to terrestrial ecology (flora), terrestrial ecology (fauna) and Species of Special Concern (SSC).
- Consider seasonal changes and long-term trends, such as due to climate change;

¹ Formally gazetted on 16 February 2018 (GN No. 113)

² Formally gazetted on 20 March 2020 (GN No. 320)

- Identify any SSC or protected species on site and clearly map with a high degree of certainty the exact no-go zones with a high level of confidence;
- Map the sensitive ecological features within the proposed project area, showing any 'no-go' areas (i.e. 'very high' sensitivity). Specify set-backs or buffers and provide clear reasons for these recommendations. Also map the extent of disturbance and transformation of the site;
- Identify and assess the potential impacts of the project on the terrestrial environment and provide mitigation measures to include in the environmental management plan; and
- The assessment should be based on existing information, national and provincial databases, SANBI mapping, professional experience and field work conducted.

1.3 Specialist Credentials

Dr David Hoare

Education

Matric - Graeme College, Grahamstown, 1984

B.Sc (majors: Botany, Zoology) - Rhodes University, 1991-1993

B.Sc (Hons) (Botany) - Rhodes University, 1994 with distinction

M.Sc (Botany) - University of Pretoria, 1995-1997 with distinction

PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Main areas of specialisation

- Vegetation ecology, primarily in grasslands, thicket, coastal systems, wetlands.
- Plant biodiversity and threatened plant species specialist.
- Alien plant identification and control / management plans.
- Remote sensing, analysis and mapping of vegetation.
- Specialist consultant for environmental management projects.

Membership

Professional Natural Scientist, South African Council for Natural Scientific Professions, 16 August 2005 – present. Reg. no. 400221/05 (Ecology, Botany)

Member, International Association of Vegetation Scientists (IAVS)

Member, Ecological Society of America (ESA)

Member, International Association for Impact Assessment (IAIA)

Member, Herpetological Association of Africa (HAA)

Employment history

1 December 2004 – present, Director, David Hoare Consulting (Pty) Ltd. Consultant, specialist consultant contracted to various companies and organisations.

1 January 2009 – 30 June 2009, Lecturer, University of Pretoria, Botany Dept.

1 January 2013 – 30 June 2013, Lecturer, University of Pretoria, Botany Dept.

1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.

Experience as consultant

Ecological consultant since 1995. Author of over 500 specialist ecological consulting reports. Wide experience in ecological studies within grassland, savanna and fynbos, as well as riparian, coastal and wetland vegetation.

1.4 Assessment Methodology

This report provides a BA level description of the site and assessment of the proposed project from an ecology perspective. The detailed methodology followed as well as the sources of data and information used as part of this assessment is described below.

1.4.1 Assessment philosophy

Many parts of South Africa contain high levels of biodiversity at species and ecosystem level. At any single site there may be large numbers of species or high ecological complexity. Sites also vary in their natural character and uniqueness and the level to which they have been previously disturbed. Assessing the potential impacts of a proposed development often requires evaluating the conservation value of a site relative to other natural areas and relative to the national importance of the site in terms of biodiversity conservation. A simple approach to evaluating the relative importance of a site includes assessing the following:

- Is the site unique in terms of natural or biodiversity features?
- Is the protection of biodiversity features on the site of national/provincial importance?
- Would development of the site lead to contravention of any international, national or provincial legislation, policy, convention or regulation?

Thus, the general approach adopted for this type of study is to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically focus on red flags and/or potential fatal flaws. Biodiversity issues are assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. These can be organised in a hierarchical fashion, as follows:

Species

1. threatened plant species
2. protected trees
3. threatened animal species

Ecosystems

1. threatened ecosystems
2. protected ecosystems
3. critical biodiversity areas
4. areas of high biodiversity
5. centres of endemism

Processes

1. corridors
2. mega-conservancy networks

3. rivers and wetlands
4. important topographical features

It is not the intention to provide comprehensive lists of all species that occur on site, since most of the species on these lists are usually common or widespread species. Rare, threatened, protected and conservation-worthy species and habitats are considered to be the highest priority, the presence of which are most likely to result in significant negative impacts on the ecological environment. The focus on national and provincial priorities and critical biodiversity issues is in line with National legislation protecting environmental and biodiversity resources, including, but not limited to the following which ensure protection of ecological processes, natural systems and natural beauty as well as the preservation of biotic diversity in the natural environment:

1. Environment Conservation Act (Act 73 of 1989)
2. National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998)
3. National Environmental Management Biodiversity Act, 2004. (Act 10 Of 2004)

1.4.2 *Species of conservation concern*

There are two types of species of concern for the site under investigation, (i) those listed by conservation authorities as being on a Red List and are therefore considered to be at risk of extinction, and (ii) those listed as protected according to National and/or Provincial legislation.

1.4.2.1 *Red List plant species*

Determining the conservation status of a species is required in order to identify those species that are at greatest risk of extinction and, therefore, in most need of conservation action. South Africa has adopted the IUCN Red List Categories and Criteria to provide an objective, rigorous, scientifically founded system to identify Red List species. A published list of the Red List species of South African plants (Raimondo et al. 2009) contains a list of all species that are considered to be at risk of extinction. This list is updated regularly to take new information into account, but these are not published in book/paper format. Updated assessments are provided on the SANBI website (<http://redlist.sanbi.org/>). According to the website of the Red List of Southern African Plants (<http://redlist.sanbi.org/>), *the conservation status of plants indicated on the Red List of South African Plants Online represents the status of the species within South Africa's borders. This means that when a species is not endemic to South Africa, only the portion of the species population occurring within South Africa has been assessed. The global conservation status, which is a result of the assessment of the entire global range of a species, can be found on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species: <http://www.iucnredlist.org>.* The South African assessment is used in this study.

The purpose of listing Red List species is to provide information on the potential occurrence of species at risk of extinction in the study area that may be affected by the proposed infrastructure. Species appearing on these lists can then be assessed in terms of their habitat requirements in order to determine whether any of them have a likelihood of occurring in habitats that may be affected by the proposed infrastructure.

Lists were compiled specifically for any species at risk of extinction (Red List species) previously recorded in the area. Historical occurrences of threatened plant species were obtained from the South African National Biodiversity Institute (<http://posa.sanbi.org>) for the quarter degree square/s within which the study area is situated. Habitat information for each species was obtained from various published sources. The probability of finding any of these species was then assessed by comparing the habitat requirements with those habitats that were found, during the field survey of the site, to occur there.

1.4.2.2 *Protected trees*

Regulations published for the National Forests Act (Act 84 of 1998) as amended, provide a list of protected tree species for South Africa. The species on this list were assessed in order to determine which protected tree species have a geographical distribution that coincides with the study area and habitat requirements that may be met by available habitat in the study area. The distribution of species on this list were obtained from published sources (e.g. van Wyk & van Wyk 1997) and from the SANBI Biodiversity Information System website (<http://sibis.sanbi.org/>) for quarter degree grids in which species have been previously recorded. Species that have been recorded anywhere in proximity to the site (within 100 km), or where it is considered possible that they could occur there, were listed and were considered as being at risk of occurring there. The site was searched for these species during the field survey and any individuals or concentrations noted.

1.4.2.3 *Other protected species*

National legislation was evaluated in order to provide lists of any plant or animal species that have protected status. The most important legislation is the following:

- *National Environmental Management: Biodiversity Act (Act No 10 of 2004)*

This legislation contains lists of species that are protected. These lists were scanned in order to identify any species that have a geographical range that includes the study area and habitat requirements that are met by those found on site. These species were searched for within suitable habitats on site or, where relevant, it was stated that it was considered possible that they could occur on site.

There is additional legislation that provides lists of protected species, but the legislation to which these are attached deal primarily with harvesting or trade in listed species and do not specifically address transformational threats to habitat or individuals. This includes the following legislation:

- *CITES: Convention on the Trade in Endangered Species of Wild Fauna and Flora.*

1.4.2.4 *Red List animal species*

Lists of threatened animal species that have a geographical range that includes the study area were obtained from literature sources (for example, Alexander & Marais 2007, Branch 1988, 2001, du Preez & Carruthers 2009, Friedmann & Daly 2004, Mills & Hes 1997, Monadjem et al. 2010). The likelihood of any of them occurring was evaluated on the basis of habitat preference and habitats available at each of the proposed sites. The three parameters used to assess the probability of occurrence for each species were as follows:

- *Habitat requirements*: most Red Data animals have very specific habitat requirements and the presence of these habitat characteristics within the study area were assessed;
- *Habitat status*: in the event that available habitat is considered suitable for these species, the status or ecological condition was assessed. Often, a high level of degradation of a specific habitat type will negate the potential presence of Red Data species (especially wetland-related habitats where water-quality plays a major role); and
- *Habitat linkage*: movement between areas used for breeding and feeding purposes forms an essential part of ecological existence of many species. The connectivity of the study area to these surrounding habitats and adequacy of these linkages are assessed for the ecological functioning Red Data species within the study area.

1.4.2.5 *Species probability of occurrence*

Some species of plants may be cryptic, difficult to find, rare, ephemeral or generally not easy to spot while undertaking a survey of a large area. An assessment of the possibility of these species occurring there was therefore provided. For all threatened or protected flora that occur in the general geographical area of the site, a rating of the likelihood of it occurring on site is given as follows:

- LOW: no suitable habitats occur on site / habitats on site do not match habitat description for species;
- MEDIUM: habitats on site match general habitat description for species (e.g. karoo shrubland), but detailed microhabitat requirements (e.g. mountain shrubland on shallow soils overlying sandstone) are absent on the site or are unknown from the descriptions given in the literature or from the authorities;
- HIGH: habitats found on site match very strongly the general and microhabitat description for the species (e.g. mountain shrubland on shallow soils overlying sandstone);
- DEFINITE: species found in habitats on site.

1.4.3 *Field surveys*

The study area was visited and assessed to confirm patterns identified from the desktop assessment. Three site visits were undertaken, one on 9 July 2020, one on 10 September 2020, and the third on 12 - 24 October 2020. The three site visits covered seasonal variation as well as growth at the height of the growing season. Specific features of potential concern were investigated in the field, including the following:

- General vegetation status, i.e. whether the vegetation was natural, disturbed/secondary or transformed;
- Presence of habitats of conservation concern in terms of high biodiversity, presence of species of concern, specific sensitivities, e.g. wetlands, and any other factors that would indicate an elevated biodiversity or functional value that could not be determined from the desktop assessment;
- Presence of protected trees;
- Potential presence of species of concern, including observation of individual plants found on site or habitats that are suitable for any of the species identified from the desktop assessment.

The entire site was walked during the site visit in such a way as to cover all parts of the site as well as ensure any unusual habitats or features were observed. A checklist of species occurring on site was collected during

the survey. The site was traversed by foot and species listed as they were encountered. Plant names follow Germishuizen *et al.* (2005). The season of the combined surveys was favourable, and it is likely that many of species present on site were identifiable at the time of the survey. The survey was of adequate duration and intensity to characterise the flora of the site.

2. ASSUMPTIONS AND LIMITATIONS

Red List species are, by their nature, usually very rare and difficult to locate. Compiling the list of species that could potentially occur in an area is limited by the paucity of collection records that make it difficult to predict whether a species may occur in an area or not. The methodology used in this assessment is designed to reduce the risks of omitting any species, but it is always possible that a species that does not occur on a list may be unexpectedly located in an area.

3. TECHNICAL DESCRIPTION

3.1 Project Location

The proposed power line and substations project area is located approximately 50 km north-west of Matjiesfontein, originating in the Namakwa Local Municipality in the Northern Cape and linking in to the Kappa substation in the Witzenberg Local Municipality in the Western Cape Province (Error! Reference source not found.).

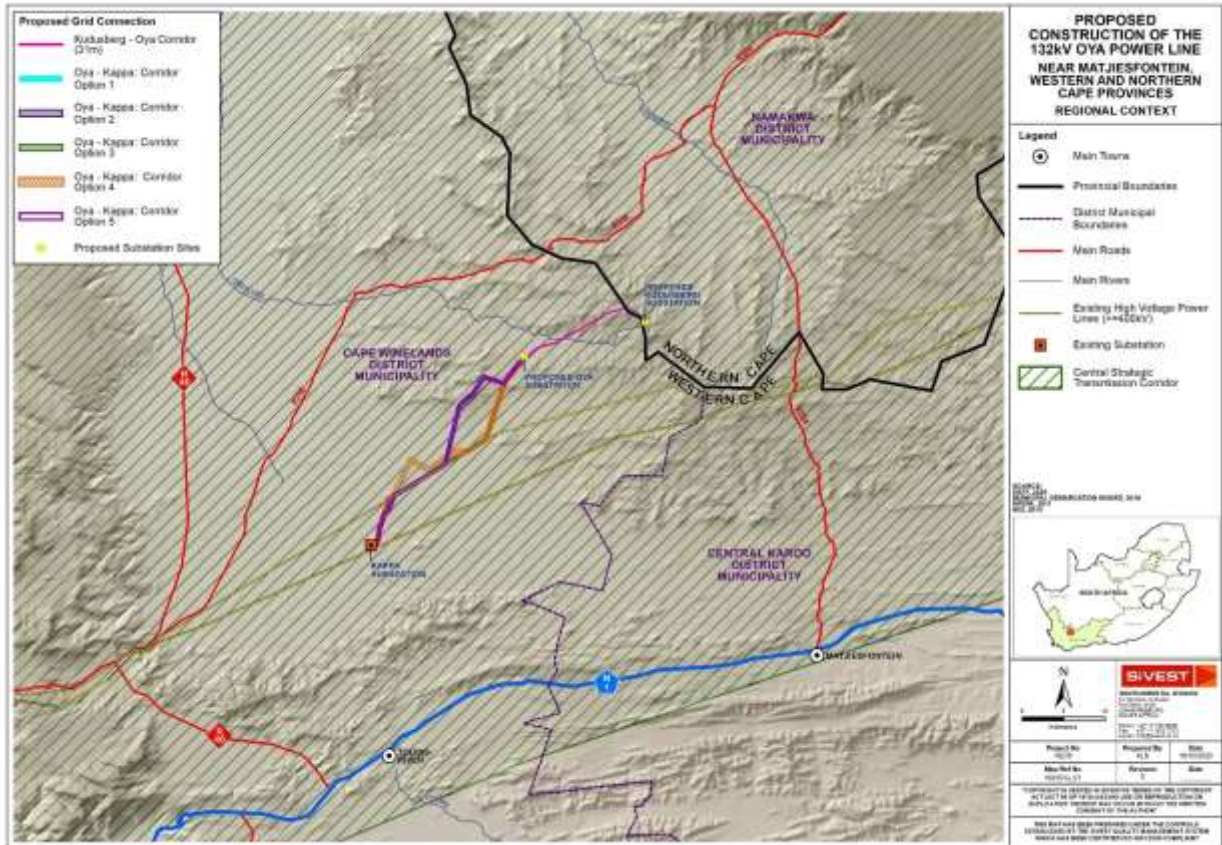


Figure 1: Oya 132kV overhead power line Regional context map.

The proposed overhead power line corridors and substations will affect the following properties³:

- Portion 2 of the Farm Bakovens Kloof No 152 (2/152): C01900000000015200002
- Remainder of the Farm Bakovens Kloof No 152 (RE/152): C01900000000015200000
- Portion 3 of the Farm Baakens Rivier No 155 (3/155): C01900000000015500003
- Remainder of the Farm Baakens Rivier No 155 (RE/155): C01900000000015500000
- Portion 1 of the Farm Gats Rivier No 156 (1/156): C01900000000015600001
- Remainder of the Farm Gats Rivier No 156 (RE/156): C01900000000015600000
- Portion 1 of the Farm Amandelboom No 158 (1/158): C01900000000015800001
- Remainder of the Farm Oliviers Berg No 159 (RE/159): C01900000000015900000
- Portion 2 of the Farm Bantamsfontein No 168 (2/168): C01900000000016800002
- Portion 4 of the Farm Bantamsfontein No 168 (4/168): C01900000000016800004
- Portion 5 of the Farm Bantamsfontein No 168 (5/168): C01900000000016800005
- Portion 7 of the Farm Bantamsfontein No 168 (7/168): C01900000000016800007
- Portion 13 of the Farm Bantamsfontein No 168 (13/168): C01900000000016800013
- Remainder of the Farm Bantamsfontein No 168 (RE/168): C01900000000016800000
- Remainder of the Farm Lower Roodewal No 169 (RE/169): C01900000000016900000
- Remainder of the Farm Matjes Fontein No 194 (RE/194): C07200000000019400000
- The Farm Platfontein No 240 (240): C01900000000024000000
- The Farm Die Brak No 241 (241): C01900000000024100000
- Portion 1 of the Farm Rietpoort No 243 (1/243): C01900000000024300001
- Remainder of the Farm Rietpoort No 243 (RE/243): C01900000000024300000

³ 21-digit surveyor general (SG) codes also provided

- Remainder of the Farm Toover berg No 244 (RE/244): C0190000000024400000

The proposed power line is located in the Witzenberg and Karoo Hoogland Local Municipalities respectively, which fall within the Cape Winelands and Namakwa District Municipalities.

The entire extent of the proposed overhead power line is located within one (1) of the Strategic Transmission Corridors as defined and in terms of the procedures laid out in GN No. 113, namely the Central Corridor.

3.2 Project Technical Details

At this stage, it is anticipated that the proposed development will include a 132kV power line and two (2) 33/132kV substations to feed electricity generated by the renewable energy facilities owned by the applicant into the national grid at the Kappa substation.

The type of power line towers being considered at this stage include both lattice and monopole towers and it is assumed that these towers will be located approximately 200m to 250m apart. The towers will be up to 45m in height, depending on the terrain, but will ensure minimum overhead line clearances from buildings and surrounding infrastructure.

300m wide power line corridors (i.e. 150m on either side) are being assessed to allow flexibility when determining the final route alignment. The proposed power line however only requires a 31m wide servitude and as such, this servitude would be positioned within the assessed corridor.

The size of the proposed Oya and Kudusberg on-site Eskom substation and O&M building site will be approximately 4 hectare (ha) each.

3.2.1 Alternatives

Only one (1) route is possible for the section of the proposed power line which connects the Kudusberg on-site substation (authorised under 14/12/16/3/3/1/1976/AM1) to the Oya on-site substation. No alternatives can therefore be provided for this section of the power line. The Kudusberg to Oya power line corridor route is approximately 16.6km in length and runs from the Kudusberg on-site substation along the RE/194, 1/158, RE/159, RE/156, 1/156 and RE/155 properties to the Oya on-site substation.

Five (5) power line corridor route alternatives have however been provided for the section of the proposed overhead power line which connects the on-site substation to the Kappa substation (i.e. Oya to Kappa). The alternatives are described below:

- **Power Line Corridor Alternative 1 (Oya to Kappa):** Approximately 34.14km in length and runs along the RE/155, RE/152, 2/152, RE/169, RE/243, 241, 240 and RE/244 properties to the Kappa substation
- **Power Line Corridor Alternative 2 (Oya to Kappa):** Approximately 32.43km in length and runs along the RE/155, 3/155, RE/152, 2/152, RE/169, 13/168, 5/168, 1/243, RE/243, 241 and 240 properties to the Kappa substation
- **Power Line Corridor Alternative 3 (Oya to Kappa):** Approximately 30.56km in length and runs along the RE/155, 4/168, 13/168, 5/168, 1/243, 240 and RE/244 properties to the Kappa substation
- **Power Line Corridor Alternative 4 (Oya to Kappa):** Approximately 32.94km in length and runs along the RE/155, 4/168, 13/168, RE/169, RE/243, 241 and 240 properties to the Kappa substation
- **Power Line Corridor Alternative 5 (Oya to Kappa):** Approximately 32.26km in length and runs along the RE/155, RE/152, 2/152, RE/169, 5/168, 1/243 and 240 properties to the Kappa substation

3.2.2 'No-go' alternative

The 'no-go' alternative is the option of not fulfilling the proposed project as well as prevent the connection of the energy development in the area to feed electricity into the national grid. This alternative would result in no environmental impacts from the proposed project on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report. Implementing the 'no-go' option would entail no development. The affected properties are currently not used for agricultural activities, although they are suitable for very low-level grazing.

The 'no-go' option is a feasible option, however, this would prevent the proposed development from contributing to the environmental, social and economic benefits associated with the development of the renewables sector.

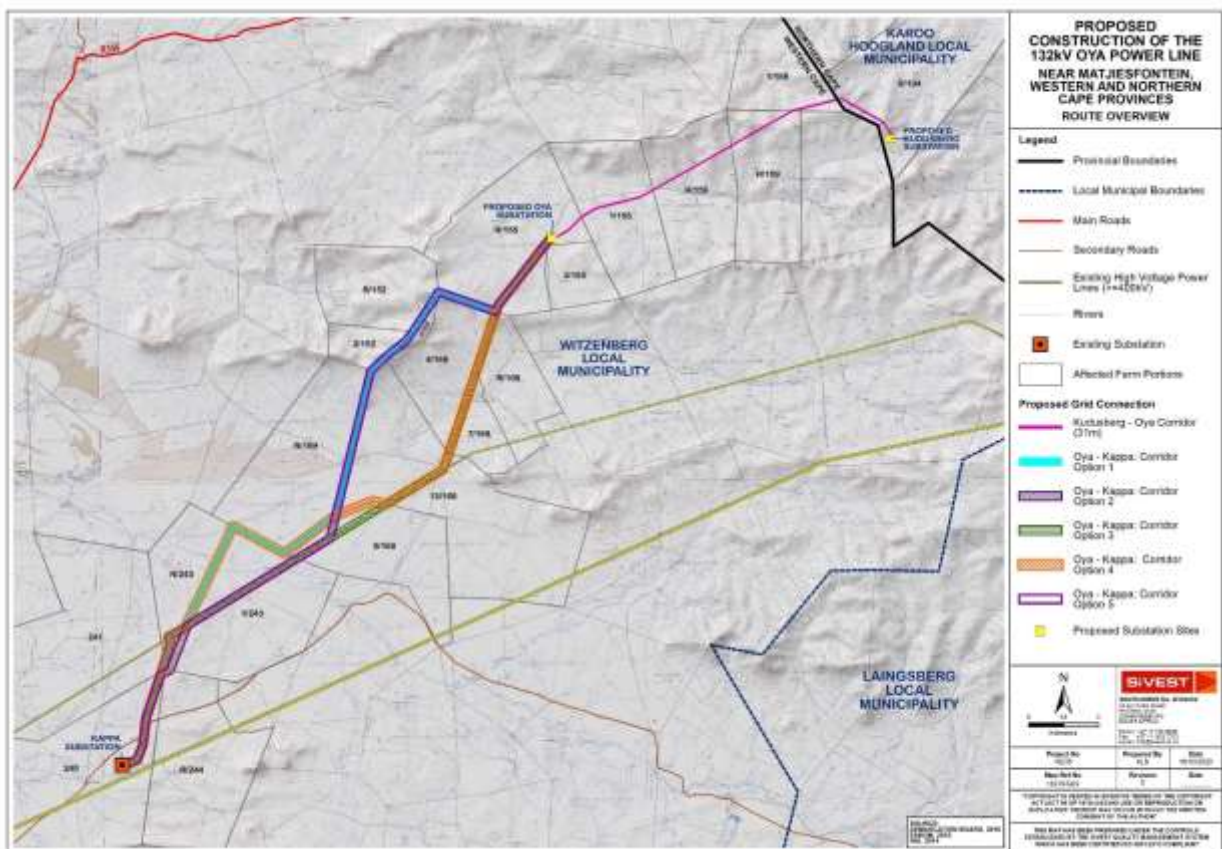


Figure 2: Oya 132kV overhead power line alternatives located near Matjiesfontein in the Western and Northern Cape Provinces

4. LEGAL REQUIREMENT AND GUIDELINES

Relevant legislation is provided in this section to provide a description of the key legal considerations of importance to the proposed project. The applicable legislation is listed below.

4.1 Convention on Biodiversity (CBD)

South Africa became a signatory to the United Nations Convention on Biological Diversity (CBD) in 1993, which was ratified in 1995. The CBD requires signatory states to implement objectives of the Convention, which are the conservation of biodiversity; the sustainable use of biological resources and the fair and equitable sharing of benefits arising from the use of genetic resources. According to Article 14 (a) of the CBD, each Contracting Party, as far as possible and as appropriate, must introduce appropriate procedures, such as environmental impact assessments of its proposed projects that are likely to have significant adverse effects on biological diversity, to avoid or minimize these effects and, where appropriate, to allow for public participation in such procedures.

4.2 National Environmental Management Act, Act No. 107 of 1998 (NEMA)

NEMA is the framework environmental management legislation, enacted as part of the government's mandate to ensure every person's constitutional right to an environment that is not harmful to his or her health or wellbeing. It is administered by Department of Environment, Forestry and Fisheries (DEFF) but several functions have been delegated to the provincial environment departments. One of the purposes of NEMA is to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment. The Act further aims to provide for institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state and to provide for the administration and enforcement of other environmental management laws.

NEMA requires, inter alia, that:

- “development must be socially, environmentally, and economically sustainable”,
- “disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied”,
- “a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions”,

NEMA states that “the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people’s common heritage.”

This report considers the Environmental Impact Assessment (EIA) Regulations of 2014 (NEMA, 2014) as amended in 2017 (NEMA, 2017), under the National Environmental Management Act, (Act No. 107 of 1998). According to these Regulations under Listing Notice 1 (GRN No. 327), Listing Notice 2 (GRN No 325) and Listing Notice 3 (GRN No 324), the activities listed are identified as activities that may require Environmental Authorisation prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of the Act.

The EIA Regulations (2014, as amended) include three lists of activities that require environmental authorisation:

- Listing Notice 1: activities that require a basic assessment (GNR. 327 of 2014, as amended),
- Listing Notice 2: activities that require a full environmental impact assessment report (EIR) (GNR. 325 of 2014, as amended),

- Listing Notice 3: activities that require a basic assessment in specific identified geographical areas only (GNR. 324 of 2014, as amended).

4.3 National Environmental Management: Biodiversity Act (Act No 10 of 2004)

As the principal national act regulating biodiversity protection, NEM:BA, which is administered by DEA, is concerned with the management and conservation of biological diversity, as well as the use of indigenous biological resources in a sustainable manner. The term biodiversity according to the Convention on Biodiversity (CBD) refers to the variability among living organisms from all sources including, inter alia terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity in genes, species and ecosystems.

In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

Chapter 4 of the Act relates to threatened or protected ecosystems or species. According to Section 57 of the Act, "Restricted activities involving listed threatened or protected species":

- (1) A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7.

Such activities include any that are "of a nature that may negatively impact on the survival of a listed threatened or protected species".

4.3.1 Alien and Invasive Species

Chapter 5 of NEM:BA relates to species and organisms posing a potential threat to biodiversity. The Act defines alien species and provides lists of invasive species in regulations. The Alien and Invasive Species (AIS) Regulations, in terms of Section 97(1) of NEM:BA, was published in Government Notice R598 in Government Gazette 37885 in 2014 (NEM:BA, 2014). The Alien and Invasive Species (AIS) lists were subsequently published in Government Notice R 864 of 29 July 2016 (NEM:BA, 2016).

According to Section 75 of the Act, "Control and eradication of listed invasive species":

- (1) Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.
- (2) Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.

- (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

The National Environmental Management: Biodiversity Act (NEMBA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Chapter 5 of the Act relates to species and organisms posing a potential threat to biodiversity. The purpose of Chapter 5 is:

- a) to prevent the unauthorized introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur;
- b) to manage and control alien species and invasive species to prevent or minimize harm to the environment and to biodiversity in particular;
- c) to eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats;

According to Section 65 of the Act, "Restricted activities involving alien species":

- 1) A person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7. Restricted activities include the following:
 - a. Importing into the Republic, including introducing from the sea, any specimen of a listed invasive species.
 - b. Having in possession or exercising physical control over any specimen of a listed invasive species.
 - c. Growing, breeding or in any other way propagating any specimen of a listed invasive species, or causing it to multiply.
 - d. Conveying, moving or otherwise translocating any specimen of a listed invasive species.
 - e. Selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any other way acquiring or disposing of any specimen of a listed invasive species.
 - f. Spreading or allowing the spread of any specimen of a listed invasive species.
 - g. Releasing any specimen of a listed invasive species.
 - h. Additional activities that apply to aquatic species.
- 2) A permit referred to in subsection (1) may be issued only after a prescribed assessment of risks and potential impacts on biodiversity is carried out.

An "**alien species**" is defined in the Act as:

- a) a species that is not an indigenous species; or
- b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by means of migration or dispersal without human intervention.

According to Section 71 of the Act, "Restricted activities involving listed invasive species":

- 1) A person may not carry out a restricted activity involving a specimen of a listed invasive species without a permit issued in terms of Chapter 7.
- 2) A permit referred to in subsection (1) may be issued only after a prescribed assessment of risks and potential impacts on biodiversity is carried out.

An "**invasive species**" is defined in the Act as any species whose establishment and spread outside of its natural distribution range:

- a) threaten ecosystems, habitats or other species or have demonstrable potential to threaten ecosystems, habitats or other species; and
- b) may result in economic or environmental harm or harm to human health.

A "**listed invasive species**" is defined in the Act as any invasive species listed in terms of section 70(1).

According to Section 73 of the Act, "Duty of care relating to listed invasive species":

- 2) A person who is the owner of land on which a listed invasive species occurs must-
 - a) notify any relevant competent authority, in writing, of the listed invasive species occurring on that land;
 - b) take steps to control and eradicate the listed invasive species and to prevent it from spreading; and
 - c) take all the required steps to prevent or minimize harm to biodiversity.

According to Section 75 of the Act, "Control and eradication of listed invasive species":

- (1) Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.
- (2) Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.
- (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

4.3.2 *Government Notice No. 1002 of 2011: National List of Ecosystems that are Threatened and in need of protection*

Published under Section 52(1)(a) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004). This Act provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2004).

4.3.3 *GNR 151: Critically Endangered, Endangered, Vulnerable and Protected Species List*

Published under Section 56(1) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).

4.3.4 *GNR 1187: Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List*

Published under Section 56(1) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).

4.3.5 *Government Notice No. 40733 of 2017: Draft National Biodiversity Offset Policy*

Published under the National Environmental Management Act (Act No. 107 of 1998). The aim of the Policy is to ensure that significant residual impacts of developments are remedied as required by NEMA, thereby ensuring sustainable development as required by section 24 of the Constitution of the Republic of South Africa, 1996. This policy should be taken into consideration with every development application that still has significant residual impact after the Mitigation Sequence has been followed. The mitigation sequence entails the consecutive application of avoiding or preventing loss, then at minimizing or mitigating what cannot be avoided, rehabilitating where possible and, as a last resort, offsetting the residual impact. The Policy specifies that one impact that has come across consistently as unmitigable is the rapid and consistent transformation of certain ecosystems and vegetation types, leading to the loss of ecosystems and extinction of species. The Policy specifically targets ecosystems where the ability to reach protected area targets is lost or close to being lost. However, the Policy states that “[w]here ecosystems remain largely untransformed, intact and functional, an offset would not be required for developments that lead to transformation, provided they have not been identified as a biodiversity priority”. Biodiversity offsets should be considered to remedy residual negative impacts on biodiversity of ‘medium’ to ‘high’ significance. Residual impacts of ‘very high’ significance are a fatal flaw for development and residual biodiversity impacts of ‘low’ significance would usually not require offsets. The Policy indicates that impacts should preferably be avoided in protected areas, CBAs, verified wetland and river features and areas earmarked for protected area expansion.

Based on site characteristics and the impact assessment undertaken here, no offsets were considered to be required for the current project.

4.4 National Forests Act (Act no 84 of 1998)

Protected trees

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that ‘no person may cut, damage, disturb, destroy or remove any *protected tree*, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister’.

Forests

Prohibits the destruction of indigenous trees in any natural forest without a licence.

4.5 National Water Act (Act 36 of 1998)

Wetlands, riparian zones and watercourses are defined in the Water Act as a water resource and any activities that are contemplated that could affect the wetlands requires authorisation (Section 21 of the National Water Act of 1998). A "watercourse" in terms of the National Water Act (Act 36 of 1998) means:

- River or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and

Any collection of water which the Minister may, by notice in the gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks. However, this has been dealt with in more detail by the Wetland Specialist.

4.6 Conservation of Agricultural Resources (Act No. 43 of 1983) as amended in 2001

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

- Category 1 plants: are prohibited and must be controlled.
- Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.
- Category 3 plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands.

The impact on agricultural resources is assessed in a separated assessment.

4.7 National Veld and Forest Fire Act (Act No. 101 of 1998)

Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 of the Act places a duty on landowners to prepare and maintain firebreaks. Chapter 5 of the Act places a duty on all landowners to acquire equipment and have available personnel to fight fires.

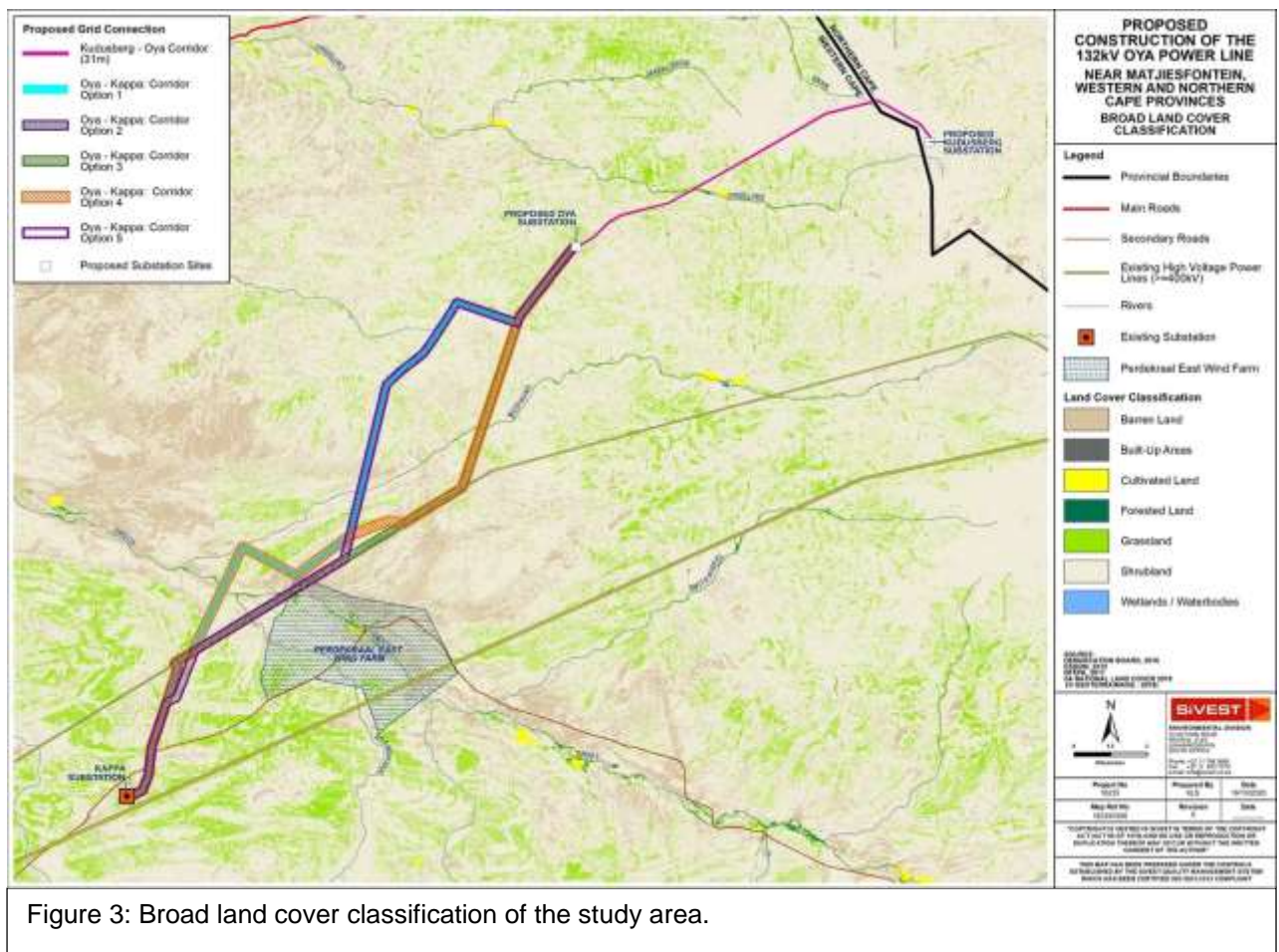
5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

5.1 Site conditions

The entire study area is largely in a natural state, with the exception of some scattered farm buildings, narrow gravel roads, jeep tracks and fences. According to National Land Cover data (Figure 3) derived from classification of satellite data, the vegetation on site is a combination of "*shrubland*" and "*grassland*". The reality is that the vegetation is karroid dwarf shrubland that may, after good rains, appear to be dominated by

grasses in places. There is also a significant part of the landscape classified as “barren land”, which is areas of rock cover, as well as naturally bare areas (Figure 3). There are small areas classified as “forested land”, which is patches of dense woodland within the major water courses, consisting primarily of patches of dense *Vachellia karroo* thorn trees, a typical pattern in this part of the country and consistent with patterns seen on site.

The vegetation was previously used primarily for livestock grazing, but not currently, and is affected to some degree by this usage, but not to the extent that any obvious degradation was noted on site. No alien plants were seen anywhere during the field survey. The vegetation and habitats on site appear to be largely in a natural state and reflecting what would be expected according to the natural relationship between the physical environment and the vegetation. This natural pattern extends beyond the site in all directions and gives the general area a sense of being relatively unspoilt, remote and natural.



5.2 Topography and drainage

The study area is situated in an area with moderately to steeply sloping topography in the north-eastern two-thirds, occurring on the broad ridges of the low mountain ranges and escarpment foothills that border the southern Tanqua Karoo. There are also extensive flat plains in the south-western areas. The hills and mountains are drained by several dry streams, most of which drain eventually towards the north-west, the main channel of which is called the Ongeluks River (Figure 4).

The central ridge of the site is on a mini scarp slope that rises from the plains south of this (Figure 4). This low ridge is approximately 940 – 1120 m above sea level. There are some low hills in the southern half of the site, with the landscape falling away towards the north until it reaches the Ongeluks River close to the northern boundary of the site. This dry riverbed falls from 860 m above sea level on the eastern side to 770 m above sea level on the western side where it exits the site. From here the topography rises steeply again to over 1200 m above sea level.

A broad indication of slope inclination categories is shown in Figure 5 (next page), derived from a landscape level model of topography. This shows that the landscape on site varies from level to steep (Figure 5). Most parts of the site within the area being considered for the project have a slope inclination of less steep than 1:10, although some localised areas are steeper than 1:5 (Figure 5).

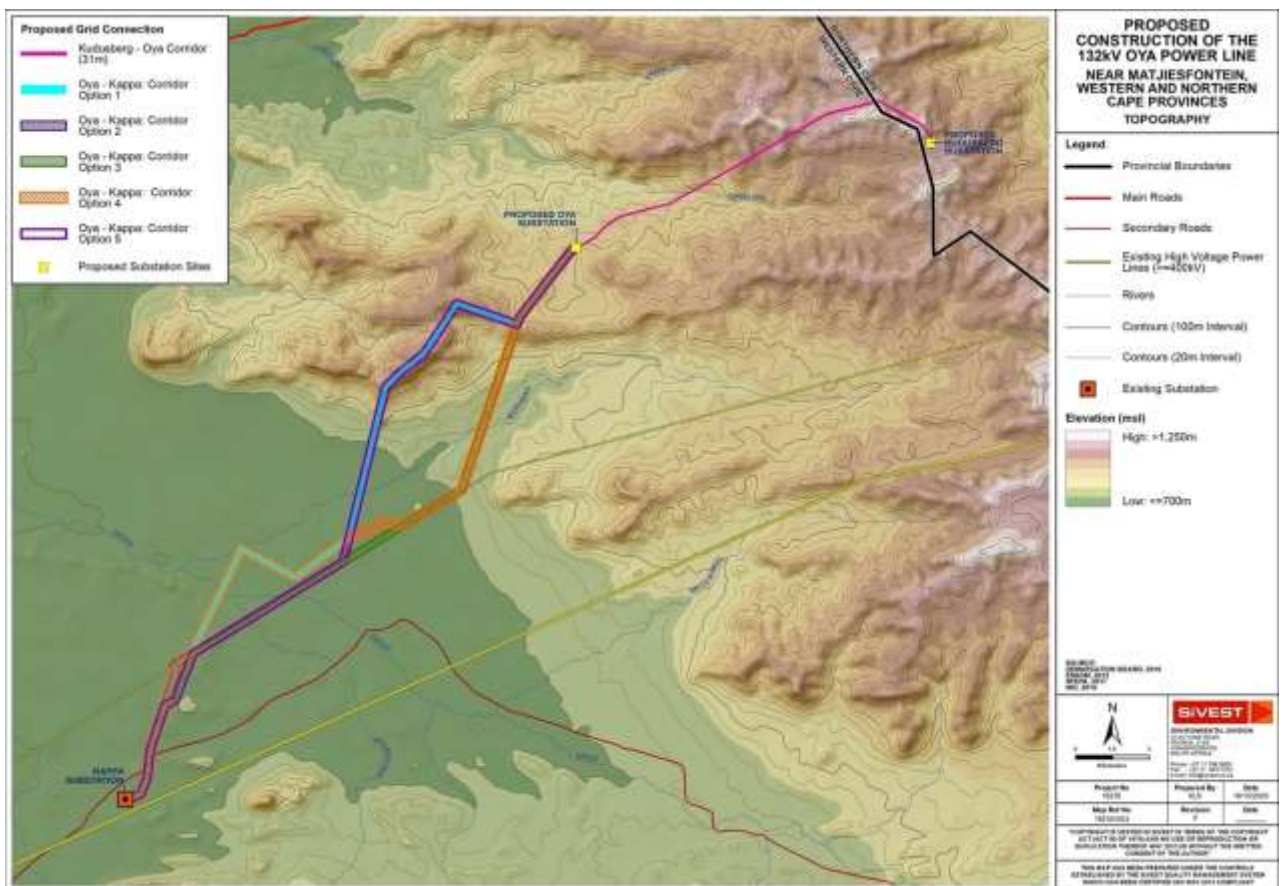


Figure 4: Topography and main perennial rivers of the study area.

5.3 Climate

The study area is within an arid environment with an annual rainfall of just over 200 mm per annum (Mucina & Rutherford 2006). Rainfall can potentially occur at any time of the year, but is more likely in mid to late winter, most often from May to August (Mucina & Rutherford 2006). Winter frost is common and occurs on average 30 days per year (Mucina & Rutherford 2006). In contrast, summers can be very hot (Mucina & Rutherford 2006).

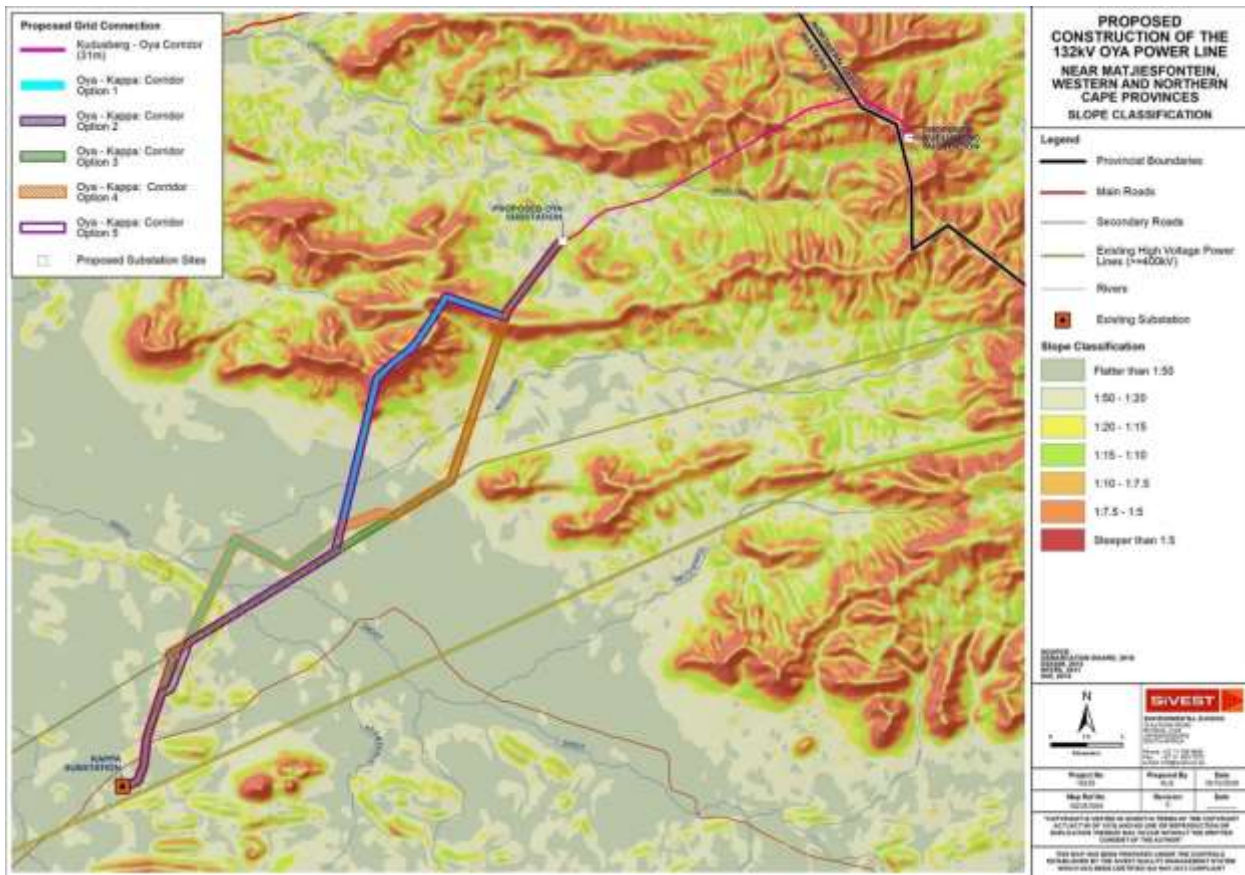


Figure 5: Slope inclination of the study area.

5.4 Broad vegetation patterns

There are four regional vegetation types occurring in the general area, namely Central Mountain Shale Renosterveld, Koedoesberge-Moordenaars Karoo, Tankwa Wash Riviere and Tankwa Karoo (Figure 7). The vegetation types that occur on site and nearby areas are briefly described below.

5.4.1 Central Mountain Shale Renosterveld

Distribution: Northern and Western Cape Provinces: Southern and south-eastern slopes of the Klein-Roggeveldberge and Komsberg below the Roggeveld section of the Great Escarpment (facing the Moordenaars Karoo) as well as farther east below Besemgoedberg and Suurkop west of Merweville and in the west in the Karookop area between Losper se Berg and high points around Thyshoogte. Altitude 1 050–1 500 m.

Vegetation & Landscape Features: Slopes and broad ridges of low mountains and escarpments, with tall shrubland dominated by renosterbos and large suites of mainly non-succulent karoo shrubs and with a rich geophytic flora in the undergrowth or in more open, wetter or rocky habitats.

Geology & Soils: Clayey soils overlying Adelaide Subgroup (Beaufort Group of the Karoo Supergroup) mudstones and subordinate sandstones. Glenrosa and Mispah forms are prominent. Land types mainly Ib and Fc.

Climate: Arid to semi-arid climate. MAP 180–410 mm (mean: 290 mm), with relatively even rainfall, but still showing a slight high in autumn-winter. Mean daily maximum and minimum temperatures 29.9°C and 0.9°C for January and July, respectively. Frost incidence 20–50 days per year.

Important Taxa:

Low Shrubs: *Elytropappus rhinocerotis* (d), *Amphiglossa tomentosa*, *Asparagus capensis* var. *capensis*, *Chrysocoma ciliata*, *C. oblongifolia*, *Diospyros austro-africana*, *Eriocephalus africanus* var. *africanus*, *E. ericoides* subsp. *ericoides*, *E. eximius*, *E. grandiflorus*, *E. microphyllus* var. *pubescens*, *E. pauperrimus*, *E. purpureus*, *Euryops imbricatus*, *Exomis microphylla*, *Felicia filifolia* subsp. *filifolia*, *F. muricata* subsp. *muricata*, *F. ovata*, *Galenia africana*, *Helichrysum dregeanum*, *H. lucilioides*, *Hermannia multiflora*, *Lessertia fruticosa*, *Lycium cinereum*, *Nenax microphylla*, *Pelargonium abrotanifolium*, *Pentzia incana*, *Pteronia ambrariifolia*, *P. glauca*, *P. glomerata*, *P. incana*, *P. sordida*, *Rosenia glandulosa*, *R. humilis*, *R. oppositifolia*, *Selago albida*, *Tripteris sinuata*, *Zygophyllum spinosum*

Succulent Shrubs: *Delosperma subincanum*, *Drosanthemum lique*, *Euphorbia stolonifera*, *Trichodiadema barbatum*, *Tylecodon reticulatus* subsp. *reticulatus*, *T. wallichii* subsp. *wallichii*

Woody Climber: *Asparagus aethiopicus*

Herbs: *Dianthus (caespitosus subsp. caespitosus) namaensis*, *Heliophila pendula*, *Lepidium desertorum*, *Osteospermum acanthospermum*, *Senecio hastatus*

Geophytic Herbs: *Bulbine asphodeloides*, *Drimia intricata*, *Othonna auriculifolia*, *Oxalis obtusa*

Succulent Herbs: *Crassula deceptor*, *C. muscosa*, *C. tomentosa* var. *glabrifolia*, *Curio radicans*

Graminoids: *Ehrharta calycina*, *Tribolium purpureum*, *Tenaxia stricta*

Remarks: This is a very poorly known renosterveld type despite its interesting biogeographical borderline position—the unit straddles the Fynbos, Succulent Karoo and marginally the Nama-Karoo Biomes. It does not appear to have any endemic species.

5.4.2 Koedoesberge-Moordenaars Karoo

Distribution: Found in the Western Cape and Northern Cape Provinces in the Koedoesberge and Pienaar se Berg low mountain ranges bordering on southern Tanqua Karoo and separated by the Klein Roggeveld Mountains from the Moordenaars Karoo in the broad area of Laingsburg and Merweville. The unit also includes the Doesberg region east of Laingsburg and piedmonts of the Elandsberg as far as beyond the Gamkapoort Dam at Excelsior (west of Prince Albert). The vegetation type occurs at an altitude of 500–1 250 m (most of the area is at 680–1 120 m).

Vegetation & Landscape Features: The vegetation occurs on slightly undulating to hilly landscape covered by low succulent scrub and dotted by scattered tall shrubs, patches of 'white' grass visible on plains, the most conspicuous dominants being dwarf shrubs of *Pteronia*, *Drosanthemum* and *Galenia*.

Geology & Soils: Mudstone (mainly), shale and sandstone of the Adelaide Subgroup (Beaufort Group), accompanied by sandstone, shale and mudstone of the Permian Waterford Formation (Ecca Group) and sandstone and shale of other Ecca Group Formations as well as Dwyka Group diamictites (all of the Karoo Supergroup). This geology gives rise to shallow, skeletal soils. Region is classified as Fc land type (to a large extent), with Ib land type playing a subordinate role.

Climate: Probability of rain is given for the entire year, but it is higher in winter. Mean Annual Precipitation (MAP) is slightly above 200 mm. There are two slight rainfall optima: one in March and another spread from May to August. Mean Annual Temperature (MAT) is close to 16°C and incidence of frost relatively high (30 days).

Important Taxa:

Succulent Shrubs: *Hereroa odorata* (d), *Antimima fergusoniae*, *Antimima maxwellii*, *Antimima wittebergensis*, *Aridaria noctiflora* subsp. *straminea*, *Crassula nudicaulis*, *Crassula rupestris* subsp. *commutata*, *Cylindrophyllum comptonii*, *Drosanthemum framesii*, *Drosanthemum karroense*, *Drosanthemum lique*, *Euphorbia decussata*, *Euphorbia eustacei*, *Euphorbia mauritanica*, *Hoodia gordonii*, *Hoodia grandis*, *Lycium oxycarpum*, *Manochlamys albicans*, *Peersia macradenia*, *Pelargonium crithmifolium*, *Ruschia grisea*, *Ruschia intricata*, *Salsola aphylla*, *Sarcocaulon crassicaule*, *Sceletium rigidum*, *Tetragonia robusta* var. *psiloptera*, *Trichodiadema barbatum*, *Tylecodon reticulatus*, *Tylecodon wallichii* subsp. *wallichii*, *Zygophyllum flexuosum*

Tall Shrub: *Diospyros pallens*

Low Shrubs: *Pteronia incana* (d), *Amphiglossa tomentosa*, *Aptosimum indivisum*, *Aptosimum spinescens*, *Asparagus burchellii*, *Asparagus capensis* var. *capensis*, *Athanasia minuta* subsp. *inermis*, *Barleria stimulans*, *Berkheya spinosa*, *Chrysocoma ciliata*, *Eriocephalus africanus*, *Eriocephalus ericoides*, *Eriocephalus pauperrimus*, *Eriocephalus spinescens*, *Euryops lateriflorus*, *Felicia filifolia*, *Felicia macrorrhiza*, *Felicia*

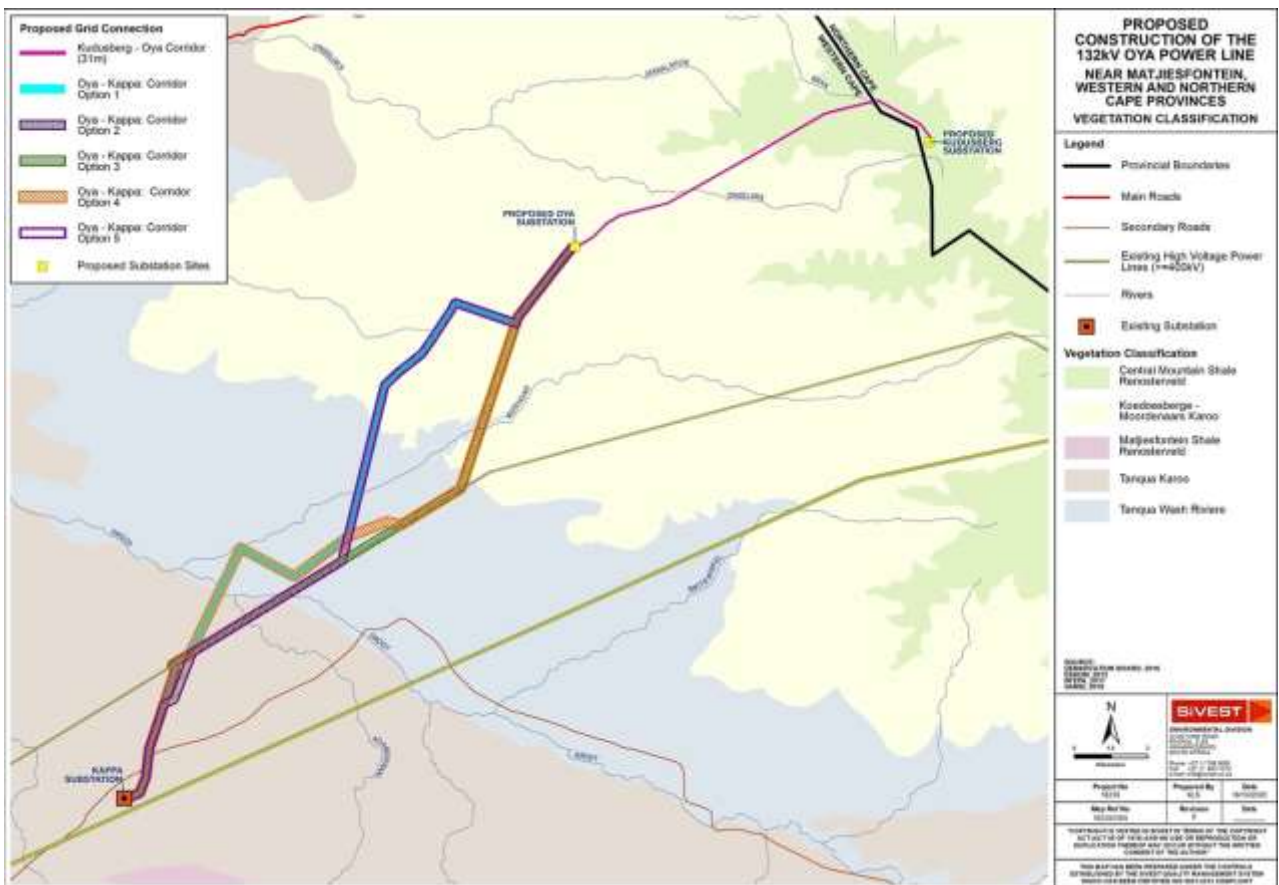


Figure 6: Vegetation types of the study area.

muricata, *Felicia scabrada*, *Galenia africana*, *Galenia fruticosa*, *Garuleum bipinnatum*, *Helichrysum lucilioides*, *Hermannia grandiflora*, *Hermannia multiflora*, *Lessertia fruticosa*, *Limeum aethiopicum*, *Melolobium candicans*, *Menodora juncea*, *Microloma armatum*, *Monechma spartioides*, *Muraltia scoparia*, *Pelargonium*

hirtum, *Pentzia incana*, *Polygala seminuda*, *Pteronia adenocarpa*, *Pteronia ambrariifolia*, *Pteronia empetrifolia*, *Pteronia glauca*, *Pteronia glomerata*, *Pteronia pallens*, *Pteronia scariosa*, *Pteronia sordida*, *Rhigozum obovatum*, *Senecio haworthii*, *Tripteris sinuata*, *Zygophyllum microphyllum*, *Zygophyllum retrofractum*, *Zygophyllum spinosum*

Semiparasitic Shrub: *Thesium lineatum*

Woody Climbers: *Asparagus fasciculatus*, *Asparagus racemosus*, *Asparagus retrofractus*, *Microcoma sagittatum*

Herbaceous Climber: *Fockea sinuata*

Semiparasitic Epiphytic Shrub: *Viscum capense*

Herbs: *Atriplex suberecta*, *Felicia bergeriana*, *Gazania jurineifolia* subsp. *scabra*, *Hermannia althaeifolia*, *H. pulverata*, *Lepidium africanum*, *L. desertorum*, *Leysera tenella*, *Pelargonium minimum*, *Pelargonium nervifolium*, *Syncarpha dregeana*, *Ursinia nana*, *Zaluzianskya inflata*, *Zaluzianskya peduncularis*

Geophytic Herbs: *Drimia intricata*, *Geissorhiza karoocica*, *Ixia marginifolia*, *Ixia rapunculoides*, *Ornithogalum adseptentrionesvergentulum*, *Oxalis obtusa*, *Romulea austinii*, *Romulea tortuosa* subsp. *tortuosa*, *Strumaria karoocica*, *Strumaria pubescens*, *Trachyandra thyrsoides*

Succulent Herbs: *Astroloba foliolosa*, *Astroloba spiralis*, *Brownanthus vaginatus*, *Crassula deceptor*, *Crassula muscosa*, *Crassula tomentosa*, *Deilanthus thudichumii*, *Haworthia marumiana* var. *archeri*, *Mesembryanthemum stenandrum*, *Pectinaria articulata*, *Piarranthus parvulus*, *Psilocaulon coriarium*, *Psilocaulon junceum*, *Quaqua arenicola* subsp. *arenicola*, *Quaqua arida*, *Quaqua ramosa*, *Stapelia pillansii*, *Stapelia rufa*, *Stapeliopsis exasperata*, *Tetragonia microptera*, *Tripteris aghillana* var. *integrifolia*

Parasitic Herb: *Hyobanche glabrata*

Graminoids: *Aristida adscensionis*, *A. diffusa*, *Ehrharta calycina*, *Ehrharta delicatula*, *Enneapogon scaber*, *Fingerhuthia africana*, *Karoochloa tenella*, *Pentaschistis airoides*, *Stipagrostis ciliata*, *S. obtusa*

Biogeographically Important Taxa:

(^{GKB}Great Karoo basin endemic, ^{RH}Roggeveld-Hantam endemic, ^SSouthern distribution limit, ^WWestern distribution limit)

Succulent Shrubs: *Deilanthus peersii*^W, *Hereroa crassa*^{GKB}, *Pleiospilos nelii*^{GKB}, *Rhinephyllum graniforme*^{GKB}, *Ruschia crassa*^{GKB}, *R. perfoliata*

Low Shrubs: *Felicia lasiocarpa*^{GKB}, *Sericocoma pungens*^S

Herbs: *Helichrysum cerastioides* var. *aurosicum*^W, *Ilfloga molluginoides*^S

Geophytic Herbs: *Brunsvigia comptonii*^S, *Drimia karoocica*^W

Succulent Herbs: *Aloe longistyla*^W, *Crassula hemisphaerica*^W, *Pectinaria longipes* subsp. *longipes*^{RH}, *Piarranthus comptus*^{GKB}, *Quaqua parviflora* subsp. *gracilis*^{RH}, *Tridentea parvipuncta* subsp. *parvipuncta*^{GKB}

Endemic Taxa:

Succulent Shrubs: *Antimima karroidea*, *A. loganii*, *Calamophyllum teretiusculum*, *Cerochlamys gemina*, *Drosanthemum comptonii*, *Ruschia karroocica*, *Tanquana archeri*, *Trichodiadema hallii*, *Tylecodon faucium*

Low Shrub: *Pelargonium stipulaceum* subsp. *ovato-stipulatum*

Semiparasitic Shrub: *Thesium marlothii*

Geophytic Herbs: *Lachenalia comptonii*, *Strumaria undulata*

Succulent Herbs: *Haworthia nortieri* var. *pehlemanniae*

Remarks: Koedoesberge-Moordenaars Karoo remains poorly researched from the vegetation-ecological point of view. This means that information on plant species occurring there, including those of conservation importance, is relatively poor.

5.4.3 Tanqua Wash Riviere

Distribution: Western Cape and (to a smaller extent) Northern Cape Provinces: Alluvia of the Tankwa and Doring Rivers and sheet-wash plains of their less important tributaries embedded within SKv 5 Tanqua Karoo. Altitude ranging from 300–1 000 m.

Vegetation & Landscape Features: Deeply incised valleys (sometimes several hundred metres broad) of intermittent rivers supporting a mosaic of succulent shrublands with *Salsola* and *Lycium* alternating with *Acacia karroo* gallery thickets. The broad sheet-wash plains support sparse vegetation of various *Salsola* species, often building phytogenic hillocks interrupting the monotonous barren face of a sheet wash. Occasional rainfalls in early winter result in localised displays of annuals and early flowering geophytes along washes.

Geology & Soils: Broad Quaternary alluvial floors and drainage lines filled with recent sediments mostly from eroded Karoo Supergroup sediments. Sodic loamy to sandy soils (Ia land type) are predominantly supported by sediments of the Ecca and Dwyka Groups of the Karoo Supergroup. In the west, rocks of the Devonian Bokkeveld Group (Cape Supergroup) and in the east, the Permian Adelaide Subgroup (Karoo Supergroup) also support these soils. The run-off in these habitats is very low and spread over large areas.

Climate: Region characterised by arid to hyperarid climate, with MAP ranging between 100 mm and 170 mm (lowest long-term average is 72.3 mm for Elandsvlei on the Tankwa River). Overall MAP 162 mm, mainly falling in autumn and winter. Mean daily maximum and minimum temperatures are 32.5°C and 3.0°C for January and July, respectively. Overall MAT is slightly higher than 17°C. Due to basin macrotopography the occurrence of frost is fairly frequent.

Important Taxa:

Riparian thickets: Small Tree: *Acacia karroo* (d).

Alluvial shrublands & herblands: Low Shrub: *Galenia africana*. **Succulent Shrubs:** *Lycium cinereum* (d), *Malephora luteola*, *Salsola arborea*, *Sarcocornia mossiana* agg. **Geophytic Herbs:** *Moraea speciosa*, *Tritonia florentiae*. **Graminoids:** *Cladoraphis spinosa*, *Stipagrostis obtusa*.

Sheet washes: Succulent Shrubs: *Augea capensis*, *Salsola aphylla*. **Herbs:** *Euryops annuus*, *Gazania lichtensteinii*, *Osteospermum pinnatum*, *Ursinia nana*.

Endemic Taxa:

Alluvial shrublands & herblands: Herbs: *Limonium* sp. nov. (Mucina 310104/1 STEU).

Sheet washes: Succulent Shrub: *Salsola ceresica* (d).

Remarks: This unit is of heterogeneous character at present and the ecological and floristic relationship between the *Acacia karroo*-dominated riparian vegetation on the one hand and the *Salsola*-dominated sheet-wash vegetation on the other, deserves re-evaluation in the light of new data still to be collected.

5.4.1 Tanqua Karoo

Distribution: Western and Northern Cape Provinces: Basin encompassing valleys of Tanqua and Doring Rivers located between Cederberg (Swartruggens) in the west, the Roggeveld Escarpment in the east and Klein Roggeveld Mountains in the southeast; towards the north this unit borders on higher elevated plains of the Hantam Karoo. Altitude 240–960 m (most of the area at 300–450 m).

Vegetation & Landscape Features: Slightly undulating intra-mountain basin sheltered by steep slopes of mountain ranges. The plain is interrupted by a series of solitary dolerite butts and elevated ridges, extensive, flat sheet-washes and deeper incised channels of intermittent rivers (these habitats support vegetation of the AZI 7 Tanqua Wash Riviere). The plains are very sparsely vegetated (low succulent shrubland with *Ruschia*, *Drosanthemum*, *Aridaria*, *Augea*, *Zygophyllum*), in extreme precipitation-poor years appearing barren, while the slopes of the koppies and adjacent mountain piedmonts support well-developed medium-tall succulent *Euphorbia hamata*–*Pteronia incana* shrubland (Rubin 1998). Small quartz patches occur in the southern Tanqua Basin. Annual flora (*Gazania lichtensteinii*, *Euryops annuus*, *Ursinia nana*) becomes conspicuous with sufficient precipitation, while geophytes and grasses play a subordinate role. *Stipagrostis ciliata* and *S. obtusa* can become locally dominant in places.

Geology & Soils: Permian Volksrust Formation mudrocks of the Eccca Group, Carboniferous Dwyka Group diamictites and Ceres Subgroup sandstones (Bokkeveld Group) predominate. Intrusive Jurassic Karoo dolerite dykes occur in the northwest. Sandy-loamy soils of various depths. Quartz patches are a rare phenomenon concentrated in the southern portions of the Tanqua Basin. Fc is the dominant land type, with Ag land type playing subordinate role.

Climate: Winter-rainfall regime: most of the precipitation falls between May and August, while December and January are virtually precipitation-free. The region has high spatial variability of precipitation, with some rainshadows experiencing as little as 40 mm of rainfall per year (in extremely dry years). MAP varies from a low of 72 mm in the central part of the unit (Elandsvlei on the Tanqua River, 41 years of records) to 112 mm in the north of the unit (Reenen on the Wolf River, 79 years) and to 111 mm in the south of the unit (Spes Bona on the Doring River, 29 years). MAT is slightly above 17°C, but in winter the temperature can often fall below the frost mark (15 days in a year). Mean maximum and minimum monthly temperatures of 35.9°C and 5.64°C occur in January and July, respectively.

Important Taxa: (^WWestern distribution limit)

Succulent Shrubs: *Antimima hantamensis* (d), *Augea capensis* (d), *Gibbaeum gibbosum* (d), *Ruschia spinosa* (d), *Antimima wittebergensis*, *Aridaria noctiflora* subsp. *noctiflora*, *A. noctiflora* subsp. *straminea*, *Braunsia apiculata*, *Cephalophyllum curtrophyllum*, *C. framesii*, *Crassula subaphylla*, *C. tetragona* subsp. *connivens*, *Drosanthemum delicatulum*, *D. framesii*, *D. lique*, *Euphorbia decussata*, *E. mauritanica*, *E. multiceps*, *E. rectirama*, *Hoodia gordonii*, *Leipoldtia schultzei*, *Lycium cinereum*, *Othonna pteronioides*, *Peersia macradenia*, *Pelargonium crithmifolium*, *Phyllobolus grossus*, *P. splendens*, *Ruschia intricata*, *Salsola aphylla*, *S. namibica*, *Sarcocaulon crassicaule*, *Scopelogenia bruynsii*, *Tetragonia fruticosa*, *T. robusta* var. *psiloptera*, *Tylecodon reticulatus*, *T. wallichii* subsp. *wallichii*, *Zygophyllum flexuosum*, *Z. microcarpum*.

Low Shrubs: *Tripteris sinuata* (d), *Aptosimum indivisum*, *Asparagus capensis* var. *capensis*, *Berkheya spinosa*, *Chrysocoma ciliata*, *Eriocephalus africanus*, *E. ericoides*, *E. pauperrimus*, *E. spinescens*, *Euryops cuneatus*, *Galenia africana*, *G. fruticosa*, *Hermannia multiflora*, *Lessertia fruticosa*, *Limeum aethiopicum*, *Monechma spartioides*, *Pelargonium grandicalcaratum*, *Pteronia aspalatha*, *P. ciliata*, *P. erythrochaeta*, *P. glauca*, *P. intermedia*, *P. oblanceolata*, *P. pallens*, *P. scariosa*, *P. sordida*, *Rhynchosia bullata*, *Stachys cuneata*^W, *Zygophyllum microphyllum*.

Semiparasitic Shrub: *Thesium lineatum*.

Woody Climbers: *Asparagus fasciculatus*, *Microlooma sagittatum*.

Herbaceous Climber: *Cyphia comptonii*.

Herbs: *Gazania lichtensteinii* (d), *Amellus microglossus*, *A. strigosus* subsp. *pseudoscabridus*, *Dicoma capensis*, *Emex australis*, *Euryops annuus*, *Hebenstretia parviflora*, *Helichrysum herniarioides*, *Lepidium africanum*, *L. desertorum*, *Lessertia pauciflora*, *Leysera tenella*, *Lotononis parviflora*, *Lyperia tristis*, *Oncosiphon grandiflorum*, *Osteospermum pinnatum*, *Pelargonium minimum*, *Plantago cafra*, *Radyera urens*, *Ursinia nana*.

Geophytic Herbs: *Drimia intricata*, *Lachenalia ameliae*, *Moraea pallida*, *M. speciosa*, *Ornithogalum xanthochlorum*, *Ornithoglossum viride*, *Oxalis pes-caprae*, *Strumaria unguiculata*, *Tritonia florentiae*.

Succulent Herbs: *Brownanthus vaginatus*, *Crassula muscosa*, *Duvalia caespitosa* subsp. *caespitosa*, *Mesembryanthemum excavatum*, *M. guerichianum*, *M. stenandrum*, *Psilocaulon articulatum*, *P. junceum*, *Tetragonia microptera*.

Graminoids: *Stipagrostis ciliata* (d), *S. obtusa* (d), *Aristida adscensionis*, *Cladoraphis spinosa*, *Ehrharta calycina*, *Enneapogon desvauxii*, *E. scaber*, *Fingerhuthia africana*.

Biogeographically Important Taxa (^{RH}Roggeveld-Hantam endemic, ^SSouthern distribution limit)

Low Shrubs: *Nenax cinerea*^{RH}, *Stachys aurea*^{RH}.

Herbs: *Alatoseta tenuis*^{RH}, *Dimorphotheca polyptera*^S, *Nemesia karroensis*^{RH}.

Geophytic Herbs: *Haemanthus barkerae*^{RH}, *Lapeirousia violacea*^{RH}.

Succulent Herbs: *Stapelia surrecta*^{RH}, *Tridentea parvipuncta* subsp. *truncata*^{RH}, *Tromotriche thudichumii*^{RH}.

Endemic Taxa:

Succulent Shrubs: *Braunsia stayneri*, *Cephalophyllum corniculatum*, *Didymaotus lapidiformis*, *Drosanthemum bellum*, *D. lignosum*, *Euphorbia gentilis* subsp. *tanquana*, *Hammeria meleagris*, *Hereroa nelli*, *H. teretifolia*, *Malephora crassa*, *Ruschia tardissima*, *Tanquana prismatica*.

Geophytic Herbs: *Haemanthus tristis*, *Strumaria karooportensis*.

Remark 1:

Tanqua (Tankwa) Karoo is one of the driest forms of the Succulent Karoo Biome, and the whole appearance of the landscape resembles desert rather than semidesert during most of the year (in extremely precipitation-poor years in particular). The eastern edge (the foot of the Roggeveld Escarpment) and southern parts of the Tanqua Karoo, are wetter and consequently more densely vegetated. The classification status of the driest parts of the Tanqua Karoo as rainshadow desert rather than semidesert (Succulent Karoo) remains open for the time being. The mapped unit nevertheless lies within the same range of MAP corresponding to some of the Succulent Karoo mapped elsewhere within the winter-rainfall region (Port Nolloth southwards to Wallekraal) but lacks the coastal fog of the latter area. The role of heavy grazing pressure in the 19th and early 20th centuries in the Tanqua Karoo needs to be evaluated in places where it is 'terribly tramped out' according to Acocks (1953).

Remark 2:

Tanqua Karoo (including the extensive sheet-wash plains) is an important local centre of endemism housing two endemic genera (*Didymaotus* and *Eurystigma*) and three near-endemic genera (*Braunsia*, *Hammeria* and *Tanquana*)—all of the family Aizoaceae.

5.5 Conservation status of broad vegetation types

On the basis of a scientific approach used at national level by SANBI (Driver et al., 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale the thresholds are as depicted in Table 3 below, as determined by best available scientific approaches (Driver et al., 2005). The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver et al., 2005).

Determining ecosystem status (Driver et al., 2005). *BT = biodiversity target (the minimum conservation requirement).

Habitat remaining (%)	80–100	least threatened	LT
	60–80	vulnerable	VU
	*BT–60	endangered	EN
	0–*BT	critically endangered	CR

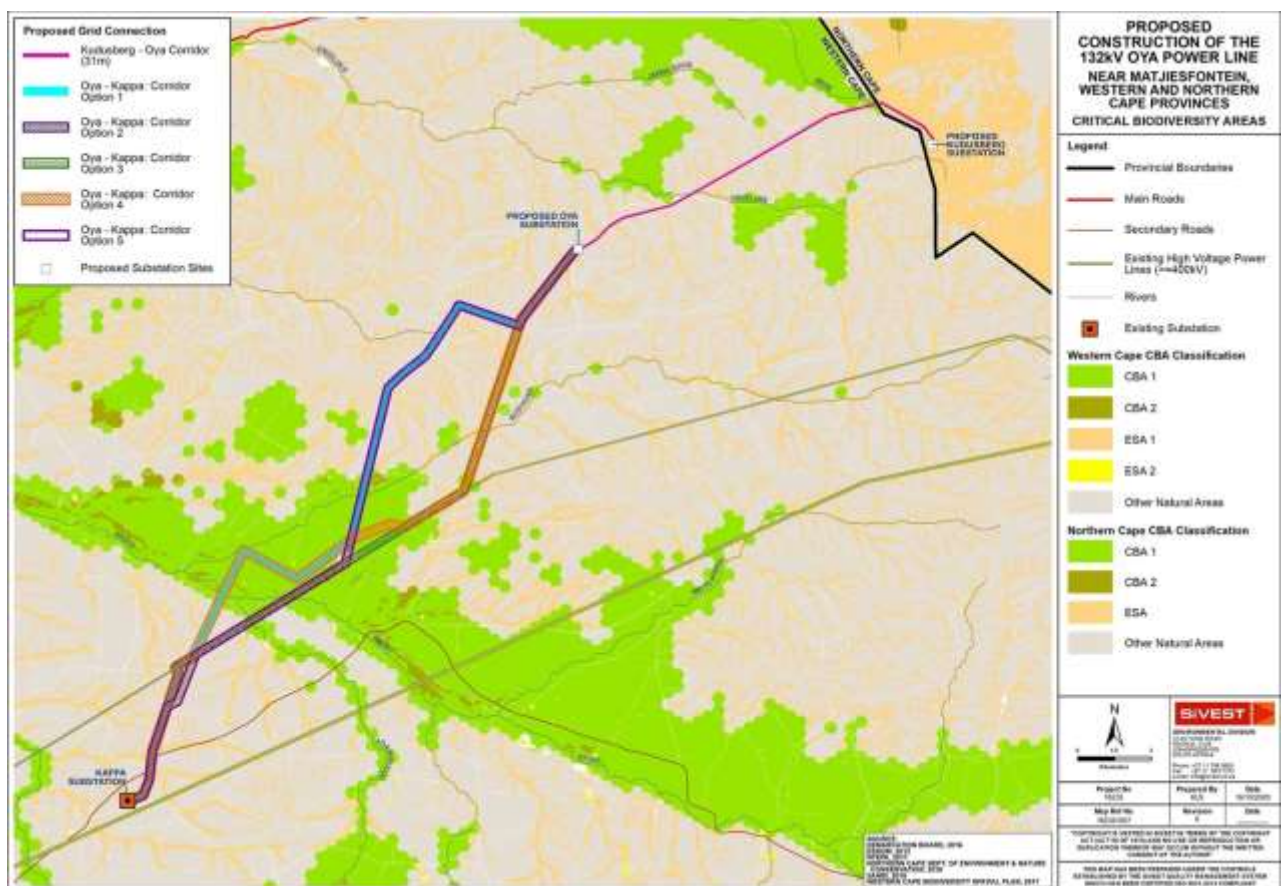


Figure 7: Critical Biodiversity Areas of the study area.

Table 1: Conservation status of different vegetation types occurring in the study area.

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation status	
				Driver <i>et al.</i> 2005; Mucina <i>et al.</i> , 2006	National Ecosystem List (NEM:BA)
Koedoesberge-Moordenaars Karoo	19	0.3	1	Least threatened	Not listed
Central Mountain Shale Renosterveld	27	0	1	Least threatened	Not listed
Tanqua Wash Riviere	19	13	3	Least threatened	Not listed
Tanqua Karoo	19	14	1	Least threatened	Not listed

According to scientific literature (Driver *et al.*, 2005; Mucina *et al.*, 2006), as shown in Table 3, all four vegetation types are listed as Least Threatened. The total extent of the Koedoesberge-Moordenaars Karoo vegetation type is 47,145,009 hectares, very little of which has been transformed. It extends from near Tanqua Karoo towards Laingsburg and slightly beyond.

The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists national vegetation types that are afforded protection on the basis of rates of transformation. The thresholds for listing in this legislation are higher than in the scientific literature, which means there are fewer ecosystems listed in the National Ecosystem List versus in the scientific literature.

None of the vegetation types are listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).

5.6 Biodiversity Conservation Plans

The Western Cape CBA map classifies the natural vegetation of the province according to conservation value in decreasing value, as follows:

1. Protected Area
2. Critical Biodiversity Area 1
3. Critical Biodiversity Area 2
4. Ecological Support Area 1: Terrestrial
5. Ecological Support Area 1: Aquatic
6. Ecological Support Area 2
7. Other Natural Area: Natural to Near Natural
8. Other Natural Area: Degraded
9. No Natural Remaining

This shows features within the study area within three of these classes, as shown in Figure 8 below:

1. Critical Biodiversity Areas 1: There is a broad area of CBA1 that runs through the south-central part of the study area, associated with the broad Tanqua drainage system running through the study area. There are other areas of CBA1 in the northern part of the study area (Figure 7), but these have mostly

been excluded from the footprint of the proposed project. For the proposed powerline the entire development area (except for the drainage basin) is located outside of CBA1 and CBA 2.

2. Ecological Support Areas 1 (ESA 1): All of the drainage lines and riparian habitat in the study area has been designated as Ecological Support Area 1.
3. Other Natural Areas (ONA): The majority of the site in is an ONA

The Western Cape Biodiversity Spatial Plan Handbook (Pool-Stanvliet et al. 2017) provides recommended guidelines for land-use activities within different CBA categories and these provide the best indication of the type of development that may or may not be acceptable within these defined units. Those that are relevant to the current project are as follows:

Map Category	Desired Management Objective
Critical Biodiversity Area 1	Keep natural, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land-uses are appropriate.
Ecological Support Area 1: Terrestrial	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.
Other Natural Area	Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land-uses, but some authorisation may still be required for high impact land uses.

According to the Western Cape Biodiversity Spatial Plan Handbook (Pool-Stanvliet et al., 2017), the desired land management objective in CBA1 areas is to maintain the area in a natural state with no biodiversity loss. The Plan does not support developments that result in the significant transformation of natural habitat within CBA1 areas.

5.7 Proposed protected areas

According to the National Parks Area Expansion Strategy (NPAES), there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore outside the NPAES focus area. The entire study area is also outside of the Draft 2018 NPAES. There are many areas outside of the study site, to the north, south, east and west that are included as being part of future protected areas, but not within or adjacent to the site itself.

5.8 Red List plant species of the study area

Lists of plant species previously recorded in the study area were obtained from the South African National Biodiversity Institute (SANBI) website (<http://newposa.sanbi.org/>). These are listed in Appendix 3. This list has been supplemented from information obtained from two published sources (Van der Merwe et al., 2008 a, b; Clark et al. 2011; Steyn et al., 2013) as well as a published specialist report for the neighbouring WEF project (Ekotrust 2018). This list was refined for the study area after the suitability of the site had been assessed for the species on this list during a detailed field survey of the site.

Table 2: Explanation of IUCN Version 3.1 categories (IUCN 2001) and Orange List categories (Victor & Keith 2004).

IUCN / Orange List category	Definition	Class
EX	Extinct	Extinct
CR	Critically Endangered	Red List
EN	Endangered	Red List
VU	Vulnerable	Red List
NT	Near Threatened	Orange List
Declining	Declining taxa	Orange List
Rare	Rare	Orange List
Critically Rare	Rare: only one subpopulation	Orange List
Rare-Sparse	Rare: widely distributed but rare	Orange List
DDD	Data Deficient: well known but not enough information for assessment	Orange List
DDT	Data Deficient: taxonomic problems	Data Deficient
DDX	Data Deficient: unknown species	Data Deficient

The list contains 28 species listed in an IUCN threat category (Critically Endangered, Endangered or Vulnerable (see Table 4 above) of which 2 have a possibility of occurring in the general area and in the type of habitats available in the study area. This does not mean that they will occur there, only that a literature review has identified that these are species that should be assessed as possibly occurring in the area. These species are as follows: *Lotononis venosa*, and *Octopoma nanum*. Neither of these species were encountered on site or on the WEF project (Ekotrust 2018).

There are an additional three (3) species that are listed as Near Threatened that were assessed as having a possibility of occurring on site, two (2) of which have been previously recorded in the study area (Ekotrust 2018), namely *Geissorhiza karooica* (Iridaceae) and *Lachenalia whitehillensis* (Hyacinthaceae). Both of these are spring-flowering geophytes, and neither was seen on the current site. The other species is *Ehrharta eburnea*. None of these three species were found on site.

There are an additional 24 species listed by SANBI as either Rare or Critically Rare, five (5) of which have been previously recorded in the study area (Ekotrust 2018), namely *Bulbine torta* (Asphodelaceae), *Cleretum lyratifolium* (Aizoaceae), *Eriocephalus grandiflorus* (Asteraceae), *Moraea contorta* (Iridaceae), and *Pectinaria articulata* (Apocynaceae). These are all late-winter to early spring-flowering plants, four of which were not seen on the current site. The succulent, *Pectinaria articulata*, was recorded a number of times on site but not within the servitude of the powerline.

For all the species discussed here, it must be kept in mind that species are listed in a threat category or in a rarity category often due to being extremely rare as well as being threatened by some factor. They could also be highly cryptic or seasonal and therefore difficult to spot. It is usually very difficult to locate such species, even when it is known that they occur in a particular locality. One way of addressing this uncertainty is to attempt to identify habitats in which they are most likely to occur and then to treat these habitats as being potentially sensitive on the basis of being possible habitat for species of concern. This is somewhat circular, but of value in the absence of confirmed siting's. Logically, it is also only possible to prove the presence of a species, not its absence.

5.9 Protected plants (National Environmental Management: Biodiversity Act)

Plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) are listed in Appendix 6. One (1) species on this list could potentially occur on site, namely *Hoodia gordonii*. There are no other plant species protected according to this legislation that have a geographical distribution that includes the study area.

5.9.1 *Hoodia gordonii*

This species is widespread in the arid parts of South Africa and also occurs in Namibia, Botswana and Angola. It occurs in a wide variety of arid habitats from coastal to mountainous, on gentle to steep ridges and from dry, rocky places to sandy spots in riverbeds. It is harvested indiscriminately for its high economic value nationally and internationally. It can be locally common, but its status is unknown due to high levels of recent decline. It is currently listed as Data Deficient on the Red List of South African Plants (<http://redlist.sanbi.org/species.php?species=2705-13>, accessed on 21 July 2020). Any impacts on this species will require a permit from the relevant authorities. A walk-down survey did not encounter any individuals of this species.

5.10 Protected plants (Cape Nature and Environmental Conservation Ordinance 19 of 1974)

Plant species protected under the Cape Nature and Environmental Conservation Ordinance 19 of 1974 are listed in Appendix 5. There are two Schedules under this Ordinance, the first (Schedule 3) being Endangered species and the second (Schedule 4) Protected species. None of the species in the first Schedule (Schedule 3: Endangered species) have a geographical distribution that includes the site. They therefore do not occur there.

A number of species protected according to Schedule 4 were found on site. From the field surveys of the site, this includes the following species:

- *Antimima hallii* (AIZOACEAE)
- *Antimima pumila* (AIZOACEAE)
- *Astroloba bullulata* (ASPHODELACEAE)
- *Babiana cuneata* (IRIDACEAE)
- *Babiana spathacea* (IRIDACEAE)
- *Brunsvigia comptonii* (AMARYLLIDACEAE)
- *Cephalophyllum* sp. (AIZOACEAE)
- *Cheiridopsis namaquensis* (AIZOACEAE)
- *Crassula columnaris* subsp. *columnaris* (CRASSULACEAE)

- *Delosperma* sp. (AIZOACEAE)
- *Drosanthemum* sp. (AIZOACEAE)
- *Gladiolus splendens* (IRIDACEAE)
- *Hammeria gracilis* (AIZOACEAE)
- *Hammeria meleagris* (AIZOACEAE)
- *Lampranthus* sp. (AIZOACEAE)
- *Leipoldtia schultzei* (AIZOACEAE)
- *Mesembryanthemum guerichianum* (AIZOACEAE)
- *Mesembryanthemum junceum* (AIZOACEAE)
- *Mesembryanthemum nitidum* (AIZOACEAE)
- *Mesembryanthemum noctiflorum* (AIZOACEAE)
- *Mesembryanthemum tortuosum* (AIZOACEAE)
- *Microlooma sagittatum* (APOCYNACEAE)
- *Moraea cuspidata* (IRIDACEAE)
- *Moraea flaccida* (IRIDACEAE)
- *Moraea pritzeliana* (IRIDACEAE)
- *Moraea tripetala* (IRIDACEAE)
- *Pectinaria articulata* (APOCYNACEAE)
- *Psilocaulon junceum* (AIZOACEAE)
- *Quaqua mammillaris* (APOCYNACEAE)
- *Ruschia intricata* (AIZOACEAE)
- *Ruschia multiflora* (AIZOACEAE)
- *Veltheimia capensis* (HYACINTHACEAE)

Despite not being threatened, any impacts on these species (and other additional species that may be found that are listed as protected) will require a permit from the relevant authorities. An application for a permit for these species is being applied for. Many of these species are widespread and not of any conservation concern but protected due to the fact that the Cape Nature and Environmental Conservation Ordinance 19 of 1974 protects entire families of flowering plants irrespective of whether some members are rare or common. The identity, location and numbers of protected plants has been established during a walk-down survey of the proposed infrastructure footprint, and the measures to manage these are described in a Plant Rescue/Management Plan. a permit application is currently in progress.

5.11 Protected trees

Tree species protected under the National Forest Act are listed in Appendix 2. There are none with a geographical distribution that includes the region in which the proposed project is located. There is one (1) species that has a geographical distribution that ends south of the study area, namely *Podocarpus latifolius*, but this species does not occur near to the site.

In summary, no species of protected trees were found or are likely to occur in the geographical area that includes the site.

5.12 Vertebrate animal species of the study area

Vertebrate species (mammals, reptiles, amphibians) with a geographical distribution that includes the study area are listed in Appendix 4. All threatened (Critically Endangered, Endangered or Vulnerable) or near threatened vertebrate animals that could occur in the study area and have habitat preference that includes habitats available in the study area, are discussed further below.

5.12.1 Mammals

There are 56 mammal species that have a geographical distribution that includes the study area, of which seven (7) are listed in a conservation category of some level (see Appendix 3). This is a relatively moderate to low diversity of mammals compared to other parts of South Africa. Based on the natural state of the study area and surrounding areas, it is considered likely that many of these species could occur on site, especially the smaller species, such as various rodents, insectivores and small predators. Listed species with a geographical range that includes the site are discussed in more detail below to evaluate the potential for them to occur on site.

Riverine Rabbit

The Riverine Rabbit (*Bunolagus monticularis*), listed as Critically Endangered, has not been previously recorded in the grid in which the site is located. Known records include grids further to the north, east and south of the current site, most of which are on the highlands above the escarpment slopes. Although not previously recorded in the grid in which the site is located nor any immediately adjacent grids, the relatively wide distribution and scattered records, including a number of recent new sightings in widely-separated locations, suggest that there is a possibility of individuals occurring on site or migrating through the site, if suitable habitat occurs there. Habitat suitability monitoring (Collins & Du Toit 2016) indicates that the site is marginal for the species. The species has narrowly defined habitat requirements and is found only in dense riverine vegetation on alluvial soils adjacent to seasonal rivers. Within the study area are a number of non-perennial watercourses, but none of these are significant in terms of having both extensive and deep alluvial soils as well as dense riverine vegetation. It is considered that there is a very low possibility of the species being found on site. Nevertheless, any suitable habitat should be treated as sensitive and appropriately managed during this project.

Black Rhinoceros

The Black Rhinoceros (*Diceros bicornis bicornis*), listed as Critically Endangered, has a geographical distribution that includes the study area. The species is confined to formal conservation areas as well as a few individuals held on private land. Although the habitat on site is suitable for this species, it does not occur there and would not be found there unless deliberately introduced.

Grey Rhebok

The Grey Rhebok (*Pelea capreolus*), listed as Near Threatened, is endemic to South Africa, Lesotho and parts of Swaziland. In the south and southwest, their distribution is associated with the rocky hills of mountain Fynbos and the Little Karoo (Taylor et al. 2016). They are predominantly browsers, feeding on ground-hugging forbs, and largely water independent, obtaining most of their water requirements from their food (Taylor et al.

2016). Local declines in their population have been attributed to increased densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. It has been recorded in both grids in which the site is located, and a small number were seen on a nearby site. However, it is a relatively mobile species and not necessarily dependent on habitat at any particular location. It is more likely to be found lower down in the topography, on the lowland plains and footslopes rather than high up on the ridge. It is likely to move away from the path of any construction and development of parts of the study area. The proposed development is therefore unlikely to have any negative effect on the species, even though it probably occurs there.

Black-footed Cat

The Black-footed Cat (*Felis nigripes*), listed as Vulnerable, has been previously recorded in the grid to the north of the study area, but not in the grid in which the project is located. It's known distribution is on the inland part of most of South Africa, but seemingly not within the winter-rainfall part of the country. It also occurs in Botswana and Namibia. The current site is therefore on the western limit of its general distribution, although there is undoubtedly a possibility of it occurring in the area. The species is nocturnal and carnivorous, favouring any vegetation cover that is low and not too dense. They make use of dens in the daytime, which can be abandoned termite mounds, or dens dug by other animals, such as aardvark, springhares or cape ground squirrels. Local declines in their population have been attributed to increased densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. They are highly vulnerable to domestic carnivores. The study area is definitely suited to this species and it could occur there, although not likely in high densities. The proposed development is therefore unlikely to have significant negative effect on the species, even though it is likely to occur there.

Leopard

The Leopard (*Panthera pardus*), listed as Vulnerable, has a wide habitat tolerance, but with a preference for densely wooded areas and rocky areas. In montane and rocky areas of the Western and Northern Cape, they prey on dassies and klipspringers. They have large home ranges, but do not migrate easily, males having ranges of about 100 km² and females 20 km². It has been recorded in two adjacent grids, as well as throughout most of the Fynbos Biome. It has been confirmed by landowners to occur in the area, so there is a high probability of this species occurring on site, in which case it would be at very low densities. The proposed project could displace individuals but is unlikely to have a significant effect on overall population densities.

Spectacled Dormouse

The Spectacled Dormouse (*Graphiurus ocularis*), listed as Near Threatened, is endemic to South Africa, where it is found in the Northern, Eastern and Western Cape Provinces. It is associated with rock piles, crevices, outcrops and stone kraals. They may be territorial. The site is well-within the known distribution of this species and there are historical records for two adjacent grids to the east, although not from the current grid. There is therefore a high probability of the site being suitable for this species. It is considered likely that it could occur on site and individuals could be affected by construction activities, if suitable habitat is damaged.

African Striped Weasel

The African Striped Weasel (*Poecilogale albinucha*), listed as Near Threatened, is found throughout most of South Africa, except for the arid interior, and into central Africa (excluding Namibia). It has not been recorded in the grid in which the site is located or any surrounding grid, but the site is within the overall distribution range for the species. It is found primarily in moist grasslands and fynbos, where adequate numbers of prey may be found. It is considered unlikely to occur in the study area and the proposed development will therefore not affect this species.

Of the species currently listed as threatened or protected (see Appendix 5 for list of protected species), those listed in Table 3 are considered to have a low - medium probability of occurring on site and being potentially negatively affected by proposed activities on site.

Table 3: Mammal species of conservation concern with a likelihood of occurring on site.

Scientific name	Common name	Status	Likelihood of occurrence
<i>Panthera pardus</i>	Leopard	Vulnerable, protected	High
<i>Graphiurus ocellatus</i>	Spectacled Dormouse	Near Threatened	High
<i>Pelea capreolus</i>	Grey Rhebok	Near Threatened	High
<i>Mellivora capensis</i>	Honey Badger	Protected	Medium
<i>Felis nigripes</i>	Black-footed Cat	Vulnerable	Medium
<i>Bunolagus monticularis</i>	Riverine Rabbit	Critically Endangered, protected	Low
<i>Poecilogale albinuca</i>	African Striped Weasel	Near Threatened	Low

5.12.2 Reptiles

A total of 74 reptile species have a geographical distribution that includes the general study area in which the site is found (Alexander & Marais 2007, Bates et al. 2014, Branch 1988, Marais 2004, Tolley & Burger 2007). This is a fairly high potential diversity compared to average diversity in other parts of the country. Of the reptile species that could potentially occur in the study area, the Karoo Dwarf Tortoise, listed as Near Threatened, has been listed in a threat category.

Karoo Dwarf Tortoise

The Karoo Dwarf Tortoise (*Chersobius boulengeri*), listed as Near Threatened, is associated with dolerite ridges and rocky outcrops of the southern Succulent Karoo and Nama-Karoo Biomes, and Albany Thicket in the southeast, at altitudes of approximately 800 m to 1 500 m. It occurs within dwarf shrubland that often contains succulent and grassy elements (Bates et al. 2014). It usually takes shelter under rocks in vegetated areas or in rock crevices. It has been previously recorded in the grid in which the site is located and, based on habitat requirements, there is a high probability that the species could occur on site.

Armadillo Girdled Lizard

The Armadillo Girdled Lizard (*Ouroborus cataphractus*), protected according to the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004), is endemic to the Succulent Karoo Biome in the winter rainfall zone of the Northern and Western Cape, South Africa (Mouton 2014). It occurs from the southern Richtersveld to the southern Tankwa Karoo and Matjiesfontein. It is group-living and found in rock crevices, especially of sandstone. It is particularly abundant on rock outcrops on the western coastal lowlands, but also found on lower mountain slopes (Mouton 2014). It has been previously recorded in the grid in which the site is located as well as all the surrounding grids and, based on habitat requirements, there is a high probability that the species occurs on site.

There is therefore one (1) reptile species of conservation concern and one (1) protected reptile species that could potentially occur in the study area and that may therefore be affected by the proposed project, shown in Table 4.

Table 4: Reptile species of conservation concern with a likelihood of occurring on site.

Scientific name	Common name	Status	Likelihood of occurrence
<i>Chersobius boulengeri</i>	Karoo Dwarf Tortoise	Near Threatened	High
<i>Ouroborus cataphractus</i>	Armadillo Girdled Lizard	Protected	High

5.12.3 Amphibians

A total of only seven (7) frog species have a geographical distribution that includes the general study area in which the site is found (Du Preez & Carruthers 2009). Some of these species are only marginally present in the study area due to the fact that their distribution range ends close to the study area. Of the frog species that could potentially occur in the study area, none are listed in a threat category.

It is concluded that the site contains habitat that is suitable for various frog species, although no species of conservation concern are likely to occur in the study area.

Table 5: Amphibian species of conservation concern with a likelihood of occurring on site.

Scientific name	Common name	Status	Likelihood of occurrence
None	None	N/A	N/A

5.13 Protected animals

There are a number of animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004). According to this Act, "a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7". Such activities include any that are "of a nature that may negatively impact on the survival of a listed threatened or protected species". This implies that any negative impacts on habitats in which populations of protected species occur or are dependent upon would be restricted according to this Act.

Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in Appendix 6, marked with the letter "N". This includes the following species: Black Rhinoceros (does not occur on site), Honey Badger, Black-footed Cat, Leopard, Cape Fox, Riverine Rabbit (unlikely to occur on site) and Armadillo Lizard.

Due to habitat and forage requirements, and the fact that some species are restricted to game farms and/or conservation areas, only the Honey Badger, Black-footed Cat, Leopard, Cape Fox, Riverine Rabbit and Armadillo Lizard have any likelihood of occurring on site. Some of these species are mobile animals (Honey

Badger, Black-footed Cat, Leopard, Cape Fox) that are likely to move away in the event of any activities on site disturbing them. However, there are some (Armadillo Lizard) that may be dependent on a small patch of habitat within their range to exist there. They could therefore be affected by the proposed development of the project, although the risk is low.

6. SPECIALIST FINDINGS / IDENTIFICATION AND ASSESSMENT OF IMPACTS

6.1 Habitats found on site

The natural habitat units found on site broadly correspond with the national vegetation types, with added variation due to local drainage and surface rockiness. These are as follows:

1. Mountain summit vegetation (Central Mountain Shale Renosterveld);
2. Hills vegetation (Koedoesberge-Moordenaars Karoo);
3. Lowland plains vegetation (Tanqua Karoo);
4. Broad lowland floodplain vegetation (Tanqua Wash Riviere).
5. Rocky outcrops & cliffs;
6. Quartz patches;
7. Stream beds and associated riparian vegetation.

These are described in more detail below.

6.1.1 Hills and plains vegetation

The general study area is characterised by a low succulent, dwarf shrubland, typical of the regional vegetation type, Koedoesberge-Moordenaars Karoo, which is described as “low succulent scrub and scattered tall shrubs, patches of ‘white’ grass visible on plains, the most conspicuous dominants being dwarf shrubs of *Pteronia*, *Drosanthemum* and *Galenia*” (Mucina & Rutherford 2006). A typical view of this vegetation on site is shown in Figure 10 below.

This is also equivalent to *Ruschia intricata* – *Mesembryanthemum noctiflorum* Tanqua Karoo described by Van der Merwe et al. (2008a; 2008b). It is also within the area described as Association 4: *Leipoldtia schultzei* – *Euphorbia mauritanica* lower slopes by EKOTRUST CC (2018) in the assessment report for the proposed development of the 325 MW Kudusberg Wind Energy Facility, the study area of which partially overlaps with the current site.

The general floristic character of this vegetation on site is fairly uniform across wide areas, often dominated by the same suite of species, including *Ruschia spinosa*, *Pteronia incana*, *Galenia africana*, *Lycium cinereum*, *Asparagus capensis*, *Leipoldtia schultzei* and *Eriocephalus punctulatus*. However, any local variation in topography can lead to localized increase in richness associated with a more diverse species composition.

There is a high degree of succulence in the flora of this vegetation, a function largely of the aridity of the area, the mostly winter rainfall and the skeletal soils. The vegetation is drought-hardy and tolerant of a low level of grazing / browsing, but it has a low ability to recover from disturbance where the vegetation cover is removed. This is a typical pattern in arid areas where slow growth rates and water-scarcity do not allow rapid recovery from vegetation loss. In this vegetation, there are low rates of recruitment and existing plants are relatively old. The vegetation is an important cover for the landscape and, although not necessarily floristically sensitive, is sensitive to disturbance.

6.1.2 Riparian, drainage and floodplain vegetation

There is a network of dry stream beds throughout the study area, with smaller streams eventually joining together to form larger systems further downstream. In the upper reaches of slopes these start as dry drainage lines that reflect the characteristics of the surrounding vegetation rather than that of being a unique habitat. Where the dry streams occur as a unique habitat, they consist of a sandy or rocky bed, often unvegetated or sparsely vegetated, bordered by a line of shrubs or small thorn trees. A typical example is shown in Figure 11 below and Figure 12 (next page). As the stream beds get larger, the riparian fringe becomes more pronounced, often developing an almost impenetrable margin of thorn trees. There is a continuum from the smallest streams to the larger “rivers”.

This is also equivalent to the area described as Association 6: *Vachellia karroo* drainage lines by EKOTRUST CC (2018) in the assessment report for the proposed development of the Oya Hybrid Energy Facility, the study area of which partially overlaps with the current site.

The riparian areas have a species composition and structure that is almost completely different to the surrounding landscape. The habitat contains a combination of bare rock and deeper sands, so it is able to support a flora that is adapted to these substrate conditions, in addition to the sporadic flooding and scouring that takes place in these habitats as a result of rare large rainfall events. The thorn trees (and other shrubs) occur here because they can root deeply to access underground water, a source that is not available to other terrestrial habitats. Although not necessarily floristically sensitive, the habitat that is derived under these ecological conditions is critically important for fauna, providing food and shelter as well as corridors for undetected movement. In times of drought, riparian areas may offer the only slightly green vegetation as a source of food. The deeper sands are important for burrowing animals and the shrubs and low trees offer shelter and browse.

Riparian habitats are disproportionately important in terms of the proportion of the area that they occupy in the landscape – they probably occupy 5-10% of the landscape in total but provide a unique and important habitat for both flora and fauna. The plant species occurring within these habitats are not necessarily rare in a global sense, but degradation of this interconnected system can cause floristic loss and change in areas far removed from any impact. Maintenance of regional vegetation patterns therefore is dependent on maintaining the health and functionality of this component of the landscape. For this reason, and for the utilitarian importance to fauna, the riparian vegetation is considered to be ecologically sensitive. In addition, if there is any likelihood of the Riverine Rabbit occurring on site then this is the habitat in which it would be found.

6.2 Habitat sensitivity

To determine sensitivity on site, local and regional factors were taken into account. There are some habitats on site that have been described as sensitive in their own right, irrespective of regional assessments. This includes primarily the dry stream beds and associated riparian zones and adjacent floodplains however a detailed assessment of these areas has been undertaken by an aquatic specialist. Rocky outcrops and steep slopes, especially at higher elevations are more sensitive than surrounding areas, mainly due to higher floristic diversity and the likelihood of plant species with low local abundance occurring there.

In terms of other species of concern, including both plants and animals, there are no specific locations where conservation of habitat would benefit a specific species based on the existing data available. Both reptile species of concern, all mammal species of concern and all protected plant species described previously could occur on any part of the site, whether in the mountains or on the lowlands.

A summary of sensitivities that occur on site and that may be vulnerable to damage from the proposed project are as follows:

1. Dry stream beds, including the associated riparian habitats and adjacent floodplains;
2. Rock outcrops;
3. Very steep slopes;

6.3 Potential sensitive receptors in the general study area

A summary of the potential ecological issues for the study area is as follows (issues assessed by other specialists, e.g. on wetlands, are not included here):

- Presence of natural vegetation on site, some of which has high conservation value due to being within Critical Biodiversity Areas.
- Potential presence of a number of protected plant species. A permit from the relevant Provincial authorities will be required for any protected species lost to the development.
- Potential presence of the following animals of conservation concern:
 - *Panthera pardus* (Leopard) Vulnerable, protected
 - *Graphiurus ocularis* (Spectacled Dormouse) Near Threatened
 - *Pelea capreolus* (Grey Rhebok) Near Threatened
 - *Mellivora capensis* (Honey Badger) Protected
 - *Felis nigripes* (Black-footed Cat) Vulnerable
 - *Chersobius boulengeri* (Karoo Dwarf Tortoise) Near Threatened
 - *Ouroborus cataphractus* (Armadillo Girdled Lizard) Protected
- Potential invasion of natural habitats by alien invasive plants, thus causing additional impacts on biodiversity features. Alien invasive plants are required by law to be controlled.
- Presence of habitats associated with riparian habitats, drainage lines and dry stream beds. These are linear habitats that are important for various species for shelter, movement and resources, and

for which impacts could potentially cause fragmentation and/or a disconnect between different parts of the system.

- Presence of rocky areas that tend to contain species restricted to such habitats.
- Succulent karoo vegetation has a structure and composition that has developed over millenia. Any loss of habitat is effectively permanent in that it is not possible in human lifespans to recover any habitat lost to disturbance. Vegetation recovery after disturbance is to a composition that can be observed on old lands and differs substantially from the typical natural vegetation. Any unnecessary destruction of habitat must therefore be avoided.

Based on this information, habitats on site were placed into different sensitivity classes, namely HIGH for wetlands, floodplains and riparian habitats, MEDIUM-HIGH for drainage areas and rock outcrops, and MEDIUM for mid-slopes and plains vegetation. The areas of HIGH sensitivity should be avoided, if possible, or impacts on these areas minimised as much as possible.

6.4 Overall Impact Rating

6.4.1 Planning / Pre construction

The Planning / Pre construction Phase includes any activities associated with planning of the project. This does not involve any physical disturbance of the landscape. There are therefore no impacts on biodiversity / ecology that are relevant to this phase. Nevertheless, measures taken during the Design Phase of the project can potentially have a significant effect on the nature, extent and intensity of impacts experienced during the Construction Phase.

6.4.2 Construction

Direct Impacts include the following:

6.4.2.1 Loss and/or fragmentation of indigenous natural vegetation due to clearing for construction

The regional vegetation types in the broad study area are classified in the scientific literature as Least Threatened (Mucina et al., 2008) and not listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). Any areas of natural habitat within this regional vegetation type are therefore considered to have moderate conservation value. Some infrastructure is located within Critical Biodiversity Areas for the Western Cape, but the effect of this is assessed separately.

Vegetation on site is within a very arid region and consists of slow-growing dwarf shrubs, many of which are partially succulent. These species are slow to grow, and individuals are much older than they appear from their size. Disturbed areas are not likely to recover to any natural state and clearing must therefore be kept to an absolute minimum to avoid habitat degradation issues.

Habitat loss refers to physical disturbance of habitats through clearing, grading and other permanent to semi-permanent loss or degradation. Loss of habitat on site could lead to loss of biodiversity as well as habitat important for the survival of populations of various species. Habitat fragmentation will occur primarily through the construction of access roads. Edge effects related to roads are difficult to quantify or predict, but anything within 50 m of a road is almost certain to be affected by the changed physical conditions.

All infrastructure components will require clearing of vegetation prior to construction. The substations and access roads will require vegetation clearing, as well as each of the powerline tower structures. For all infrastructure components, loss of habitat will occur, but this will be relatively insignificant in comparison to the total area of the vegetation types concerned.

6.4.2.2 Loss of individuals of listed or protected plant species

Plant species are especially vulnerable to infrastructure development due to the fact that they cannot move out of the path of the construction activities but are also affected by overall loss of habitat within which metapopulation dynamics occur (dispersal, recruitment, pollination, etc.).

There is one (1) species protected according to the National Environmental Management: Biodiversity Act, *Hoodia gordonii*, that could potentially occur on site. There are a number of species protected according to Provincial legislation. These are listed in a section above in this report.

6.4.2.3 Loss of faunal habitat and refugia

Construction activities will lead to direct loss of habitat favourable for various faunal species, including sites where mobile fauna would obtain refuge and sedentary fauna would have permanent homes. The total loss of habitat will be a relatively small proportion of the available habitat on site. Loss of habitat could potentially affect all animal species occurring on site, although threatened and protected species are of greater concern. There are two (2) animal species of particular concern for this project, namely the Karoo Dwarf Tortoise and the Armadillo Girdled Lizard, neither of which were seen on site, although they have been assessed as having a probability of occurring there. There are also other more mobile species that are protected by legislation, including the Honey Badger, Black-footed Cat, Leopard and Cape Fox.

6.4.2.4 *Direct mortality of fauna due to machinery, construction and increased traffic*

There is a possibility that animals will be killed by machinery during construction, especially sedentary or relatively sedentary species, and those that move too slowly to move out of the path of construction. This will inevitably lead to mortality of individuals of such animals. There is also a possibility of collisions with vehicles due to increased traffic along roads and within the project area. Faunal mortalities may also be caused by electric fences, ingestion of waste material and/or accidental ensnarement.

6.4.2.5 *Displacement of mobile terrestrial fauna*

Construction activities, loss of habitat, noise, dust and general activity associated with the construction phase of the project are likely to cause all mobile species to move away from the site. Mobile species of conservation concern that could potentially be affected by the proposed project are as follows:

- Honey Badger,
- Black-footed Cat,
- Leopard,
- Cape Fox, and
- Grey Rhebok.

All these species are mobile terrestrial species with a large home range and the ability to travel long distances in short periods of time. Individuals may be locally displaced, but this will have little effect on the overall range of the species nor is it expected that any overall impacts will result from local displacement.

6.4.2.6 *Effects on physiological functioning of vegetation due to dust deposition*

There is a high probability during construction that dust will be created that will settle on surrounding vegetation. This will be due to earth-moving equipment as well as vehicles moving around on site as well as into and out of the site. There will be a definite increase in the amount of traffic on access roads to the site that will also affect surrounding areas. Dust deposited on vegetation directly screens incoming radiation as well as affects stomatal gas-exchange. The combined effect is a reduction in fitness of affected vegetation which will lead to reduced potential growth rates, damage to leaves, and possibly reduced ability to resist pathogens. In addition to direct effects on the vegetation, there is also a possibility that grazing animals will be affected through a reduction in palatability of plants, and increased silica on surfaces of edible plants that will possibly affect dental wear-and-tear.

6.4.2.7 *Impact on integrity of Critical Biodiversity Areas*

Some parts of the site are included in Critical Biodiversity Areas for the Western Cape. There are CBA1 areas that are within the direct footprint of the proposed project. There are also extensive areas of Ecological Support Areas, in the form of drainage lines, that could potentially be affected directly by proposed infrastructure, depending on detailed layout plans and layout options.

All infrastructure components will require clearing of vegetation prior to construction. However, the access roads and substations will cause local permanent loss of vegetation, although not of significant extent in comparison to the entire extent of affected regional vegetation.

Indirect Impacts include the following:

6.4.2.8 *Increased poaching and/or illegal collecting due to increased access to the area*

The site is in a relatively remote area with moderately low access to the public. More importantly, access to mountainous areas is limited due to it being on private land. There is therefore a relatively low risk of opportunistic or targeted poaching of plants or animals. The construction of roads into the project area and the increased amount of traffic from outside areas will increase the opportunity for poaching or illegal collecting. From a botanical perspective, there are a number of plants in succulent or geophyte groups that are attractive to collectors. There are also animals, such as lizards and tortoises that may be attractive to collectors or vulnerable to opportunistic collection. Many of these groups are protected under national and/or provincial legislation, but this does not necessarily prevent ill-informed or determined collectors. Poaching of animals or plants for meat or medicinal purposes is a separate risk that is also more likely to occur where physical access is created.

6.4.2.9 *Establishment and spread of declared weeds and alien invader plants due to the clearing and disturbance of indigenous vegetation*

Major factors contributing to invasion by alien invader plants includes inter alia high disturbance (such as clearing for construction activities) and negative grazing practices (Zachariades et al. 2005). Exotic species are often more prominent near infrastructural disturbances than further away (Gelbard & Belnap 2003, Watkins et al., 2003). Consequences of this may include:

- loss of indigenous vegetation;
- change in vegetation structure leading to change in various habitat characteristics;
- change in plant species composition;
- change in soil chemical properties;
- loss of sensitive habitats;
- loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
- fragmentation of sensitive habitats;
- change in flammability of vegetation, depending on alien species;
- hydrological impacts due to increased transpiration and runoff; and
- impairment of wetland function.

No existing populations of alien plants were seen on site, but areas of farm infrastructure were not investigated during the field survey. There is a high possibility that alien plants could be introduced to areas within the footprint of the proposed activities from surrounding areas in the absence of control measures. The potential consequences may be of moderate seriousness for affected natural habitats. Control measures could prevent the impact from occurring. These control measures are relatively standard and well-known.

6.4.2.10 *Changes to behavioural patterns of animals, including possible migration away or towards the project area*

The increased human presence and/or construction operations will increase noise levels as well as light levels at night. The increased human presence, elevated noise and light levels, loss of animal habitat and compaction of soils may alter the behavioural patterns of some animals. Some of these changes may favour certain species and negatively affect others and consequently change the composition of the animal communities. Some of these changes could possibly increase levels of predation. Territorial species such as steenbok, grey duiker and klipspringer will be negatively affected as well as species that live or move in the soil. These species might undergo a local reduction in their population size.

6.4.2.11 *Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to changes in downslope areas*

Increased erosion (water and wind) and water run-off will be caused by the clearing of indigenous vegetation, creation of new hard surfaces and compaction of soil. Service roads will be the main source of disturbance and erosion if not properly constructed and provided with water run-off structures. The construction site, substation site and crane pads will furthermore be levelled and compacted causing additional run-off and erosion. Increased run-off and erosion could affect hydrological processes in the area and will change water and silt discharge into drainage lines and streams.

Table 6: Rating of construction phase impacts

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction																				
Direct Impacts																				
Indigenous natural vegetation	Clearing of vegetation for construction of infrastructure will lead to direct loss and/or fragmentation of indigenous natural vegetation.	1	4	3	3	4	2	30	-	Medium	<ul style="list-style-type: none"> • Keep footprint as small as possible by selecting options that affect a smaller overall area of habitat. • As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores, taking the ecological sensitivity map into account. • Wherever technically possible, avoid sensitive features and habitats when locating infrastructure. • Cross streams and other linear features at right angles, where possible, and also near their end-points or where there are natural breaks in the feature of concern. • Apply mitigation measures according to assessment by 	1	4	2	2	4	2	26	-	Medium

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION										
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S	
Construction																					
											<p>Surface Water Specialist.</p> <ul style="list-style-type: none"> • Where possible, access roads should be located along existing farm, access and district roads, even if these require upgrading. • Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. • Footprints of construction sites, roads and substation sites should be clearly demarcated. • Ensure all possible steps are taken to limit erosion of surfaces, including proper management of storm-water runoff. • Compile a Rehabilitation Plan prior to the commencement of construction. • No additional clearing of vegetation 										

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction																				
												should take place without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas. • No driving of vehicles off-road outside of construction areas.								
Listed or protected plant species	Direct loss of individuals of protected and/or listed plant species, as well as loss of habitat for these species.	1	4	2	2	3	2	24	-	Medium	<ul style="list-style-type: none"> • It is a legal requirement to obtain permits for specimens that will be lost. • It is possible that some plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas. Any such measures will reduce the irreplaceable loss of resources as well as the cumulative effect. Note that Search and 	1	4	2	2	2	1	11	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION												
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S				
Construction																								
												Rescue is only appropriate for some species and that a high mortality rate can be expected from individuals of species that are not appropriate to transplant. • For any plants that are transplanted, annual monitoring should take place to assess survival. This should be undertaken for a period of three years after translocation and be undertaken by a qualified botanist. The monitoring programme must be designed prior to translocation of plants and should include control sites to evaluate mortality relative to wild populations.												

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction																				
Faunal habitat and refugia	Direct loss of habitat favourable for various faunal species, including sites where mobile fauna would obtain refuge and sedentary fauna would have permanent homes	1	2	2	2	3	2	20	-	Low	<ul style="list-style-type: none"> Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. Limit clearing of natural habitat designated as sensitive, especially rocky outcrops, cliffs and riparian habitats, where possible. This has already been applied during the Design phase of the project where attempts have been made to avoid sensitive habitats. All mitigation measures that apply to "Loss and/or fragmentation of indigenous natural vegetation" also apply here. 	1	2	2	2	3	1	10	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction																				
Fauna	Direct mortality due to machinery, construction and/or increased traffic	1	3	1	2	1	1	8	-	Low	<ul style="list-style-type: none"> • Access to sensitive areas outside of development footprint should not be permitted during construction. • Speed limits should be set for all roads on site, as well as access roads to the site. Strict enforcement of speed limits should occur – install speed control measures, such as speed humps, if necessary. • Night driving should be strictly limited and, where absolutely required, lower speed limits should apply for night driving. • Pre-construction walk-through in front of construction must be undertaken to move any individual animals, such as tortoises, prior to construction. • No dogs or other pets should be allowed on site, 	1	2	1	2	1	1	7	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION											
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S			
Construction																							
											except those confined to landowners' dwellings. <ul style="list-style-type: none"> Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas.. Proper waste management must be implemented, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard. 												

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction																				
Fauna	Displacement of mobile fauna as a result of habitat loss, noise, dust, and general activity.	1	2	2	1	1	1	7	-	Low	<ul style="list-style-type: none"> Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. Access to sensitive areas outside of development footprint should not be permitted during construction. Adhere to speed limits – install speed control measures, such as speed humps, if necessary No hunting of protected species. Personnel to be undergo induction and be educated about protection status of species, including distinguishing features to be able to identify protected species. Report any mortality of protected species to conservation authorities 	1	2	2	1	1	1	7	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction																				
Indigenous natural vegetation	Negative effects on physiological functioning of vegetation due to dust deposition	2	4	2	2	1	2	22	-	Low	<ul style="list-style-type: none"> No speeding on access roads – install speed control measures, such as speed humps, if necessary, and penalties for non-compliance. Excessive dust can be controlled by using appropriate dust-control measures. 	2	3	2	2	1	1	10	-	Low
Critical Biodiversity Areas	Loss of integrity of CBAs due to direct loss of habitat and/or fragmentation of core areas and linkages.	1	2	2	2	3	2	20	-	Low	<ul style="list-style-type: none"> All mitigation measures suggested for Impact 1 (Loss and/or fragmentation of indigenous natural vegetation) apply to this potential impact. 	1	2	2	2	3	1	10	-	Low
Indirect Impacts																				
Flora and fauna	Increased poaching and/or illegal collecting due to improved access to previously remote areas.	1	2	2	2	4	2	22	-	Low	<ul style="list-style-type: none"> Personnel to be educated about protection status of species, including distinguishing features, to be able to identify protected species. Implement strict access control for the site. 	1	2	2	2	4	1	11	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction																				
												<ul style="list-style-type: none"> No hunting / collecting of protected species. Report any illegal collection to conservation authorities. 								
Indigenous natural vegetation	Establishment and spread of declared weeds and alien invader plants due to the clearing and disturbance of indigenous vegetation	1	3	2	3	3	2	24	-	Medium	<ul style="list-style-type: none"> Implement the alien management plan, which highlights control priorities and areas and provides a programme for long-term control. Undertake regular monitoring to detect alien invasions early so that they can be controlled, as per the Alien Management Plan. Implement control measures, as per the Alien Management Plan. 	1	2	2	2	3	1	10	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction																				
Fauna	Changes to behavioural patterns of animals, including possible migration away or towards the project area	1	2	2	1	1	1	7	-	Low	<ul style="list-style-type: none"> • Access to sensitive areas outside of development footprint should not be permitted during construction. • Personnel to be educated about environmental sensitivities and issues on site. • Appropriate lighting should be installed to minimize impacts on nocturnal animals, as per visual specialist assessment. • Construction activities should not be undertaken at night. 	1	2	2	1	1	1	7	-	Low
Indigenous natural vegetation	Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to changes in downslope areas	1	3	2	3	3	2	24	-	Medium	<ul style="list-style-type: none"> • Maintain adequate buffer zones around hydrological features so that these do not become degraded from runoff and erosion. • Compile and implement a Stormwater Management Plan, which highlights 	1	2	2	2	3	1	10	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION									
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S	
Construction																					
												control priorities and areas and provides a programme for long-term control. <ul style="list-style-type: none"> • Undertake regular monitoring to detect erosion features early so that they can be controlled. • Implement control measures. • Construct proper culverts, bridges and/or crossings at drainage-line crossings, and other attenuation devices to limit overland flow. 									

6.4.3 Operation

Direct Impacts include the following:

6.4.3.1 *Continued disturbance to natural habitats due to general operational activities and maintenance*

During the operational phase of the project, there will be continuous activity on site, including normal operational activities, maintenance and monitoring. There may also be minor additional construction. Rehabilitation of various sites will also take place. These activities all have the potential to cause additional direct and/or indirect damage to natural habitat and vegetation.

6.4.3.2 *Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure*

There are various animal species of particular concern for this project, including the Karoo Dwarf Tortoise and the Armadillo Girdled Lizard. There are also other more mobile species that are protected by legislation, including the Honey Badger, Black-footed Cat, Leopard and Cape Fox. It is possible that individuals of these species may suffer mortality or removal of individuals through road kills, encounters with infrastructure, illegal hunting, illegal collecting (especially for the tortoise and lizard) and possible damage to habitats.

6.4.3.3 *Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape*

Increased erosion (water and wind) and water run-off will be caused by the clearing of indigenous vegetation, creation of new hard surfaces and compaction of soil. The internal access roads will be the main source of disturbance and erosion if not properly constructed and provided with water run-off structures. The construction site, substation site and crane pads will furthermore be levelled and compacted causing additional run-off and erosion. Increased run-off and erosion could affect hydrological processes in the area and will change water and silt discharge into drainage lines and streams.

Indirect Impacts include the following:

6.4.3.4 *Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors*

The presence of disturbed surfaces on site creates ecological edges and corridors along which alien species can travel and become established.

6.4.3.5 Changes to behavioural patterns of animals, including possible migration away or towards the project area

The increased human presence and/or construction operations will increase noise levels as well as light levels at night. The increased human presence, elevated noise and light levels, loss of animal habitat and compaction of soils may alter the behavioural patterns of some animals. Some of these changes may favour certain species and negatively affect others and consequently change the composition of the animal communities. Some of these changes could possibly increase levels of predation. Territorial species such as steenbok, grey duiker and klipspringer will be negatively affected as well as species that live or move in the soil. These species might undergo a local reduction in their population size.

Table 7: Rating of operational phase impacts.

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Operation																				
Direct Impacts																				
Indigenous natural vegetation	Continued disturbance of indigenous natural vegetation	1	3	2	2	3	2	22	-	Low	<ul style="list-style-type: none"> No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas. No driving of vehicles 	1	3	2	2	3	1	11	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION										
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		
Operation																						
												off-road. <ul style="list-style-type: none"> • Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. • Access to sensitive areas outside of development footprint should not be permitted during operation. • Surface runoff and erosion must be properly controlled, and any issues addressed as quickly as possible. • Continued implementation and monitoring of Rehabilitation Plan. 										
Fauna	Direct mortality due to increased traffic, illegal collecting, poaching and/or entanglement with infrastructure	1	2	2	2	3	2	20	-	Low	<ul style="list-style-type: none"> • Personnel and vehicles should be restricted to access; internal roads and no off-road driving should occur. • No speeding on access roads – install speed control measures, such as 	1	2	2	1	3	1	9	-	Low		

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION											
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S			
Operation																							
											<ul style="list-style-type: none"> speed humps, if necessary No illegal collecting of any individuals, particularly the Armadillo Girdled Lizard. No hunting of protected species or hunting of any other species without a valid permit. Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. Prevent unauthorised access to the site – project roads provide access to remote areas that were not previously easily accessible for illegal collecting or hunting. 												

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Operation																				
Indigenous natural vegetation	Continued runoff and erosion due to presence of hard surfaces that change the infiltration and runoff properties of the landscape.	1	3	2	3	3	2	24	-	Medium	<ul style="list-style-type: none"> • Maintain adequate buffer zones around hydrological features so that these do not become degraded from runoff and erosion. • Compile and implement a Stormwater Management Plan, which highlights control priorities and areas and provides a programme for long-term control. • Undertake regular monitoring to detect erosion features early so that they can be controlled. • Implement control measures. • Construct proper culverts, bridges and/or crossings at drainage-line crossings, and other attenuation devices to limit overland flow. 	1	2	2	2	3	1	10	-	Low
Indirect Impacts																				

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Operation																				
Indigenous natural vegetation	Establishment and spread of declared weeds and alien invader plants due to presence of disturbed habitats, migration corridors and disturbance vectors	1	3	2	3	3	2	24	-	Medium	<ul style="list-style-type: none"> • Compile and implement an Alien Management Plan, which highlights control priorities and areas and provides a programme for long-term control. • Undertake regular monitoring to detect alien invasions early so that they can be controlled. This should include formal monitoring on an annual basis by a qualified botanist for up to five years. • Implement control measures on an ongoing basis, according to the Alien Management Plan. • Do NOT use any alien plants during rehabilitation. 	1	2	1	2	3	1	9	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Operation																				
Fauna	Changes to behavioural patterns of animals, including possible migration away or towards the project area	1	2	2	1	3	1	9	-	Low	<ul style="list-style-type: none"> Personnel to be educated about environmental sensitivities and issues on site. Appropriate lighting should be installed to minimize impacts on nocturnal animals, as per assessment by visual specialist. <ul style="list-style-type: none"> Routine maintenance activities should not be undertaken at night. Noise and light pollution should be managed according to guidelines from the noise specialist study and visual specialist assessment respectively. 	1	2	2	1	3	1	9	-	Low

6.4.4 Decommissioning

It is expected that the project will operate for a minimum of twenty to twenty-five years (a typical planned life-span for a project of this nature). Decommissioning will probably require a series of steps resulting in the removal of equipment from the site and rehabilitation of footprint areas. It is possible that the site could be returned to a rural nature, but it is unlikely that natural vegetation would become established at disturbed locations on site for a very long time thereafter. The reality is that it is not possible to determine at this stage whether rehabilitation measures will be implemented or not or what the future plans for the site would be nor is it possible at this stage to determine what surrounding land pressures would be. These uncertainties make it difficult to undertake any assessment to determine possible impacts of decommissioning. It is recommended that a closure and rehabilitation plan be compiled near to the stage but in advance of when decommissioning is planned, and that this would be required to be implemented prior to closure of the project. Possible impacts are described below.

Direct Impacts include the following:

6.4.4.1 *Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites*

During the decommissioning phase of the project, there will be a flurry of activity on site over a period of time, similar to during the construction phase, including dismantling and removal of equipment and rehabilitation. There may also be minor additional construction. Rehabilitation of various sites will also take place. These activities all have the potential to cause additional direct and/or indirect damage to natural habitat and vegetation.

6.4.4.2 *Direct mortality of fauna due to machinery, decommissioning and increased traffic*

It is possible that individuals of species of concern, as well as other species, may suffer mortality or removal of individuals through road kills, encounters with infrastructure, illegal hunting, illegal collecting (especially for the tortoise and lizard) and possible damage to habitats. The animal species of particular concern for this project include the Karoo Dwarf Tortoise and the Armadillo Girdled Lizard. There are also other more mobile species that are protected by legislation, including the Honey Badger, Black-footed Cat, Leopard and Cape Fox.

6.4.4.3 *Effects on physiological functioning of vegetation due to dust deposition*

There is a moderate risk during decommissioning that dust will be created that will settle on surrounding vegetation. This will be due to earth-moving equipment as well as vehicles moving around on site as well as into and out of the site. There will be a definite increase in the amount of traffic on access roads to the site that will also affect surrounding areas.

Extent	The impact will affect vegetation on site and in all areas with access roads leading to site.
Probability	The impact will almost certainly happen.
Reversibility	Partly reversible with time.
Irreplaceable loss of resources	Low to marginal loss of resources will occur.
Duration	The impact will be of short-term duration for access roads (only subject to high traffic volumes during decommissioning).
Intensity/magnitude	Medium. May impact on population processes.

Indirect Impacts include the following:

6.4.4.4 *Displacement and/or disturbance of fauna due to increased activity and noise levels*

Decommissioning and rehabilitation activities may lead to loss of habitat, noise, dust and general activity that are likely to cause all mobile species to move away from the site. Mobile species of conservation concern that could potentially be affected by the proposed project are as follows:

- Honey Badger,
- Black-footed Cat,
- Leopard,
- Cape Fox,
- Grey Rhebok.

All these species are mobile terrestrial species with a large home range and the ability to travel long distances in short periods of time. Individuals may be locally displaced, but this will have little effect on the overall range of the species nor is it expected that any overall impacts will result from local displacement.

6.4.4.5 *Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors*

The presence of disturbed surfaces on site creates ecological edges and corridors along which alien species can travel and become established.

6.4.4.6 *Changes to behavioural patterns of animals, including possible migration away or towards the project area*

The increased human presence and/or decommissioning operations will increase noise levels as well as light levels at night. The increased human presence, elevated noise and light levels, loss of animal habitat and compaction of soils may alter the behavioural patterns of some animals. Some of these changes may favour certain species and negatively affect others and consequently change the composition of the animal communities. Some of

these changes could possibly increase levels of predation. Territorial species such as steenbok, grey duiker and klipspringer will be negatively affected as well as species that live or move in the soil. These species might undergo a local reduction in their population size.

Table 8: Rating of decommissioning phase impacts.

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Decommissioning																				
Direct Impacts																				
Indigenous natural vegetation	Additional disturbance of indigenous natural vegetation	1	3	2	2	2	2	20	-	Low	<ul style="list-style-type: none"> No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas. No driving of vehicles off-road. Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. Access to sensitive areas outside of 	1	3	2	2	2	1	10	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION									
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Decommissioning																				
											development footprint should not be permitted during operation. <ul style="list-style-type: none"> • Surface runoff and erosion must be properly controlled, and any issues addressed as quickly as possible. • Continued implementation and monitoring of Rehabilitation Plan. 									
Fauna	Direct mortality due to machinery, decommissioning and/or increased traffic	1	2	2	2	1	1	8	-	Low	<ul style="list-style-type: none"> • Personnel and vehicles to avoid sensitive habitats. • No speeding on access roads – install speed control measures, such as speed humps, if necessary • No illegal collecting of any individuals, particularly the Armadillo Girdled Lizard. • No hunting of protected species or hunting of any other species without a valid permit. 	1	2	2	1	1	1	7	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION									
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S	
Decommissioning																					
												<ul style="list-style-type: none"> • Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. • Report any siting's to conservation authorities. <ul style="list-style-type: none"> • Prevent unauthorised access to the site – project roads provide access to remote areas that were not previously easily accessible for illegal collecting or hunting. 									
Indigenous natural vegetation	Negative effects on physiological functioning of vegetation due to dust deposition	2	4	2	2	1	2	22	-	Medium	<ul style="list-style-type: none"> • No speeding on access roads – install speed control measures, such as speed humps, if necessary, and penalties for non-compliance. • Excessive dust can be controlled by using appropriate dust-control measures. 	2	3	2	2	1	1	10	-	Low	
Indirect Impacts																					

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Decommissioning																				
Fauna	Displacement of mobile fauna as a result of noise, dust, and general activity.	1	2	2	1	1	1	7	-	Low	<ul style="list-style-type: none"> • Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. • No speeding on access roads – install speed control measures, such as speed humps, if necessary • No hunting of protected species. • Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. • Report any siting's to conservation authorities. 	1	2	2	1	1	1	7	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Decommissioning																				
Indigenous natural vegetation	Continued establishment and spread of declared weeds and alien invader plants due to presence of disturbed habitats, migration corridors and disturbance vectors	1	3	2	3	3	2	24	-	Medium	<ul style="list-style-type: none"> Implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. Undertake regular monitoring to detect alien invasions early so that they can be controlled. Post-decommissioning monitoring should continue for an appropriate length of time to ensure that future problems are avoided. The required time-period should be indicated in the Alien Invasive Management Plan. Do NOT use any alien plants during any rehabilitation that may be required. 	1	2	2	2	1	1	8	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Decommissioning																				
Fauna	Changes to behavioural patterns of animals, including possible migration away or towards the project area	1	3	2	1	1	1	8	-	Low	<ul style="list-style-type: none"> • Access to sensitive areas outside of infrastructure footprint should not be permitted during decommissioning. • Personnel to be educated about environmental sensitivities and issues on site. • Appropriate lighting should be installed to minimize impacts on nocturnal animals. • Project decommissioning activities should not be undertaken at night. • Noise and light pollution should be managed according to guidelines from the noise specialist study and visual specialist respectively. No dangerous pits, trenches, etc. should remain on site after rehabilitation. 	1	2	2	1	1	1	7	-	Low

6.4.5 "No-go" Impact

Direct Impacts include the following:

6.4.5.1 Degradation of indigenous natural vegetation due to overgrazing by domestic livestock

The regional vegetation types in the broad study area are used primarily for grazing, although currently, due to the tourism use of some of the properties, some areas are only grazed by wildlife. There is little evidence of overgrazing across the entire study area, although there are localised areas on some properties where this is partially evident.

Indirect Impacts include the following:

There are no indirect impacts of significance associated with the "No-go" option.

Table 9: Rating of "No-go" impacts.

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
"No-Go"																				
Direct Impacts																				

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
“No-Go”																				
Indigenous natural vegetation	Overgrazing by livestock	1	2	2	2	3	2	20	-	Low	Maintain ecological stocking rates	1	1	1	1	3	1	7	-	Low
Indirect Impacts																				
None																				

6.5 Cumulative Impacts

The projects listed in Table 10 have been identified within a 35 km radius of the Oya OHL (shown in Figure 8 below) and are included in the Cumulative Impact Assessment. There are 14 projects listed that cover a fairly broad area, mostly to the north-east of the current project.

Table 10: Renewable energy developments identified within a 35km radius of the proposed development

Applicant	Project	Technology	Capacity	Status of Application / Development
Yemaya Energy (Pty) Ltd	Yemaya Solar PV Facility	Solar PV	400MW	EIA Process underway
Oya Energy (Pty) Ltd	Oya Energy Facility	Solar PV and Fuel-based Generator Facility (FBGF)	750MW	EIA Process underway
Brandvalley Wind Farm (Pty) Ltd	Brandvalley WEF	Wind	140MW	Approved
Biotherm Energy (Pty) Ltd	Esizayo WEF	Wind	140MW	Approved
African Clean Energy Developments Renewables	Hidden Valley (Karusa Soetwater) WEF	Wind	140MW	Under Construction
Karreebosch Wind Farm (Pty) Ltd	Kareebosch WEF	Wind	140W	Approved
Rondekop Wind Farm (Pty) Ltd	Rondekop WEF	Wind	325MW	Approved
Kudusberg Wind Farm (Pty) Ltd	Kudusberg WEF	Wind	325W	Approved
South Africa Mainstream Renewable Power Perdekraal West (Pty) Ltd	Perdekraal West WEF	Wind	150MW	Approved
South Africa Mainstream Renewable Power Perdekraal East (Pty) Ltd	Perdekraal East WEF	Wind	110MW	Operational
Rietkloof Wind Farm (Pty) Ltd	Rietkloof WEF	Wind	186MW	Approved
Roggeveld Wind Power (Pty) Ltd	Roggeveld WEF	Wind	140MW	Under Construction

Applicant	Project	Technology	Capacity	Status of Application / Development
ENERTRAG SA (Pty) Ltd	Tooverberg WEF	Wind	140MW	Approved

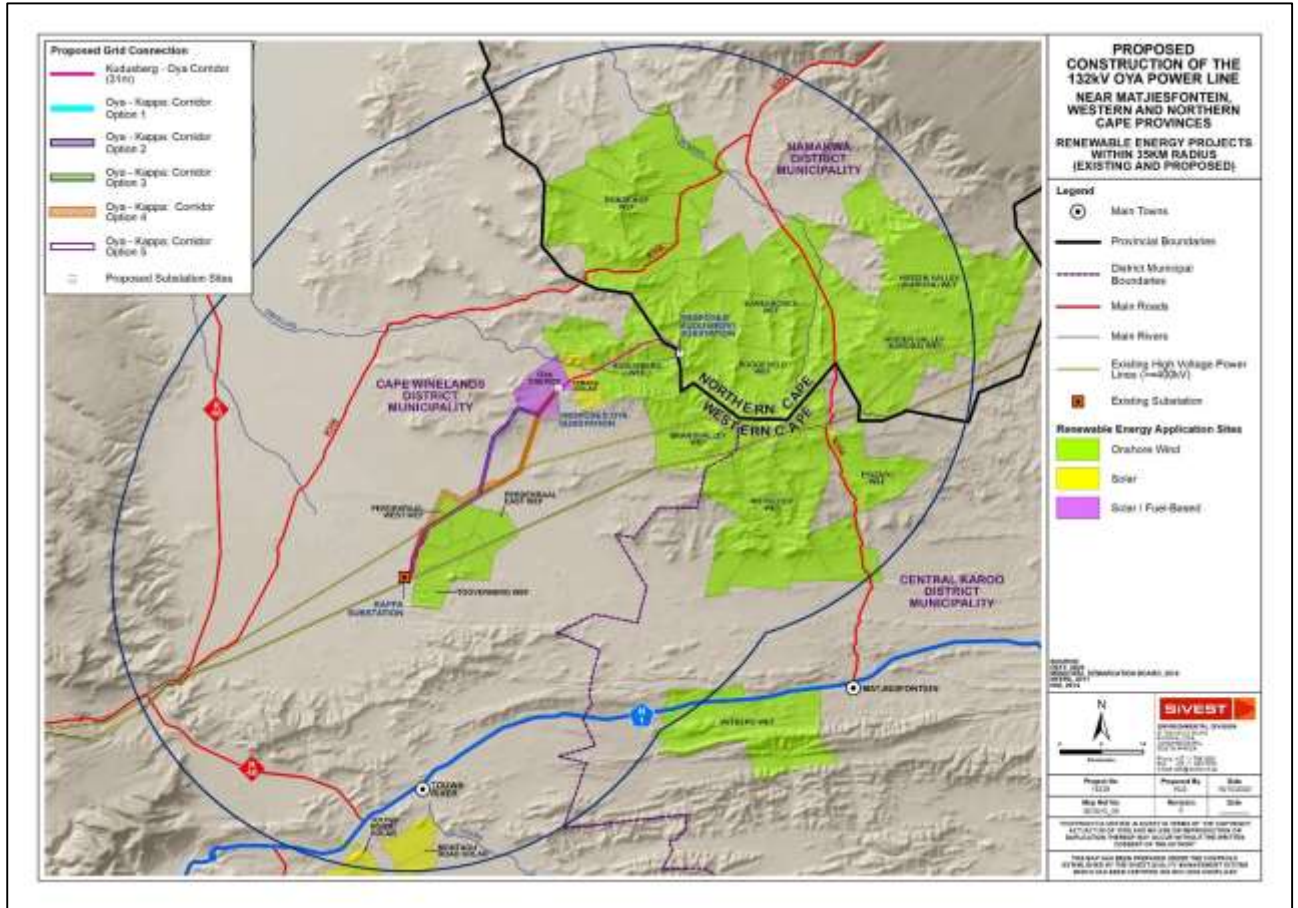


Figure 8: Renewable energy developments identified within a 35km radius of the proposed development

6.5.1 Cumulative Impact Rating

Direct Impacts include the following:

6.5.1.1 Cumulative impacts on indigenous natural vegetation

The projects shown in Figure 8 are primarily within two vegetation types (although they partially also affect others), namely Koedoesberg-Moordenaars Karoo and Central Mountain Shale Renosterveld. These two regional terrestrial vegetation types in the broad study area are listed as Least Threatened and generally have large areas (47145009 and 12223622 ha respectively). Loss of habitat will definitely occur for each project, each of which will be a small area in comparison to the total area of the vegetation type. The total loss of habitat due to a number of projects together will be greater than for any single project, so a cumulative effect will occur. However, based on the fact that most of these projects are wind energy projects, which occupy a small footprint relative to the extent of the project, the area lost in total will be small compared to the total area of the vegetation type concerned.

Of more concern is the total degree of fragmentation and/or edge effects due to the combination of all projects, which will be much more significant than gross loss of habitat, measured in hectares. Direct loss of habitat will not result in a change in the conservation status of the vegetation types, but overall degradation due to fragmentation effects is a greater cause for concern. This effect will affect almost the entire extent of Koedoesberg-Moordenaars Karoo and a significant proportion of Central Mountain Shale Renosterveld. The cumulative effect will therefore be low for vegetation loss, but possibly significant for fragmentation.

In addition to habitat loss and habitat fragmentation, the projects are located in a rural area with the little existing infrastructure nearby. The combination of projects will fundamentally change the character of this area in terms of its remoteness and natural state. This has been partially assessed as part of the Visual Impact Assessment as well as the proposed developments location in the Komsberg REDZ. However, this will have an ecological effect that could fundamentally negatively affect plant and animal populations in the region.

6.5.1.2 Cumulative impacts on plant species of concern and protected plant species

There are various plant species of conservation concern and protected plant species that occur in the study area, most of which are relatively widespread, others of which have a relatively narrow geographical distribution and are relatively rare in the landscape. A distinction is made here between protected species, which are often widespread, and threatened species, which are often rare. Constructing the current project as well as all other renewable energy projects increases the likelihood of individuals being affected, but unless large numbers of individuals are directly affected, there will only be small to moderate cumulative effects on the more common species, possibly a more significant impact on rare species. In principle,

no development should allow loss of populations of threatened species, so the assessment undertaken below is for protected species (although effects on threatened species are also discussed).

6.5.1.3 *Cumulative impacts on ecological processes*

There are various ecological processes that may be affected at a landscape level by the presence of multiple projects. This includes obvious processes, such as migration, pollination and dispersal, but also more difficult to interpret factors, such as spatial heterogeneity, community composition and environmental gradients, that can become disrupted when landscapes are disturbed at a high level. Disturbance can alter the pattern of variation in the structure or function of ecosystems. Fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. An important consequence of repeated, random clearing is that contiguous cover can break down into isolated patches. This happens when the area cleared exceed a critical level and landscapes start to become disconnected. Spatially heterogenous patterns can be interpreted as individualistic responses to environmental gradients and lead to natural patterns in the landscape. Disrupting gradients and creating disturbance edges across wide areas is very disruptive of natural processes and will lead to fundamental changes in ecosystem function.

6.5.1.4 *Cumulative impacts on CBAs and conservation planning*

Significant proportions of the site and surrounding sites are included in Critical Biodiversity Areas for the Western Cape. Disruption of these areas means that conservation planners have to find alternative sites to include in future CBAs according to an algorithm that seeks a least-cost outcome for preserving biodiversity, i.e. the least amount of land space for preserving the greatest amount of area of biodiversity importance, as well as meeting specific conservation targets. At some point, the loss of suitable sites leads to a situation where it is no longer possible to plan effective conservation networks or the cost of doing so increases due to a lack of choice. The higher the density of similar projects in a uniform area, the less chance there is of finding sites suitable for conservation that contain all the attributes that are desired to be conserved, including both ecological processes and ecological patterns. However, at the current stage there is sufficient CBA that can protect these ecological processes while still allowing development to occur as a result this cumulative impact is low.

Indirect Impacts include the following:

6.5.1.5 *Cumulative impacts on fauna*

Construction activities, loss of habitat, noise, dust and general activity associated with the construction phase of the project are likely to cause all mobile species to move away from the area. This effect will be increased if there are a number of projects being constructed at the same time or in

quick succession, so the effect is likely to be cumulative. However, the geographical ranges of the species of concern is wide and it is considered that the significance of the effect will be low in the long-term, although probably significant during the combined construction phase of the projects. It is possible that some species will be more significantly negatively affected than others, especially shy species, territorial species that get displaced, or those with large territories that get shrunk. It is also possible that some species will benefit from the increased presence of humans and will migrate into the area. This will possibly cause additional shifts in other species that are affected by the increase in numbers or new species.

6.5.1.6 *Cumulative impacts due to spread of declared weeds and alien invader plants*

There is a moderate possibility that alien plants could be introduced to areas within the footprint of the proposed infrastructure from surrounding areas in the absence of control measures. The greater the number of projects, the more likely this effect will happen; therefore, the effect is cumulative. For the current site, the impact is predicted to be low due to the current absence of invasive species on site and the high ability to control any additional impact. The significance will therefore be low, especially if control measures are implemented. However, the increased overall disturbance of the landscape will create opportunities and, if new invasions are not controlled, can create nodes that spread to new locations due to the heightened disturbance levels.

6.5.1.7 *Cumulative impacts due to loss of protected animals*

There are various animal species protected according to National legislation that occur in the geographical area covered by the combined projects. Some of these animals may be vulnerable to secondary impacts, such as hunting, roadkill and illegal collecting (the Armadillo Girdled Lizard may be particularly vulnerable to this). The greater the number of projects, the more likely this effect will happen; therefore, the effect is cumulative. However, in all cases, the geographical distribution of each species is much wider than the combined project areas. The significance will therefore be low, especially if control measures are implemented.

Table 11: Rating of cumulative impacts.

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Cumulative																				
Direct Impacts																				
Indigenous natural vegetation	Clearing of vegetation for construction of infrastructure will lead to direct loss and/or fragmentation of indigenous natural vegetation.	2	4	4	2	4	2.5	40	-	Medium	All projects should adhere to the site-specific recommendations of the ecologists to ensure that all facilities mitigate impacts.	2	4	4	2	4	2	32	-	Medium
Listed or protected plant species	Direct loss of individuals of protected and/or listed plant species, as well as loss of habitat for these species.	2	4	2	2	3	2	26	-	Medium	All projects should adhere to the site-specific recommendations of the ecologists to ensure that all facilities mitigate impacts where possible	2	4	2	2	2	2	24	-	Medium
Landscape ecological processes	Disruption, disturbance, and alteration of landscape ecological processes due to loss of habitat across a number of projects.	2	2	2	3	3	2	24	-	Medium	All projects should adhere to the site-specific recommendations of the ecologists to ensure that all facilities mitigate impacts where possible.	2	2	2	2	2	2	20	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Cumulative																				
Critical Biodiversity Areas	Loss, degradation or fragmentation of areas of habitat categorised as CBAs thus leading to reduced effectiveness of Provincial conservation planning.	3	4	3	2	4	2	32	-	Medium	All projects should adhere to the site-specific recommendations of the ecologists to ensure that all facilities mitigate impacts where possible.	3	4	3	2	4	2	32	-	Medium
Indirect Impacts																				
Fauna	Landscape level impacts on populations of fauna as a result of loss of multiple habitats, changes in behaviour, reduction in range, and migration.	2	3	2	2	3	2	24	-	Medium	All projects should adhere to the site-specific recommendations of the ecologists to ensure that all facilities mitigate impacts where possible.	2	3	2	2	3	2	24	-	Medium
Indigenous natural vegetation	Degradation of habitat as a result of landscape level increase in the spread of declared weeds and alien invader plants.	2	3	2	3	3	2	26	-	Medium	All projects should adhere to the site-specific recommendations of the ecologists to ensure that all facilities mitigate impacts where possible.	2	2	1	2	3	1	10	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Cumulative																				
Protected fauna	Loss of individuals and populations due to secondary impacts, such as hunting, road kill and illegal collecting	2	3	2	2	3	2	24	-	Medium	All projects should adhere to the site-specific recommendations of the ecologists to ensure that all facilities mitigate impacts where possible.	2	3	2	2	3	2	24	-	Medium

6.6 Recommendations / Conditions / Measures to be included in EMPr

The following main recommendations / conditions / mitigation measures should be considered for inclusion in the EMPr / EA (should such authorisation be granted by the DEFF):

Pre-Construction / Design Phase:

- Select the route alignment that has the least impact on sensitive receptors. From an ecological perspective, this is considered to be Option 3.
- As far as possible, locate infrastructure within or near to areas that have been previously disturbed or in areas with lower sensitivity scores, taking the ecological sensitivity map into account.
- Where possible, access roads should be located along existing farm, access and district roads, even if these require upgrading.
- Wherever technically possible, avoid sensitive features and habitats when locating infrastructure.
- Maintain adequate buffer zones around hydrological features so that these do not become degraded from runoff and erosion. The width of these buffer zones should follow legal requirements and/or the recommendations of the hydrological specialist.
- Cross streams and other linear features at right angles, where possible, and also near their endpoints or where there are natural breaks in the feature of concern.
- Compile a Rehabilitation Plan prior to the commencement of construction.
- It is a legal requirement to obtain permits for individuals of protected species that will be lost.
- A Plant Rescue Plan must be compiled to be approved by the appropriate authorities.
- Compile and implement a Stormwater Management Plan, which highlights control priorities and areas and provides a programme for long-term control.
- Compile and implement an Alien Invasive Plant Management Plan, which highlights control priorities and areas and provides a programme for long-term control.

Construction Phase:

- Keep construction footprint as small as possible and construction areas must be clearly demarcated and fenced prior to the commencement of construction activities. All construction activities must remain within the boundary of the development area, as demarcated at the start of construction.
- Restrict impact to development footprint only and limit disturbance spreading into surrounding areas.
- Footprints of laydown areas, construction sites, roads and substation sites should be clearly demarcated.
- Ensure all possible steps are taken to limit erosion of surfaces, including proper management of storm-water runoff.
- No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas.
- No driving of vehicles off-road outside of construction areas.
- Speed limits should be set for all roads on site, as well as access roads to the site. Strict enforcement of speed limits should occur – install speed control measures, such as speed humps, if necessary.
- Night driving should be strictly limited and, where absolutely required, lower speed limits should apply for night driving.
- No dogs or other pets should be allowed on site, except those confined to landowners' dwellings.
- Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas, that the intentional killing of any animal is not permitted, that poaching or the intentional killing of animals (even snakes) is illegal and that it must be a condition of employment that any employee caught poaching will be dismissed.
- Construction areas must be swept for nests, dens and other habitats prior to construction taking place.

- All construction vehicles, equipment and construction material should be free of plant material. They should be thoroughly cleaned prior to access to the construction site, which must be verified by the ECO.
- No hunting or collecting of protected species.
- Report any illegal collection to conservation authorities.
- Report any mortality of protected species to conservation authorities
- Proper waste management must be implemented, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard.
- Excessive dust must be controlled by using appropriate dust-control measures.
- Implement control measures on an ongoing basis, according to the Alien Management Plan.
- Appropriate lighting should be installed to minimize impacts on nocturnal animals, as per visual specialist assessment.
- Construction activities should not be undertaken at night.
-
- Do NOT use any alien plants during rehabilitation.

Operational Phase:

- Ensure all possible steps are taken to limit erosion of surfaces, including proper management of storm-water runoff.
- No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas.
- No driving of vehicles off-road outside of construction areas.
- Speed limits should be set for all roads on site, as well as access roads to the site. Strict enforcement of speed limits should occur – install speed control measures, such as speed humps, if necessary.
- Night driving should be strictly limited and, where absolutely required, lower speed limits should apply for night driving.
- No dogs or other pets should be allowed on site, except those confined to landowners' dwellings.
- Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas, that the intentional killing of any animal is not permitted, that poaching or the intentional killing of animals (even snakes) is illegal and that it must be a condition of employment that any employee caught poaching will be dismissed.
- Proper waste management must be implemented, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard.
- No hunting or collecting of protected species.
- Report any illegal collection to conservation authorities.
- Report any mortality of protected species to conservation authorities
- Excessive dust must be controlled by using appropriate dust-control measures.
- Implement control measures for alien invasive plants, as per the Alien Management Plan.

Decommissioning Phase:

- All construction phase measures should be implemented during decommissioning.

Cumulative Impacts

- Adhere to the site-specific recommendations of the ecologists to ensure that all facilities mitigate impacts where possible.

The following buffer(s) must be applied:

- The width of buffer zones around hydrological features should follow legal requirements and/or the recommendations of the hydrological specialist.
- Buffer zones of a minimum of 20 m should be observed around other identified sensitive features.

Pre-Construction / Design Phase Monitoring:

- None proposed.

Construction Phase Monitoring:

- Dust monitoring, as per best practice guidelines.
- Rehabilitation must be monitored in order to determine whether methods implemented have been successful.

Operation Phase Monitoring:

- For any plants that are transplanted, annual monitoring should take place to assess survival. This should be undertaken for a period of three years after translocation and be undertaken by a qualified botanist. The monitoring programme must be designed prior to translocation of plants and should include control sites to evaluate mortality relative to wild populations.
- Undertake regular monitoring to detect erosion features early so that they can be controlled.
- Undertake regular monitoring to detect alien invasions early so that they can be controlled. This should include formal monitoring on an annual basis by a qualified botanist for up to five years. Information to be collected should include the identity of any alien invasive species, and the exact location of any individuals or populations/concentrations. Photographic evidence of species occurrences should be collected. Any control measures undertaken should be documented.
- Continue monitoring of construction phase rehabilitation.

Decommissioning Phase Monitoring:

- Undertake monitoring to detect alien invasions. This should include formal monitoring on an annual basis by a qualified botanist for up to five years.
- Continue monitoring of decommissioning phase rehabilitation.

7. COMPARATIVE ASSESSMENT OF ALTERNATIVES

There are five alternative alignments for the powerline for the section between Oya and Kappa. These are compared in the table below. The alternatives are as follows:

1. Power Line Corridor Alternative 1 (Oya to Kappa): Approximately 34.14km in length and runs along the RE/155, RE/152, 2/152, RE/169, RE/243, 241, 240 and RE/244 properties to the Kappa substation
2. Power Line Corridor Alternative 2 (Oya to Kappa): Approximately 32.43km in length and runs along the RE/155, 3/155, RE/152, 2/152, RE/169, 13/168, 5/168, 1/243, RE/243, 241 and 240 properties to the Kappa substation
3. Power Line Corridor Alternative 3 (Oya to Kappa): Approximately 30.56km in length and runs along the RE/155, 4/168, 13/168, 5/168, 1/243, 240 and RE/244 properties to the Kappa substation
4. Power Line Corridor Alternative 4 (Oya to Kappa): Approximately 32.94km in length and runs along the RE/155, 4/168, 13/168, RE/169, RE/243, 241 and 240 properties to the Kappa substation
5. Power Line Corridor Alternative 5 (Oya to Kappa): Approximately 32.26km in length and runs along the RE/155, RE/152, 2/152, RE/169, 5/168, 1/243 and 240 properties to the Kappa substation

Key

PREFERRED	The alternative will result in a low impact / reduce the impact / result in a positive impact
FAVOURABLE	The impact will be relatively insignificant
LEAST PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
POWER LINE CORRIDOR ROUTE ALTERNATIVES		
Power Line Corridor Alternative 1 (Oya to Kappa)	LEAST PREFERRED	This route option has the most potential impacts/risks of all the options. Traverses lowland to upland regions via a steep section of landscape between 32°55'38"S, 20°09'19" and 32°58'20"S, 20°07'11", which introduces additional risks in terms of erosion of landscape surfaces. Traverses steep slope at 33°02'34"S, 20°02'44" and quartz patch at 33°02'39"S, 20°02'41". It is also the longest of all the route options. Significant sections with no existing access roads.
Power Line Corridor Alternative 2 (Oya to Kappa)	NOT PREFERRED	Traverses lowland to upland regions via a steep section of landscape between 32°55'38"S, 20°09'19" and 32°58'20"S, 20°07'11", which introduces additional risks in terms of erosion of landscape surfaces. These sections have limited existing access roads.

Alternative	Preference	Reasons (incl. potential issues)
Power Line Corridor Alternative 3 (Oya to Kappa)	PREFERRED	Shortest of all the route options. Adjacent to existing powerline for significant sections, including the entire distance through a CBA1 area. Existing access roads for most sections. Avoids steep slopes and other sensitivities identified for other route options. Existing access roads for most sections.
Power Line Corridor Alternative 4 (Oya to Kappa)	FAVOURABLE	Traverses short section of moderately steep slope at 33°02'34"S, 20°02'44" and small quartz patch at 33°02'39"S, 20°02'41". Existing access roads for some sections.
Power Line Corridor Alternative 5 (Oya to Kappa)	NOT PREFERRED	Traverses lowland to upland regions via a steep section of landscape between 32°55'38"S, 20°09'19" and 32°58'20"S, 20°07'11", which introduces additional risks in terms of erosion of landscape surfaces.

8. CONCLUSION AND SUMMARY

8.1 Summary of Findings

The project study area consists of natural habitat within a largely rural area. This is within an area where portions of the natural habitat have been assessed as having potential conservation value, although this project site falls outside of the NPAES entirely and are therefore not earmarked for future conservation. Currently, the rates of transformation within the vegetation in this area is low. The regional vegetation types that occur on site are listed as Least Threatened in the National List of Ecosystems that are Threatened and need of protection (GN 1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004).

The Western Cape Biodiversity Spatial Plan, published in 2017 (Pool-Stanvliet et al. 2017) indicates that there are CBA1 areas in two parts of the powerline study area:

1. associated with the floodplain of the Grootrivier, corresponding largely with the Tanqua Wash Riviere regional vegetation type - it is not possible to avoid this CBA1 area, although powerline Option 3 traverses this area entirely adjacent to an existing powerline.
2. in the northern side of the study area, which are mostly excluded from the direct footprint of the proposed project, with the exception of a 550 m section within a steep valley across which the powerline corridor traverses - due to the topography, it is possible that this section can be almost completely spanned with a tower structure on each side.

All riparian and drainage areas on site are included in Ecological Support Areas, but these have been designated as sensitive on their own merits.

There is one (1) plant species, *Hoodia gordonii*, protected according to the National Environmental Management: Biodiversity Act, that could potentially occur on site, although none were seen during the field survey. There are a number of species protected according to the Cape Nature and Environmental Conservation Ordinance Act (Act No. 19 of 1974) that were recorded on site. None of the species listed that were found on site are of conservation concern, but the fact that they are protected means that a permit will be required for their removal. This is a standard flora permit obtained from the provincial department. Final species and numbers have been determined from a walk-through survey of the proposed infrastructure, for which details are provided in this report (in the section, "Protected Plants: Cape Nature and Environmental Conservation Ordinance 19 of 1974"), where a list of 32 species are known to occur within the footprint of the proposed infrastructure, many of these being common on site and in surrounding areas.

There are a small number of fauna of possible conservation concern that were assessed as having a possibility of occurring on site. This includes the Vulnerable Leopard and Black-footed Cat, the near threatened Karoo Dwarf Tortoise, Grey Rhebok (seen on site) and Spectacled Dormouse, and a number of protected species, including the Armadillo Girdled Lizard, the Honey Badger, the Black-footed Cat, the Leopard and the Cape Fox. The likelihood of these occurring on site varies between species, with the Grey Rhebok highly likely to occur on site, the Leopard almost certain to occur there, the Spectacled Dormouse and Karoo Dwarf Tortoise having a high probability, and the Black-footed Cat having a moderate probability of occurring there. Based on distribution, habitat requirements and other monitoring research, the Riverine Rabbit is unlikely to occur on site. Some of the species that could potentially occur on site are highly mobile species that are unlikely to be affected by any activities on site, but others are more restricted or territorial and could be more significantly affected. Of those that are more likely to be affected, if they occur there, are the Black-footed Cat, the Spectacled Dormouse, the Armadillo Girdled Lizard and the Karoo Dwarf Tortoise.

The vegetation on site consists largely of succulent dwarf shrubland typical of the regional vegetation types. The vegetation on site is relatively uniform within regional vegetation types but varies across the geographical distance of the proposed powerline corridor. The pattern observed on site is that local diversity increases with increased elevation and with higher local surface rockiness. This means that the greatest diversity is at the highest elevations, but also located within specific habitats. Mountain summits, crests and plateau, as well as rocky outcrops, riparian habitats, and scarp valleys were identified as sensitive, either due to having higher diversity, higher value as refugia, or as being particularly sensitive to disturbance.

For all infrastructure components, loss of habitat will occur. This will be relatively insignificant in comparison to the total area of the regional vegetation types concerned but may be more significant in terms of local patterns and diversity that could be affected. There is some variability between sites due to local conditions (microhabitats), which has a greater influence on floristic variability than any geographical gradient across the site.

The main sensitivity on site is the presence of various watercourses in which there are dry riverbeds and associated riparian vegetation. This habitat is disproportionately important due to the functional value of these watercourses and the important habitat and forage that they provide for animal populations. The habitat is also interconnected and any damage to one point will affect all downstream areas. For this reason, these

riparian habitats, along with their floodplains, have been designated as especially sensitive. Other important habitats on site include rocky outcrops, small quartz patches, as well as some steep, south-facing slopes.

The project involves construction of a powerline (the tower structures being the primary ground-level construction) as well as substations, and maintenance access roads for the powerline (for which some already exist along the proposed alignments). It is important to avoid local sensitivities and ensure that ecological processes are not compromised. This will ensure that impacts on site do not unnecessarily affect surrounding areas.

A detailed assessment of potential impacts was undertaken which identified that loss of habitat is probably the most important potential impact on site. This is a typical outcome for a project proposed to be constructed within a Greenfields area. However, it is important to emphasize that the spatial scale of transformation of natural habitats on site due to the proposed project is negligible in area compared to the total area of vegetation types concerned, as well as any Critical Biodiversity Areas. The footprint of the proposed project will be relatively small due to the fact that each tower structure probably does not occupy more than a 10 x 10 m area. Assuming a total distance of close to 50 km for the powerline, and a tower structure on average every 400 m, this amounts to total area of less than 2 ha. This is in comparison to the total area of Koedoesberge-Moordenaars Karoo, for example, which occupies in the vicinity of close to five hundred (500) square kilometres, or 50 million hectares. The loss of habitat associated with this project is therefore seven orders of magnitude smaller than this and therefore regionally insignificant.

Biodiversity patterns on site have been established to a moderate degree of confidence, including a detailed desktop assessment, two reconnaissance field surveys and a detailed walkthrough survey of the entire alignment of proposed alternatives. From this assessment, the following has been established:

1. No threatened plant or animal species are likely to be affected by the proposed project;
2. A number of plant species protected according to Provincial legislation will be affected, but these are all common and / or widespread species, none of which are of conservation concern. The presence of these species triggers a permit requirement, but does not affect rare or threatened species;
3. The vegetation types affected by the project are widespread and have been transformed overall to a small degree. They are therefore of low conservation concern. The amount of transformation due to the proposed project is small in absolute terms and also relative to the overall distribution of the regional vegetation;
4. There are habitats on site that have been identified as being of higher sensitivity and value than the general vegetation, including wetland and riparian vegetation. These have all been mapped in detail and should be avoided by the project. Residual impacts on these areas of elevated sensitivity are small compared to the distribution of these on site.
5. The only matter of concern for the site is the presence of Critical Biodiversity Areas, which occur in specific areas, and Ecological Support Areas, which coincide entirely within drainage lines and riparian areas. Mitigation measures have been proposed to minimise potential impacts on these areas.

8.2 Conclusion

At the site-specific scale, some sensitivities have been identified, primarily related to natural habitat, but also to some individual (protected) species. Many of these can be minimised or avoided with the application of appropriate mitigation or management measures, including, in some cases, avoidance of sensitive locations. There will be residual impacts, primarily on natural habitat. The amount of habitat that will be lost to the project is insignificant compared to the area in hectares of the regional vegetation type that occurs on site and over the entire geographical range of the vegetation type. In most cases, the exact locations of important biodiversity features have been identified in the field at a relatively high level of confidence.

8.3 Impact Statement

It is unlikely that the proposed project will have an unacceptable impact on the natural environment or any ecological features of concern. Based on the analysis provided in this report, the overall impact will have LOW significance, the only residual impact of medium significance being on loss of vegetation due to clearing for construction. The conclusion is that the project should be authorised. For the section from Oya to Kappa, the preferred alignment is Option 3 with Option 4 being favourable.

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10. APPENDICES

10.1 Appendix 1: Plant species of conservation importance (Threatened, Near Threatened and Declining) that have historically been recorded in the study area.

Sources: see text.

Taxon	Latest (IUCN version 3.1) Conservation Status**	Habitat	Flowering Time	Probability of occurrence*
Romulea albiflora <i>IRIDACEAE</i>	Critically Endangered	Known from three collections from one continuous subpopulation. Part of the subpopulation was lost to cereal cultivation and the rest occurs on the edge of a ploughed field. There are fewer than 250 mature individuals extant and decline due to crop cultivation is continuing.	September-October	LOW , known distribution is further north
Secale strictum subsp. africanum <i>POACEAE</i>	Critically Endangered	A range-restricted species that was once common on the Roggeveld, but is now known from one subpopulation on a farm, where there are fewer than 50 mature individuals. This taxon has experienced severe declines due to overgrazing and poor veld management. It is cultivated and several attempts are being made to reintroduce it to other properties on the Roggeveld.	December	LOW , known distribution is further north
Daubenya aurea <i>HYACINTHACEAE</i>	Endangered	Plants at four to five locations continue to decline due to ongoing expansion of crop cultivation and overgrazing.	September	LOW , known distribution is further north
Ixia thomasiae <i>IRIDACEAE</i>	Endangered	A rare, and highly restricted species, known from two to three locations and declining due to ongoing habitat loss to crop cultivation.	September-November	LOW , known distribution is further north
Oxalis lineolata <i>OXALIDACEAE</i>	Endangered	A range-restricted species and only known from three locations, within a small area around Doornbosch. There is continuous decline as a result of habitat loss due to expanding crop cultivation. The species is estimated to have a population size between 150-300 individuals.	May-June	LOW , known distribution is further northwest

Oxalis marlothii OXALIDACEAE	Endangered	A range-restricted species, occurring at two to three locations and declining due to ongoing habitat loss and degradation. Roggeveld Shale Renosterveld, Roggeveld Karoo, High altitude shale and sandstone plateaus.	September-October	LOW , known distribution is close to site, but different habitat
Polhillia involucreta FABACEAE	Endangered	A range-restricted Roggeveld endemic, this species has been recorded from three subpopulations that occur at two locations. Habitat loss in the past has occurred due to crop cultivation and livestock grazing. Being highly palatable, this species continues to experience ongoing decline as a result of overgrazing	January	LOW , known distribution is further north
Hoodia dregei APOCYNACEAE	Vulnerable	Merweville, Beaufort West and Prince Albert (to east of current site on flats between Groot Swartberg range and Karoo mountains). Gamka Karoo. Stony slopes of hills or stony flat areas.		LOW , habitat matches, but outside distribution
Asparagus mollis ASPARAGACEAE	Vulnerable	A rare and poorly known species with a restricted range. There are fewer than 10 locations, and it continues to decline due to ongoing habitat loss in the Overberg. Subpopulations in the northern part of the range are not threatened only the population in the Overberg is threatened.	January	LOW
Carex acocksii CYPERACEAE	Vulnerable	One known location is potentially threatened by livestock overgrazing.	October-November	LOW , known distribution is much further north
Cliffortia arborea ROSACEAE	Vulnerable	Fewer than 10 known locations. Continues to decline due to inappropriate fire management and harvesting for firewood. Hantam Karoo, Hantam Plateau Dolerite Renosterveld, Upper Karoo Hardeveld, Nieuwdtville-Roggeveld Dolerite Renosterveld, Tanqua Escarpment Shrubland, Central Mountain Shale Renosterveld, Roggeveld Shale Renosterveld. Cliffs and ledges of dolerite, sandstone and shale escarpment.	October-December	LOW , all previous records are in escarpment zone.
Delosperma sphalmanthoides AIZOACEAE	Vulnerable	A rare, localized habitat specialist, known from two to three locations and potentially	August	LOW , known distribution

		threatened by habitat degradation due to overstocking of rangelands for livestock. Roggeveld Shale Renosterveld, shallow soils over shale rock. 3220DA, DB		is further east
Diascia lewisiae SCROPHULARIACEAE	Vulnerable	Known from five small subpopulations that together consist of fewer than 1000 mature individuals. Four of the five subpopulations occur on private land and are potentially threatened by crop cultivation and road widening.	August-September	LOW , known distribution is much further northwest
Geissorhiza spiralis IRIDACEAE	Vulnerable	Three known locations are potentially threatened by livestock overgrazing and soil erosion. Roggeveld Shale Renosterveld, Roggeveld Karoo, mountain renosterveld, on stony clay slopes. 3220DA, DB.	July-September	LOW , known distribution is slightly north-east and different habitat.
Gethyllis pectinata IRIDACEAE	Vulnerable	Known from one location. Potentially threatened by overgrazing and illegal bulb collecting.	December	LOW , known distribution is further northwest
Helictotrichon barbatum POACEAE	Vulnerable	Known from two disjunct locations (Kamiesberg in Namaqualand and Hantamberge around Calvinia) and potentially threatened by overgrazing. Lower rocky slopes in mountain renosterveld on clays.	November	LOW , known distribution is further north
Helictotrichon namaquense POACEAE	Vulnerable	Acocks (1990) indicates that this taxon had a very similar distribution to <i>H. barbatum</i> occurring on all the Karoo mountains i.e. Bokkeveld, Kamiesberg, Roggeveld and Hantamsberg, but stated that it had disappeared from much of its range due to overgrazing. The species was rediscovered in 1986 in the Roggeveld where it was common along the roadside verges but declining due to being heavily grazed. Roggeveld and Hantamsberg Mountain.	September	LOW , known distribution is slightly north-east and different habitat.,
Hesperantha hantamensis IRIDACEAE	Vulnerable	Known from one location. Even though locally common and partly conserved in a nature reserve, it was and remains potentially threatened by dam expansion and road widening	July-September	LOW , known distribution is much further northwest
Hesperantha purpurea IRIDACEAE	Vulnerable	Known from the type locality. Threatened by livestock overgrazing and trampling	September	LOW , known distribution is much

				further northwest
<i>Ixia rivulicola</i> IRIDACEAE	Vulnerable	A localized habitat specialist, and potentially threatened by habitat degradation and disturbance due to crop cultivation and dam construction.	October-November	LOW , known distribution is further north
<i>Jamesbrittenia incisa</i> SCROPHULARIACEAE	Vulnerable	Known from seven locations. Declining in habitat quality and number of mature individuals due to livestock grazing.	September	LOW , known distribution is further north and east
<i>Lachenalia longituba</i> HYACINTHACEAE	Vulnerable	A range-restricted and localized habitat specialist, known from five locations and potentially threatened by habitat loss and degradation. Roggeveld Karoo, Roggeveld Shale Renosterveld, Central Mountain Shale Renosterveld. Stony clay in seasonally wet, boggy sites that bake hard in summer.	April-June	LOW , occurs in wet, boggy Sites on Roggeveld plateaux
<i>Lachenalia schelpei</i> HYACINTHACEAE	Vulnerable	Known from one location. Not currently declining but potentially threatened by crop cultivation and overgrazing by goats.	June-September	LOW , known distribution is further north
<i>Lotononis venosa</i> FABACEAE	Vulnerable	Few known locations. Some of the habitat has been transformed for crop cultivation in the past. Further agricultural expansion and overgrazing by livestock are potential threats. Klein Roggeveld Mountains. Central Mountain Shale Renosterveld, Koedoesberge-Moordenaars Karoo. Open karroid scrub on sandy clay alluvium.	September	HIGH , vegetation type and habitat suitable.
<i>Phyllobolus tenuiflorus</i> (<i>Mesembryanthemum tenuiflorum</i>) AIZOACEAE	Vulnerable	Knersvlakte. Habitat at five to 10 locations is declining due to mining.	August	LOW , wrong distribution for current site.
<i>Octopoma nanum</i> AIZOACEAE	Vulnerable	A localized habitat specialist with fewer than 10 known locations and declining due to overgrazing by livestock and game. Tanqua Karoo, Western Little Karoo, Koedoesberge-Moordenaars Karoo, Matjiesfontein Quartzite Fynbos, Tanqua Wash Riviere, Flats and gentle slopes with loamy soils and sparse quartz gravel. Previously recorded in grid as well as a number of surrounding grids that include Roggeveld	November	HIGH , Found on flats and gentle slopes with loamy soils and sparse quartz grave

		plateaux, Moordenaars karoo and Cape mountains.		
Romulea hallii IRIDACEAE	Vulnerable	A Roggeveld endemic known from two locations. It is potentially threatened by road maintenance and expansion and livestock overgrazing.	July-August	LOW only Roggeveld plateau.
Romulea membranacea IRIDACEAE	Vulnerable	Known from six locations, five of which are threatened by rapidly expanding rooibos tea cultivation	July-August	LOW , known distribution is further northwest
Romulea multifida IRIDACEAE	Vulnerable	Known from three locations. Potentially threatened by crop cultivation	August	LOW only Roggeveld plateau
Hoodia pilifera APOCYNACEAE	Near threatened (NT)	Montagu to Uniondale, Matjiesfontein to Laingsburg and Gamka Poort, and Klaarstroom (to south-east of current site along northern side of Groot Swartberg range). Fynbos. On steep shale slopes or near the foot of sandstone mountains, usually on hotter, northern aspects, occasional it is found on flat areas and cooler, southern slopes.		LOW , distribution out, no suitable habitat on site
Ehrharta eburnea POACEAE	Near Threatened	Calvinia, Sutherland and Montagu. Rocky places in mountain renosterveld.	September-November	HIGH , habitat and distribution matches
Geissorhiza karoocica IRIDACEAE	Near Threatened	Roggeveld Mountains to Matjiesfontein. Succulent karoo shrubland on coarse shale slopes.	August-September	HIGH , previously recorded on nearby site
Lachenalia whitehillensis HYACINTHACEAE	Near Threatened	Southern Roggeveld Escarpment near Sutherland to Matjiesfontein in the southern Great Karoo. Sandy soils in riverbeds and on alluvial plains, sometimes in damp places among rocks in river beds.	October	HIGH , recorded on nearby project
Manulea incana SCROPHULARIACEAE	Near Threatened	Roggeveld Escarpment.	September-October	LOW , known distribution is further northeast
Pauridia alticola HYPOXIDACEAE	Near Threatened	Hantamsberg near Calvinia southwards across the Roggeveld Escarpment to the Swaruggens Mountains and Koue Bokkeveld near Ceres. Seasonally inundated depressions on shale and dolerite, and shale bands in the Cedarberg.	June-September	LOW , right distribution and habitat, but only in higher mountainous areas
Romulea komsbergensis IRIDACEAE	Near Threatened	Roggeveld Escarpment, Komsberg Pass to Middelpoort.	August-September	LOW , known distribution

				is further northeast
<i>Romulea subfistulosa</i> IRIDACEAE	Near Threatened	Calvinia to Roggeveld Escarpment at Sutherland. A Roggeveld endemic known from 11 locations. Threatened by ongoing but slow conversion of habitat for crop cultivation.	August-October	LOW , known distribution is further northwest
<i>Romulea syringodeoflora</i> IRIDACEAE	Near Threatened	Roggeveld Plateau, a range-restricted Roggeveld endemic, known from nine location and possibly occurring at a few more in unsurveyed parts of its range. Suspected to occur at less than 15 locations in total. Experiencing ongoing decline of habitat to crop cultivation as well as habitat degradation as a result of livestock overgrazing.	October	LOW , known distribution is further northwest
<i>Romulea unifolia</i> IRIDACEAE	Near Threatened	Roggeveld, known from seven locations, but at least five more locations likely as this is a poorly explored area with much intact habitat. Estimate that fewer than 15 locations exist. Subpopulations are declining in some areas due to livestock trampling and habitat loss to wheat cultivation. Roggeveld, succulent karoo, dolerite flats.	August-September	LOW , Roggeveld plateaux
<i>Antimima androsacea</i> AIZOACEAE	Critically rare	Roggeveld Escarpment, a range-restricted species (EOO 10 km ²), known from one site where it is not threatened.	August	LOW
<i>Moraea marginata</i> IRIDACEAE	Critically rare	Sutherland, known from a single population. Not threatened.	November	LOW
<i>Senecio erysimoides</i> ASTERACEAE	Data Deficient – Taxonomically problematic	Unknown, but recorded on three occasions in similar landscapes (Roggeberg foothills) to the north of the site.	December-April	HIGH , habitat matches

* Conservation Status Category assessment according to IUCN Ver. 3.1 (IUCN, 2001), as evaluated by the Threatened Species Programme of the South African National Biodiversity Institute in Pretoria. *IUCN (3.1) Categories: VU = Vulnerable, EN = Endangered, CR = Critically Endangered, NT = Near Threatened.

10.2 Appendix 2: List of protected tree species (National Forests Act).

<i>Vachellia erioloba</i>	<i>Acacia haematoxylon</i>
<i>Adansonia digitata</i>	<i>Afzelia quanzensis</i>
<i>Balanites maughamii</i> subsp. <i>maughamii</i>	<i>Barringtonia racemosa</i>
<i>Boscia albitrunca</i>	<i>Brachystegia spiciformis</i>
<i>Breonadia salicina</i>	<i>Bruguiera gymnhorrhiza</i>
<i>Cassipourea swaziensis</i>	<i>Catha edulis</i>
<i>Ceriops tagal</i>	<i>Cleistanthus schlechteri</i> var. <i>schlechteri</i>
<i>Colubrina nicholsonii</i>	<i>Combretum imberbe</i>
<i>Curtisia dentata</i>	<i>Elaeodendron transvaalensis</i>
<i>Erythrophysa transvaalensis</i>	<i>Euclea pseudebenus</i>
<i>Ficus trichopoda</i>	<i>Leucadendron argenteum</i>
<i>Lumnitzera racemosa</i> var. <i>racemosa</i>	<i>Lydenburgia abottii</i>
<i>Lydenburgia cassinoides</i>	<i>Mimusops caffra</i>
<i>Newtonia hildebrandtii</i> var. <i>hildebrandtii</i>	<i>Ocotea bullata</i>
<i>Ozoroa namaensis</i>	<i>Philenoptera violacea</i>
<i>Pittosporum viridiflorum</i>	<i>Podocarpus elongatus</i>
<i>Podocarpus falcatus</i>	<i>Podocarpus henkelii</i>
<i>Podocarpus latifolius</i>	<i>Protea comptonii</i>
<i>Protea curvata</i>	<i>Prunus africana</i>
<i>Pterocarpus angolensis</i>	<i>Rhizophora mucronata</i>
<i>Sclerocarya birrea</i> subsp. <i>caffra</i>	<i>Securidaca longependunculata</i>
<i>Sideroxylon inerme</i> subsp. <i>inerme</i>	<i>Tephrosia pondoensis</i>
<i>Warburgia salutaris</i>	<i>Widdringtonia cedarbergensis</i>
<i>Widdringtonia schwarzii</i>	

None have a geographical distribution that is close to the study area.

10.3 Appendix 3: Plant species previously recorded in the general area.

This list was compiled by extracting a list of species that have been recorded within a rectangular area that includes the study area as well as similar habitats in surrounding areas, as obtained from <http://newposa.sanbi.org/> accessed on 10 October 2018. It is probable that it includes some species that occur in habitats that do not occur on site.

The list is arranged by family in alphabetical order. Species listed in green are those that were found on site.

Aizoaceae

Acrosanthes humifusa (Thunb.) Sond. Indigenous; Endemic
Aizoon africanum
Antimima pygmaea (Haw.) H.E.K. Hartmann Indigenous; Endemic
Aridaria noctiflora
Cheiridopsis namaquensis
Cleretum lyratifolium Ihlenf. & Struck Indigenous; Endemic
Conicosia elongata (Haw.) N.E.Br. Indigenous; Endemic X
Conophytum minimum (Haw.) N.E.Br. Indigenous; Endemic
Conophytum truncatum (Thunb.) N.E.Br. subsp. *truncatum* var. *truncatum* Indigenous; Endemic
Deilanthe peersii (L. Bolus) N.E.Br. Indigenous; Endemic X
Drosanthemum species
Hammeria gracilis Burgoyne Indigenous; Endemic
Hammeria meleagris
Lampranthus species
Leipoldtia schultzei
Mesembryanthemum crystallinum L. Indigenous
Mesembryanthemum guerichianum Pax Indigenous
Mesembryanthemum nodiflorum L. Indigenous X
Mesembryanthemum tortuosum L. Indigenous; Endemic X
Psilocaulon junceum
Ruschia cradockensis
Ruschia intricata
Ruschia sp.

Amaranthaceae

Atriplex nummularia Lindl. subsp. *nummularia*; Naturalised
Salsola kali
Salsola tuberculiformis Botsch. Indigenous

Amaryllidaceae

Boophone disticha
Brunsvigia comptonii

Anacampserotaceae

Anacampseros sp.

Anacardiaceae

Laurophyllus capensis Thunb. Indigenous; Endemic
Schinus molle, not Indigenous; Naturalised
Searsia lancea (L.f.) F.A. Barkley Indigenous
Searsia undulata (Jacq.) T.S. Yi, A.J. Mill. & J. Wen Indigenous

Apocynaceae

Eustegia filiformis (L.f.) Schult. Indigenous; Endemic
Hoodia gordonii PROTECTED
Huernia barbata (Masson) Haw. subsp. *barbata* Indigenous
Microlooma sagittatum
Quaqua mammillaris

Asparagaceae

Asparagus burchellii Baker Indigenous; Endemic
Asparagus capensis L. var. *capensis* Indigenous
Asparagus suaveolens Burch. Indigenous

Asphodelaceae

Aloe comosa
Aloe microstigma
Astroloba bullata
Tulista pumila (L.) G.D. Rowley Indigenous; Endemic

Asteraceae

Amphiglossa tomentosa
Arctotis argentea Thunb. Indigenous; Endemic
Athanasia minuta (L.f.) Kallersjo subsp. *inermis* (E. Phillips) Kallersjo Indigenous; Endemic
Berkheya spinosa (L.f.) Druce Indigenous; Endemic
Chrysocoma ciliata
Cineraria lobata L'Her. subsp. *lobata* Indigenous
Cotula leptalea
Cotula macroglossa Bolus ex Schltr. Indigenous; Endemic
Crassothonna protecta. Indigenous; Endemic
Cullumia bisulca (Thunb.) Less. Indigenous; Endemic
Curio radicans
Elytropappus rhinocerotis
Eriocephalus ericoides
Eriocephalus punctulatus
Eumorphia sp.
Euryops erectus (Compton) B. Nord. Indigenous; Endemic
Euryops lateriflorus
Euryops microphyllus (Compton) B. Nord. Indigenous; Endemic
Euryops rehmannii Compton Indigenous; Endemic
Euryops tenuissimus (L.) DC. subsp. *tenuissimus* Indigenous
Felicia australis
Felicia filifolia
Felicia lasiocarpa DC. Indigenous; Endemic
Felicia muricata
Felicia whitehillensis Compton Indigenous; Endemic
Garuleum bipinnatum (Thunb.) Less. Indigenous; Endemic
Gazania rigida
Gazania tenuifolia Less. Indigenous
Gorteria alienata (Thunb.) Stangb. & Anderb. Indigenous; Endemic
Haplocarpha sp.
Helichrysum archeri Compton Indigenous; Endemic
Helichrysum asperum
Helichrysum cylindriflorum (L.) Hilliard & B.L. Burt Indigenous; Endemic
Helichrysum lancifolium (Thunb.) Thunb. Indigenous; Endemic
Helichrysum pulchellum DC. Indigenous; Endemic
Hymenolepis incisa DC. Indigenous; Endemic
Lasiospermum brachyglossum DC. Indigenous
Leysera tenella DC. Indigenous
Macledium spinosum
Osteospermum calendulaceum L.f. Indigenous; Endemic
Othonna auriculifolia Licht. ex Less. Indigenous; Endemic
Othonna pavonia E. Mey. Indigenous; Endemic
Othonna pteronioides Harv. Indigenous; Endemic
Othonna ramulosa DC. Indigenous; Endemic
Pentzia incana (Thunb.) Kuntze Indigenous
Pteronia ambrariifolia Schltr. Indigenous; Endemic

Pteronia aspalatha DC. Indigenous; Endemic
Pteronia empetrifolia DC. Indigenous; Endemic
Pteronia glauca
Pteronia glomerata
Pteronia incana
Pteronia pallens
Rosenia sp.
Senecio achilleifolius DC. Indigenous
Senecio arenarius Thunb. Indigenous
Senecio erysimoides DC. Indigenous; Endemic
Senecio laxus DC. Indigenous; Endemic
Senecio sp.
Steirodiscus capillaceus (Thunb.) Less. Indigenous; Endemic
Syncarpha paniculata (L.) B. Nord. Indigenous; Endemic
Ursinia nana
Ursinia pilifera (P.J. Bergius) Poir. Indigenous; Endemic
Ursinia punctata (Thunb.) N.E.Br. Indigenous; Endemic

Brassicaceae

Heliophila bulbostyla P.E. Barnes Indigenous; Endemic
Heliophila carnososa (Thunb.) Steud. Indigenous
Heliophila digitata L.f. Indigenous; Endemic
Heliophila pectinata Burch. ex DC. Indigenous; Endemic
Lepidium desertorum Eckl. & Zeyh. Indigenous

Bruniaceae

Audouinia laxa (Thunb.) A.V. Hall Indigenous; Endemic

Campanulaceae

Microcodon glomeratus A. DC. Indigenous; Endemic

Capparaceae

Cadaba aphylla

Celastraceae

Maytenus oleoides (Lam.) Loes. Indigenous; Endemic

Chenopodiaceae

Manochlamys albicans

Colchicaceae

Colchicum coloratum J.C.Manning & Vinn. subsp. *burchellii* (Baker) J.C.Manning & Vinn. Indigenous; Endemic

Ornithoglossum parviflorum B. Nord. Indigenous, Endemic

Ornithoglossum undulatum Sweet Indigenous; Endemic

Crassulaceae

Cotyledon papillaris

Cotyledon orbiculata

Crassula arborescens (Mill.) Willd. subsp. *arborescens* Indigenous; Endemic

Crassula clavata

Crassula columnaris subsp. *columnaris*

Crassula cotyledonis

Crassula deltoidea

Crassula dependens

Crassula montana Thunb. subsp. *quadrangularis* (Schonland) Toelken Indigenous; Endemic

Crassula muscosa L. var. *muscosa* Indigenous; Endemic

Crassula pubescens subsp. *pubescens*

Crassula pyramidalis

Crassula rupestris

Crassula saxifraga Harv. Indigenous; Endemic

Crassula subaphylla subsp. *subaphylla*

Crassula tomentosa subsp. *glabrifolia*

Tylecodon paniculatus (L.f.) Toelken Indigenous; Endemic

Tylecodon reticulatus (L.f.) Toelken subsp. *reticulatus* Indigenous; Endemic

Tylecodon wallichii (Harv.) Toelken subsp. *wallichii* Indigenous; Endemic

Cyperaceae

Ficinia deusta (P.J. Bergius) Levyns Indigenous; Endemic

Pseudoschoenus inanis (Thunb.) Oteng-Yeb. Indigenous

Ebenaceae

Diospyros lycioides Desf. subsp. *lycioides* Indigenous

Euclea undulata Thunb. Indigenous

Ericaceae

Erica arcuata Compton Indigenous; Endemic

Erica loganii Compton Indigenous; Endemic

Erica rigidula (N.E.Br.) E.G.H. Oliv. Indigenous; Endemic

Erica tenuis Salisb. Indigenous; Endemic

Erica terniflora E.G.H. Oliv. Indigenous

Euphorbiaceae

Euphorbia clava Jacq. Indigenous; Endemic

Euphorbia decussata

Euphorbia loricata Lam. Indigenous; Endemic

Euphorbia mauritanica

Euphorbia multiceps A. Berger Indigenous; Endemic

Euphorbia rhombifolia Boiss. Indigenous; Endemic

Euphorbia sp.

Euphorbia stellispina Haw. Indigenous; Endemic

Euphorbia stolonifera Marloth ex A.C. White, R.A.Dyer & B.Sloane Indigenous; Endemic

Euphorbia tenax Burch. Indigenous; Endemic

Euphorbia tuberosa L. Indigenous; Endemic

Fabaceae

Aspalathus crassisejala R. Dahlgren Indigenous; Endemic

Aspalathus hystrix L.f. Indigenous; Endemic

Aspalathus nigra L. Indigenous; Endemic

Aspalathus sericea P.J. Bergius Indigenous; Endemic

Aspalathus shawii L. Bolus subsp. *shawii* Indigenous; Endemic

Aspalathus subtingens Eckl. & Zeyh. Indigenous; Endemic

Calobota psiloloba (E. Mey.) Boatwr. & B.-E.van Wyk Indigenous; Endemic

Lessertia annularis Burch. Indigenous

Medicago polymorpha L. not Indigenous; Naturalised; Invasive

Melolobium candicans

Rafnia elliptica Thunb. Indigenous; Endemic

Trifolium suffocatum L. not Indigenous; Naturalised

Vachellia karroo

Frankeniaceae

Frankenia pulverulenta L. Indigenous

Geraniaceae

Monsonia crassicaulis

Pelargonium abrotanifolium

Pelargonium alternans J.C. Wendl. subsp. *alternans* Indigenous; Endemic

Pelargonium brevipetalum N.E.Br. Indigenous; Endemic

Pelargonium crispum (P.J. Bergius) L'Her. Indigenous; Endemic
Pelargonium crithmifolium
Pelargonium hystrix Harv. Indigenous; Endemic
Pelargonium laevigatum (L.f.) Willd. subsp. *diversifolium* (J.C. Wendl.) Schonken Indigenous; Endemic
Pelargonium magenteum
Pelargonium nervifolium Jacq. Indigenous; Endemic
Pelargonium rapaceum (L.) L'Her. Indigenous; Endemic
Pelargonium stipulaceum (L.f.) Willd. subsp. *stipulaceum* Indigenous; Endemic
Pelargonium trifidum Jacq. Indigenous; Endemic
Sarcocaulon crassicaule

Hyacinthaceae

Albuca setosa
Drimia capensis (Burm.f.) Wijnands Indigenous
Drimia filifolia (Jacq.) J.C. Manning & Goldblatt Indigenous; Endemic
Drimia physodes (Jacq.) Jessop Indigenous; Endemic
Drimia sp.
Lachenalia comptonii W.F. Barker Indigenous; Endemic
Lachenalia ensifolia (Thunb.) J.C. Manning & Goldblatt Indigenous; Endemic
Lachenalia isopetala Jacq. Indigenous; Endemic
Lachenalia alba
Lachenalia sp.
Lachenalia whitehillensis W.F. Barker Indigenous; Endemic
Massonia depressa Houtt. Indigenous; Endemic

Iridaceae

Babiana cuneata
Ferraria variabilis Goldblatt & J.C. Manning Indigenous; Endemic
Gladiolus splendens (Sweet) Herb. Indigenous; Endemic
Moraea crispa Thunb. Indigenous
Moraea karroica Goldblatt Indigenous; Endemic
Moraea miniata Andrews Indigenous; Endemic
Moraea species
Moraea setifolia (L.f.) Druce Indigenous; Endemic
Romulea atrandra G.J. Lewis var. *atrandra* Indigenous; Endemic
Romulea austinii E. Phillips Indigenous; Endemic
Romulea hirta Schltr. Indigenous; Endemic

Juncaceae

Juncus sp.

Lamiaceae

Salvia disermas L. Indigenous

Lobeliaceae

Wimmerella secunda (L.f.) Serra, M.B. Crespo & Lammers Indigenous; Endemic

Malvaceae

Anisodontea anomala (Link & Otto) Bates Indigenous; Endemic
Anisodontea elegans (Cav.) Bates Indigenous; Endemic
Anisodontea procumbens (Harv.) Bates Indigenous; Endemic
Hermannia aspera J.C. Wendl. Indigenous; Endemic
Hermannia burkei Burtt Davy Indigenous
Hermannia cuneifolia Jacq. var. *cuneifolia* Indigenous
Hermannia cuneifolia Jacq. var. *glabrescens* (Harv.) I. Verd. Indigenous
Hermannia filifolia L.f. var. *filifolia* Indigenous; Endemic
Hermannia filifolia L.f. var. *grandicalyx* I. Verd. Indigenous; Endemic
Hermannia grandiflora Aiton Indigenous
Hermannia incana Cav. Indigenous; Endemic

Hermannia odorata Aiton Indigenous; Endemic
Hermannia sp.

Melanthaceae

Melianthus comosus Vahl Indigenous

Molluginaceae

Pharnaceum lanatum Bartl. Indigenous; Endemic

Orchidaceae

Disperis purpurata Rchb.f. subsp. *purpurata* Indigenous; Endemic

Holothrix secunda (Thunb.) Rchb.f. Indigenous; Endemic

Pterygodium schelpei H.P. Linder Indigenous; Endemic

Oxalidaceae

Oxalis melanosticta Sond. var. *melanosticta* Indigenous; Endemic

Oxalis flava Indigenous; Endemic

Oxalis obtusa Indigenous; Endemic

Oxalis palmifrons T.M. Salter Indigenous; Endemic

Oxalis purpurea L. Indigenous; Endemic

Oxalis tenuipes T.M. Salter var. *tenuipes* Indigenous; Endemic

Poaceae

Aristida diffusa Trin. subsp. *burkei* (Stapf) Melderis Indigenous

Cymbopogon marginatus (Steud.) Stapf ex Burtt Davy Indigenous

Ehrharta calycina Sm. Indigenous

Ehrharta sp.

Lophochloa pumila (Desf.) Bor not Indigenous; Naturalised

Pentameris airoides Nees subsp. *airoides* Indigenous

Pentameris distichophylla (Lehm.) Nees Indigenous; Endemic

Pentameris eriostoma (Nees) Steud. Indigenous

Pentameris macrocalycina (Steud.) Schweick. Indigenous; Endemic

Pentaschistis airoides

Phragmites australis

Poa bulbosa L. Indigenous

Schismus barbatus (Loefl. ex L.) Thell. Indigenous

Schismus scaberrimus Nees Indigenous; Endemic

Tenaxia stricta

Tribolium hispidum (Thunb.) Desv. Indigenous; Endemic

Tribolium obtusifolium (Nees) Renvoize Indigenous; Endemic

Tribolium tenellum (Nees) Verboom & H.P. Linder Indigenous

Polygalaceae

Muraltia commutata Levyns Indigenous; Endemic

Muraltia heisteria (L.) DC. Indigenous; Endemic

Muraltia karroica Levyns Indigenous; Endemic

Muraltia macrocarpa Eckl. & Zeyh. Indigenous

Proteaceae

Leucadendron barkerae I. Williams Indigenous; Endemic

Leucadendron salignum P.J. Bergius Indigenous; Endemic

Protea canaliculata Andrews Indigenous; Endemic

Protea laurifolia Thunb. Indigenous; Endemic

Protea lepidocarpodendron (L.) L. Indigenous; Endemic

Spatalla confusa (E. Phillips) Rourke Indigenous; Endemic

Restionaceae

Elegia asperiflora (Nees) Kunth Indigenous; Endemic

Rhamnaceae

Phylica lanata Pillans Indigenous; Endemic
Phylica odorata Schltr. Indigenous; Endemic
Phylica paniculata Willd. Indigenous
Phylica pulchella Schltr. Indigenous; Endemic
Phylica rigidifolia Sond. Indigenous; Endemic
Phylica sp.
Phylica vulgaris Pillans var. *vulgaris* Indigenous; Endemic

Rutaceae

Adenandra fragrans (Sims) Roem. & Schult. Indigenous; Endemic
Adenandra villosa (P.J. Bergius) Licht. ex Roem. & Schult. subsp. *umbellata* (J.C. Wendl.) Strid Indigenous; Endemic
Agathosma barnesiae Compton Indigenous; Endemic
Diosma acmaeophylla Eckl. & Zeyh. Indigenous; Endemic
Euchaetis elsieae I. Williams Indigenous; Endemic

Ruscaceae

Eriospermum sp.

Santalaceae

Thesium capituliflorum Sond. Indigenous; Endemic
Thesium hillianum Compton Indigenous; Endemic
Thesium lineatum
Thesium marlothii Schltr. Indigenous; Endemic
Viscum capense L.f. Indigenous
Viscum rotundifolium Indigenous

Sapindaceae

Dodonaea viscosa Jacq. var. *angustifolia* (L.f.) Benth. Indigenous

Scrophulariaceae

Aptosimum indivisum Burch. ex Benth. Indigenous
Nemesia ligulata

Sinopteridaceae

Cheilanthes hastata (L.f.) Kunze Indigenous

Solanaceae

Lycium cinereum

Thymelaeaceae

Lachnaea penicillata Meisn. Indigenous; Endemic
Lasiosiphon deserticola (Gilg) C.H. Wright Indigenous; Endemic
Passerina comosa (Meisn.) C.H. Wright Indigenous; Endemic
Passerina obtusifolia Thoday Indigenous; Endemic
Passerina truncata (Meisn.) Bredek. & A.E. van Wyk subsp. *truncata* Indigenous; Endemic
Struthiola confusa C.H. Wright Indigenous; Endemic

Zygophyllaceae

Roepera lichtensteiniana (Cham.) Beier & Thulin Indigenous
Roepera sp.

10.4 Appendix 4: Animal species with a geographical distribution that includes the study area.

Notes:

1. Species of conservation concern are in red lettering.
2. Species protected according to the National Environmental Management: Biodiversity Act of 2004 (Act 10 of 2000) (see Appendix 6) marked with “N”

Mammals (excluding bats):

Red hartebeest
Springbok
^NBlack rhinoceros (arid ecotype) **EN**
Klipspringer
Grey rhebok **NT**
Steenbok
Cape grysbok
Common duiker
Rock hyrax
Water mongoose
Black-backed jackal
Caracal
Yellow mongoose
^NBlack-footed cat **VU**
African wild cat
Small grey mongoose
Small-spotted genet
Striped polecat
^NHoney badger
Bat-eared fox
^NLeopard **VU**
Aardwolf
Suricate
^NCape fox
Cape golden mole
Reddish-grey musk shrew
Lesser dwarf shrew
^NRiverine rabbit **CR**
Cape/desert hare
Scrub/savannah hare
Hewitt's red rock rabbit
Chacma baboon
Vervet monkey
Grant's rock mouse
Namaqua rock mouse
Common mole rat
Grey climbing mouse
Short-tailed gerbil
Cape mole rat
Hairy-footed gerbil
Spectacled dormouse **NT**
Porcupine
Large-eared mouse
Pygmy mouse
Vlei rat
Saunders's vlei rat
Karoo bush rat

(Brant's whistling rat)
(Springhare)
(Barbour's rock mouse)
Pygmy rock mouse
Striped mouse
Cape gerbil
(Cape rock sengi)
(Karoo rock sengi)
Western rock sengi
Karoo round-eared sengi
Aardvark

Reptiles:

Pelomedusidae:

Marsh terrapin

Testudinidae:

Angulate tortoise
Parrot-beaked dwarf tortoise
Karoo dwarf tortoise **NT**
Greater dwarf tortoise
Tent tortoise
(Leopard tortoise)

Gekkonidae:

Common giant gecko
Bibron's gecko
Striped pygmy gecko
Cape gecko
Southern rough gecko
Ocellated gecko
Thin-skinned gecko
Spotted gecko
Common banded gecko
Golden spotted gecko
Purcell's gecko
Weber's gecko
Spotted barking gecko

Amphisbaenidae:

Lacertidae:

Knox's desert lizard
Spotted desert lizard
Karoo sandveld lizard
Western sandveld lizard
Burchell's sand lizard
Karoo sand lizard
Common sand lizard
Namaqua sand lizard

Cordylidae:

Cape girdled lizard

Western dwarf girdled lizard
Cape cliff lizard
Southern karusa lizard
N Armadillo (girdled) lizard
Nuweveldberg crag lizard
Gerrhosauridae:
Dwarf plated lizard
(Karoo plated lizard)
Cape long-tailed seps
Scincidae:
Striped dwarf legless skink
Cape legless skink
Cape skink
Red-sided skink
Western three-striped skink
Western rock skink
Variegated skink
Varanidae:
Chamaeleonidae:
Namaqua chameleon
Agamidae:
Western ground agama
(Anchieta's agama)
Southern rock agama
Southern spiny agama
Typhlopidae:
Delelande's beaked blind snake
Leptotyphlopidae
Slender thread snake
Viperidae:
Puff adder
Horned adder
Red adder
Lamprophiidae:
Spotted harlequin snake
Common house snake
Aurora snake
Fisk's snake
Spotted rock snake
Brown water snake
Dwarf beaked snake
Cross-marked grass snake
Karoo sand snake
Spotted grass snake
(South African slug eater)
Sundevall's shovel-snout
Mole snake
Elapidae:
Coral shield cobra
Rinkhals
Cape cobra
Colubridae:
Red-lipped snake
Rhombic egg eater
Boomslang
Beetz's tiger snake

Karoo toad
Common platanna
Boettger's caco
Karoo caco
Cape river frog
Cape sand frog
Tandy's sand frog
Raucous toad
Poynton's river frog

Amphibians

10.5 Appendix 5: Flora protected under the Cape Nature and Environmental Conservation Ordinance 19 of 1974

SCHEDULE 3: Endangered Flora

As per the Cape Nature and Environmental Conservation Ordinance 19 of 1974

Family: APOCYNACEAE	Common name / Additional notes
<i>Pachypodium namaquanum</i>	Halfmens (currently listed as LC)
Family: GESNERIACEAE	
<i>Charadrophila capensis</i>	Cape Gloxinia (currently listed as Rare)
Family: LILIACEAE	
<i>Aloe pillansii</i>	Now called <i>Aloidendron pillansii</i> , currently listed as Endangered
<i>Aloe buhrii</i>	Currently listed as Vulnerable
<i>Aloe erinacea</i>	Now called <i>Aloe melanacantha</i> , currently listed as Least Concern
Family: PROTEACEAE	
<i>Mimetes capitulates</i>	Currently listed as Endangered
<i>Mimetes hottentoticus</i>	Currently listed as Critically Endangered
<i>Mimetes stokoei</i>	Currently listed as Critically Endangered
<i>Orothamnus zeyheri</i>	Currently listed as Vulnerable
<i>Protea odorata</i>	Currently listed as Critically Endangered
Family: STANGERIACEAE	
<i>Stangeria eriopus</i>	Bobbejaankos (currently listed as Vulnerable)
Family: ZAMIACEAE	
<i>Encephalartos</i> spp.	Cycads, all species

SCHEDULE 4: PROTECTED SPECIES

As per the Cape Nature and Environmental Conservation Ordinance 19 of 1974

Family: AMARYLLIDACEAE	All species
Family: APOCYNACEAE	All species except those listed in Schedule 3
Family: AQUIFOLIACEAE	All species
<i>Ilex mitis</i>	
Family: ARACEAE	
<i>Zantedeschia elliottiana</i>	Yellow arum lily (currently DDT)
Family: ASCLEPIADACEAE (now Apocynaceae)	All species
Family: BORAGINACEAE	
<i>Echiostachys spicatus</i>	
Family: BRUNIACEAE	All species
Family: COMPOSITAE (now Asteraceae)	
<i>Senecio colyphyllous (coleophyllous?)</i>	
<i>Cotula duckettae</i>	
Family: CRASSULACEAE	
<i>Crassula columnaris</i>	
<i>Crassula perfoliata</i>	
<i>Crassula pyramidalis</i>	
<i>Kalanchoe thyrsiflora</i>	
<i>Rochea coccinea (now Crassula cochinea)</i>	
Family: CUNONIACEAE	
<i>Cunonia capensis</i>	
<i>Platylophus trifolius</i>	

Family: DIOSCOREACEAE	
<i>Testudinaria sylvatica</i> (now <i>Dioscorea sylvatica</i>)	
<i>Testudinaria elephantipes</i> (now <i>Dioscorea elephantipes</i>)	
Family: ERICACEAE	All species
Family: EUPHORBIACEAE	
<i>Euphorbia bupleurifolia</i>	
<i>Euphorbia fasciculata</i>	
<i>Euphorbia globosa</i>	
<i>Euphorbia horrida</i>	
<i>Euphorbia meloformis</i>	
<i>Euphorbia obesa</i>	
<i>Euphorbia schoenlandii</i>	
<i>Euphorbia symmetrica</i>	
<i>Euphorbia valida</i>	
Family: GEISSOLOM(AT)ACEAE	All species
Family: GESNERIACEAE	
<i>Streptocarpus</i>	All species
Family: GRAMINAE (now Poaceae)	
<i>Arundinaria tessellata</i> (<i>Thamnocalamus tessellatus</i>)	
<i>Secale africanum</i> (now <i>Secale strictum</i> subsp. <i>africanum</i>)	
Family: GRUBBIACEAE	All species
Family: IRIDACEAE	All species
Family: LEGUMINOSAE (now Fabaceae)	
<i>Erythrina acanthocarpa</i>	
<i>Erythrina humeana</i>	
<i>Liparia comantha</i>	
<i>Liparia sphaerica</i>	
<i>Liparia splendens</i>	
<i>Podalyria calyptrata</i>	
<i>Priestleya vestita</i>	
<i>Priestleya tomentosa</i>	
Family: LILIACEAE (now split into a number of families)	
All species of the genus ALOE except those specified in Schedule 3 and the species <i>Aloe ferox</i>	
<i>Gasteria beckeri</i>	
<i>Gloriosa superba</i>	
All species of the genus <i>Haworthia</i>	
All species of the genus <i>Kniphofia</i>	
All species of the genus <i>Lachenalia</i>	
<i>Littonia modesta</i>	
<i>Sandersonia aurantiaca</i>	
All species of the genus <i>Veltheimia</i>	
<i>Agapanthus walshii</i>	
<i>Daubenya aurea</i>	
Family: MELIACEAE	
<i>Nymania capensis</i>	
Family: MESEMBRYANTHEMACEAE (now Aizoaceae)	All species
Family: MUSACEAE (now Strelitziaceae)	
<i>Strelitzia</i>	All species
Family: NYMPHAECEAE	
<i>Nymphaea capensis</i> (now <i>N. nouchali</i>)	
Family: ORCHIDACEAE	All species
Family: OXALIDACEAE	
<i>Oxalis nutans</i> (no such species)	

Family: PENAEACEAE	All species
Family: POLYGALACEAE	
<i>Muraltia minuta</i>	
Family: POLYPODIACEAE	
<i>Adiantum (now Family Pteridaceae)</i>	All species
<i>Hemitelia capensis (now Alsophila capensis, Family Cyathaceae)</i>	
<i>Polystichum adiantiforme (now Rumohra adiantiformis, Family Dryopteridaceae)</i>	
Family: PORTULACACEAE	
<i>Anacampseros (now Family Anacampserotaceae)</i>	All species
Family: PROTEACEAE	
<i>All species</i>	
Family: RANUNCULACEAE	
<i>Anemone capensis (now A. tenuifolia)</i>	
Family: RESTIONACEAE	
<i>Chondropetalum</i>	
<i>Acockii pillans (no such species)</i>	
<i>Elegia fenestrata</i>	
<i>Restio acockii</i>	
<i>Restio micans</i>	
<i>Restio sabulosus</i>	
Family: RETZIACEAE (now Stilbaceae)	
<i>Retzia capensis</i>	
Family: RHAMNACEAE	
<i>Phyllica pubescens</i>	
Family: RORIDULACEAE	All species
Family: RUTACEAE	All species
Family: SCROPHULARIACEAE	
<i>Diascia</i>	All species
<i>Harveya</i>	All species
<i>Nemesia strumosa</i>	
<i>Halleria</i>	All species
Family: THYMELAEACEAE	
<i>Lachnaea aurea</i>	

10.6 Appendix 6: Flora protected under the Northern Cape Nature Conservation Act No. 9 of 2009.

SCHEDULE 1: SPECIALLY PROTECTED SPECIES

As per the Northern Cape Nature Conservation Act, No. 9 of 2009, Schedule 1

Family: AMARYLLIDACEAE	
<i>Clivia mirabilis</i>	Oorlofskloof bush lily / <i>Clivia</i>
<i>Haemanthus graniticus</i>	April fool
<i>Hessea pusilla</i>	
<i>Strumaria bidentata</i>	
<i>Strumaria perryae</i>	
Family: ANACARDIACEAE	
<i>Ozoroa</i> spp.	All species
Family: APIACEAE	
<i>Centella tridentata</i>	
<i>Chamarea snijmaniae</i>	
Family: APOCYNACEAE	
<i>Hoodia gordonii</i>	
<i>Pachypodium namaquanum</i>	Elephant's trunk
Family: ASPHODOLACEAE	
<i>Aloe buhrii</i>	
<i>Aloe dichotoma</i>	
<i>Aloe dichotoma</i> var. <i>rumosissima</i>	Maiden quiver tree
<i>Aloe dabenorisana</i>	
<i>Aloe erinacea</i>	
<i>Aloe meyeri</i>	
<i>Aloe pearsonii</i>	
<i>Aloe pillansii</i>	
<i>Trachyandra prolifera</i>	
Family: ASTERACEAE	
<i>Athanasia adenantha</i>	
<i>Athanasia spathulata</i>	
<i>Cotula filifolia</i>	
<i>Euryops mirus</i>	
<i>Euryops rosulatus</i>	
<i>Euryops virgatus</i>	
<i>Felicia diffusa</i> subsp. <i>khamiesbergensis</i>	
<i>Othonna armiana</i>	
Family: CRASSULACEAE	
<i>Tylecodon torulosus</i>	
Family: DIOSCORACEAE	
<i>Dioscorea</i> spp.	Elephant's foot, all species
Family: ERIOSPERMACEAE	
<i>Eriospermum erinum</i>	
<i>Eriospermum glaciale</i>	
Family: FABACEAE	
<i>Amphithalea obtusiloba</i>	
<i>Lotononis acutiflora</i>	
<i>Lotononis polycephala</i>	
<i>Lessertia</i> spp.	
<i>Sceletium toruosum</i>	
<i>Sutherlandia</i> spp.	Cancer Bush, all species
<i>Wiborgia fusca</i> subsp. <i>macrocarpa</i>	

Family: GERANIACEAE	
Pelargonium spp.	Pelargonium, all species
Family: HYACINTHACEAE	
Drimia nana	
Ornithogalum bicornutum	
Ornithogalum inclusum	
Family: IRIDACEAE	
Babiana framesii	
Ferraria kamiesbergensis	
Freesia marginata	
Geissorhiza subrigida	
Hesperantha minima	
Hesperantha oligantha	
Hesperantha rivulicola	
Lapeirousia verecunda	
Moraea kamiesensis	
Moraea namaquana	
Romulea albiflora	
Romulea discifera	
Romulea maculata	
Romulea rupestris	
Family: MOLLUGINACEAE	
Hypertelis trachysperma	
Psammotropha spicata	
Family: ORCHIDACEAE	
Corycium ingeanum	
Disa macrostachya	Disa
Family: OXALIDACEAE	
Oxalis pseudo-hirta	Sorrel
Family: PEDALIACEAE	
Harpagophytum spp.	Devils' claw
Family: POACEAE	
Prionanthium dentatum	
Secale strictum subsp. africanum	Wild rye
Family: PROTEACEAE	
Leucadendron meyerianum	Tolbos
Mimetes spp.	All species
Orothamnus zeyheri	
Family: ROSACEAE	
Cliffortia arborea	Sterboom
Family: SCROPHULARIACEAE	
Charadrophila capensis	Cape Gloxinia
Family: STANGERIACEAE	
Stangeria spp.	Cycads, all species
Family: ZAMIACEAE	
Encephalartos spp.	Cycads, all species

SCHEDULE 2: PROTECTED SPECIES

As per the Northern Cape Nature Conservation Act, No. 9 of 2009, Schedule 2

Family: ACANTHACEAE	
Barleria paillosa	
Monechme saxatile	
Peristrophe spp.	All species
Family: ADIANTHACEAE	
Adiantum spp.	Maidenhair Fern, all species
Family: AGAPANTHACEAE	

Agapanthus spp.	All species
Family: AIZOACEAE (MESEMBRYANTHEMACEAE)	All species
Family: AMARYLLIDACEAE	All species except those listed in Schedule 1
Family: ANTHERICACEAE	All species
Family: APIACEAE	All species except those listed in Schedule 1
Family: APOCYNACEAE	All species except those listed in Schedule 1
Family: AQUIFOLIACEAE	All species
Ilex mitis	
Family: ARACEAE	
Zantedeschia spp.	Arum lilies, all species
Family: ARALIACEAE	
Cussonia spp.	Cabbage trees, all species
Family: ASPHODOLACEAE	All species except those listed in Schedule 1 and the species <i>Aloe ferox</i>
Family: ASTERACEAE	
Helichrysum jubilatam	
Felicia deserti	
Gnaphalium simii	
Lopholaena longipes	
Senecio albo-punctatus	
Senecio trachylaenus	
Trichogyne lerouxiae	
Tripteris pinnatilobata	
Troglophyton acocksianum	
Vellereophyton lasianthum	
Family: BURMANNIACEAE	
Burmannia madagascariensis	Wild ginger
Family: BURSERACEAE	
Commiphora spp.	All species
Family: CAPPARACEAE	
Boscia spp.	Shepherd's trees, all species
Family: CARYOPHYLLACEAE	
Dianthus spp.	All species
Family: CELASTRACEAE	
Gymnosporia spp.	All species
Family: COLCHICACEAE	
Androcymbium spp.	All species
Gloriosa spp.	All species
Family: COMBRETACEAE	
Combretum spp.	All species
Family: CRASSULACEAE	All species except those listed in Schedule 1
Family: CUPPRESSACEAE	
Widdringtonia spp.	Wild cypress, all species
Family: CYATHEACEAE	
Cyathea spp.	Tree ferns, all species
Cyathea capensis	Tree Fern
Family: CYPERACEAE	
Carex acocksii	
Family: DROSERACEAE	
Drosera spp.	Sundews, all species
Family: DRYOPTERIDACEAE	
Rumohra spp.	Seven Weeks Fern, all species
Family: ERICACEAE	Erica, all species
Family: EUPHORBIACEAE	
Alchornea laxiflora	Venda Bead-string
Euphorbia spp.	All species

Family: FABACEAE	
Aspalathus spp.	Tea Bush, all species
Erythrina zeyheri	Ploughbreaker
Argyrolobium petiolare	
Caesalpinia bracteata	
Calliandra redacta	
Crotalaria pearsonii	
Indigofera limosa	
Lebeckia bowieana	
Polhillia involucrate	
Rhynchosia emarginata	
Wiborgia humilis	
Family: HYACINTHACEAE	
Daubenya spp	
Lachenalia spp.	Daubenya, all species
Veltheimia spp.	Violtjie, all species
Eucomis spp.	Pineapple flower, all species
Neopatersonia namaquensis	
Ornithogalum spp.	All species
Family: IRIDACEAE	All species except those listed in Schedule 1
Family: LAURACEAE	
Ocotea spp.	Stinkwood, all species
Family: MESEMBRYANTHEMACEAE	All species
Family: MELIACEAE	
Nymanina capensis	Chinese Lantern
Family: OLEACEAE	
Olea europea subsp. africana	Wild olive
Family: ORCHIDACEAE	Orchids, all species except those listed in Schedule 1
Family: OROBANCHACEAE	
Harveya spp.	Harveya, all species
Family: OXALIDACEAE	
Oxalis spp.	Sorrel, all species except those listed in Schedule 1
Family: PLUMBAGINACEAE	
Afrolimon namaquanum	
Family: POACEAE	
Brachiaria dura var. dura	
Dregeochloa calviniensis	
Pentaschistis lima	
Family: PODOCARPACEAE	
Podocarpus spp.	Yellowwoods, all species
Family: PORTULACACEAE	
Anacampseros spp.	All species
Avonia spp.	All species
Portulaca foliosa	
Family: PROTEACEAE	All species except those listed in Schedule 1
Family: RESTIONACEAE	All species
Family: RHAMNACEAE	
Phyllica spp.	All species
Family: RUTACEAE	
Agathosma spp.	Buchu, all species
Family: SCROPHULARIACEAE	
Diascia spp.	All species
Halleria spp.	All species
Jamesbrittenia spp.	All species
Manulea spp.	All species

Nemesia spp.	All species
Phyllopodium spp.	All species
Polycarena filiformis	
Chaenostoma longipedicellatum	
Family: STRELITZIACEAE	
Strelitzia spp.	All species
Family: TECOPHILACEAE	
Cyanella spp.	All species
Family: THYMELAEACEAE	
Gnidia leipoldtii	
Family: ZINGIBERACEAE	
Siphonochilus aethiopicus	Wild ginger

10.7 Appendix 7: Flora and vertebrate animal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

(as updated in R. 1187, 14 December 2007)

CRITICALLY ENDANGERED SPECIES

Flora

Adenium swazicum

Aloe pillansii

Diaphanathe millarii

Dioscorea ebutsniorum

Encephalartos aemulans

Encephalartos brevifoliolatus

Encephalartos cerinus

Encephalartos dolomiticus

Encephalartos heenanii

Encephalartos hirsutus

Encephalartos inopinus

Encephalartos latifrons

Encephalartos middelburgensis

Encephalartos nubimontanus

Encephalartos woodii

Reptilia

Loggerhead sea turtle

Leatherback sea turtle

Hawksbill sea turtle

Aves

Wattled crane

Blue swallow

Egyptian vulture

Cape parrot

Mammalia

Riverine rabbit

Rough-haired golden mole

ENDANGERED SPECIES

Flora

Angraecum africae

Encephalartos arenarius

Encephalartos cupidus

Encephalartos horridus

Encephalartos laevifolius

Encephalartos lebomboensis

Encephalartos msinganus

Jubaeopsis caffra

Siphonochilus aethiopicus

Warburgia salutaris

Newtonia hilderbrandi

Reptilia

Green turtle

Giant girdled lizard

Olive ridley turtle

Geometric tortoise

Aves

Blue crane

Grey crowned crane

Saddle-billed stork

Bearded vulture

White-backed vulture

Cape vulture

Hooded vulture

Pink-backed pelican

Pel's fishing owl

Lappet-faced vulture

Mammalia

Robust golden mole

Tsessebe

Black rhinoceros

Mountain zebra

African wild dog

Gunning's golden mole

Oribi

Red squirrel

Four-toed elephant-shrew

VULNERABLE SPECIES

Flora

Aloe albida

Encephalartos cycadifolius

Encephalartos Eugene-maraisii

Encephalartos ngovanus

Merwillia plumbea

Zantedeschia jucunda

Aves

White-headed vulture

Tawny eagle

Kori bustard

Black stork

Southern banded snake eagle

Blue korhaan

Taita falcon

Lesser kestrel

Peregrine falcon

Bald ibis

Ludwig's bustard

Martial eagle

Bataleur

Grass owl

Mammalia
Cheetah
Samango monkey
Giant golden mole
Giant rat
Bontebok
Tree hyrax
Roan antelope
Pangolin
Juliana's golden mole
Suni
Large-eared free-tailed bat
Lion
Leopard
Blue duiker

PROTECTED SPECIES

Flora

Adenia wilmsii
Aloe simii
Clivia mirabilis
Disa macrostachya
Disa nubigena
Disa physodes
Disa procera
Disa sabulosa
Encephelartos altensteinii
Encephelartos caffer
Encephelartos dyerianus
Encephelartos frederici-guilielmi
Encephelartos ghellinckii
Encephelartos humilis
Encephelartos lanatus
Encephelartos lehmannii
Encephelartos longifolius
Encephelartos natalensis
Encephelartos paucidentatus
Encephelartos princeps
Encephelartos senticosus
Encephelartos transvenosus
Encephelartos trispinosus
Encephelartos umbeluziensis
Encephelartos villosus
Euphorbia clivicola
Euphorbia meloformis
Euphorbia obesa
Harpagophytum procumbens
Harpagophytum zeyherii
Hoodia gordonii
Hoodia currorii