Msenge Emoyeni Powerline Deviation

TERRESTRIAL SPECIALIST REPORT

Prepared for:
Nala Environmental
Kikuyu Waterfall
Johannesburg
2090

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EXECUTIVE SUMMARY

The main objective of the assessment was to assess to the impact that the planned construction would have on the terrestrial ecological community (fauna and flora) found within and proximal to the proposed 300m corridor and project area. This included the powerline deviation, on-site substation and associated access tracks and water course crossings.

The following approach and methodology were employed for this report:

- A field survey was conducted to assess the environmental structure of all the habitat types across the field site and the proximity of these different habitat structures to proposed infrastructure.
- The field survey was also used to determine the species diversities and densities associated with the different habitat structures across the project area.
- A desktop assessment was conducted to elucidate the ecologically important geographical and environmental features across the project area.
- A desktop assessment was conducted to compile a potential species list for the property with a particular focus on threatened and protected taxa.
- Identify the manner and extent to which the proposed development will impact the terrestrial fauna and flora found within the project area.
- Provide mitigation protocols that can be used to reduce the impact on the terrestrial communities and their associated habitats.
- Produce a concluding statement summarizing all the findings with an over-arching recommendation for the project.

The estimated impact for the cumulative impacts on the terrestrial flora is summarised in the Table below. Despite the large number of WGTs in the Cookhouse-Bedford area together with the associated road network – the cumulative impacts are still low. It could be argued convincingly that overstocking with livestock and recently game animals in the area has caused vastly more damage. Provided overstocking does not occur in tandem with the WEF development, the vegetation, productive capacity of the land and the vigour of SCC populations will increase steadily.

Nature: Demise of SCC plants from a combination of overstocking with livestock, uncontrolled bush encroachment, high density of AIPs (Alien Invasive Plants) and the illegal poaching of plants for the plant collecting trade		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Low (1)	Low (1)
Duration	Medium-term (4)	Medium-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	***Low (44)***	***Medium (27)***
Status (positive or negative)	Negative	Negative

Reversibility	High[1] to Low	High to Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes, unless active mitigation is not followed up with compliance monitoring	Yes, unless active mitigation is not followed up with compliance monitoring
Mitigation: The security of the powerline corridor (and greater WEF) needs to restrict access with a controlled access point and locked gates along main roads. The location of key SCC needs to be carefully guarded and documents with locality must not be made freely available to the public. For selected key species such as *E. meloformis*, *Faucaria tuberculosa*, and *Huernia* spp., permits are needed from DEDEAT to collect specimens (in the construction footprint and possibly outside the buffers), for mass propagation and rewilding back to the site to prevent numbers of plants falling below a threshold for a Minimum Viable Population (MVP). The Alien Invasive Management Plan requires a co-management agreement with the landowners and this requires implementation and monitoring. The Bush Encroachment Management plan, requires a co-management agreement with the landowners and this requires implementation and monitoring. Veld condition assessments from a professional rangeland ecologist are required as per management plans.		
Residual Impacts: Same as above for the same Nature.		

The estimated impact for the cumulative impacts on the terrestrial fauna is summarised in the Table below.

Nature: This refers to the loss of natural habitat on the property either directly or indirectly over the course of the project and in conjunction with neighbouring windfarms and commercial farms. Direct effects include habitat loss as a result of bush clearing, heavy machinery and chemical use and infrastructure development. Indirect effects refer to the indirect loss of habitat through soil erosion, sedimentation, and alien plant invasions. These direct and indirect effects are considered in relation to the proposed power line and associated infrastructure under consideration, the existing wind farms in the immediate area and the livestock farming that takes place between and on the same properties as the wind farms.		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Low (2)	Medium (3)
Duration	Medium-term (3)	Long Term (4)
Magnitude	Medium (5)	High (6)
Probability	Highly Probable (4)	Definite (5)
Significance	**Medium (40)**	**High (65)**

[1] Reversibility can be applied to SCC up to a point where a threshold is crossed for a Minimum Viable Population, after which the probability % drops off rapidly to zero (the point of local species extinction).

Status (positive or negative)	Negative	Negative
Reversibility	Medium	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes

Mitigation:

- Limit construction to the immediate footprint of the project.
- Reduce the overall burden on the ecosystems by decreasing livestock grazing pressure which exacerbates the deleterious and homogenizing effects of construction.
- Rewild the buffer zones post-construction using similar species assemblages of fauna and flora.
- Carefully dismantle rocky outcrops (avoid crushing fauna and flora) and relocate and recreate rocky habitats, as best as possible, outside of the footprint of the project.
- Move rocks away from the proposed access tracks, and not just to the side of the road, as they present ideal micro habits for fauna and flora.
- Ensure that all excess wastewater and chemicals from the construction process are appropriately managed so that they don't overflow into local wetlands and drainage lines.
- Monitor the buffer zones to ensure that the rewilding process is successful and is not negatively impacted by livestock and alien plant species.
- Develop a management plan for all by products of the construction and operation process to ensure they are not exported into neighbouring habitats.
- Monitor the area for alien fauna and flora and remove where necessary.

Residual Impacts:

There will be an irreparable loss of habitat irrespective of the mitigations. There is a cumulative effect between all the infrastructure on the properties and all neighboring wind farms combined. Because of this cumulative impact, the negative impact on the environment is inevitable. This negative impact needs to be mitigated as much as possible, using all the mitigations to ensure that the proposed power line and associated infrastructure in question is not contributing to the habitat degradation, fragmentation and destruction that is found throughout the neighbouring properties. This project does not constitute an unacceptable risk provided all the aforementioned mitigations are implemented.

Based on the findings of our surveys, previous reports, and all relevant literature, we believe that the proposed 66kV overhead power line, access tracks and water course crossing infrastructure within the 300m development corridor and the on-site substation within the 300m development radius will not have an irreversible and substantial negative effect on the terrestrial fauna and flora in the area provided all the necessary mitigations are implemented and sensitive areas are avoided.

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ACRONYMS AND ABBREVIATIONS

AIPs	Alien Invader Plants
AOO	Area of Occurrence
BAR	Basic Assessment Report
BCP	Biodiversity Conservation Plan
BESS	Battery Energy Storage System
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CBA1	Critical Biodiversity Area Category 1
CBA2	Critical Biodiversity Area Category 2
CR	Critically Endangered
CNEO	Cape Nature and Environmental Ordinance
DD	Data Deficient
DEA	Department of Environmental Affairs[2]
DEDEAT	Department of Economic Development, Environment and Tourism
DFFE	Department of Forestry, Fisheries and Environment
ECBP	Eastern Cape Biodiversity Plan
ECO	Environmental Control Officer
ECPTA	Eastern Cape Parks and Tourism Agency
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EN	Endangered
EOO	Extent of Occurrence
ESA	Ecological Support Areas
EW	Extinct in the Wild
FBAR	Final Basic Assessment Report
I&AP	Interested and Affected Parties
kV	kilo Volt
LC	Least Concern
LOO	Likelihood of Occurrence
MTS	Main Transmission Substation
MVP	Minimum Viable Population
NBA	National Biodiversity Assessment
NE	Not Evaluated
NEMA	National Environmental Management Act
NEMBA	National Environment: Biodiversity Management Act
NEMPA	National Environment: Protect Areas Management Act
NFA	National Forests Act (Act 84 of 1988)
NPAES	National Protected Area Expansion Plan
NT	Near Threatened
NWA	National Water Act
OHL	Over-Head Line
PDI	Previously Disadvantaged Individuals

[2] Department name changed to DFFE.

R	Rare
RLE	Red Listed Ecosystems
RRRG	Rhodes Restoration Research Group
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SE	Savannah Environmental
SMME	Small, Medium and Micro-Enterprise
Sp.	Species singular
Spp.	Species plural
STEP	Subtropical Thicket Ecosystem Programme
ToPS	Threated or Protected Species (NEMBA 2007)
TORs	Terms of Reference
VU	Vulnerable
WEF	Wind Energy Facility
WGTs	Wind Generating Turbines
ZTP	Zero Tolerance Policy

1. INTRODUCTION AND CONTEXT

Scherman Environmental cc. was contracted by Nala Environmental to conduct a terrestrial ecology (fauna and flora) assessment for the proposed deviation of the 66kV overhead line (OHL) and associated substation.

1.1 BACKGROUND

A terrestrial ecology (fauna and flora) assessment was undertaken to assess the current biodiversity of the study area and to identify and assess likely impacts of the proposed powerline deviation, on-site substation and associated access tracks and water course crossings (**Figure 1.1**).

The following properties have been identified for the above infrastructure and key components (as determined by the Terms of Reference (TORs) received):

- Remainder of Farm Leeuw Fontein No. 221
- Portion 1 of Farm Normandale No. 206
- Portion 3 of Farm Plat House No. 203
- Remaining Extent of Farm Kop Leegte No. 205
- Remainder of Farm 260 No. 260
- Remainder of Farm 242 No. 242
- Remainder of Farm 148 No. 148
- Portion 3 of Farm 148 No. 148
- Portion 5 of the Farm Van Wyks Kraal No.73

1.2 STUDY AREA

Site location

The proposed 300m grid corridor and on-site substation associated with the authorised Msenge Emoyeni Wind Energy Facility (WEF) is located approximately 20km south-west of the town of Bedford in the Eastern Cape Province (**Figure 1.1**). Details of the terrestrial fauna and flora for the study area are described in the sections below.

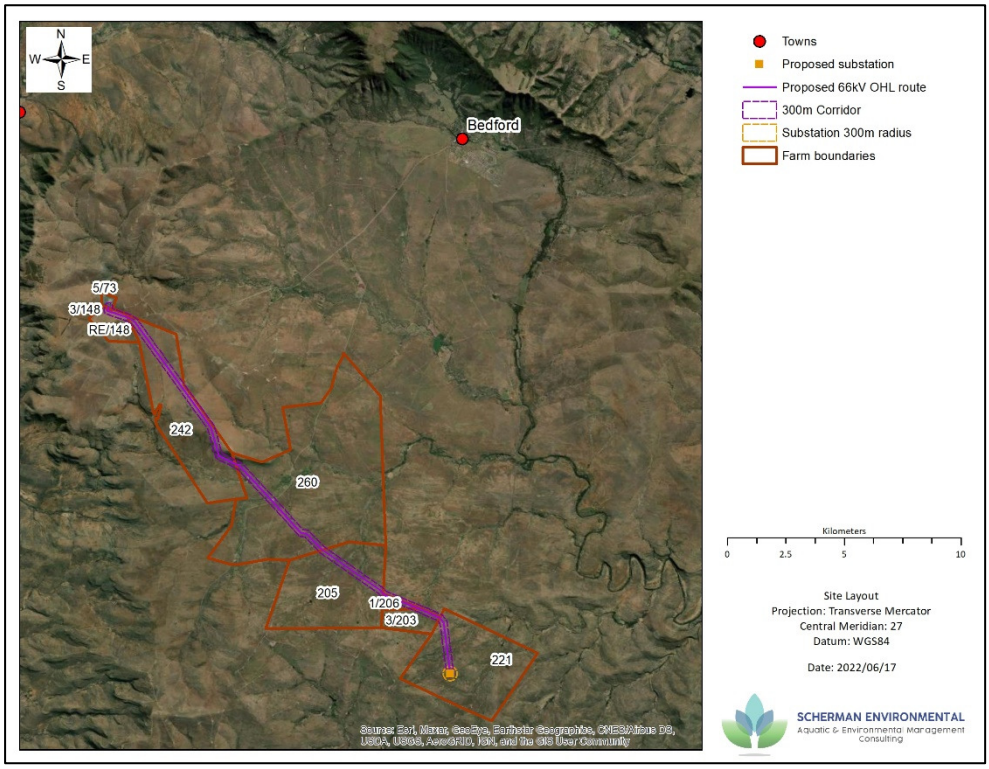

Figure 1.1. The proposed powerline and substation associated with the Msenge Emoyeni WEF

Ecosystem Threat Status

The Ecosystem Threat Status, defined in the National Biodiversity Assessment (NBA) of 2018, gives an indication of the degree to which ecosystems are still intact or losing vital aspects of their structure, function and composition (Skowno *et al*. 2019a). Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Concern (LC), based on the proportion of each ecosystem type that remains in good ecological condition relative to a series of thresholds. For the NBA 2018 the IUCN Red List of Ecosystems was used as the risk assessment framework for terrestrial ecosystems (Skowno *et al*. 2019a).

The Ecosystem Threat Status of the project area (**Figure 1.2**) is Least Concern (LC). This is an ecosystem type that has experienced little or no loss of natural habitat or deterioration in condition (Skowno *et al*. 2019a). Widespread and abundant species are typically classified in this category.

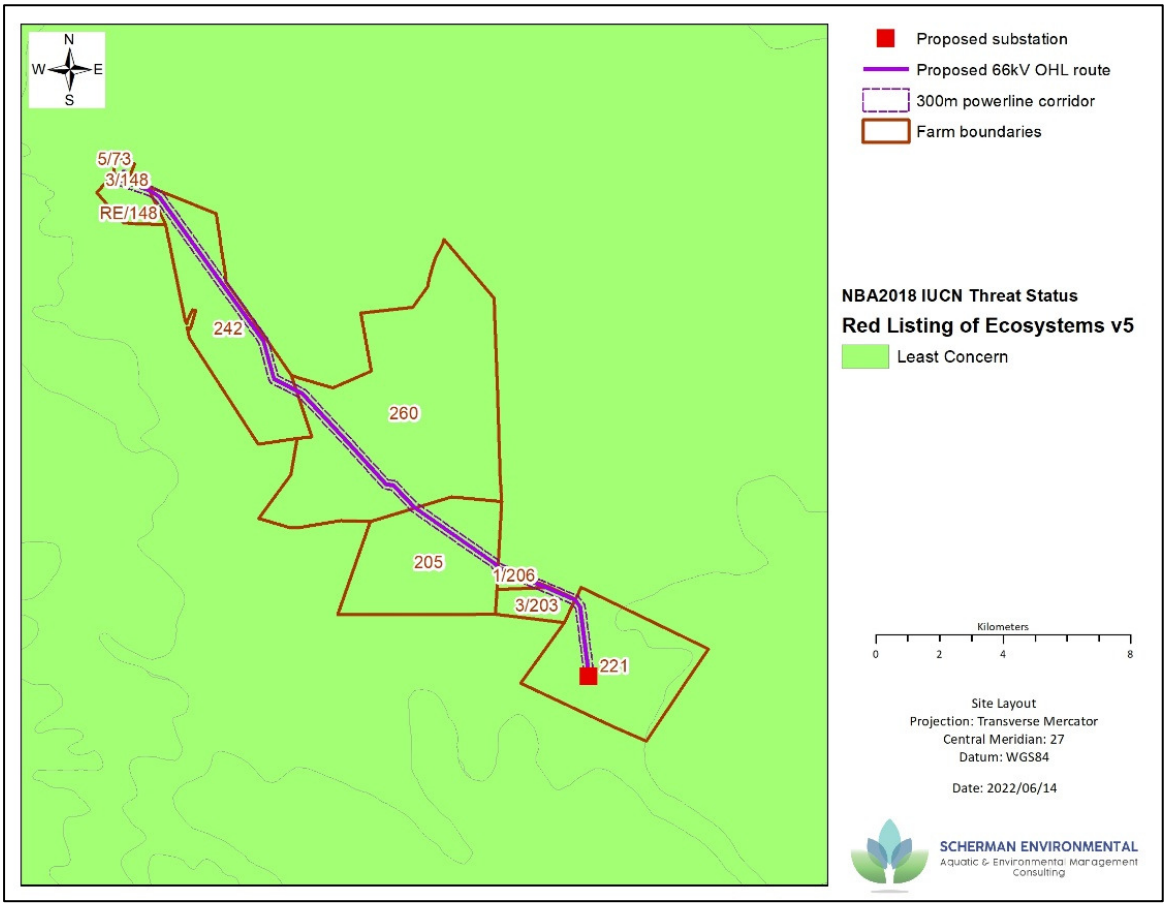

Figure 1.2. The Ecosystem Threat Status of the project area as defined in the NBA of 2018

Ecosystem Protection Level

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected (Skowno *et al*. 2019a). Ecosystem types are categorised as Not Protected, Poorly Protected, Moderately Protected or Well Protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the National Environmental Management: Protected Areas Act (Act 57 of 2003).

Figure 1.3 shows the Ecosystem Protection Status of the project area is Not Protected (NP). This is an ecosystem type that has less than 5% of its biodiversity target included in one or more protected areas (Skowno *et al*. 2019a). A small section of Farm 221 is Poorly Protected (PP) but falls out of the footprint of the proposed infrastructure. PP is an ecosystem type which has between 5% and 50% of its biodiversity target included in one or more protected areas.

The National Protected Area Expansion Strategy (NPAES 2017)

The National Protected Area Expansion Strategy (NPAES), updated in 2017, presents a 20 year strategy for the expansion of protected areas in South Africa for improved ecosystem representation, ecological sustainability and resilience to climate change (DEA, 2016). The proposed 300m grid corridor within which the 66kV power line, access tracks and water course crossings will be located and on-site substation does not fall within the 2017 NPAES (**Figure 1.4**).

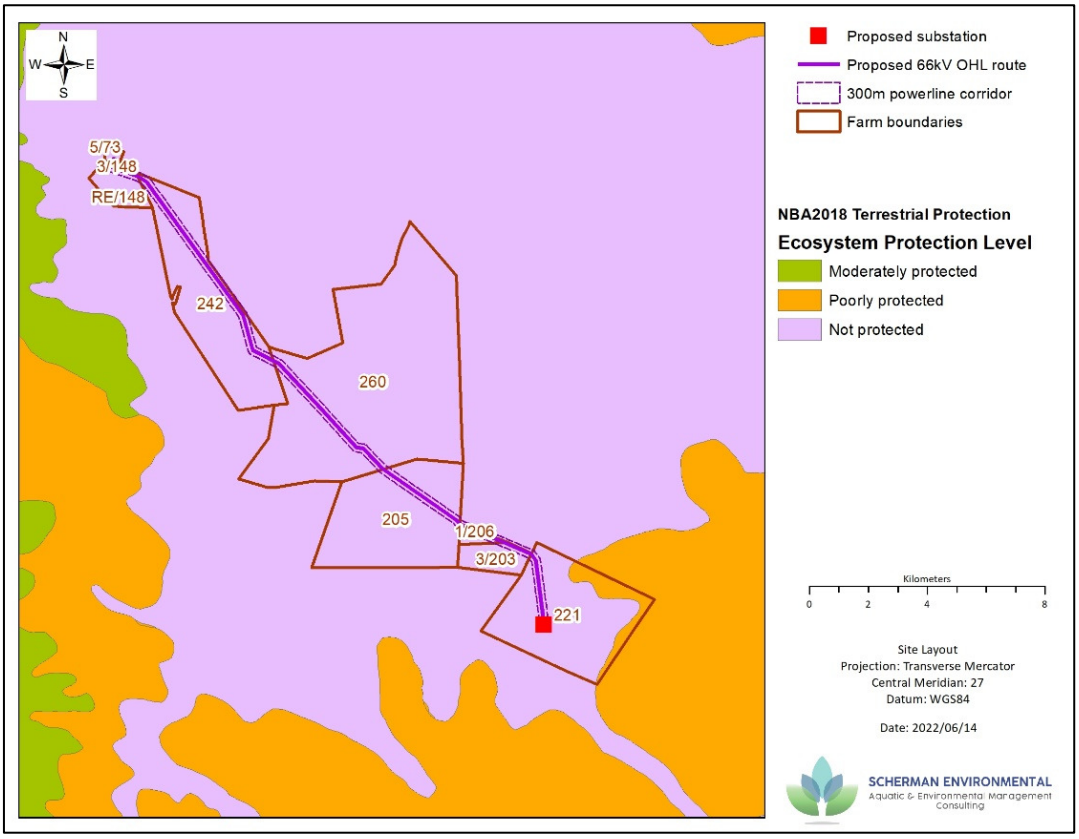

Figure 1.3. The Ecosystem Protection Status of the project area as defined in the NBA of 2018

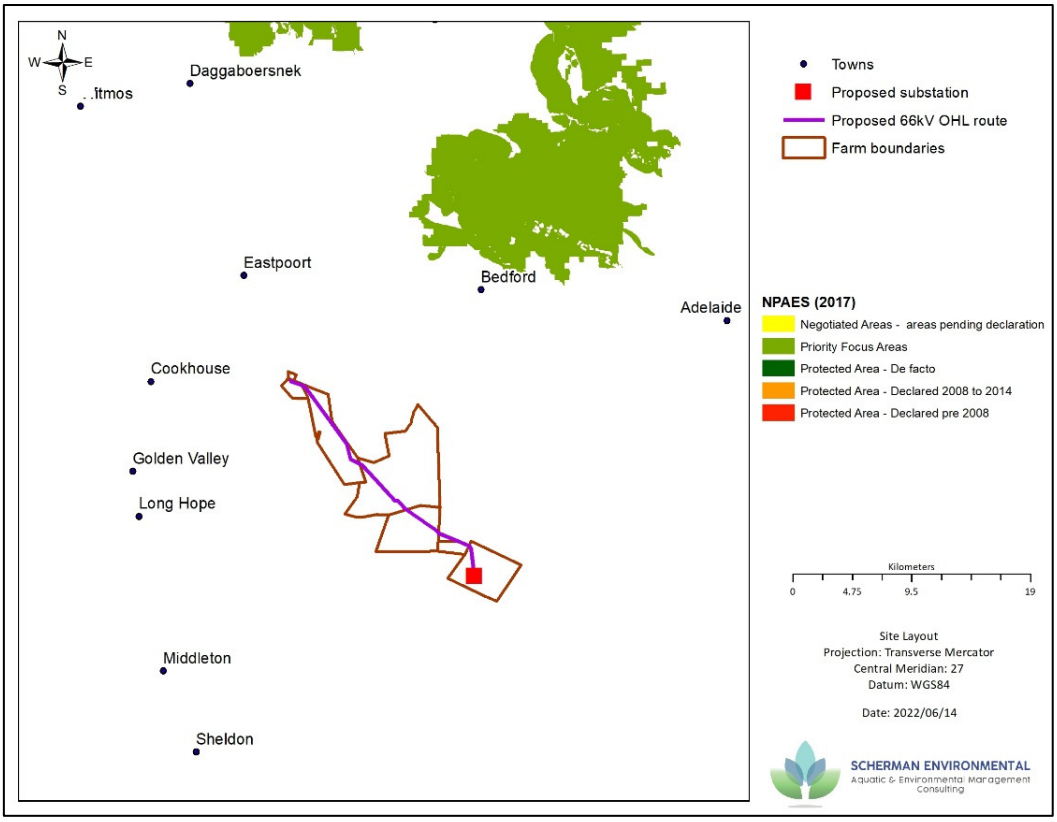

Figure 1.4. National Protected Area Expansion Strategy (2017) in relation to the project area

Critical Biodiversity Areas

A Biodiversity Conservation Plan (BCP) is a provincial dataset that guides and informs land use and resource-use planning and decision making in order to preserve long-term functioning and health of priority areas outside of the protected areas network (ECBCP, 2019). These are known as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). The proposed 300m grid corridor within which the 66kV power line, access tracks and water course crossings will be located and on-site substation does not fall within a CBA or ESA area (**Figure 1.5**). The project area falls within "Other Natural Areas" which are in a natural or near natural state but have not been identified as priority areas in the current BCP (ECBCP, 2019). These areas still support biodiversity and deliver ecosystem services. Therefore, specialist's recommendations on biodiversity rich habitats based on observations taken in the field should be taken note of.

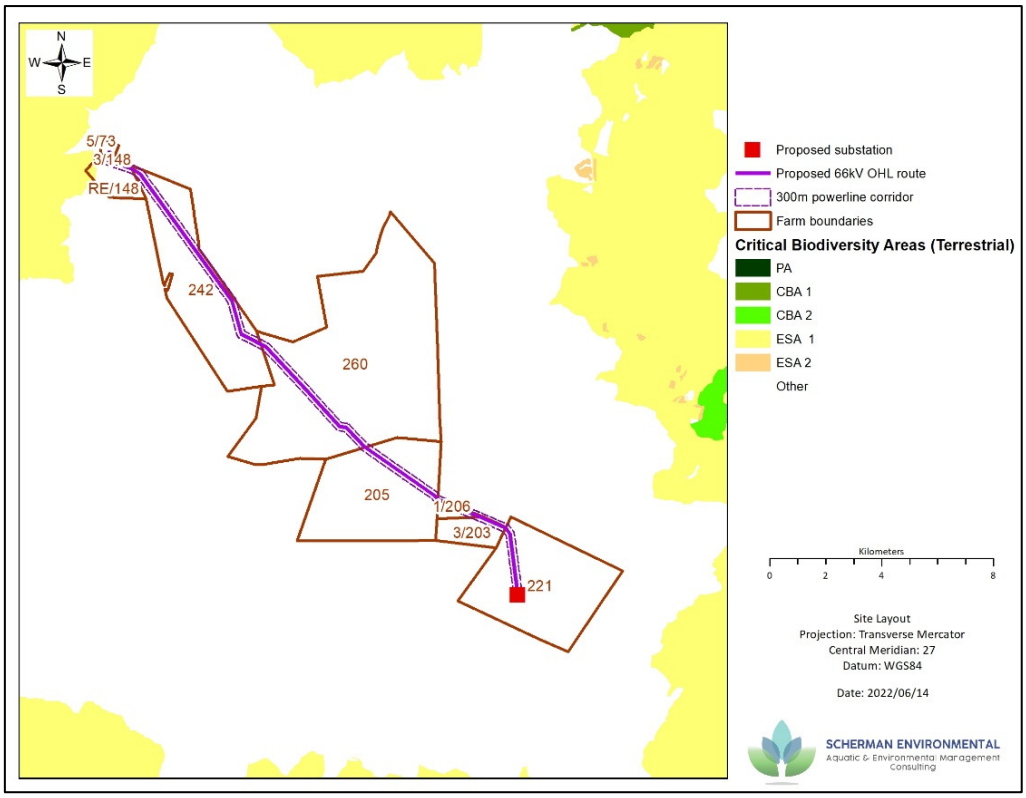

Figure 1.5. Critical Biodiversity Areas (Terrestrial) in relation to the project area

1.3 PROJECT ACITIVITIES

The infrastructure and key components considered as part of this Basic Assessment process include:

- 66kV overhead single circuit powerline approximately 22.7km long in a 300m wide assessment corridor (150m on either side), from the proposed Msenge Emoyeni Wind Energy Facility (WEF) onsite substation to the Poseidon Main Transmission Substation (MTS).
- Access tracks of up to 7m in width following the powerline route from the proposed Msenge Emoyeni WEF onsite substation to the Poseidon MTS to enable construction and maintenance activities.
- Water course crossings along the powerline route from the proposed Msenge Emoyeni WEF onsite substation to the Poseidon MTS.
- 33kV/132kV on-site substation with a footprint occupying an area of 250m x 200m, within a 300m radius to allow movement where possible.

A field survey of the proposed infrastructure was conducted to familiarise the team with the terrain, the vegetation types, the habitat types, the species found in the proposed footprints and to assess the ecological status of the landscape (**Figure 1.6**).

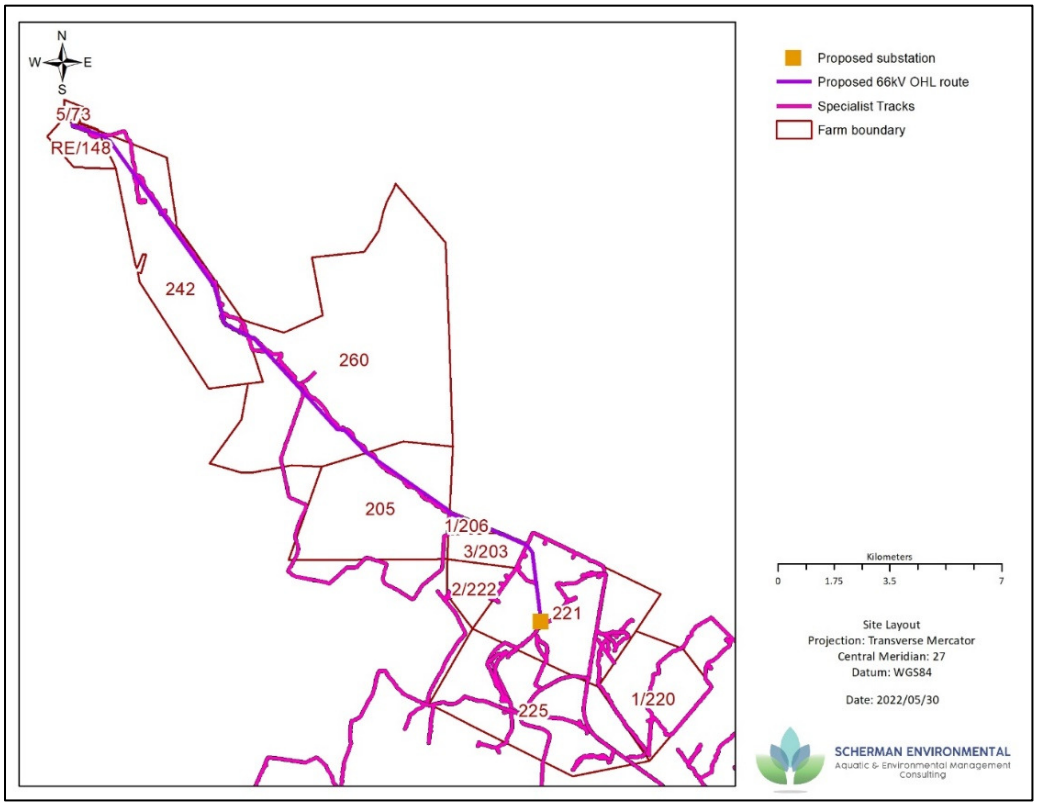

Figure 1.6. The specialist tracks for the fieldwork in relation to the proposed deviations for infrastructure

1.4 PROJECT TEAM

The study team consisted of the following members and associates of *Scherman Environmental*:

Table 1.1. Specialist team

Member	Company/organization	Task
Dr Patsy Scherman	Scherman Environmental	Author Professional Natural Scientist: Aquatic Science,120112 (SACNASP).
Michael Powell	Rhodes Restoration Research Group	Vegetation assessment
Dr Chad Keates	Rhodes University Entomology Dept.	Terrestrial fauna
Nicholaus Huchzermeyer	Scherman Environmental Associate	Vegetation assessment, GIS and mapping

This report has been prepared as per Section 17 of GNR 543 – Environmental Impact Assessment Regulations and the National Environmental Management Act (No. 107 of 1998) which specifies the *General Requirements for a person compiling a specialist report or undertaking a specialised* process. All specialists' work has been conducted independently of influence or prejudice by any parties.

This study has been commissioned to meet the requirements of a BA process in the form of a single assessment, as set out by the National Environmental Management Act (1998). Furthermore, this study should and has been done in accordance with the Gazetted Protocols 3(a),(c) and (d) in terms of Section 24(5)(a) and 24(5)(h) of NEMA (Published on the 20th of March 2020); and meet the requirements as set out within the Aquatic Biodiversity Protocol published in GN NO. 1105 of 30 October 2020.

2. TERRESTRIAL FLORA

2.1. SCOPE OF WORK

The scope of work required both a desktop assessment and field site visit. The itemised TORs includes the following:

- Undertake one site assessment or survey to ground-truth the desktop assessment.
- Fieldwork will be limited to visual sightings by means of transect walks and plot-based sampling.
- Results from the data analysis will provide a description of the dominant and typical species occurring on the site, and will include:
    - Identification of the SA vegetation types on site and national threat status of the vegetation types
    - Threatened, endemic or rare species, with an indication of the relative functionality and conservation importance of the specific community in the area
    - Identify sensitive plant species requiring protection or relocation and propose rehabilitation measures as required.
    - Invasive or exotic species present in the area
    - The functional and conservation importance of vegetation communities in the area of investigation
- Identification and mapping (Google Earth kmz files) of any recorded or likely plant Species of Conservation Concern (SCC) in the area.
- Identification and motivation of any No Go areas.
- Identify and rate potential environmental impacts in terms of acceptable EIA methodology to be provided by the client.
- Identify mitigations for negative and positive impacts.
- Make recommendations for the Environmental Management Programme Report.
- Produce a draft report for comment by the authorities.
- Produce a second report for review by Interest and Affected Parties (IAPs).
- Produce a final report once all comments have been satisfied.

2.2. APPROACH AND METHODOLOGY

The routing of the proposed powerline corridor, on-site substation and associated access tracks and water course crossings, were provided to the specialist team. A desktop assessment was conducted in which a thorough assessment of plant species listed for the associated vegetation types in the national plant classification systems was conducted. In addition, previous reports pertaining to the Amakhala, Msenge and Iziduli Wind Energy Facilities were reviewed for additional plant species that may have been classified as SCC.

A field survey of the proposed infrastructure was conducted to familiarise the team with the terrain, the vegetation types, the habitat types, the species found in the proposed footprints and to assess the ecological status of the landscape (**Figure 1.6**). All SCC were listed. Potential SCC were systematically evaluated for Likelihood of Occurrence (LOO) based on distribution descriptions from the literature, various field guides, and botanical reference books.

2.3. ASSUMPTIONS AND LIMITATIONS

As per the TORs for the appointment for the BAR, field work was completed during March, April and May 2022. This seasonal timing provides significant limitations for the detection of certain guilds of plants (geophytes, creepers and succulents). To locate and identify to the species or subspecies level a flower is usually needed.

2.4. DESKTOP ASSESSMENT

Due to the limitations of seasonality and the low probability of locating or sighting SCC it was deemed necessary to conduct a thorough assessment of plant species listed for the associated vegetation types in the national plant classification systems (Acocks 1988, Low & Rebelo 1996, Vlok *et al*. 2003, Mucina & Rutherford 2006 and SANBI 2018). More importantly it was key to assess the previous reports pertaining to the Amakhala, Msenge and Iziduli Wind Energy Facilities for additional plant species that may have been classified as SCC.

The plant species from the field work and the desktop work was cross referenced against the National Red Data List for Plants (http://redlist.sanbi.org/), as well as Golding *et al*. (2002) and Hilton Taylor (1996). Species were also cross-referenced to the out-dated, but functioning, Eastern Cape Provincial Ordinance of 1974 for Endangered and Protected plant species (Schedules 3 and 4 respectively). The full species list was also cross referenced against the protected species list in the National Forest Act, as well as the Threatened or Protected Species (ToPs) species listed in the NEMBA Regulations.

SCC listed in the ordinance that underwent taxonomic name changes (family, genus and species level) were traced by using Dyer (1975 and 1976) or web-based search engines like: https://en.wikipedia.org/wiki/ or https://www.gbif.org/.

Potential SCC were systematically evaluated for Likelihood of Occurrence (LOO) based on distribution descriptions from the literature, various field guides, and botanical reference books.

2.5. SITE SURVEY AND METHODOLOGY OF ASSESSMENT

The basic approach was to undertake a field visit to familiarise the team with the terrain, the vegetation types, the habitat types, the species found in the proposed footprints and to assess the ecological status of the landscape. The proposed 66kV OHL 300m corridor was followed and accessed as well as the footprint of the proposed substation and a 300m development radius around the proposed substation (the field survey for the 300m corridor deviation took place from 29/03/2022 – 31/03/2022 and for the proposed substation and immediate OHL deviation from 12/05/2022 – 13/05/2022). According to the provincial ordinance for protected plant species in the Eastern Cape, only two species belonging to the grass family (Poaceae[3]) are

[3] Formerly known (and listed in the ordinance) as Gramineae.

listed as protected[4] and none as endangered. The field work excluded extensive species listing and searching for these species, as well as mosses (Bryophyta) and lichen species. All other species were recorded or photographed and positive identification was obtained from Tony Dold at the Schonland Herbarium.

2.6. RESULTS

2.6.1 Vegetation Types

None of the properties investigated showed grasslands, thicket or savanna in good ecological condition (see **Figure 2.1** below), which indicates a steady regime of overgrazing and insufficient resting to allow palatable species to persist in the landscape. At most of the sites visited, the ecological conditions indicated towards rangelands that require significant periods of rest. The bushclumps exhibited the most degree of vegetation structure changes.

Figure 2.1. The remnants of a large bush clump which would have exhibited a closed canopy, complex architecture and a canopy height of 2-3m

Acocks Veld Types (Acocks 1988)

Figure 2.2 below gives the location of the various infrastructure according to the Acocks (1988) vegetation classification. A small proportion of the development consists of **Eastern Cape False Thornveld.** The plants that typified this vegetation type are listed as: *Scutia myrtina, Vachellia karoo*[5]*, Gymnosporia polyacantha, Gymnosporia capitata, Capparis sepiaria* var. *cirifolia*, *Ehretia rigida, Carissa haematocarpa, Cussonia spicata, Allophylus decipens, Azima tetracantha, Canthium inerme, Brachylaena ilicifolia, Schotia latifolia, Grewia occidentalis, Searsia longispina, Cassine aethiopica, Cassine pappilosa, Olea europea* subsp. *africana*, *Hippobromus pauciflorus, Boscia oleoides, Ptaeroxylon obliquum*, and *Sideroxlon inerme*. The latter being the only SCC as per the tables below. Acocks (1988), specially mentions the invasion of this vegetation type by *V. karoo*. The bulk of the development footprint is covered with **Eastern Province Grassveld,** and typified by a

[4] *Secale africanum* (wild rye grass) and *Arundinaria tessellata* (mountain bamboo).
[5] Species underlined in text indicate species listed in Appendix 1.

wide range of grass species, isolated *V. karoo* and a limited number of karroid shrubs (*Pentzia incana*, *Pelargonium abrantofolium*, *Euryops anthemoides*, *Cyanotis speciosa*, *Selago saxatilis*, *Nenax microphylla*, *Felicia muticata* and *Helichrysum dregeana*) which tend to increase with over-grazing. No SCC mentioned for this vegetation type. Acocks list *Crassula capitella* subsp. *thrysifolia*[6] as a key succulent species. A small section of **False Karroid Broken Veld** occurs in the region of the planned substation. Typical species include *Euclea undulata*, *Pappea capensis*, *Cussonia spicata*, *V. karoo*, *Schotia afra* var. *afra*, *Aloe ferox*, *Pentzia incana*, *Chrysochoma ciliata*, *Ocimum burchelliana*, *Asparagus striatus*, *Drosanthemum lique*[7] and *Drosanthemum hispidum*.

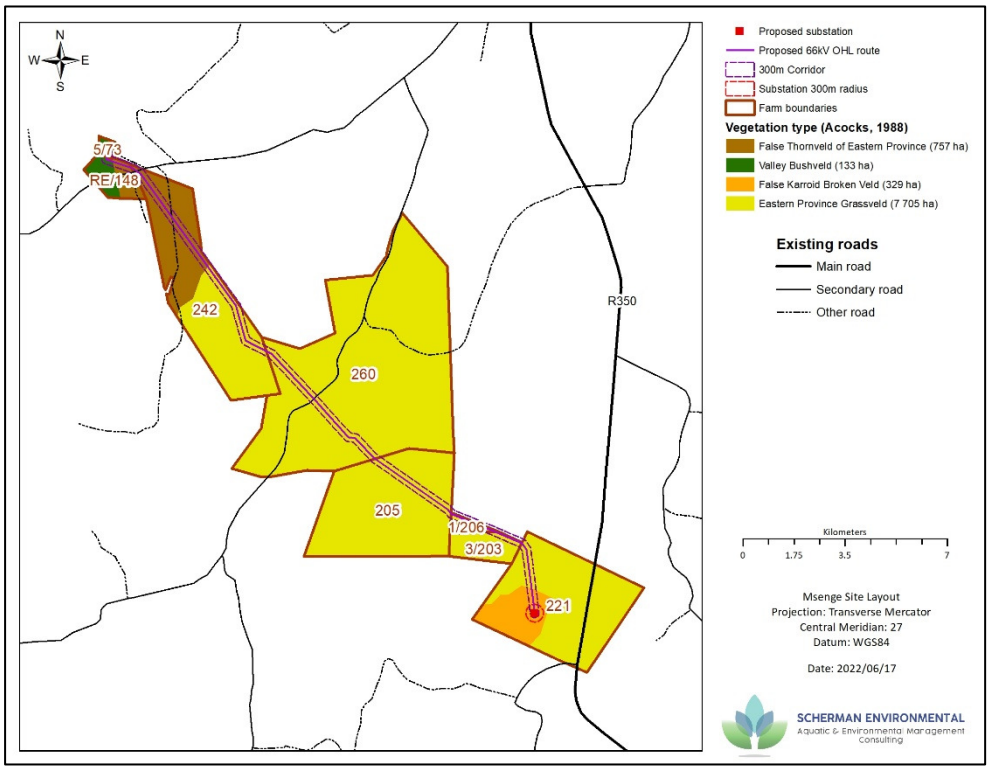

Figure 2.2. The distribution of Acocks vegetation types in relation to the planned infrastructure

Low and Rebelo

The work of Low & Rebelo (1996) saw the creation of the new Subtropical Thicket Biome. The only vegetation type in Low & Rebelo is outlined in **Figure 2.3,** but we were not able to locate the original descriptive texts.

[6] Listed as Protected but not found in the fieldwork.
[7] Species in red are currently listed as SCC

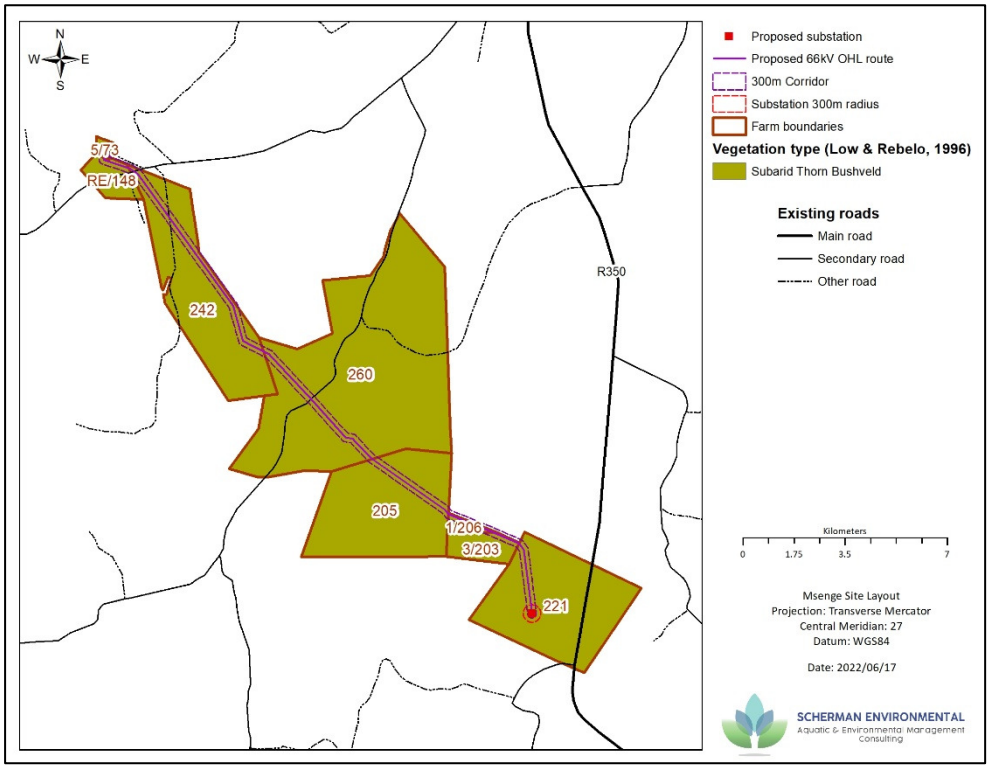

Figure 2.3. The vegetation classification for the study area as defined by Low and Rebelo (1996)

Hoare *et al*. (2006) list this vegetation type as a synonym for their "Eastern Cape Escarpment Thicket" and list the following as key species: *Aloe ferox*[8], *Euphorbia tetragona, Vachellia karroo, Cussonia spicata, Olea europaea* subsp. *africana, Scutia myrtina, Buddleja uriculata*, *Euclea crispa*, *E. undulata*, *Grewia occidentalis*, *Gymnosporia heterophylla*, *Hippobromus pauciflorus*, *Leucosidea sericea*[9], *Myrsine africana*, *Rhus dentata*, *R. lucida*, *R. tomentosa*, *Scolopia zeyheri*, *Anthospermum rigidum* subsp. *pumilum*, *Argyrolobium collinum*, *Asparagus striatus*, *Chaetacanthus setiger*[10], *Felicia filifolia*, *F. muricata*, *Hermannia althaeoides*, *Lantana rugosa*, *Pelargonium alchemilloides*, *Phyllanthus maderaspatensis*, *Polygala fruticosa*, *Selago corymbosa*, *Solanum rigescens*, *Bergeranthus artus*, *Crassula obovata*, *Viscum rotundifolium*, *Asparagus aethiopicus*, *Plumbago auriculata*, *Senecio deltoideus* and a host of grass SCC.

Interestingly, the following succulents and bulbs are listed: *Stapelia glabricaulis*, *Drimia uniflora, Bulbine asphodeloides*, *Bulbine narcissifolia*, *Drimia intricata*. The key forbs include: *Cyanotis speciosa*, *Amaranthus praetermissus*, *Blepharis integrifolia,* var. *clarkei*, *Commelina africana*, *Dianthus caespitosus*, *Gerbera piloselloides*, *Hibiscus aethiopicus*, *H. pusillus*[11], *Hypoestes aristata*, *Senecio retrorsus*, and *Sida ternata*. The key species in terms of SCC status are: 1) *Bergaranthus artus*[12] whose range is Queenstown to Elliot and listed as **Vulnerable** (Dold & Victor 2005), and 2) *Stapelia glabricaulis* (which was reclassified as one of the five variations of *Stapelia hirsuta,* all of which are Least Concern).

[8] Species underlined in text indicate species listed in Appendix 1.
[9] The elevation at this study site is too low for this species.
[10] Species changed to *Dyschoriste setigera* and is Least Concern (Kamandi 2006).
[11] Species underlined in text indicate species listed in Appendix 1.
[12] Species in red are currently listed as SCC.

Subtropical Thicket Ecosystem Programme (STEP) Project vegetation types (Vlok et al. 2003)

The following milestone in South African vegetation classification (for this area) was from the Subtropical Thicket Ecosystem Project (STEP), which sought to improve on the spatial delineation and classification of the vegetation for only the new Subtropical Thicket Biome. **Figure 2.4** below outlines these changes as detailed by Vlok *et al*. (2003). The Vlok *et al*. (2003) publication only provides the following:

Hartebeeste Karroid Thicket, 1) Character Species – *Papea capensis*[13] and *Ocimum burchelliana*, and 2) dominant species – *Pentzia incana* and *Ocimum burchelliana*.

Vlok & Euston Brown (2002) provide slightly more information: The vegetation type is one of the mosaic forms with isolated bushclumps containing *P. capensis* and *Euphorbia tetragona*. They contend that most of the spekboom (*Portulacaria afra*) has been eliminated, together with the palatable grasses, due to injudicious livestock management. *V. karoo* occurs sporadically[14], but the dominant vegetation is a karroid shrubland with *O. burchellianum*, *Gnidia cuneata*, *Eriocephalus africanus* and *Petzia incana*. No SCC are mentioned.

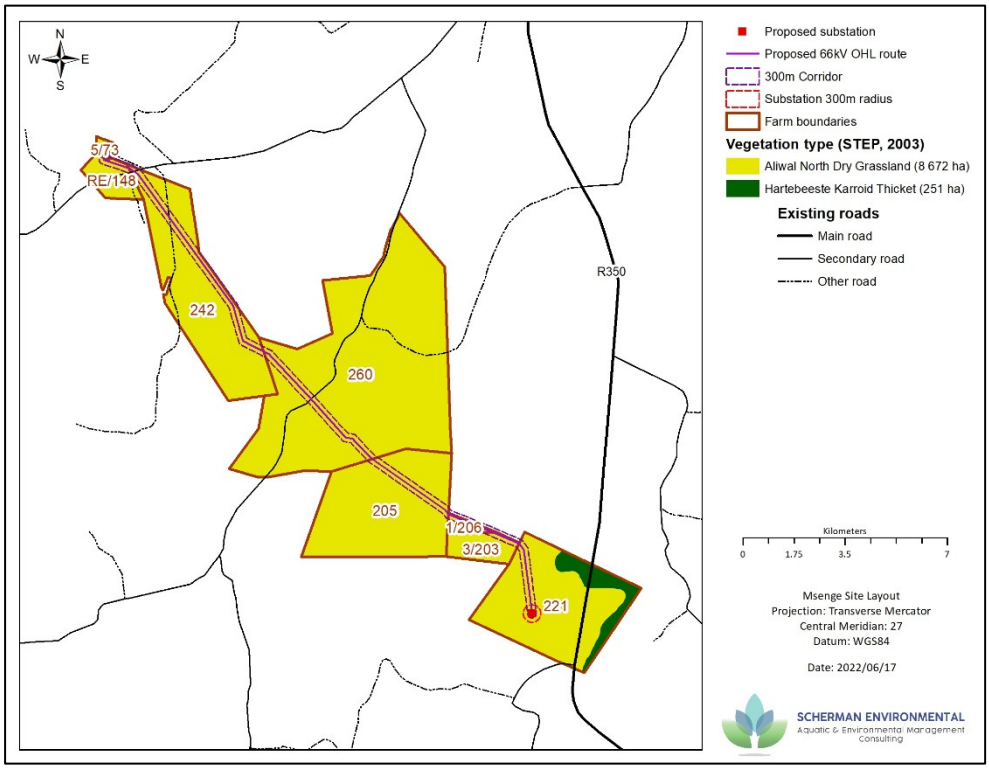

Figure 2.4. The distribution of vegetation types from the Subtropical Thicket Ecosystem Programme (STEP) Project (Vlok et al. 2003), in relation to the planned infrastructure

VegMap 2006 (Mucina & Rutherford 2006)

The seminal work of Mucina & Rutherford (2006) significantly improved the national vegetation mapping efforts. Unfortunately, the fine resolution of the STEP mapping for Thicket (122 distinct Thicket types) was lost and spatially distilled into 14 Thicket types. The biome was also renamed the **Albany Thicket Biome** (Hoare *et al*. 2006). **Figure 2.5** below indicates that the entire development footprint for this report is restricted to **Bedford Dry Grasslands** and **Great Fish Thicket** (Mucina *et al*. 2006).

[13] Species underlined in text indicate species listed in Appendix 1

[14] Supports our contention that *V. karoo* is becoming a bush encroachment problem.

Bedford Dry Grasslands have, no formal conservation areas and only 1% of the vegetation conserved in private nature reserves. The typical species listed are very similar to those of Acocks (1988): A host of grass species, *Blepharis integrifolia, Commelina africana*[15], *Emex australis, Gazania krebsiana,* subsp. *krebsiana, Oxalis depressa, P. sidoides, Helichrysum rugulosum, Crassula expansa, V. karoo, Helichrysum dregeana, N. microphylla, Asparagus striatus, Chrysocoma ciliata, Euryops anthemoides, Hermannia anthemoides, F. muricata, Indigofera sessifololia, Jamesbittiana microphylla, Lycium cinereum, Molobodium burchellii, Pelargonium aridum, Talinum arnotii, Pentzia globosa, Selago fruiticosa, S. saxatilis, Cotyledon orbiculata, Tephrosia capensis* var. *acutifolia* and *Limeun aethiopicum* and *Mestoklema tuberosum*[16].
Great Fish Thicket has 96% habitat remaining, is poorly conserved (6%) with the following species (Hoare *et al*. 2006):

Cyphostemma quinatum, *Pelargonium peltatum*, *Sarcostemma viminale, Asparagus multiflorus*, *A. racemosus*, *Capparis sepiaria* var. *citrifolia*, *Jasminum angulare*, *Plumbago auriculata*, *Rhoicissus digitata*, *Cyanotis speciosa, Hypoestes aristata*, *Salvia scabra*, *Abutilon sonneratianum*, *Aizoon glinoides*, *Hibiscus pusillus*, *Lepidium africanum*, *Sida ternatam, Crassula expansa, Senecio radicans*, *Sansevieria hyacinthoides, Euphorbia triangularis*, *Aloe ferox*, *Euphorbia tetragona*, *Papea capensis*, *Vachellia natalitia*, *Boscia oleoides*[17], *Brachylaena ilicifolia*, *Cussonia spicata*, *Ozoroa mucronata*, *Ptaeroxylon obliquum*, *Schotia afra var. afra*, *Zanthoxylum capense*, *Euclea undulata*, *Allophylus decipiens*, *Azima tetracantha*, *Carissa bispinosa* subsp. *bispinosa*, *Coddia rudis*, *Diospyros scabrida* var. *cordata*, *Ehretia rigida*, *Flueggea verrucosa*, *Grewia occidentalis*, *Grewia robusta*, *Gymnosporia capitata*, *G. heterophylla*, *Hippobromus pauciflorus*, *Mystroxylon aethiopicum*, *Olea europaea* subsp. *africana*, *Putterlickia pyracantha*, *Searsia incisa*, *Searsia refracta*, *Scolopia zeyheri*, *Scutia myrtina*, *Asparagus striatus*, *Chaetacanthus setiger*, *Chrysocoma ciliata*, *Asparagus subulatus*, *Felicia muricata*, *Hermannia althaeoides*, *Indigofera sessilifolia*, *Leucas capensis*, *Limeum aethiopicum*, *Lycium cinereum*, *Phyllanthus maderaspatensis*, *Selago fruticose*, *Crassula cordata*, *C. ovata*, *Portulacaria afra*[18], *Aloiampelos tenuior*[19], *Delosperma ecklonis*, *Kalanchoe rotundifolia*, *Mestoklema tuberosum*, *Tetradenia barberae*[20], *Viscum rotundifolium,* and *Crassula perforata*.

[15] Species underlined in text indicate species listed in Appendix 1
[16] Species in red are currently listed as SCC.
[17] Hoare *et al*. (2006) lists *Boscia albitruca* but this species does not occur in the Eastern Cape.
[18] Species underlined in text indicate species listed in Appendix 1.
[19] Species in red are currently listed as SCC.
[20] This species is listed as Rare (Van Jaarsveld & Potter), but restricted to dry coastal thickets between the Mbashe River and Fish River – hence unlikely in this study area.

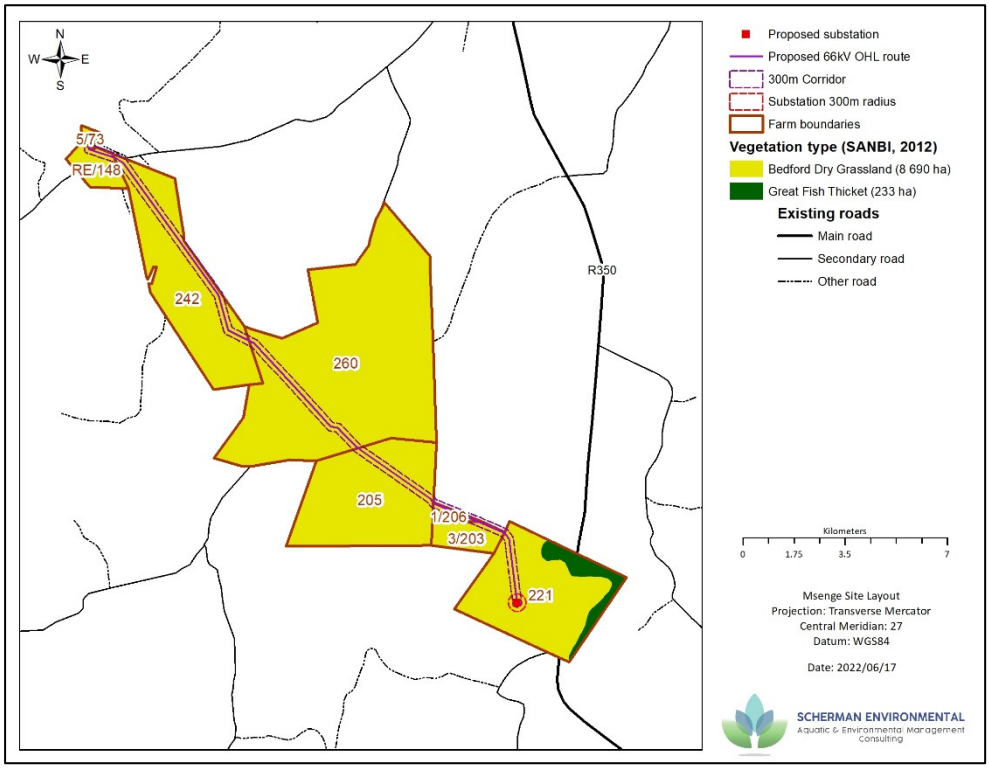

Figure 2.5. The distribution of vegetation types from the 2012 stage of the SANBI VegMap Project (Mucina & Rutherford 2006), in relation to the planned infrastructure

VegMap 2018 (SANBI 2018)

The recent changes to the national vegetation mapping for the Eastern Cape (**Figure 2.6**) have largely been concentrated in the Albany Thicket Biome. The 14 thicket types listed by Hoare *et al*. (2006), have been expanded to 44 to reincorporate some of the thicket classes defined by Vlok[21] *et al*. (2003). The study area does not reflect any solid thicket types in the development footprint (**Figure 2.6** below), but lists the mosaic thicket type: Double Drift Karroid Thicket. This was previously absorbed into Great Fish Thicket (Hoare *et al*. 2006), but the boundaries for this vegetation type would be the same as in Mucina *et al*. (2006).

The same species listed Bedford Dry Grassland (Mucina *et al*. 2006), can be found listed above.

Double Drift Karroid Thicket (Grobler *et al*. 2018) has the following species:

Pappea capensis[22], *Euphorbia tetragona*, *Schotia afra*, *Vachellia karoo*, *Portulacaria afra*, *Aloe striata*, *Aloiampelos tenuior*[23], *Bulbine frutescens*, *Euphorbia curvirama*, *Euphorbia stellata*[24], *Haworthia cooperi*, *Aloe ferox*, *Bulbine narcissifolia*, *Trachyandra giffenii*, *Aristida congesta*, *Digitaria argyrograpta*, *Themedea triandra*, *Ocimum burchellianum*, *Eriocephalus africanus*, *Lasiosiphon meiserianus*, *Penztia incana*, *Pteronia incana.*

[21] Largely restricted the "mosaic" thicket types.
[22] Species underlined in text indicate species listed in Appendix 1.
[23] Species in red are currently listed as SCC.
[24] We would consider this species to be included as a SCC.

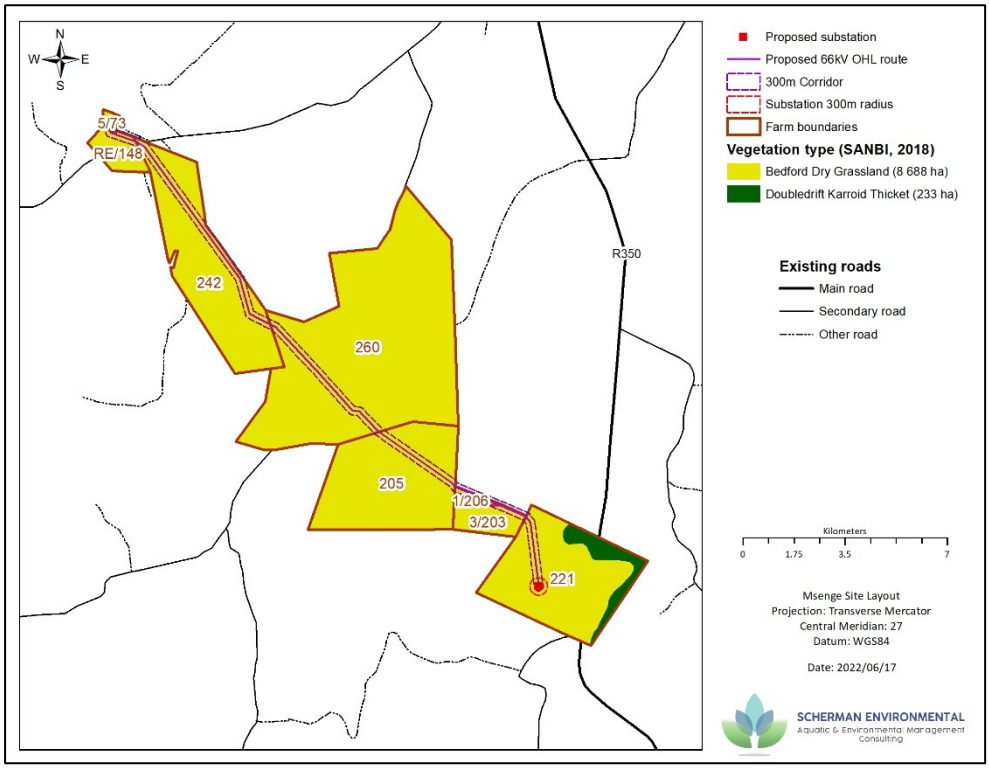

Figure 2.6. The distribution of vegetation types from the SANBI VegMap Project (SANBI 2018), in relation to the planned infrastructure

2.6.2 Threatened Vegetation Types

The **Bedford Dry Grasslands** vegetation type is listed **Least Threatened** as by Mucina *et al*. (2006) and Department of Forestry, Fisheries and Environment (2021). Bedford Grasslands is endemic to the Eastern Cape, has 98% of the habitat remaining in "natural extent" with low levels of habitat loss and hence a "low risk" class in terms of ecosystem collapse (Department of Forestry, Fisheries and Environment 2021).

Great Fish Thicket is listed as **Least Threatened** by Mucina *et al*. (2006) but has subsequently been re-divided to reflect a host of vegetation classes: Fish Spekboom Thicket, Fish Thicket, Fish Valley Thicket, and the associated mosaic thicket types of Vlok *et al*. (2003): Crossroads Grassland Thicket, Doubledrift Karroid Thicket and Hartebeest Karroid Thicket. There may be considerable areas of **Albany Alluvial Vegetation** in areas previously classified as Great Fish Thicket (see below).

Double Drift Karroid Thicket are listed as **Least Concern**, has also experienced low rates of transformation, is an Eastern Cape endemic, has 88% of the habitat in natural extent but is poorly protected (Department of Forestry, Fisheries and Environment 2021).

Skowno *et al*. (2019b) assessed the terrestrial threat status changes between 2011 and 2018 (National Biodiversity Assessments or NBAs) and concluded that Bedford Dry grasslands had undergone "no change"[25] and could be classified as "**Least Concern**" when it came to Red List of Ecosystems (RLE) classes. The assessment of RLE status Double Drift Karroid Thicket (Skowno *et al*. 2019b), could not detect change (2011-2018) as the vegetation was a new ecosystem type. The vegetation and ecology of the area is not a significant

[25] It is worth noting that these assessments only focus on landcover class changes or transformation of vegetation, and therefore excludes the bulk of the degradation gradient.

national priority in terms of the National Protected Area Expansion Plan (DEA 2016)[26], with the closest boundary being the slopes of the Winterberg Mountains northeast of Bedford. The area is also not included in the Eastern Cape Biodiversity Plan in terms of CBA1 or CBA2 Status (ECBP 2019).

Recent work by RRRG and Jan Vlok has raised the possibility of the study site containing significant components of the Albany Alluvial Vegetation type in the area. This vegetation is endemic to the Eastern Cape, has lost 55% of its natural habitat and is as **Endangered** (Department of Forestry, Fisheries and Environment 2021). It has a narrow distribution along drainage lines, and is prone to habitat conversion, and hence in danger of ecosystem collapse (Department of Forestry, Fisheries and Environment 2021). Albany Alluvial Vegetation is strongly associated with the Albany Thicket Biome (Hoare *et al*. 2006). The biome in general has the vegetation types distributed as follows across the threat classes: Critically Endangered, 0.9%, Endangered 1.6%, Vulnerable 17.3%, Least Concern 80.2% (Skowno & Monyeki 2021).

2.6.3 Species of Conservation Concern (SCC)

The SCC can be divided into three classes, with some degree of overlap. Those plants protected under the National Forest Act (Act 84 no of 1988) are presented in Appendix 3, with our estimation of their LOO in the study site as well as the most recent national conservation status. The only species that is likely to occur in the site is *Sideroxylon inerme* (Milkwood) and is always associated with thicket clumps. The second tier is national list for SCC is the NEMBA Threatened or Protected Species (ToPs) list – see Appendix 4. The lowest tier is the provincially species listed as Endangered or Protected according to the Provincial Ordinance of 1974, which is sadly outdated and leads to confusion with the listing of SSS due to taxonomic advancements. The full list is attached as Appendix 5, but without expansion on the families listed as a group (e.g. Apocynacea or Aizoaceae).

Agricultural activities and developments have a key role to play in slowing the rate of South African plants going extinct, and this WEF has the opportunity to be a leading light in terms of actively restoring locally extinct populations and preventing some species from going extinct.

The field work during March-May 2022, yielded close to 200 plant species, with at least 23 having either provincial or national threat status. These SCC are listed in **Table 2.1** below, and it should be emphasized that a number of key SCC were not located in the field, but reported in previous studies (Hoare 2010, Savannah Environmental 2014, Sherman Colloty & Associates 2017, Nkurenkuru 2018 and TBC 2020a). This can be attributed to: 1) flowering time not coinciding with field trips, 2) limited field time 3) large buffer areas 4) cryptic habits.

In light of the previous statement, we undertook to review the SCC from previous studies but firstly only included those recorded in the field. A number of reports have covered the study area of the period 2010-2020 (Hoare 2010, Savannah Environmental 2014, Sherman Colloty & Associates 2017, Nkurenkuru 2018 and TBC 2020a). These SCC are presented in **Table 2.2** and should be viewed as a preliminary composite list[27] of SCC for the Msenge and Iziduli WEF developments[28].

[26] TBC (2020a) list a spatial overlap with the Amathole Tarkastad NPAES.
[27] Species highlighted in yellow should be excluded
[28] There will be other species that will be added to the list by the ECO over time.

Other useful data can be gleaned from previous studies that estimated or hypothesized about species that could occur in the study site. Firstly, we took the most recent study (TBC 2020a) and categorised their listed SCC plants for protected areas status (provincial and national) and systematically assessed the Likelihood of Occurrence (LOO) for the study area using a variety of web-based platforms and botanical reference books. The results for the TBC (2020a) report are presented as **Appendix 2**.

We repeated the same exercise for the potential SCC listed by Hoare (2010) as well as all the full potential species listed for the study site by Hoare (2010). These results are attached as **Appendix 6 and Appendix 7** respectively. These lists will be instrumental for the incumbent ECO to implement baselines and monitoring.

SCC located during field RRRG visits (2022)

Table 2.1 gives a composite summary of the plant species technically listed as SCC, that we positively identified during the 2022 field visits (includes species from the Msenge WEF and Iziduli WEF footprint).

Table 2.1. SCC identified by RRRG during the fieldwork.

No	Genus	Species	Sub-species	Variation	Conservation Status
1	*Aloe*	*maculata*			Protected (EC Prov Ordinance 1974)[29]
2	*Aloe*	*striata*			Protected (EC Prov Ordinance 1974)
3	*Aloiampelos*	*tenuior*			Least Concern (Mtshali 2018) but Protected (EC Prov Ordinance 1974)
4	*Ammocharis*	*coranica*			Protected (EC Prov Ordinance 1974)
5	*Anacampseros*	*arachnoides*			Protected (EC Prov Ordinance 1974)
6	*Boophane*	*distichia*			Listed as Protected in NEMBA 2007.
7	*Chasmatophyllum*	*musculinum*			Protected (EC Prov Ordinance 1974)
8	*Delosperma*	*adelaidensis*			Listed as Protected in NEMBA 2007.
9	*Diascua*	*cuneata*			Protected (EC Prov Ordinance 1974)
10	*Duvalia*	*casespitosa*			Protected (EC Prov Ordinance 1974)
11	*Duvalia*	*Modesta*			Protected (EC Prov Ordinance 1974)
12	*Euphorbia*	*gorgonis*			Not Determined (Möller & Becker 2019)
13	*Euphorbia*	*meloformis*			Near Threatened Protected (EC Prov Ordinance 1974). Listed as Protected in NEMBA 2007.[30]
14	*Euphorbia*	*micracantha*			Least concern (Möller & Becker 2019), but not listed on SANBI Red Data list
15	*Euphorbia*	*stellata*			Least Concern[31]
16	*Faucaria*	*tuberculosa*			Protected (EC Prov Ordinance 1974)
17	*Glotiphyllum*	*longum*			Protected (EC Prov Ordinance 1974)
18	*Haemanthus*	*albibos*			Protected (EC Prov Ordinance 1974)
19	*Hereroa*	*granulata*			Protected (EC Prov Ordinance 1974)
20	*Huernia*	*theretii*			Protected (EC Prov Ordinance 1974)
21	*Mestoklema*	*albanucum*			Protected (EC Prov Ordinance 1974), Listed as Protected in NEMBA 2007.
22	*Mestoklema*	*tuberosum*			Protected (EC Prov Ordinance 1974)
23	*Pachypodium*	*succulentum*			Protected (EC Prov Ordinance 1974)
24	*Radamanthus*	*sp1*			New species to science (Data Deficient)
25	*Ruschia*	*brittinae*			Protected (EC Prov Ordinance 1974)
26	*Ruschia*	*cradockensis*			Protected (EC Prov Ordinance 1974)
27	*Stapelia*	*grandiflora*			Protected (EC Prov Ordinance 1974)

[29] Government Gazette 1974.
[30] Government Gazette 2007.
[31] Included in this list due to the combination of the date of last assessment (2005) and the danger from plant collectors and overgrazing.

28	*Syringodea*	*bifucata*			Listed as Protected in NEMBA 2007.
29	*Trichodiadema*	*introrosum*			Protected (EC Prov Ordinance 1974)
30	*Trichodiadema*	*pormeridianum*			Listed as Protected in NEMBA 2007.
31	*Tritonia*	*securigera*			Protected (EC Prov Ordinance 1974)

SCC recorded on site by previous reports

The Table below provides **(Table 2.2)** the list of all SCC recorded on site by all previous reports related the Msenge WEF, with an indication of which report found the species.

Table 2.2. SCC recorded in the Msenge-i field study sites from 2010 to 2022[32].

No	Genus	Species	Sub-species / Variation	Savannah Environmental (2014)	Hoare (2010)[33]	Scherman[34] Colloty (2017)	Nkurenkuru (2018)	The Biodiversity Company (2020)	RRRG (2022)	Comment
1	*Aloe*	*humilis*		X						
2	*Aloe*	*maculata*		X					X	
3	*Aloe*	*striata*		X		X		X	X	
4	*Aloiampelos*	*tenuior*		X					X	
5	*Aloe*	*ferox*		X						Savannah report lists the species as protected by CITIES, and the 2013 NEMBA regulations
6	*Aloe*	*pluridens*								
7	*Ammocharis*	*coranica*		X					X	
8	*Anacampseros*	*arachnoides*		X			X		X	
9	*Bergeranthus*	*addoensis*					X			
10	*Bergeranthus*	*sp.*		X						Sp. level identification needed
11	*Boophane*	*distichia*		X				X	X	
12	*Bulbine*	*sp.*		X						
13	*Carpobrotus*	*edulis*				X				Useful for landscaping and restoration but not a SCC
14	*Brachystelma*	*sp.*		X						Sp. level identification needed
15	*Brunsvigia*	*radulosa*		X						
16	*Brunsvigia*	*gregaria*		X	X					
17	*Carissa*	*bispinosa*						X		Mistaken as a SCC due to the Family Apocyanaceae incorporating the previous Asclepiadaceae

[32] The study area for the various reports has changed significantly, which could explain our report not listed key iconic species such as *Aloe pluridens*.

[33] Hoare (2010) does not provide a list of species identified on the Msenge WEF *per se*, but an exhaustive list all plant species recorded for the study area from his previous studies, as well as a suggested list of protected tree species (National Forest Act, NFA) that are likely to occur. These will be assessed in detail in the Basic Assessment Report.

[34] Only three *Crassula* sp. are protected by the provincial ordinance (*C. columnaris, C. perfoliata, C. pyramidalis*)

No	Genus	Species	Sub-species / Variation	Savannah Environmental (2014)	Hoare (2010)[33]	Scherman[34] Colloty (2017)	Nkurenkuru (2018)	The Biodiversity Company (2020)	RRRG (2022)	Comment
18	*Ceropegia*	*fimbriata*								
19	*Chasmatophyllum*	*musculinum*		**X**					**X**	
20	*Corycium*	*tricuspidatum*			**X**					
21	*Crassula*	*decidua*			**X**					
22	*Crinum*	*macowanii*		**X**	**X**					
23	*Delosperma*	*sp.*				**X**				Sp. level identification needed
24	*Cyrtanthus*	*contractus*						**X**		
25	*Drosanthemum*	*hispidum*		**X**				**X**		
26	*Delosperma*	*adelaidensis*							**X**	
27	*Drimia*	*altissima*								Least concern and abundant (not protected provincially)
28	*Diascia*	*cuneata*							**X**	Listed as Least Concern (Foden & Potter 2005)
29	*Duvalia*	*caespitosa*							**X**	Less than 5 remaining populations, Uitenhage to Port Elizabeth, 20km from the coast (Möller & Becker 2019).
30	*Duvalia*	*sp.*						**X**		Sp. level identification needed
31	*Duvalia*	*modesta*		**X**					**X**	
32	*Encephalartos*	*lehmannii*			X					
33	*Euphorbia*	*globosa*						**X**		Mistaken for *E. tridentata*
34	*Euphorbia*	*gatbergensis*		**X**						Mistaken for *E. gorgonis*.
35	*Euphorbia*	*mauritanica*		**X**						Not protected with the Provincial Ordinance
36	*Euphorbia*	*gorgonis*							**X**	**Not yet assessed for SCC status**
37	*Euphorbia*	*meloformis*		**X**	**X**		**X**	**X**	**X**	
38	*Euphorbia*	*micracantha*		**X**[35]			**X**		**X**	**Not yet assessed for SCC status**
	Euphorbia	*stellata*							**X**	
39	*Euphorbia*	*tridentata*							**X**	
40	*Faucaria*	*tuberculosa*		**X**			**X**		**X**	Listed as **LC**, but should be SCC

[35] Listed as *E. micrantha*.

No	Genus	Species	Sub-species / Variation	Savannah Environmental (2014)	Hoare (2010)[33]	Scherman[34] Colloty (2017)	Nkurenkuru (2018)	The Biodiversity Company (2020)	RRRG (2022)	Comment
41	*Gasteria*	*sp.*		**X**						Only *Gasteria beckeri* is protected. Sp identification needed
42	*Glotiphyllum*	*longum*							**X**	
43	*Gomphocarpus*	*physocarpus*						**X**		Weed species
44	*Haemanthus*	*montanus*		**X**						
45	*Haemanthus*	*albibos*						**X**[36]	**X**	
46	*Haworthia*	*bolusii*		**X**						
47	*Hereroa*	*granulata*							**X**	
48	*Hermannia*	*violacea*			**X**					Listed as **Rare**, EC endemic and a narrow range
49	*Holothrix*	*sp.*						**X**		Sp. level identification needed
50	*Holothrix*	*macowaniana*			**X**					
51	*Huernia*	*brevirostris*					**X**	**X**		
52	*Huernia*	*kennedyana*			**X**					
53	*Huernia*	*thuretii*							**X**	
54	*Mestoklema*	*sp.*		**X**						Sp. level identification needed
55	*Mestoklema*	*albanucum*							**X**	
56	*Mestoklema*	*tuberosum*							**X**	
57	*Moraea*	*sp.*		**X**				**X**		Sp. level identification needed
58	*Nerine*	*huttonae*			**X**					Only likely on alluvial gravel beds
59	*Orbea*	*sp.*		**X**						Sp. level identification needed
60	*Pachycarpus*	*Cf.*		**X**						
61	*Pachypodium*	*succulentum*		**X**			**X**		**X**	
62	*Pelargonium*	*sidoides*[37]		**X**[38]			**X**	**X**	**X**	Listed as Least Concern (De Castro et al. 2005)
63	*Radamanthus*	*sp.*							**X**	Sp. level identification needed

[36] Only listed as *Haemanthus* sp. but most likely *H. albiflos*.

[37]Although listed in numerous reports as Protected – the species is Declining but has not other threat status.

[38] Savanna 2014 Environmental report suggests *P. sidoides* to be Protected in the NEMBA 2013 revised regulations.

No	Genus	Species	Sub-species / Variation	Savannah Environmental (2014)	Hoare (2010)[33]	Scherman[34] Colloty (2017)	Nkurenkuru (2018)	The Biodiversity Company (2020)	RRRG (2022)	Comment
64	*Ruschia*	*sp.*		**X**				**X**		Sp. level identification needed
65	*Ruschia*	*brittinae*							**X**	
66	*Ruschia*	*cradockensis*							**X**	
67	*Scadoxus*	*puniceus*		**X**						
68	*Sideroxlon*	*inerme*	*inerme*			**X**				
69	*Stapelia*	*grandiflora*							**X**	
70	*Syringodea*	*bifucata*							**X**	
71	*Trichodiadema*	*introrosum*							**X**	
72	*Trichodiadema*	*sp.*		**X**						Sp. level identification needed
73	*Trichodiadema*	*orientalis*					**X**			
74	*Trichodiadema*	*pormeridianum*							**X**	
75	*Tritonia*	*laxifolia*		**X**						
76	*Tritonia*	*securigeaa*							**X**	
77	*Ceropegia*	*linearis*								
78	*Brachystelma*	*huttonae*[39]*								
79	*Ornithogalum*	*nannoides**								

[39] Species marked with * have been added on the advice of T. Dold and highly likely to occur on site.

At the start of the field work the two species identified as top priority, based on previous reports and their national ToPs threat status. These were *E. meloformis* and *E. globosa*. The latter species turned out to be a case of mistaken identity that was perpetuated. The former was difficult to locate and we initially reported that the population may have suffered a crash in recent years due to the combined effects of a five-year drought and trampling from livestock. **Figure 2.7** below shows the location of the individuals we found during the limited field time, as well as from previous studies. Distribution of this figure needs to be limited as a precautionary measure against plant collectors - until proper fencing and security is erected.

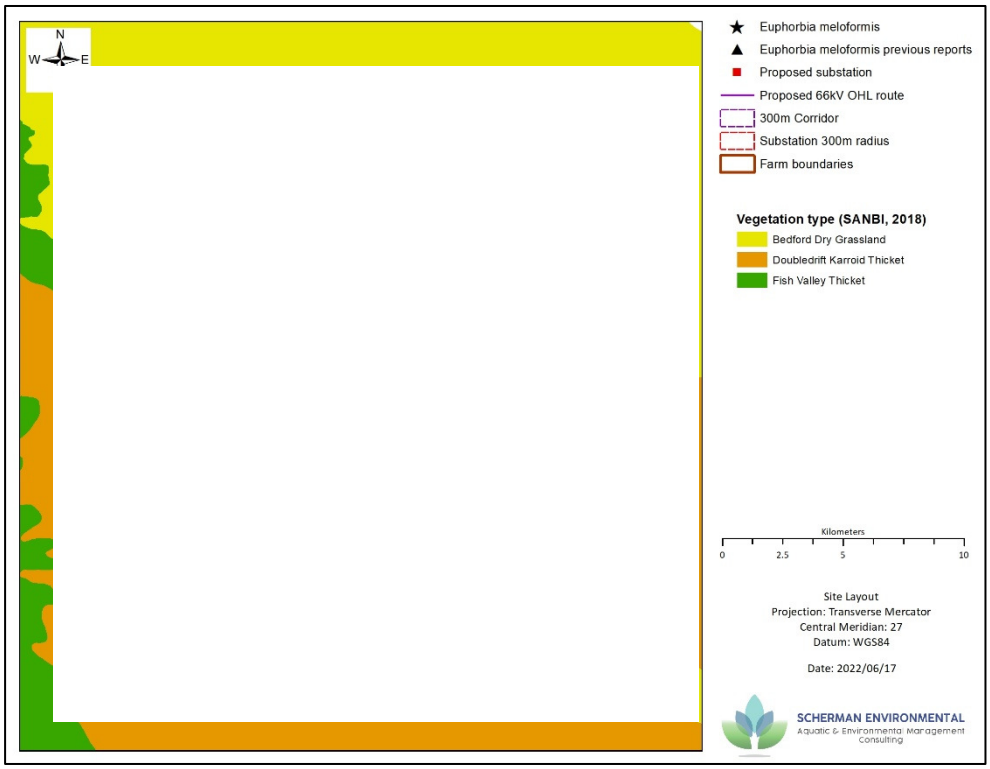

Figure 2.7. The total know distribution records of *Euphorbia meloformis* within and surrounding the planned infrastructure

One of the recommendations for the EA process is to undertake this spatial monitoring for all the species listed in **Table 2.1**, to enable the proper management and monitoring of the SCC. There will be a number of SCC species listed in the Provincial Ordinance that will be too numerous to monitor individual. *Moraea polystachya* is a prime example, which can cover large swathes (Goldblatt & Anderson 1986), and *Euphorbia tridentata* can be super-abundant in certain locales.

Appendix 2 shows a rapid assessment of the SCC for the Msenge Wind Farm as listed by TBC (2020a). The authors did provide a disclaimer that the field work was a "dry survey" and was limited to two days in the field. This walkthrough (12-13 May 2022) was neither a "wet survey" nor a "dry survey" as it was conducted in early autumn. The flowering time of some species and their cryptic habits could account for not being listed in our field survey (e.g. *Cyrtanthus, Nerine, Gladiolus* spp.).

In **Appendix 2**, the species highlighted as "NIL" in the column (Rhodes Restoration Research Group Likelihood of Occurence (RRRG LOO)), yellow and bold are highly unlikely to occur anywhere close to the development

zone and are a function of using a Quarter Degree Square (QDS) approach employed by the TBC, and not a habitat-specific probability rating[40]. This method to select SCC is misleading and not helpful to the developer.

The Hoare list of species (Hoare 2010) most likely to occur in the study sites (based on his previous field work) is the most useful for assessing the impacts of the WEF and the specific infrastructure developments. The list includes 698[41] records and will be systematically covered in the Walkthrough reports, as well as the species covered by Savannah Environmental 2014, Scherman Colloty & Associates 2017, Nkurenkuru 2018 and TBC 2020a.

The species highlighted in green in **Appendix 2** would warrant careful consideration based on the LOO scores. These species are *Crinum campanulatum, Nerine huttonae, Mestoklema albanicum, E. meloformis, Disa lugens* and *Orthopterum waltoniae.*

2.6.4 Alien Invader Plants and Weeds

The number of declared Alien Invader Plants (AIPs) is limited (*Opuntia ficus-indica*, *Opuntia aurantiaca*, *Opuntia megapotamica* - **Figure 2.8**), but their distributions are widespread and a significant threat to biodiversity and the rural economy. A large population of *Agave americana* is situated on the adjacent property (Farm 225) and poses a threat in the long-term. A small number of naturalized weeds were identified for the area, but these pose little threat and will reduce in number with improved veld management.

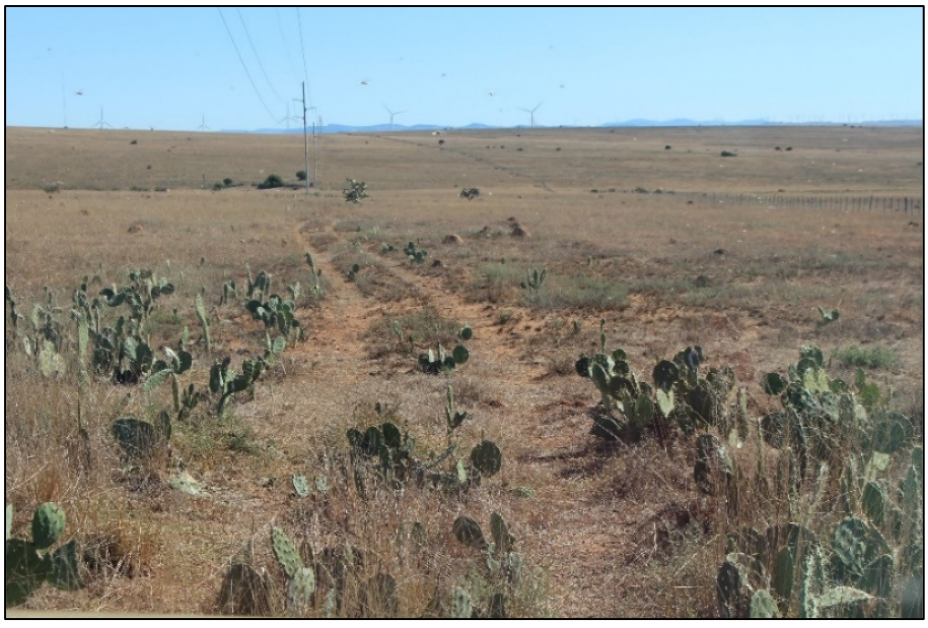

Figure 2.8*. Opuntia megapotamica* populations associated with the existing Eskom infrastructure

[40] It should be noted that a systematic search for plant species, especially to cover dry and wet seasons, would deliver a much more precise lists of SCC and ultimately save the developer in terms of reputational damage. A list of visually confirmed species is orders of magnitude more useful than a "maybe" list as indicated above.

[41] The list included seven moss species (Bryophytes), one fungi species, 33 weeds or declared aliens, 70 species with no species-level identification and 41 duplicate records.

2.6.5 Bush Encroachment

Bush encroachment by *Vachellia karoo* is prominent on some properties and will require special attention. Overgrazing and over-browsing on some properties has led to excessive invasion by the karroid shrubs **(Figure 2.9)**. The excessive overgrazing has led to large areas of the property exhibiting disproportionately high % cover for the karroid bush species (*Chrysochoma ciliata*, *Pentzia incana*, *Eriocephalus* sp., *Ruschia* spp. and *Stachys scabrida*). There has also been a steady reduction in the ratio of "increaser" to "decreaser" grass species resulting in lower productivity.

Figure 2.9. Rangeland invaded by karroid elements from overgrazing

2.7. IMPACT ASSESSMENT (FLORA)

Table 2.3 provides a summary of all impacts that will potentially affect the terrestrial flora over the course of the project.

Table 2.3. Summary of impacts (impact statement) affecting the terrestrial flora over the course of the project.

Phase	Impact type	Expected Impacts
Construction Phase	Direct	Destruction of natural vegetation from construction and associated activities,
		Loss of rare or threatened plant species (SCC) from construction and associated activities
		Dust pollution deposition on vegetation
		Habitat fragmentation
		Positive: reduction of AIPs in the footprint of the developments
	Indirect	Poaching of plants for the plant-collecting trade
		Loss of plant populations to waterflow impediments at water crossings
Operational Phase	Direct	Habitat fragmentation
	Indirect	The loss of SCC to the plant collecting trade

		The loss of SCC plants due to poor livestock management (which includes game animals).
		Increase in the diversity and density of AIPs
		The spread of bush encroacher species will negatively impact the highly localized SCC and reduce grazing capacity
		Loss of plant populations to waterflow impediments at water crossings

2.7.1 Construction Phase

During the construction phase the bulk of the direct impacts will be observed. These negative impacts are 1) Destruction of natural vegetation from construction and associated activities, 2) Loss of rare or threatened plant species (SSC) from construction and associated activities 3) Dust pollution deposition on vegetation, 4) Fragmentation of habitat. At least one positive impact from the construction will be 5) the reduction of AIPs in the footprint of the developments. Indirect impacts include 1) Poaching of plants for the plant-collecting trade and 2) Loss of plant populations to waterflow impediments at water crossings.

Direct Impacts

Table 2.4. Destruction of natural vegetation (excluding the SCC) from construction and related activities.

***Nature:* Destruction of natural vegetation *(excluding the SCC)* from construction and related activities**		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Short (1)	Short (1)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (20)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: The minor detouring of service roads to use existing farm tracks, the existing service track for the existing Poseidon-Albany OHL, wise use of contours and avoiding species rich rocky outcrops. Road width and construction material storage needs to be monitored by the ECO. All species that are not listed as SCC but are transplantable (e.g. *Aloe ferox*, *Gasteria bicolor*, *Crassula* spp. and *Cotyledon* spp.) could be effectively used in the **Revegetation and Rehabilitation Plans**. Wherever possible OHL service roads should avoid the direct route when rocky outcrops or bush clumps occur – see **Figure 2.10.**		
Residual Impacts: • Translocated species could succumb to drought or infection during the transplanting stage. • Translocated species efforts could be nullified by overstocking and poor rangeland management.		

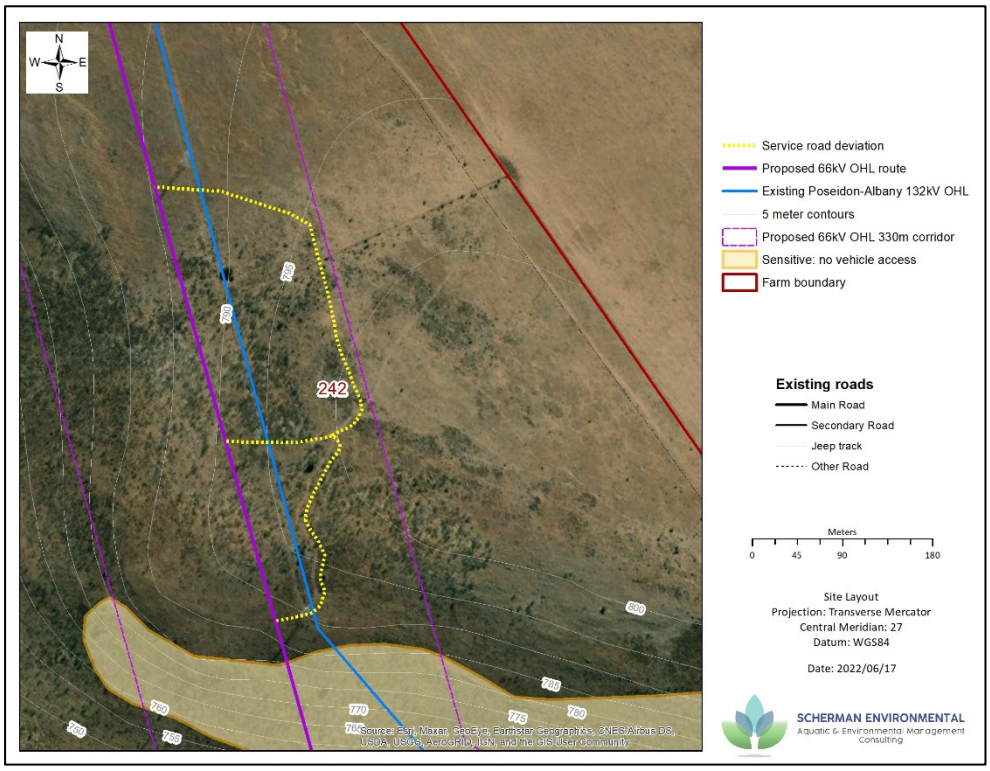

Figure 2.10. The proposed OHL cuts through sensitive habitat (Farm 242) and the careful placement of the service road could reduce the impact (yellow lines would be our suggested plan)

Given the large number of SCC plant species in the area, this has the highest potential risk for the proposed 300m grid corridor within which the 66kV power line, access tracks and water course crossings will be located and the on-site substation.

Table 2.5. Loss of rare or threatened plant species (SCC) from construction and associated activities.

Nature: **Loss of rare or threatened plant species (SCC) from construction and associated activities**		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Short (1)	Short (1)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (30)**	**Low (20)**
Status (positive or negative)	Negative	Positive
Reversibility	Low	Medium
Irreplaceable loss of resources?	Yes	Limited
Can impacts be mitigated?	Yes	
Mitigation: The minor detouring of service roads to use existing farm tracks, wise use of contours and avoiding species rich rocky outcrops. Carefully selected SCC (transplanting success) should be located well in advance of the construction phase and relocated to suitable habitats in close proximity.		

Rare (**R**), Critically Endangered (**CR**), Near Threatened (**NT**) and Vulnerable (**VU**)[42] species should be successfully translocated to fenced off areas that are zoned as "Set Asides" and protected from livestock and small game. These areas should be far from public roads and not advertised.

The location of road construction materials requires careful and systematic assessment, as per the **Plant Rescue and Protection Plan**.

The service roads beneath the OHLs are a potential risk for SCC and will also require a systematic search for SCC, and included in the implementation of the **Plant Rescue and Protection Plan**. The service roads should also be planned and laid out with a botanical ecologist (see examples in the figures below). **Figure 2.11** shows a section of the OHL which traverses a species-rich rocky slope and a service road through this zone should be avoided at all costs. Similarly, the base for the OHL pylons should not be located close to the boundary of this rocky slope. The Eskom service roads from the north should be used to access the last structure on the upslope, and the Eskom service roads from the south east (gate opposite the Amakhala WEF main entrance) should be used to access the structure on the down-slope[43].

Residual Impacts:

- Translocated species could succumb to drought or infection during the transplanting stage.
- Search and Rescue efforts could be nullified by overstocking and poor rangeland management.
- The location of Set Aside areas for rare and endemic plants could become hotspots for plant poaching

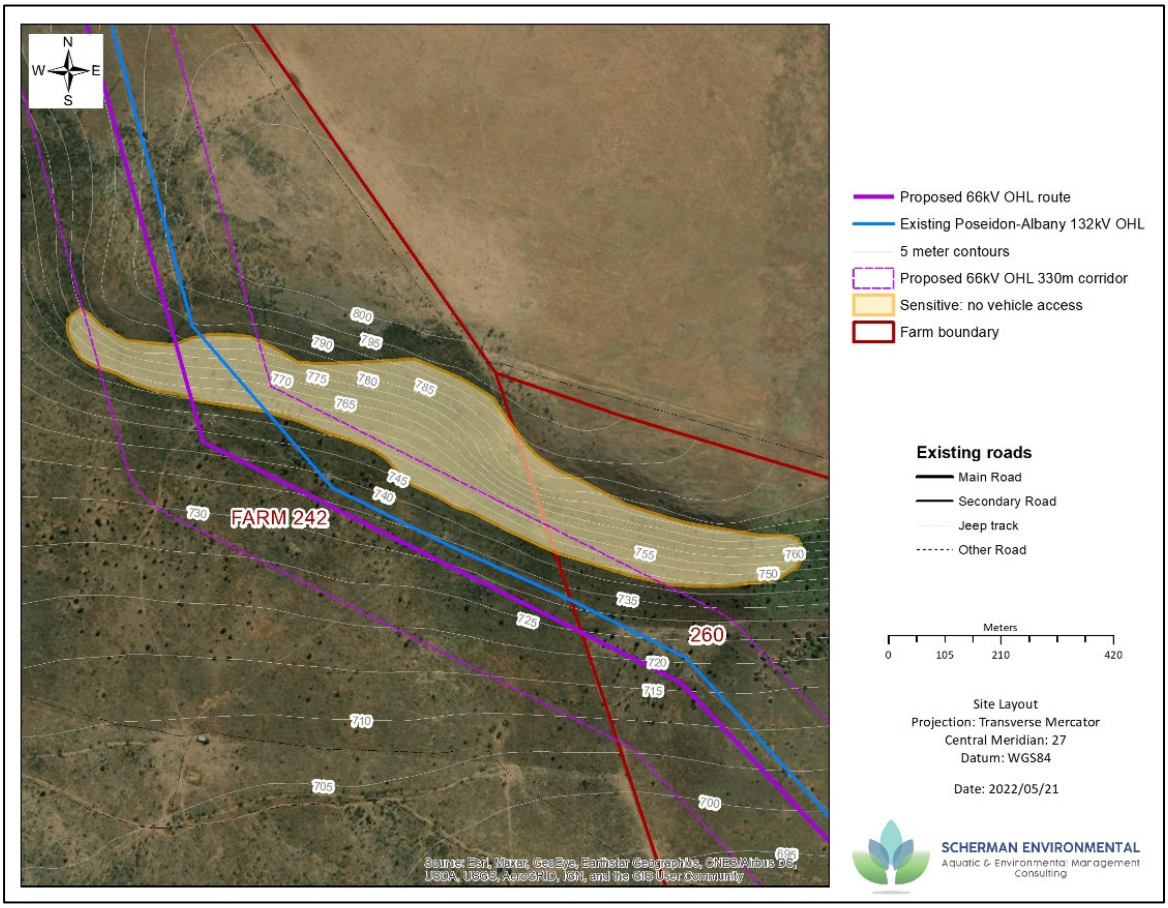

Figure 2.11. Sensitive habitat (Farm 242) where vehicular traffic could impact SCC and could avoid the impact

[42] This needs to include species that have "Not Evaluated" or **NE** status (e.g. *Euphorbia gorgonis* and *E. micrantha*) as well as species whose threat status is seriously outdated or incorrect (e.g. *Faucaria tuberculosa*).

[43] It is highly likely that the regular access from Eskom vehicles has led to the large infestation of *Opuntia megapotamica* on the lower slopes – See Figure 2.8.

Table 2.6. Dust pollution from road and infrastructure construction.

***Nature:* Dust pollution from road and infrastructure construction**		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Short (1)	Short (1)
Magnitude	Small (1)	Small (1)
Probability	Definite (5)	Definite (5)
Significance	**Medium (15)**	**Low (15)**
Status (positive or negative)	Negative	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes – but not necessary.	
Mitigation: If dust pollution is a significant concern and spraying road surfaces is required, then to spray the roadside vegetation will mitigate the effect on the plants. Given that the Eastern Cape is a drought stressed area, this is probably not a viable mitigation activity and the first post-construction rainfall event will reverse the impact.		
Residual Impacts: • None • Excessive and sustained dust pollution could negatively impact *Euphorbia tridentata* populations and the ECO would need to monitor these populations until the dust risk has abated. If there were another five year drought that coincided with the construction phase, this risk may need reassessment.		

Table 2.7. Fragmentation of Habitats.

***Nature:* Fragmentation of Habitats**		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	>15 years (4)	>15 years (4)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (28)**	**Medium (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To a limited extent – except at the decommissioning stages	
Mitigation: If the monitoring during the lifespan of the proposed 300m grid corridor within which the 66kV power line, access tracks and water course crossings will be located and the on-site substation, indicates significant but unintended or un-anticipated impacts on the plant ecology of SCC – then the entire road network needs to be decommissioned (after the Decommissioning Phase) and the roads need to be rehabilitated back to the original vegetation. The width of the road networks needs to be kept to a minimum. The mass rearing and propagation of key SCC species could include the rewilding into areas that may have become fragmented or where seed dispersal is restricted (e.g. across the R350).		
Residual Impacts: • None		

Table 2.8. Destruction of declared Alien Invader Plants.

***Nature:* Destruction of declared Alien Invader Plants**		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Short (1)	Short (1)
Magnitude	Small (1)	Small (1)
Probability	Definite (5)	Definite (5)
Significance	**Medium (15)**	**Low (15)**
Status (positive or negative)	Positive	Positive
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Not needed	
Mitigation: None needed except for the enforcement of an Alien Management Plan as per NEMBA requirements for all properties >5 hectares.		
Residual Impacts: • Construction and maintenance vehicles could transport propagules to new areas.		

Indirect Impacts

Table 2.9. Poaching of plants for the plant-collecting trade.

Nature: Poaching of plants for the plant-collecting trade		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Short (1)	Short (1)
Magnitude	Low (4)	Small (1)
Probability	Probably (3)	Probable (3)
Significance	**Medium (18)**	**Low (9)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: The security of the WEF and access to the powerline corridor needs to restrict access with a controlled access point and locked gates along the R350 and other district roads. The location of key SCC needs to be carefully guarded and documents not freely available to the public. For selected key species such as *E. meloformis*, *Faucaria tuberculosa*, and *Huernia* spp., permits are needed from DEDEAT to collect specimens (in the construction footprint and possibly outside the buffers), for mass propagation and rewilding back to the site to prevent numbers of plants falling below a threshold for a Minimum Viable Population (MVP).		
Residual Impacts: • None		

Table 2.10. Loss of plant populations to waterflow impediments at water crossings

Nature: **Loss of plant populations to waterflow impediments at water crossings**		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	>15 years (4)	>15 years (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (27)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	No (unless SCC)	No
Can impacts be mitigated?	Yes	
Mitigation: Bedford has Mean Annual Precipitation (MAP) ~500mm pa. It also serves as a catchment area for more xeric areas in the lower catchments (<300mm pa). The compound effect of slight impediments to natural water flow could have significant impacts for the ecology downstream. The region is already stressed with the unregulated harvesting of water runoff for small dams. The best designs for water crossings should be flat, ground-level water crossings and not culverts with pipes that cause restricted flow and water to backup.		
Residual Impacts: Road maintenance at road crossings (including blockages to water flow) could retard baseflows and impact downstream micro-hydrology.		

2.7.2 Operational Phase

As mentioned previously the bulk of the impact on the botanical species will have been felt in the construction phase, albeit highly localized. A direct impact would be the continued fragmentation of habitats. Two key and possibly serious indirect impacts for this long-term form of land-use are: 1) the loss of SCC to the plant collecting trade and 2) the loss of SCC plants due to poor livestock management (which includes game animals). Other indirect impacts would be 3) the rampant increase in the diversity and density of AIPs if the mitigation measures listed above for the construction phase are not implemented and sustained, 4) the spread of bush encroacher species which will negatively impact the highly localized SCC and reduce grazing capacity and 5) loss of plant populations to waterflow impediments at water crossings.

Direct Impacts

Table 2.11. Fragmentation of Habitats (Operational Phase)

Nature: **Fragmentation of Habitats**		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	>15 years (4)	>15 years (4)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (28)**	**Medium (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To a limited extent – except at the decommissioning stages	

Mitigation: If the monitoring during the lifespan of the proposed 300m grid corridor within which the 66kV power line, access tracks and water course crossings will be located and the on-site substation, indicates significant but unintended or un-anticipated impacts on the plant ecology of SCC – then the entire road network needs to be decommissioned (after the Decommissioning Phase) and the roads need to be rehabilitated back to the original vegetation. The width of the road networks needs to be kept to a minimum. The mass rearing and propagation of key SCC species could include the rewilding into areas that may have become fragmented or where seed dispersal is restricted (e.g. across the R350).
Residual Impacts: • None

Indirect Impacts

Table 2.12. Poaching of plants for the plant-collecting trade

Nature: Poaching of plants for the plant-collecting trade		
	Without mitigation	**With mitigation**
Extent	Low[44](1)	Low (1)
Duration	>15 years (4)	>15 years (4)
Magnitude	Low (3)	Minor (2)
Probability	Probable (5)	Improbably (5)
Significance	**Medium (40)**	**Improbable (20)**
Status (positive or negative)	Negative	Positive
Reversibility	Low	Medium
Irreplaceable loss of resources?	Yes	Limited
Can impacts be mitigated?	Yes	
Mitigation: The security of the WEF and access to the powerline corridor needs to restrict access with a controlled access point and locked gates along the R350 and other district roads. The location of key SCC needs to be carefully guarded and documents not freely available to the public. For selected key species such as *E. meloformis*, *F. tuberculosa*, and *Huernia* spp., permits are needed from DEDEAT to collect specimens (in the construction footprint and possibly outside the buffers), for mass propagation and rewilding back to the site to prevent numbers of plants falling below a threshold for a Minimum Viable Population (MVP). The recommendations of the Plant Rescue and Protection Plan need to be implemented. It is also strongly recommended that the developer considers the drafting of a Co-management Agreement for Sustainable Landuse Management. This document should be drafted by a rangeland ecologist with experience in these vegetation types.		
Residual Impacts: • Uncoordinated mass propagation and rewilding could lead to serious genetic pollution or hybridization, which is akin to a species extinction.		

Table 2.13. Loss of SCC populations from the lack of an integrated WEF and Livestock Management Plan

Nature: **Loss of SCC populations from the lack of an integrated WEF and Livestock Management Plan**

[44] The challenge with EIA reports is to make a composite assessment for an impact when the impact may not be uniformly distributed across SCC. *Faucaria tuberculosa* for example may have an exceptionally high vulnerability and irreplaceability, whereas *Euphorbia tridentata* is super-abundant and unlikely to become locally extinct.

	Without mitigation	With mitigation
Extent	Low (1)	Low (1)
Duration	>15 years (4)	>15 years (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (4)	Probable (4)
Significance	**Medium (36)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Low[45]	High
Irreplaceable loss of resources?	No (unless SCC)	No
Can impacts be mitigated?	Yes	
Mitigation: The implementation of a Sustainable Livestock Management is important. This involves revisiting of carrying capacities – based on regular veld condition assessments and not outdated lookout tables from Dohne Research Station. The veld needs to rest and the income from the WGTs to the farmer needs to be used as leverage to destock and wait for the productivity of the land to increase. High resolution mapping of all SCC should be undertaken and some areas need to be fenced off – based on the recommendations of an expert in SCC. The Set Asides could provide much needed refugia for key species like *Euphorbia meloformis*, *Faucaria tuberculosa* and others.		
Residual Impacts: Game management is extremely challenging in the realm of sustainable livestock management due to the inability to rotate the animals in a camp system. Unregulated high densities of wild animals (especially extra-limital species) could have significant and adverse impacts on SCC populations,		

Table 2.14. The spread of AIPs.

Nature: **The spread of AIPs will negatively impact the highly localized SCC and reduce grazing capacity**		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	>15 years (4)	>15 years (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Low and expensive	Low but less expensive
Irreplaceable loss of resources?	Yes	Limited
Can impacts be mitigated?	Yes	
Mitigation: The need for fine-scale AIP baseline mapping will be instrumental in the successful implementation of the AIP Management Plan. To improve the potential success of the AIP Management Plan, it is recommended that monitoring and implementation of the AIP Management Plan must be undertaken monthly for the first two years of the operational phase.		
Residual Impacts: Climate change is likely to exacerbate the growth rate of succulent AIPs due to elevated carbon dioxide levels and elevated temperatures, which in tandem elevated evapotranspiration rates, will give them an unfair advantage over the indigenous spp.		

[45] Reversibility can be applied to SCC up to a point where a threshold is crossed for a Minimum Viable Population, after which the probability % drops off rapidly to zero (the point of local species extinction).

Figure 2.12. High densities of *O. megapotamica* associated with the existing ESKOM service road on Farm 242

Table 2.15. The spread of bush encroacher species

Nature: **The spread of bush encroacher species will negatively impact the highly localized SCC and reduce grazing capacity**		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	>15 years (4)	>15 years (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Low and expensive	Low but less expensive
Irreplaceable loss of resources?	Yes	Limited
Can impacts be mitigated?	Yes	
Mitigation: In the same vein as the AIPs, the bush encroacher species like *V. karoo* are likely to out compete the indigenous species, especially forbs, shrubs and succulent species. This is due to the impacts of climate change. The SCC are almost exclusively succulent species which require high levels of solar radiation and are typically shade-intolerant. The **Bush Encroachment Management Plan** needs to be implemented as a co-management agreement between the developer and the landowners, while the densities are still low and the associated costs are relatively low. The **Bush Encroachment Management Plan** needs to be implemented in conjunction with the **Revegetation and Rehabilitation Plan** to make sensible use of the spinescent brush material.		
Residual Impacts: The seed banks for *V. karoo* are likely to last for many decades and the **Bush Encroachment Management Plan** timeframe is likely to outlast the development.		

Table 2.16. Loss of plant populations to waterflow impediments at water crossings

Nature: **Loss of plant populations to waterflow impediments at water crossings**		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)

Duration	>15 years (4)	>15 years (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (27)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	No (unless SCC)	No
Can impacts be mitigated?	Yes	
Mitigation: The road crossings will require maintenance in the beginning to remove topsoil and silt that collects and retards the rate of flow during rainfall evens. With the implementation of the various management plans, there will be an increase in vegetation cover and less topsoil movement.		
Residual Impacts: None		

2.7.3 Decommissioning Phase

The impact of the decommissioning phase is extremely difficult to anticipate due to the uncertainty of the project lifetime. The WGTs may be financially viable, or upgraded by the end of the first project period and this would reduce the probability of the road network being decommissioned and the subsequent rehabilitation.

2.7.4 Cumulative Impact Assessment

The estimated impact for the cumulative impacts on the terrestrial flora is summarised in the Table below. Despite the large number of WGTs in the Cookhouse-Bedford area to together with the associated road network – the cumulative impacts are still low. It could be argued convincingly that overstocking with livestock and recently game animals in the area has caused vastly more damage. Provided overstocking does not occur in tandem with the development, the vegetation, productive capacity of the land and the vigour of SCC populations will increase steadily.

Table 2.17. Demise of SCC plants from a combination of overstocking with livestock, uncontrolled bush encroachment, high density of AIPs and the illegal poaching of plants for the plant collecting trade.

Nature: Demise of SCC plants from a combination of overstocking with livestock, uncontrolled bush encroachment, high density of AIPs and the illegal poaching of plants for the plant collecting trade		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	*Low (1)*	*Low (1)*
Duration	*Medium-term (4)*	*Medium-term (4)*
Magnitude	*Moderate (6)*	*Low (4)*
Probability	*Highly Probable (4)*	*Probable (3)*
Significance	***Low (44)***	***Medium (27)***
Status (positive or negative)	*Negative*	*Negative*
Reversibility	High[46] to Low	High to Low
Irreplaceable loss of resources?	*Yes*	*Yes*

[46] Reversibility can be applied to SCC up to a point where a threshold is crossed for a Minimum Viable Population, after which the probability % drops off rapidly to zero (the point of local species extinction).

Can impacts be mitigated?	*Yes, unless active mitigation is not followed up with compliance monitoring*	*Yes, unless active mitigation is not followed up with compliance monitoring*
Mitigation: The security of the WEF and grid corridor needs to restrict access with a controlled access point and locked gates along the R350 and other district roads. The location of key SCC needs to be carefully guarded and documents containing locality information must not be made freely available to the public. For selected key species such as *E. meloformis*, *Faucaria tuberculosa*, and *Huernia* spp., permits are needed from DEDEAT to collect specimens (in the construction footprint and possibly outside the buffers), for mass propagation and rewilding back to the site to prevent numbers of plants falling below a threshold for a Minimum Viable Population (MVP). The Alien Invasive Management Plan, that requires a co-management agreement between the developer and the landowners requires implementation and monitoring. The Bush Encroachment Management plan, that requires a co-management agreement between the developer and the landowners requires implementation and monitoring. Veld condition assessments from a professional rangeland ecologist are required as per management plans.		
Residual Impacts: Same as above for the same Nature.		

2.7.5 Environmental Management Programme

The impacts and mitigations presented in the section above feed directly into the Environmental Management Programme. The Environmental Management Programme should include:

1) To successfully sustain viable populations of rare, endemic and threatened SSC. This will help reduce the impact of the destruction of natural vegetation from construction and associated activities, loss of rare or threatened plant species (SCC) from construction and associated activities and the loss of SCC plants due to poor livestock management (which includes game animals).

2) Minimise the impact to the environment through the planned and restricted movement of vehicles on site. This will reduce the impact of the destruction of natural vegetation from construction and associated activities, loss of rare or threatened plant species (SCC) from construction and associated activities, dust pollution deposition on vegetation and loss of plant populations to waterflow impediments at water crossings.

3) To successfully revegetate and rehabilitate areas degraded from construction work. This will help reduce the impacts from habitat fragmentation and the spread of bush encroachment species.

4) The successful eradication of declared AIPS as defined by NEMPA 2007. This will help reduce the diversity and density of AIPs in the development. The issue of AIPs on private property is a contentious and complex issue. In most cases the landowners did not introduce the AIPs themselves, and in many cases, it was poor judgement by residents (house cacti) or a planned import by government for fodder, dune stabilization or for forestry. To compound matters, the costs of clearing AIPs is expensive and in many areas these costs exceed the value of the land. The developer has the opportunity to forge a collaborative agreement with the landowners to embark on a Zero Tolerance Policy (ZTP) for Category 1 Declared Invaders as defined by NEMBA, through a co-management agreement. The density of AIPs on the properties is currently low enough that it would not be a massively costly exercise and could be twinned with a corporate social responsibility programme in the form of job creation and possibly Small, Medium and Micro Enterprises (SMME) with previously disadvantaged individuals (PDI) from Bedford or Cookhouse.

Objective: **To effectively sustain viable populations of rare, endemic and threatened SCC species.**		
Project Components	Watercourse crossings Service roads for the OHLs and Substation OHLs Open Space between infrastructure	
Potential Impact	The local extinction of SCC such as *Faucaria tuberculosa* and *Euphorbia meloformis* The demise of other SCC in terms of number of individuals per km^2 The cumulative impact of other WEF, without restrictions of grazing and browsing pressure, leads to the reduction in EOO and AOO for key species	
Activity	Vegetation clearing Site preparation and earthworks Excavation of foundations Construction of infrastructure, especially roads Compaction during site preparation Excavation of foundation Stockpiling of topsoil, sub-soil and spoil material.	
Mitigation Target	No SCC becoming locally extinct (development footprint) No range SCC contraction as a result of development activities No decline in density of SCC across the development footprint The mass propagation and reintroduction of genetically pure SCC	
Mitigation Action	**Responsibility**	**Timeframes**
Reduce construction footprint to a minimum	Engineers and Contractors	Construction periods
Conduct a phased by systematic **Search, Identify and Mark** SCC in close proximity to the infrastructure features. This excludes SCC directly in the development footprint but is a precautionary step to prevent accidental damage from vehicular and pedestrian traffic as well as loss from smothering. When SCC populations have been identified, these need to be marked out with clearly visible danger tape.	ECO with assistance from a botanical SCC specialist	Pre-Construction
Thicket patches need to marked out to protect cryptic SCC that are closely associated with patches.	ECO	Pre-Construction
Implement Plant Rescue and Protection Plan	ECO or contractor in conjunction with a SCC botanical specialist	Pre-Construction
Obtain required permits for collecting, storing and transplanting SCC from DEDEAT.	SCC botanical specialist	Pre-Construction

Environmental Audit Report must confirm that all SCC listed in the Plant Rescue and Protection Plan have been rescued and replanted and that the location of replanting is compliant with conditions of approvals.	ECO but needs certification by a SCC botanical specialist	Pre-Construction, and possibly some construction if the construction is staggered or phased
No herbicides must be used in demarcated SCC hotspots or Set Asides as described in the Plant Rescue and Protection Plan. All AIP clearing in these zones needs to be undertaken manually with the assistance of biocontrol. No herbicides to be used in road verge maintenance – only mechanical.	ECO and AIP contractor	Construction and Operational phases
AIP species in Set Asides and areas zoned as SCC areas need to be prioritised. AIP removal needs to be implemented according to the AIP Management Plan and herbicide usage.	ECO and AIP Contractor	Construction phases
Where vegetation has to be cleared, the debris should be handled according to the guidelines in the **Bush Encroachment Plan** as well as the **Revegetation and Rehabilitation Plan**. Vegetation debris should be used to stablise bare areas and areas re-sloped (e.g. dongas and other erosion features).	Contractor	Construction phases
Where soil and rock need to be moved and stored temporarily, this needs to avoid areas of high density for SCC (marked out by the ECO) and set asides.	Contractor	Construction phases
In the case of the development of new overhead transmission and distribution infrastructures, a one metre “trace-line” must be cut through the vegetation for stringing purposes only and no vehicle access must be cleared along the ”trace-line”. Alternative methods of stringing that limit impact to the environment must always be considered.	Contractor	
The service roads for the OHLs should not be laid out in a – direct-line-of-sight method and should avoid bushclumps and rocky outcrops	ECO and Contractor	
Implement Set Asides for areas of high density of SCC or suitable refugia for mass produced SCC facing extinction.	ECO with a SCC botanical specialist	Construction and Operational phases
Develop a mass production programme for key SCC	ECO with a SCC botanical specialist	Construction and Operational phases
Performance Indicator	Number of SCC recorded in the development footprint Number of fenced off areas and set asides	

	The density of key[47] SCC (per species) in Set Asides, fenced off areas
Monitoring	It will not be possible to monitor all SCC at the level of the individual, so the focus should be on key species such as *E. meloformis, Faucaria tuberculosa*[48] etc. Other species should be monitored through stratified subsampling (quarterly by an ECO) to obtain early warning for any negative trends. The fenced off areas or Set Asides should be monitored intensively, as well as isolated populations that are susceptible to trampling from livestock.

Objective: **Minimise impact to the environment through the planned and restricted movement of vehicles on site**		
Project Components	Development service roads ESKOM service roads	
Potential Impact	Uncontrolled access of vehicles can significantly impact on the viability of SCC populations	
Activity	• Develop a Standard Operating Procedure (SOP) for visitors, contractors, landowners, for requests to travel off road to protect SCC from cumulative mortality. • Develop a SCC zonation plan based on rarity and threat status to be used in the SOP listed above.	
Mitigation Target	No net loss of SCC populations	
Mitigation Action	**Responsibility**	**Timeframes**
	ECO, landowner	20 years
Performance Indicator	No of individuals recorded per SCC for the development	
Monitoring	It will not be possible to monitor all SCC at the level of the individual, so the focus should be on key species such as *E. meloformis, Faucaria tuberculosa*[49] etc. Other species should be monitored through stratified subsampling to obtain early warning for any negative trends. The fenced off areas or Set Asides should be monitored intensively, as well as isolated populations that are susceptible to trampling from livestock.	

Objective: **To successfully revegetate and rehabilitate areas degraded from construction work**	
Project Components	Substation OHLs pylon bases Open space between infrastructure
Potential Impact	The loss of topsoil from new constructions sites Increased probability of AIP and naturalized weed invasion
Activity	Vegetation clearing. Site preparation and earthworks. Excavation of foundations. Construction of infrastructure.

[47] Key species are listed in the Plant Rescue and Protection Plan.
[48] The definitive list of SCC for this effort should be compiled as a collaborative effort between the landowners, ECO and a SCC botanical specialist.
[49] The definitive list of SCC for this effort should be compiled as a collaborative effort between the landowners, ECO and a SCC botanical specialist.

	Site preparation (e.g. compaction). Excavation of foundations. Stockpiling of topsoil, subsoil and spoil material.	
Mitigation Target	Reduce construction footprint to a minimum Revegetate all disturbed areas in the shortest possible period Minimise the open space secondary invasion from AIPs and naturalised weeds	
Mitigation Action	**Responsibility**	**Timeframes**
Collecting, cleaning and seed storage	ECO	Preconstruction phase
Keep construction and soil storage areas to an absolute minimum	Contractor	Construction phase
Revegetation should commence ASAP following vegetation clearing and the return of the topsoil.	Contractor/ECO	Construction phase
All waste, rubble and chemicals not to be buried or relocated on the properties but removed to an approved waste disposal facility.	Contractor	Construction phase
Wherever possible local seeds, cuttings and transplants should be harvested and planted	ECO	Construction phase
All the plant debris from the clearing, should be used to stablise soil and prevent trampling. A portion of this could be chipped to be used as well.	Contractor	Construction phase
All the branches and material from the clearing of *V. karoo* according to the Bush Encroachment Management should be used to brush-pack the newly planted areas – preventing wind erosion and trampling from animals. The brush packing will also prevent the loss of young seedlings.	Contractor	Construction phase
Performance Indicator	Hectares of revegetated land Incidents of erosion on revegetated areas	
Monitoring	A systematic fixed-point monitoring system should be considered whereby a number of sites are documented at monthly intervals from the very first activity (SCC search and rescue), to post construction. These plots should focus in the construction sites, but a small number should also be planned for the general landscape to compile evidence for the desired impact from AIP Clearing Plans, Bush Encroachment Plans and general veld condition. They could be very useful in supplementing the data from the Annual Veld Condition Assessments.	

Objective: **The successful eradication of declared AIPS as defined by NEMBA 2007.**		
Project Components	Development footprint and adjacent open space	
Potential Impact	The loss of key SCC plant species and possible local extinctions The reduction (long-term) of grazing capacity and primary productivity, leading to a net loss of livelihoods after the decommissioning phase.	
Activity	AIP clearing according to current NEMBA guidelines, and future promulgations	
Mitigation Target	To reduce AIP species and densities to acceptable levels, and where possible eradicate completely.	
Mitigation Action	**Responsibility**	**Timeframes**
Mapping and zoning for fine-scale AIP clearing work	ECO, Landowners	Pre-construction
Training and Awareness of AIPs	ECO	Pre-construction – revised biannually for new spp.
AIP clearing according to current best practice	ECO and AIP contractor	Construction phase
AIP follow-up and monitoring according to current best practice	ECO and AIP contractor	Operational phase
Performance Indicator	Number of declared AIPs according to the most recent NEMBA or future regulations as defined by the state. Extent of AIPs according to the most recent NEMBA or future regulations as defined by the state. The density declared AIPs according to the most recent NEMBA or future regulations as defined by the state. The number or emergent or incoming AIP spp.	
Monitoring	The number of AIP species across the development footprint. The density of AIP species across the development footprint. The number and location of emergent and incoming spp.	

2.8. RECOMMENDATION AND CONCLUSIONS

The probability of Albany Alluvial Vegetation being present in the Msenge WEF site and grid corridor is significant and would have considerable implications on the various management plans and may affect the designs for the authorized water crossings. We highly recommend that a VEGMAP Committee Scientist is commissioned to map the Msenge WEF at 1: 10 000 scale to map the presence of sensitive vegetation types. This will assist with the implementation of all aspects of WEF and grid management and would create greater awareness among landowners. The TORs could include providing lists of addition SCC encountered.

The properties currently have low levels of AIP species and at low densities. Species such as *Opuntia aurantiaca* and *Opuntia megapotamica* pose a serious long-term threat to the biodiversity and ecological functioning of the landscape and eradication of these two species should be a top priority. The management

of AIPs will only be successful if there is collaboration and commitment from the landowners and the developer.

The first Basic Assessment Report (BAR) conducted in 2010 by Savannah Environmental only recorded one SCC[50]. The cumulative work of the previous studies and this one has expanded the list considerably and these should feature in the **Plant Rescue and Protection plan** implementation.

We have included a number of species as SCC, despite not being listed as ToPs (NEMBA) or in the Provincial Ordinance. This is partly due to the likely pressure from plant collectors and damage from trampling by livestock, as well the threat status as defined by SANBI being seriously outdated.

The SCC and other valuable plants (e.g. *Gasteria bicolor*) plants that will fall in the development footprint, will require the ECO to following the provincial guidelines as laid out by DEDEAT (2003), and use as much of the transplantable species for the revegetation and rehabilitation.

The new form of land-use (renewable energy) in the general area has the potential to provide much respite from decades of sustained grazing and browsing pressure, and the small impact of the infrastructure (provided mitigation measures are implemented) will be a positive development for the ecology – from a botanical perspective.

Impacts will be reduced if the service roads for the OHLs are designed to not follow the most direct route when there are large rocky outcrops or large bush clumps.

The concepts of Set Asides and mass propagation of key SCC should be negotiated with the landowners, and partnerships established to either mass propagate off site and rewild once the plants are more resilient to trampling, or build internal capacity and find champion farmers who may drive the process.

The lack of a detailed placement for the OHLs support structures is a reason for concern and although the footprint is really small, search and rescue will be needed to ensure key SCC are not compromised. The single individual of *F. tuberculosa* we located was directly in the path of the OHLs on Farm 2/223. The same situation will likely occur for the *E. meloformis* populations.

The lack of adequate road maintenance and runoff management in conjunction with the overgrazing has resulted in the beginnings of substantial rill and gully erosion. These areas are currently relatively small and could be rehabilitated relatively cost effective. If left unchecked, much like the AIP management the problem will escalate rapidly and cost more in the future

Monitoring Requirements

- The sporadic and *ad hoc* locations of new SCC as listed above in **Table 2.2** requires a spatially explicit monitoring programme in case there may be future developments (e.g. additional roads or WGT intensification). The ECO needs to develop a "Chance Encounter Procedure" for the sighting of new SCCs.
- The AIPs require a Strategic Adaptive Monitoring Approach with an annual report to DEDEAT summarizing the progress in the AIP Management Plan.

[50] *Encephalartos lehmanii*

- The Bush Encroachment Strategic also requires a Strategic Adaptive Monitoring Approach.
- Long-term developments such as this need to include an Annual Audit Report to DEDEAT to ensure compliance with the EA stipulations and requirements – especially where there are nationally significant biodiversity interests in the form of SCC.

Authorisation Requirements

- There are a significant number of SCC on the Msenge WEF and grid corridor and these species and populations are possibly more threatened than is currently recorded due to the fact that national assessments for many species are more than a decade out of date. The species listed for search and rescue in the Plant Rescue and Protection Plan should be a top priority.
- The grid corridor routing, WEF and the associated landowners have entered into a co-financial management agreement for the period of the project. This needs to be extended to the ecological management and include the entire properties. The key aspects that require co-management are: 1) AIPs, 2) SCC, 3) combatting soil erosion and 4) Sustainable Land use Management which includes livestock and game, as well as management of 5) Bush Encroachment. The authorization should not allow a situation where a landowner receives the financial benefit from the development, does not destock or rest the veld to appropriate levels and does not take responsibility for the sustainable management of the land.
- All mitigation requirements in this report as well as the attached management plans will need to be implemented. Some mitigation requirements will need to include the landowner and the various contractors.
- The water course crossings require special consideration in terms of design specifications so as to ***absolutely*** minimize water obstruction. The typical culverts are not recommended and a hydrologist familiar with semi-arid environments is needed for expert advice.
- As per the original EA in 2010, a faunal search and rescue is required for all the sedentary species that occupy bushclumps, termitaria but especially the rocky outcrops. This will complement the commitment to the Plant Rescue and Protection Plan.

Based on the findings of our surveys, previous reports, and all relevant literature, we believe that the following developments will not have an irreversible and substantial negative effect on the terrestrial flora in the area and can go ahead provided the necessary mitigations described above are implemented:

- The proposed 66kV overhead power line within the 300m development corridor.
- Access tracks within the 300m development corridor provided that sensitive areas are avoided.
- Water course crossings within the 300m development corridor provided that maintenance at road crossings takes into account downstream micro-hydrology.
- The on-site substation within the 300m development radius.

3. TERRESTRIAL FAUNA

3.1. SCOPE OF WORK

The main objective of the assessment was to assess to the impact that the planned construction would have on the terrestrial faunal community found in close proximity to the proposed corridor and project area. This included the wind turbines, road networks, overhead lines, substations, and all other infrastructure associated with the proposed project.

3.2. APPROACH AND METHODOLOGY

The following approach and methodology were employed for this report:

- Conduct a field survey to assess the environmental structure of all the habitat types strewn across the field site and the proximity of these different habitat structures to proposed infrastructure.
- Conduct a field survey to determine the species diversities and densities associated with the different habitat structures spread across the project area.
- Conduct a desktop assessment to determine the ecologically important geographical and environmental features strewn across the property.
- Conduct a desktop assessment to compile a potential species list for the property with a particular focus on threatened and protected taxa.
- Produce a report identifying the manner and extent to which the proposed development will impact the terrestrial fauna found within the project area.
- Produce a report that provides mitigation protocols that can be used to reduce the impact on the terrestrial faunal communities and their associated habitats.
- Produce a concluding statement summarizing all the findings with an over-arching recommendation for the project.

3.3. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations are applicable for this assessment:

- Whilst spread across several months, the study was limited to a single season constituting an autumn season survey. The seasonality of site visits was not ideal as the lack of warmer evenings and precipitation reduced the diversity of reptiles and amphibians encountered.
- While the seasonality of the field trips likely reduced the number of vertebrate species listed, lower temperatures during the surveys (compared to the summer months) facilitated the encounter of small vertebrates more frequently in the late morning and early afternoon. This maximized our time in the field and reduced the encounter bias across the properly, as sites visited in the middle of the day were not devoid of free-roaming fauna. Although the conditions were sub-optimal, amphibians were still encountered (albeit in lowered densities and diversities). This lends confidence to our overall findings as several previous surveys failed to encounter a single amphibian. Overall, I believe the seasonality of the excursions was adequate to develop a robust understanding of the potential sensitive taxa in the area given the time constraints.
- This assessment has not assessed any temporal trends.
- The fieldwork component of the study, along the proposed OHL, was limited to the 300m corridor and not all the habitats in close proximity of the corridor could be assessed.

- The work done by previous consultants was thorough and comprehensive and is citable in this report.
- It must be noted that due to time constraints, trapping was not conducted during this project. Small and meso-fauna such as rodents, reptiles and frogs were very likely under-estimated during the field component of this study.

3.4. DESKTOP ASSESSMENT

The faunal assessment of the area was produced using a multiplicity of online sources, that included but was not limited to citizen science platforms, virtual museum records, previous reports, and published literature. The species lists compiled below showcase the species that are likely to be found in the area. Whilst comprehensive, the lists provided represent an attempt to estimate the diversity of the area. Given that our understanding of the species compositions of the area is based largely on peoples understanding of the area, it is safe to assume that some species may be missing from the list. Extra effort has thus gone into assessing the Likelihood of Occurrence (LOO) for any species of conservation concern.

3.4.1 Previous Reports

David Hoare Consulting 2010
This report focused very little on the terrestrial fauna and only mentioned the potential threatened species that could be found on the property. No mention was made of animals that were visually encountered during walkthroughs of the property. The following threatened terrestrial species were discussed along with their potential likelihood of occurrence (LOO): black rhino (*Diceros bicornis bicornis*) – no LOO, white-tailed rat (*Mystromus albicaudatus*) – medium LOO, samango monkey (*Cercopithecus labiatus*) – low LOO, giant bull frog (*Pyxicephalus adspersus*) – medium LOO and southern African python (*Python natalensis*) – low LOO.

Savannah Environmental 2017 (SE 2017)
Using the sources afforded to them, Savannah Environmental listed 52 mammal species that could occur in the area. On a global scale, this represented one endangered, two vulnerable, and two near threatened mammals at the time of the study. The field surveys undertaken by TBC yielded 16 mammal records with no mammals of a global conservation concern being recorded in the area. From a reptile perspective, Savannah Environmental's desktop assessment yielded fifty species. At the time of the study, this represented three animals of conservation concern (two vulnerable, one near threatened). Field surveys of the area recorded eight species of reptile. None of these were of conservation concern either. Additionally, the desktop assessment of the amphibian communities found in the area yielded 13 potential species. None of these were of conservation concern. Field surveys of the area also yielded four species of amphibian.

Nkurenkuru 2018
This report built on the findings of Hoare (2010) by adding refinements to their proposed threatened taxa list as well as providing more refined species lists as a result of undertaking site visits. The site visit resulted in 14 confirmed mammal sightings (direct or indirect encounters) and four unconfirmed mammal sightings (unconfirmed indirect sightings). They also added five mammals to the list based on high likelihood of occurrence in the area. Four confirmed reptile sightings were also made. In addition to adding field observations, the reports clarified the CITES (the Convention on International Trade in Endangered Species of wild Fauna and Flora) and TOPS (Threatened or Protected Species) statuses of many of the organisms that occur in the region. Lastly the following Red-listed species were added to the list based on their likelihood of occurrence: black-footed cat (*Felis nigripes*) – vulnerable, spectacled dormouse (*Graphiurus ocularis*) – near

threatened, and karoo padloper (*Homopus boulengeri*) – near threatened. The likelihood of occurrence was also raised for the giant bull frog and white-tailed rat.

The Biodiversity Company 2020

The report created by The Biodiversity Company was the most thorough report done thus far with the most comprehensive desktop assessment and field survey. Using the sources afforded to them, the Biodiversity Company listed 81 mammal species that could occur in the area. On a regional basis, this represented one endangered (EN), four vulnerable (VU) and six near threatened (NT) mammals (SANBI, 2016). On a global scale, this represented one endangered, two vulnerable and five near threatened mammals (IUCN, 2017). The field surveys undertaken by TBC yielded 17 mammal records with two mammals of a global conservation concern being recorded in the area (IUCN 2017). These included the Mountain Reedbuck (EN - *Redunca fulvorufula*) and Leopard (VU - *Panthera pardus*). From a reptile perspective, the TBC's desktop assessment yielded eight species. None of these were of conservation concern. Field surveys of the area recorded seven species of reptile. None of these were of conservation concern either. Additionally, the desktop assessment of the amphibian communities found in the area yielded 25 potential species. According to IUCN (2017), three of these were of conservation concern, *Anhydrophryne rattrayi* (VU), *Cacosternum thorini* (EN) and *Vandijkophrynus amatolicus* (CR). The field surveys conducted by the TBC did not yield a single frog species.

3.4.2 Mammals

The mammal list was compiled using the MammalMap (MammalMap, 2022), the IUCN Red List spatial data (IUCN, 2017) and all previous reports (TBC, 2020; SE, 2017; Nkurenkuru, 2018; Hoare, 2010). It must be noted that TBC (2020) was incredibly comprehensive and thus formed a strong base upon which we built our mammal list of the area. Altogether 83 species of mammal, **Table 3.1**, could occur in the area, ten of which are conservation concern according to the most recent global assessment (IUCN, 2017).

Specifically, one mammal is endangered, three are vulnerable and six are near threatened (IUCN, 2017). The likelihood of occurrence (LOO) for the globally threatened taxa are as follows: *Aonyx capensis* (high LOO), *Eidolon helvum* (medium LOO), *Felis nigripes* (high LOO)*, Hydrictis maculicollis* (high LOO)*, Mystromys albicaudatus* (low LOO)*, Panthera pardus* (high LOO)*, Parahyaena brunnea* (high LOO)*, Pelea capreolus* (high LOO)*, Redunca fulvorufula* (high LOO) and *Syncerus caffer* (low LOO). Our predicted LOOs are largely in agreement with those of TBC (2020), apart from the assessment of *Eidolon helvum,* which was assessed as having a low LOO according to TBC (2020).

There are two differences between the global assessments of mammals between this report and TBC (2020). Firstly, TBC (2020) assessed the white-tailed rat (*Mystromys albicaudatus*) as endangered. Using the same source (IUCN, 2017), we recovered the species as vulnerable. We believe this to be the correct assessment as the species was downgraded from EN to VU in 1996, according to Avenant et al. (2019). Secondly, the status of African buffalo has been amended and the species has been added to our list because according to IUCN SSC Antelope Specialist Group (2019), the species is considered near threatened. Due to this species' high commercial value however, it has an incredibly low LOO.

Additionally, Hoare (2010) added two species of concern (black rhino (*Diceros bicornis bicornis*) and Samango monkey (*Cercopithecus labiatus*)) to his report. Both of these have been omitted as they are not expected to occur in the area.

Lastly, Savannah Environmental (2017) recognised five species of conservation concern in their assessment. *Amblysomus corriae* (Fynbos Golden Mole) was listed as near threatened in the Savannah Environmental (2017) report. This species has not been considered in this report as it does not occur in the area. Secondly the Savannah Environmental (2017) listed four additional species of conservation concern, namely, *Mellivora capensis* (Honey Badger – NT), *Philantomba monticola* (blue duiker – VU), *Poecilogale albinucha* (African striped weasel - VU) and *Suncus infinitesimus* (least dwarf shrew – E). All four species have since been reassessed as least concern (IUCN, 2017).

Table 3.1. List of mammals that may occur in the project area.

Species	Common name	Global conservation status (IUCN)
Amblysomus hottentotus	Hottentot's Golden Mole	LC
Antidorcas marsupialis	Springbok	LC
Aonyx capensis	Cape/African Clawless Otter	NT
Atilax paludinosus	Marsh/Water Mongoose	LC
Canis mesomelas	Black-backed Jackal	LC
Caracal caracal	Caracal	LC
Chlorocebus pygerythrus	Vervet monkey	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC
Cryptomys hottentotus	African Mole-rat	LC
Cynictis penicillata	Yellow Mongoose	LC
Dendrohyrax arboreus	Southern Tree Hyrax	LC
Dendromus melanotis	Grey Climbing Mouse	LC
Dendromus mesomelas	Brants' Climbing Mouse	LC
Desmodillus auricularis	Cape Short-eared Gerbil	LC
Eidolon helvum	African Straw-coloured Fruit-bat	NT
Elephantulus rupestris	Western Rock Sengi	LC
Felis nigripes	Black-footed Cat	VU
Felis silvestris	African Wildcat	LC
Galerlella pulverulenta	Cape Grey Mongoose	LC
Genetta genetta	Common/Small-spotted Genet	LC
Genetta tigrina	Cape Genet	LC
Georychus capensis	Cape Mole rat	LC
Grammomys cometes	Mozambique Woodland Mouse/ Mozambique Thicket Rat	LC
Graphiurus murinus	Woodland Dormouse	LC
Graphiurus ocularis	Spectacled Dormouse	LC
Herpestes ichneumon	Egyptian/Large Grey Mongoose	LC
Herpestes pulverulentus	Cape Grey Mongoose	LC
Hydrictis maculicollis	Spotted-necked Otter	NT
Hystrix africaeaustralis	Cape Porcupine	LC
Ichneumia albicauda	White-tailed Mongoose	LC
Ictonyx striatus	Striped Polecat/Zorilla	LC
Kerivoula lanosa	Lesser Woolly Bat	LC
Leptailurus serval	Serval	LC
Lepus saxatilis	Cape Scrub Hare	LC
Macroscelides proboscideus	Karoo Round-eared Sengi	LC
Mastomys natalensis	Natal Multimammate Mouse	LC

Species	Common name	Global conservation status (IUCN)
Mellivora capensis	Honey Badger	LC
Micaelamys (Aethomys) namaquensis	Namaqua rock rat	LC
Mus minutoides	African Pygmy Mouse	LC
Mus musculus	House Mouse	LC
Myosorex varius	Forest Shrew	LC
Myotis tricolor	Cape Hairy Bat	LC
Mystromys albicaudatus	White-tailed Rat	VU
Neoromicia capensis	Cape Bat	LC
Neoromicia zuluensis	Aloe/Zulu Pipistrelle Bat	LC
Nycteris thebaica	Egyptian Slit-faced/Cape Long-eared Bat	LC
Oreotragus oreotragus	Klipspringer	LC
Orycteropus afer	Aardvark	LC
Otocyon megalotis	Bat-eared Fox	LC
Otomys irroratus	Southern African Vlei Rat	LC
Otomys karoensis (saundersiae)	Roberts' Vlei Rat	LC
Otomys unisulcatus	Karoo Vlei Rat	LC
Panthera pardus	Leopard	VU
Papio ursinus	Chacma Baboon	LC
Parahyaena brunnea	Brown Hyena	NT
Pedetes capensis	Springhare	LC
Pelea capreolus	Grey Rhebok	NT
Phacochoerus africanus	Common Warthog	LC
Philantomba monticola	Blue Duiker	LC
Poecilogale albinucha	African Striped Weasel	LC
Potamochoerus larvatus	Bushpig	LC
Procavia capensis	Rock Hyrax	LC
Pronolagus saundersiae	Hewitt's Red Rock Hare	LC
Proteles cristata	Aardwolf	LC
Raphicerus campestris	Steenbok	LC
Raphicerus melanotis	Cape Grysbok	LC
Rattus rattus	House Rat	LC
Redunca fulvorufula	Mountain Reedbuck	EN
Rhabdomys pumilio	Four-striped Grass Mouse	LC
Rhinolophus capensis	Cape Horseshoe Bat	LC
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC
Rousettus aegyptiacus	Egyptian Fruit Bat	LC
Saccostomus campestris	South African Pouched Mouse	LC
Scotophilus dinganii	African Yellow Bat	LC
Suncus varilla	Lesser Dwarf Shrew	LC
Suricata suricatta	Meerkat	LC
Sylvicapra grimmia	Common Duiker	LC
Syncerus caffer	African Buffalo	NT
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC
Thryonomys swinderianus	Greater Cane Rat	LC
Tragelaphus oryx	Common Eland	LC
Tragelaphus strepsiceros	Greater Kudu	LC
Vulpes chama	Cape Fox	LC

3.4.3 Reptiles

The reptile list (**Table 3.2**) was compiled using the application HerpDistributionSA (Rebelo, 2021), which is an amalgamation of all the records from online repositories (ReptileMap, 2021 and iNaturalist, 2021) and physical specimen collections (Port Elizabeth Museum and McGregor Museum) collected before December 2021. All species recorded within QDS 3226CC and 3225DD on HerpDistributionSA were listed as potentially occurring within the study area. The list was also supplemented with species that may occur in the area based on their known distribution (Branch 1998, Marais 2004, Bates et al. 2014). Eighty-four species were listed, **Table 3.2** for the area using the methodology listed above. Whilst comprehensive, the data used by Rebelo (2021) was gleaned from citizen science platforms and thus there may be misidentifications within the quarter degree cells. Whilst every effort has been made to check the distributions of all species of conservation concern, it must be noted that some least concern species, listed in **Table 3.2,** may not be found in the area.

Savannah Environmental (2017) proposed several more species (i.e. *Pseodocordylus microlepidotus, Nucras intertexta* and *Philothamnus hoplogaster*) for the area, which we have omitted because they are not expected to be found in the area based on Rebelo (2022) and known distributions of the species' (Branch 1998).

The desktop surveys provided by Savannah Environmental (2017) also highlighted three reptiles of conservation concern. None of these are recognized on our species of conservation concern. *Cordylus tasmani*, listed as vulnerable in Savannah Environmental (2017), no longer exists as it was synonymized with *Cordylus cordylus* (Reptile Database, 2022). *Lamprophis fuscus*, which was listed as near threatened is now listed as least concern (IUCN, 2017), and *Tetradactylus fitzsimonsi* does not occur in the area (Rebelo, 2022). Another notable omission from the category of 'conservation concern', for this report, was the southern African python (*Python natalensis*) from the Hoare (2010) report. The species has since been assessed as least concern and is very unlikely to be found in the area.

Whilst TBC (2020) and Savannah Environmental (2017) severely under-estimated the reptile diversity of the region, our more comprehensive desktop assessment yielded only one species of conservation concern, namely the karoo padloper (*Homopus boulengeri*). This species needs to be considered during the construction and operational phases of the planned infrastructure as they can be sensitive to habitat fragmentation and destruction given their reduced mobility when compared to more mobile taxa.

Table 3.2. List of reptiles that may occur in the project area.

Species	Common name	Conservation status (IUCN)
Acontias breviceps	Short-headed Legless Skink	LC
Acontias gracilicauda	Thin-tailed Legless Skink	LC
Acontias orientalis	Eastern Cape Legless Skink	LC
Afroedura amatolica	Amatola Flat Gecko	LC
Afroedura karroica	Karoo Flat Gecko	LC
Afroedura tembulica	Tembu Flat Gecko	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC
Agama aculeata	Ground Agama	LC
Agama atra	Southern Rock Agama	LC
Amplorhinus multimaculatus	Many-spotted Snake	LC
Aparallactus capensis	Black-headed Centipede-eater	LC
Aspidelaps lubricus	Coral Shield Cobra	LC

Species	Common name	Conservation status (IUCN)
Bitis arietans	Puff Adder	LC
Bitis caudalis	Horned Adder	LC
Bitis inornata	Plain Mountain Adder	DD
Boaedon capensis	Brown House Snake	LC
Bradypodion ventrale	Southern Dwarf Chameleon	LC
Causus rhombeatus	Rhombic Night Adder	LC
Chamaesaura aenea	Coppery Grass Lizard	LC
Chamaesaura anguina	Cape Snake Lizard	LC
Chersina angulata	Angulate Tortoise	LC
Chersobius boulengeri	Karoo Dwarf Tortoise	EN
Chondrodactylus bibronii	Bibron's Gecko	LC
Cordylus cordylus	Cape Girdled Lizard	LC
Crotaphopeltis hotamboeia	Red-lipped Snake/ Red-lipped Herald	LC
Dasypeltis scabra	Rhombic Egg Eater	LC
Dispholidus typus	Boomslang	LC
Duberria lutrix	Common Slug Eater	LC
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC
Hemachatus haemachatus	Rinkhals	LC
Hemidactylus mabouia	Common Tropical House Gecko	LC
Homopus areolatus	Parrot-beaked Tortoise/Padloper	LC
Homopus femoralis	Greater Padloper	LC
Homoroselaps lacteus	Spotted Harlequin Snake	LC
Karusasaurus polyzonus	Karoo Girdled Lizard	LC
Lamprophis aurora	Aurora Snake	LC
Lamprophis fuscus	Yellow-bellied House Snake	LC
Lamprophis guttatus	Spotted Rock Snake	LC
Leptotyphlops conjunctus	Cape Thread Snake	LC
Leptotyphlops nigricans	Black Thread Snake	LC
Leptotyphlops scutifrons	Peter's Thread Snake	LC
Lycodonomorphus inornatus	Olive Ground Snake	LC
Lycodonomorphus laevissimus	Dusky-bellied Water Snake	LC
Lycodonomorphus rufulus	Brown Water Snake	LC
Lycophidion capense	Cape Wolf Snake	LC
Lygodactylus capensis	Common Dwarf Gecko	LC
Meroles knoxii	Knox's Desert Lizard	LC
Naja nivea	Cape Cobra	LC
Nucras lalandii	Delalande's Sandveld Lizard	LC
Nucras livida	Karoo Sandveld Lizard	LC
Nucras taeniolata	Albany Sandveld Lizard	LC
Pachydactylus capensis	Cape Gecko	LC
Pachydactylus geitje	Ocellated Gecko	LC
Pachydactylus maculatus	Spotted Gecko	LC
Pachydactylus mariquensis	Common Banded Gecko	LC
Pachydactylus oculatus	Golden Spotted Gecko	LC
Pedioplanis burchelli	Burchell's Sand Lizard	LC
Pedioplanis inornata	Plain Sand Lizard	LC
Pedioplanis lineoocellata	Spotted Sand Lizard	LC
Pedioplanis namaquensis	Namaqua Sand Lizard	LC
Pelomedusa galeata	South African Helmeted Terrapin	LC
Philothamnus occidentalis	South African Green Snake	LC
Philothamnus semivariegatus	Spotted Bush Snake	LC
Psammobates tentorius	Tent Tortoise	LC
Psammophis crucifer	Cross-marked Whip Snake	LC
Psammophis notostictus	Karoo Sand Snake	LC

Species	Common name	Conservation status (IUCN)
Psammophylax rhombeatus	Spotted Skaapsteker	LC
Pseudaspis cana	Mole Snake	LC
Pseudocordylus microlepidotus	Cape Crag Lizard	LC
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC
Scelotes caffer	Cape Dwarf Burrowing Skink	LC
Stigmochelys pardalis	Leopard Tortoise	LC
Tetradactylus seps	Short-legged Seps	LC
Tetradactylus tetradactylus	Cape Long-tailed Seps	LC
Trachylepis capensis	Cape Skink	LC
Trachylepis homalocephala	Red-sided Skink	LC
Trachylepis occidentalis	Western Three-striped Skink	LC
Trachylepis punctatissima	Speckled Rock Skink	LC
Trachylepis sulcata	Western Rock Skink	LC
Trachylepis varia	Eastern Variable Skink	LC
Trachylepis variegata	Variegated Skink	LC
Tropidosaura montana	Common Mountain Lizard	LC
Varanus albigularis	Rock Monitor/White-throated Monitor	LC
Varanus niloticus	Nile Monitor	LC

3.4.4 Amphibians

The amphibian list (

Table 3.3) was compiled using the application HerpDistributionSA (Rebelo, 2021), which is an amalgamation of all the records from online repositories (FrogMap, 2021 and iNaturalist, 2021) and physical specimen collections (Port Elizabeth Museum and McGregor Museum) collected before December 2021. All species recorded within QDS's 3226CC and 3225DD were listed as potentially occurring within the study area. Whilst comprehensive, the data used by Rebelo (2021) was gleaned from citizen science platforms and thus there may be misidentifications within the quarter degree cells. Whilst every effort has been made to check the distributions of all species of conservation concern, it must be noted that some least concern species, listed in

Table 3.3 may not be found in the area.

The desktop assessment resulted in the recovery of 27 species (

Table 3.3), three of which were of conservation concern. Although *Anhydrophryne rattrayi* (VU), *Cacosternum thorini* (EN) and *Vandijkophrynus amatolicus* (CR) were recovered within the same QDS as the proposed windfarm, they will not occur on the study site as they are Amatola endemics with specialized habitat requirements that are not supported by the proposed study site. They have only been listed in

Table 3.3 to remain consistent with the above methodology. We thus disagree with TBC's (2020) assignment of all three species to a low LOO on the property.

Another thing to note for the area is the status of the giant bullfrog (*Pyxicephalus adspersus*), as natural populations of this species are decreasing according to the most recent IUCN assessment (IUCN, 2017). The species is however still considered least concern (IUCN, 2017). Lastly, whilst Savannah Environmental (2017) included *Vandijkophrynus angusticeps* in their report, it has also been omitted in Table 3.3 as it does not occur in the area.

Table 3.3. List of amphibian species expected to occur in the project area.

Species	Common name	Global conservation status (IUCN)
Amietia delalandii	Delalande's River Frog	LC
Amietia fuscigula	Dark-throated River Frog	LC
Amietia poyntoni	Poynton's River Frog	LC
Anhydrophryne rattrayi	Hogsback Frog/ Rattray's Forest Frog	VU
Breviceps pentheri	Thicket Rain Frog	LC
Breviceps verrucosus	Plaintive Rain Frog	LC
Cacosternum boettgeri	Boettger's Dainty Frog	LC
Cacosternum nanum	Bronze Caco	LC
Cacosternum thorini	Hogsback Caco	EN
Hyperolius marmoratus	Painted Reed Frog/ Marbled Reed Frog	LC
Hyperolius semidiscus	Yellow-striped Reed Frog	LC
Kassina senegalensis	Senegal Land Frog	LC
Phrynobatrachus natalensis	Natal Dwarf Puddle Frog	LC
Poyntonophrynus vertebralis	Southern Pygmy Toad	LC
Ptychadena anchietae	Plain Grass Frog	LC
Pyxicephalus adspersus	African Bullfrog	LC
Sclerophrys capensis	Raucous Toad	LC
Sclerophrys pardalis	Eastern Leopard Toad	LC
Semnodactylus wealii	Weale's Frog	LC
Strongylopus fasciatus	Striped Stream Frog	LC
Strongylopus grayii	Clicking Stream Frog/Gray's Stream Frog	LC
Tomopterna adiastola or tandyi	Confused Sand Frog	LC
Tomopterna delalandii	Cape Sand Frog	LC
Tomopterna natalensis	Natal Sand Frog	LC
Vandijkophrynus amatolicus	Amathole Toad	CR
Vandijkophrynus gariepensis	Karoo Toad	LC
Xenopus laevis	African Clawed Frog	LC

3.4.5 Scorpions

The scorpion list (**Table 3.4**) was compiled using ScorpionMap (QDS 3226CC; ScorpionMap, 2022), iNaturalist (iNaturalist, 2022) and published literature. The desktop assessment resulted in five potential species for the area. None of the scorpion species from the proposed area have been assessed by the IUCN.

Table 3.4. List of scorpions that are expected be found in the project area.

Species	Common Name	Conservation Status IUCN (2017)
Ophistothalmus latimanus	Sideclaw Burrowing Scorpion	N/A
Hadogenes gunningi	Gunning's Rock Scorpion	N/A
Parabuthus planicauda	Drab Thicktail Scorpion	N/A
Uroplectes triangulifer	Highveld Lesser-thicktail Scorpion	N/A
Uroplectes formosus	Fair Lesser-thick Scorpion	N/A

3.5. SITE SURVEY AND METHODOLOGY OF ASSESSMENT

During the surveys of March, April and May 2022, the area around the proposed grid corridor and substation radius site was ground-truthed by foot to determine the relative faunal diversity and density of the area. The species accounts that follow represent an attempt to validate the desktop data and ground-truthing undertaken by previous consultants. Using all the data available to us, we provide recommendations about each taxon (mammals, reptiles, amphibians and scorpions) and the relative impact that the planned infrastructure will have on them.

3.6. RESULTS

3.6.1 Mammals

Twenty-one species of mammal were recorded in the project area during the survey; see **Table 3.5**. When combined with the results of previous studies, this amounts to a total of 36 direct/indirect mammal sightings on the property. Of these, only two animals were of conservation concern. These were *Redunca fulvorufula* (EN) and *Panthera pardus* (EN). Whilst both species are of conservation concern, the planned infrastructure will have little to no effect on these animals given their habits and size, which would enable them to avoid dangers associated with the construction and operations within the development.

Figure 3.1. Springbok ewe (Antidorcas marsupialis) found on the property

The newly conducted surveys did not yield any new species, meaning that the area has the potential to harbour approximately 83 species of mammal, ten of which are of conservation concern globally (IUCN, 2017). While every effort should be made to protect the animals in this area, it must be noted that most of these animals will not be adversely affected by the planned infrastructure provided that the mitigations laid out in the following sections are followed. Much like *Redunca fulvorufula* and *Panthera pardus*, most of these animals (i.e., springboks, **Figure 3.1**) are highly mobile and can avoid the dangers of construction given enough warning (mitigation: walkthrough to flush wildlife). Whilst not of conservation concern, most of the grassland rodents (i.e., mice and rats) and fossorial (i.e., mole rats) mammals are at risk during habitat clearing and construction because of their reduced size. Habitat walkthroughs and search and rescue efforts should thus prioritize these animals as this will reduce the negative impact on these animals.

Additionally, much of the small and meso-mammal diversity and density are concentrated in interspersed rocky outcrops and drainage lines. Provided these areas are appropriately buffered and avoided (as per the mitigations), these animals should avoid harm. This applies directly to *Aonyx capensis* (NT) and *Hydrictis*

maculicollis (NT) that inhabit dams and drainage lines as well as *Mystromys albicaudatus,* which inhabits interspersed rocky outcrops and vegetation clumps (VU).

Table 3.5. List of mammals encountered in the project area. Assessment Encounter denotes whether a species was encountered during this survey or on surveys undertaken by previous consultants. Blank sections indicate that the species were not included in the reports.

Species	Common Name	Conservation Status IUCN (2017)	Assessment Encounter			
			TBC (2020)	Scherman (2022)[51]	Nkuenkuru (2018)	SE (2017)
Aepyceros melampus	Impala	LC	Yes	Yes	Yes	
Antidorcas marsupialis	Springbok	LC	Yes	Yes	Yes	
Caracal caracal	Caracal	LC				Yes
Chlorocebus pygerythrus	Vervet Monkey	LC	Yes	Yes		Yes
Cryptomys hottentotus	African Mole Rat	LC				Yes
Cynictis penicillata	Yellow Mongoose	LC	Yes	Yes		Yes
Damaliscus pygargus phillipsi	Blesbok	LC		Yes	Yes	
**Desmodillus auricularis*	Cape Short-tailed Gerbil	LC			Maybe	
Galerella pulverulenta	Cape Grey Mongoose	LC				Yes
**Gerbilliscus brantsii*	Highveld Gerbil	LC			Maybe	
Genetta genetta	Small-spotted Genet	LC	Yes			
Genetta tigrina	Large-spotted Genet	LC				Yes
Georychus capensis	Cape Mole Rat	LC				Yes
Hystrix africaeaustralis	Cape Porcupine	LC	Yes	Yes	Yes	Yes
Kobus ellipsiprymnus	Waterbuck	LC		Yes	Yes	
Lepus saxatilis	Scrub Hare	LC	Yes	Yes	Yes	Yes
**Mastomys natalensis*	Natal Multimammate Mouse	LC			Maybe	
**Malacothrix typica*	Large-eared Mouse	LC			Maybe	
Orycteropus afer	Aardvark	LC	Yes	Yes	Yes	Yes
Otocyon megalotis	Bat-eared fox	LC		Yes		
Otomys irroratus	Vlei Rat	LC				Yes
Panthera pardus	Leopard	VU	Yes			
Papio ursinus	Chacma Baboon	LC	Yes	Yes		
Potamochoerus larvatus	Bushpig	LC		Yes		Yes
Pedetes capensis	Springhare	LC	Yes	Yes	Yes	
Phacochoerus africanus	Common Warthog	LC	Yes	Yes	Yes	
Procavia capensis	Rock Hyrax	LC	Yes	Yes		
Pronolagus saundersiae	Red Rock Rabbit	LC			Yes	
Raphicerus campestris	Steenbok	LC	Yes	Yes	Yes	
Raphicerus melanotis	Grysbok	LC				Yes

[51] Scherman (2022) refer to the surveys for the BA, i.e. this specialist report.

Species	Common Name	Conservation Status IUCN (2017)	Assessment Encounter			
			TBC (2020)	Scherman (2022)[51]	Nkuenkuru (2018)	SE (2017)
Redunca fulvorufula	Mountain Reedbuck	EN	Yes	Yes		
Rhabdomys pumilio	Four-striped Grass Mouse	LC				Yes
Suricata suricatta	Suricate	LC	Yes	Yes	Yes	
Sylvicapra grimmia	Common Duiker	LC	Yes	Yes	Yes	Yes
Tragelaphus strepsiceros	Greater Kudu	LC		Yes	Yes	
Tragelaphus scriptus	Bushbuck	LC		Yes		Yes
		Species Count	17	21	14	16

*Tentative records from Nkurenkuru (2018) based on a lack of definitive evidence. They have not been included in the species count as they are not confirmed.

3.6.2 Reptiles

Sixteen species of reptile, see **Table 3.6**, were recorded in the project area during the survey; see Table 3.6. When combined with the results of previous studies, this amounts to total of 20 direct/indirect reptile sightings on the property. None of these animals were of conservation concern.

Figure 3.2. Spotted Gecko (Pachydactylus maculatus) found on the property

The newly conducted surveys did not yield any new species, meaning that the area has the potential to harbour approximately 84 species of reptile, one of which is of conservation concern globally (IUCN, 2017). *Homopus boulengeri* is endangered and needs to be considered during the construction and operational phases of the planned infrastructure. This is because, like all other testudines, they can be sensitive to habitat fragmentation and destruction given their reduced mobility and speed when compared to more mobile taxa.

Unlike the mammals, which tend to be larger and more mobile, reptiles are smaller and often occupy smaller home ranges. This means that they are more at risk than mammals when it comes to the construction phase as they may not be able to escape the heavy machinery fast enough to avoid harm. This is especially true of slow-moving tortoises and rupiculous lizards and snakes that would opt rather to hide than to flee in an instance of danger. A good example of this is the spotted gecko (*Pachydactylus maculatus*; **Figure 3.2**) which can be found throughout the property, beneath rocks and fallen allows. Mitigations such as search, and rescue and habitat walkthroughs will be an integral part of preventing harm to these reptiles.

Additionally, many if not most of the reptiles found in this area are closely associated with rocky outcrops. Provided these areas are avoided (as per the mitigations set out in the EMPR below), there should be no negative impact on a large proportion of the reptiles on the property, especially since most of the proposed infrastructure for this report has been placed in Bedford Dry Grassland (SANBI, 2018).

For grassland specialists, such as grass lizards (C*hamaesaura*), seps (*Seps*), and whip snakes (Psammophiids), a walkthrough of the proposed line will be important to flush these often-fast-moving reptiles out of the immediate area. For slower-moving, wide ranging species such as tortoises, search and rescue will be important as it will allow the safe relocation of the animals. Lastly, it must be noted that the termite mounds that characterize the Bedford Dry Grasslands likely harbour high densities and diversities of reptile, especially in the winter months. The construction of this development will thus necessitate the destruction of large densities of termite mounds. It is tantamount to the approval of this project that these termite mounds are dismantled in a controlled way prior to construction, to ensure that any reptiles using this refugia can be relocated safely out of the construction footprint. This will be discussed at length in the following sections.

All reptiles that inhabit the riparian zones and drainage lines should be buffered by the buffer zones imposed on these areas and thus they need not be discussed here. While every effort should be made to protect the animals in this area, it must be noted that most of these animals will not be badly affected by the planned infrastructure provided the mitigations, as laid out in this report, are followed.

Table 3.6. List of reptiles encountered in the project area. Assessment Encounter denotes whether a species was encountered during this survey or on surveys undertaken by previous consultants. Blank sections indicate that the species were not included in the reports.

Species	Common Name	Conservation Status IUCN (2017)	Assessment Encounter			
			TBC (2020)	Scherman (2022)	SE (2017)	Nkurenkuru (2018)
Agama atra	Southern Rock Agama	LC	Yes	Yes	Yes	Yes
Bitis arietans	Puff Adder	LC			Yes	
Boaedon capensis	Brown House Snake	LC	Yes			
Chersina angulata	Angulate tortoise	LC		Yes	Yes	
Cordylus cordylus	Cape Girdles Lizard	LC	Yes	Yes		
Stigmochelys pardalis	Leopard Tortoise	LC	Yes	Yes		Yes
Homopus areolatus	Parrot-beaked padloper	LC		Yes		
Karusasaurus polyzonus	Karoo Girded Lizard	LC		Yes		
Leptotyphlops nigricans	Black Thread Snake	LC		Yes		
Naja nivea	Naja nivea	LC			Yes	
Nucras lalandii	Delalandes' Sandveld Lizard	LC		Yes		Yes
Pachydactylus maculatus	Spotted Gecko	LC	Yes	Yes		
Psammophis notostictus	Karoo Whip Snake	LC		Yes		
Psammophylax rhombeatus	Spotted Skaapsteker	LC		Yes	Yes	

Species	Common Name	Conservation Status IUCN (2017)	Assessment Encounter			
			TBC (2020)	Scherman (2022)	SE (2017)	Nkurenkuru (2018)
Pedioplanis lineoocellata pulchella	Common sand lizard	LC	Yes	Yes		
Pedioplanis burchelli	Burchell's Sand Lizard	LC		Yes		
Pseudocordylus microlepidotus fasciatus*	Karoo Crag Lizard	LC	Yes			
Trachylepis varia	Variable skink	LC		Yes	Yes	
Trachylepis capensis	Cape skink	LC		Yes	Yes	
Varanus albigularis	Rock Monitor	LC			Yes	Yes
		Species Count	7	16	8	4

* This record is most likely erroneous as the picture associated with the record is a mis-identified Karoo girdled lizard *(Karusasaurus polyzonus).*

3.6.3 Amphibians

Five species of amphibian were recorded in the project area during the survey; see **Table 3.7**. When combined with the results of previous studies, this amounts to a total of seven direct amphibian sightings on the property. None of these animals were of conservation concern. The newly conducted surveys did not yield any new species, meaning that the area has the potential to harbour approximately 24 species of amphibian, none of which are of conservation concern globally (IUCN, 2017).

Figure 3.3. Boettger's Caco (Cacosternum boettgeri) found on the property

Unlike both the mammals and the reptiles, most of the frogs found on the property will be restricted to drainage lines, natural wetlands, dams and the areas directly adjacent to these waterbodies. Because of this, most of the frogs found on the property will benefit from the mandatory buffers afforded to all aquatic bodies on the property. Whilst most frogs are protected within the buffers, there is still a substantial amount of amphibian biodiversity that can be found in the grasslands (i.e. *Breviceps*) and rocky outcrops (i.e., *Sclerophrys, Cacosternum* (**Figure 3.3**)*, Tomopterna*). To ensure the wellbeing of these animals, the mitigatory protocols (search and rescue, habitat walkthroughs, rocky outcrop avoidance) discussed below, need to be implemented across the property.

Roads that dissect watercourses need to strictly adhere to legislation to avoid siltation and water flow issues as this will severely impact the amphibian communities that rely on these systems for sustenance and to complete their life cycles. This is similarly true of aquatic invertebrates like fairy shrimp and copepods, which rely on the sporadic inundation within the drainage lines to complete their life cycles. Both the amphibians and the aquatic macroinvertebrates that can be found in the dwindling pockets of pristine habitat across the property (because of overgrazing, soil erosion, damming and siltation) should be protected over the entire course of the project. These organisms contribute to nutrient cycling, ecosystem functioning and food web health meaning that mitigatory protocols must be strictly adhered to when on site.

Table 3.7. List of amphibians encountered in the project area. Assessment Encounter denotes whether a species was encountered during this survey or on surveys undertaken by previous consultants. Blank sections indicate that the species were not included in the reports.

Species	Common Name	Conservation Status IUCN (2017)	Assessment Encounter			
			TBC (2020)	Scherman (2022)	SE (2017)	Nkurenkuru (2018)
Cacosternum boettgeri	Boettger's caco	LC		Yes	Yes	
Kassina senegalensis	Bubbling kassina	LC			Yes	
Sclerophrys capensis	Raucous toad	LC			Yes	
Semnodactylus wealii	Rattling frog	LC		Yes		
Tomopterna tandyi	Tandy's sand frog	LC		Yes		
Vandijkophrynus gariepensis	Karoo toad	LC		Yes		
Xenopus laevis	Common platanna	LC		Yes	Yes	
		Species Count	0	5	4	0

3.6.4 Scorpions

Four species of scorpion were recorded in the project area during the survey; see **Table 3.8**. No previous study of the region has considered scorpions, so when compared with the desktop assessment, the area is expected to harbour five species of scorpion.

Figure 3.4. Ophistothalmus latimanus found on the property

Although no species of concern (scorpions not yet assessed by IUCN) have been recorded within the study area, it must be noted that scorpion density on the property is high, especially in the rocky areas (i.e, *Ophitothalmus latimanus*; **Figure 3.4**). The scorpions found here likely contribute to ecosystem functioning and food web health, making them an integral component of the ecosystem. It is thus tantamount to the authorisation of the proposed 66kV overhead power line, access tracks and water course crossing infrastructure within the 300m development corridor and the on-site substation within the 300m development radius that these animals are considered during the construction and operational phases of the project.

As most of the species are limited to the rocky outcrops it is important that these areas are avoided (mitigation: buffers around rocky outcrops) and where this is not possible, search and rescue (mitigation: walkthrough of area prior to construction) is implemented to relocate scorpions out of the infrastructure footprint. As most of the construction footprint falls within Bedford Dry Grassland, the planned infrastructure is not likely to negatively affect the scorpions on the property provided the mitigations, mentioned below, are adhered to.

Table 3.8. List of scorpions encountered in the project area. Assessment Encounter denotes whether a species was encountered during this survey or on surveys undertaken by previous consultants. Blank sections indicate that the species were not included in the reports.

Species	Common Name	Conservation Status IUCN (2017)	Assessment Encounter			
			TBC (2020)	Scherman (2022)	SE (2017)	Nkurenkuru (2018)
Ophistothalmus latimanus	Sideclaw Burrowing Scorpion	NA		Yes		
Hadogenes gunningi	Gunning's Rock Scorpion	NA		Yes		
Parabuthus planicauda	Drab Thicktail Scorpion	NA		Yes		
Uroplectes triangulifer	Highveld Lesser-thicktail Scorpion	NA		Yes		
		Species Count	0	4	0	0

3.7. IMPACT ASSESSMENT (FAUNA)

This section will assess direct, indirect, and cumulative impacts associated with the construction of the following 66kV overhead double circuit line (22.7km), the 300m buffer associated with the line and 33kV/132kV on-site substation (250 x 200m) with an associated buffer radius of 300m.

3.7.1 Existing Impacts to Terrestrial Fauna

Wind farms and infrastructure: the existing infrastructure has altered the environment resulting in the loss of habitat for a wide range of fauna.

Livestock: the introduced livestock have modified the habitat through the homogenization of previously heterogeneous habitat resulting in the loss of food, shelter, and habitat for indigenous fauna.

Fences: fences impede the movement of medium and large-bodied fauna and can cause mortality in meso-ungulates (i.e., springboks) and large leopard tortoises (*Stigmochelys pardalis*) when they get stuck in the barbed wire or between low-hanging wire strands.

Roads and traffic: roadkill is one of the greatest causes of mortality in reptiles, amphibians, mammals, and birds. Given the intricate road networks that connect turbines and infrastructure across the study site, roadkill is likely one of the largest existing causes of direct mortality for terrestrial fauna, on the property.

Table 3. 9. List of potential impacts affecting the terrestrial fauna over the course of the project.

Phase	Expected Impacts
Construction Phase	Habitat loss, destruction, and fragmentation
	Noise, vibration, waste, and dust pollution
	Unintentional faunal mortality
	Intentional faunal mortality/displacement
Operational Phase	Habitat degradation
	Roadkill
	Intentional faunal mortality/displacement

3.7.2 Construction Phase

Table 3.10. Impact 1: Habitat loss, destruction, and fragmentation.

Nature: The planned infrastructure will require the clearing of large tracts of pristine habitat for the roads, the road buffers and the substation. This will include physical removal of vegetation and rocky outcrops to create corridors for infrastructure. This fragments the environment and affects the movement of fauna. This also indirectly alters species compositions and provides suitable habitat for alien invasions. The fragmentation, destruction and degradation of habitat will cause indirect mortality to terrestrial fauna through the loss of habitat (i.e., food, shelter, water, predator avoidance).		
	Without mitigation	**With mitigation**
Extent	Low (2)	Very Low (1)

Duration	Long-term (4)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (48)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Medium
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

- Construction needs to be limited to the designated footprint.
- Where rocky outcrops are unavoidable, a suitable specialist must be tasked with checking the area for fauna and removing any animals. The rocks should thereafter be relocated to a suitable habitat away from infrastructure so that they can be recolonized again by wildlife. Rocks should not be placed directly adjacent to the road as this creates ideal habitats which fauna will inhabit, subjecting them to increase mortality from roadkill.
- Areas that have been cleared during the construction phase need to re-vegetated with a similar species composition to ensure the areas are not colonised by opportunistic and alien species, which indirectly alters the biotic and abiotic landscape for terrestrial fauna.
- The affected area must be monitored for invasive vegetation and cleared and controlled when necessary. Alien vegetation homogenizes the ecosystem and causes additional indirect losses of habitat and fragmentation.

Residual Impacts:

The loss of habitat is unavoidable irrespective of whether mitigation is employed. Habitat clearing and infrastructure development will cause the loss and fragmentation of habitat, which will affect the distributions and densities of fauna within the infrastructure footprint. Habitat degradation can be limited, and broad sweeping habitat loss can be avoided provided the above mitigations are adhered to.

Table 3.11. Impact 2: Noise, vibration, waste, and dust pollution.

Nature:

The planned construction process will result in the pollution of the immediate construction area its buffers. Whilst suspended dust has a nominal effect on the terrestrial fauna, the vibration and noise pollution will affect the behaviors of terrestrial and fossorial animals, which could lead to actions that cause harm or death (i.e., ungulates run into fences, reptiles flee shelter and get predated on). Additionally, the construction process will require the use of water, chemicals, and raw materials that, if poorly managed, could pollute the immediate surroundings. The most sensitive areas are the various waterbodies scattered across the site that support a plethora of organisms. Drainage lines are particularly vulnerable as mismanaged runoff from the construction process could filter into ephemeral ponds and negatively affect both the organisms that live in the water, and the organisms that rely on the water for hydration.

	Without mitigation	**With mitigation**
Extent	Low (2)	Very Low (1)
Duration	Medium-term (3)	Very Short Duration (1)
Magnitude	High (6)	Very Low (2)
Probability	Highly Probable (4)	Improbable (2)
Significance	**Medium (44)**	**Low (8)**

Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	

Mitigation:

- Minimize the noise pollution by abbreviating construction time. Refrain from working at night to minimize effect on nocturnal predators and prey that rely on audible cues.
- Minimize light pollution by ceasing construction at night. Lights along the route and to the substation need to keep to a minimum. Red lights should be used where possible to reduce impact on nocturnal species.
- Develop and adhere to a waste management protocol to ensure the waste products produced during the construction process are not exported into the system. Water and chemicals used during the construction process must be adequately managed to ensure that there is no interference with natural aquatic systems, especially near wetlands and drainage lines.

Residual Impacts:

There will be unavoidable impacts on terrestrial fauna despite mitigations. These will likely come in the form of behavioral shifts with animals moving away from excessive sources of noise and vibration (potentially putting them at risk). This is however nominal and will only be a factor during the construction process. Pollution and more especially aquatic pollution is completely avoidable provided the mitigations mentioned above are adhered to.

Table 3.12. Impact 3: Unintentional faunal mortality.

Nature:

This applies to the direct unintentional mortality of terrestrial fauna. Unintentional mortality relates to animals dying during the construction process through the use of construction tools and/or machinery (i.e. animals crushed or lacerated).

	Without mitigation	**With mitigation**
Extent	Low (2)	Very Low (1)
Duration	Medium-term (3)	Short Duration (2)
Magnitude	Low (4)	Very Low (2)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (36)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Medium
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	

Mitigation:

- All workers need to undergo an induction prior to entering the site that informs them about the animals in the area and the best practices for avoiding animal mortality and displacement.
- Construction needs to be limited to the designated footprint.
- Construction needs to cease at night to ensure that cryptic nocturnal fauna are not harmed.
- All construction routes need to receive a walkthrough to flush any animals out in the immediate vicinity. A suitable specialist must be consulted to remove animals that do not move of their own accord.

- Responsibilities of the specialist will include checking burrows, dismantling termite mounds, and flipping rocks and logs. All encountered animals during this process need to be moved clear of the construction site to suitable site in accordance with national and provincial legislation. We must stress the importance of the controlled dismantling of termite mounds as they harbour high diversities of a wide range of small and meso-vertebrates and invertebrates. Animal densities will be higher in termite mounds in the colder months so encounter rates will definitely shift depending on the season of construction.

Residual Impacts:

Whilst unintentional human-mediated faunal mortality is unavoidable due to the secretive nature of most wildlife, adherence to the above mitigations would render the residual impacts negligible.

Table 3.13. Impact 4: Intentional faunal mortality/displacement.

Nature:

Intentional mortality relates to people killing or harming animals during the construction process either out of fear or apathy for the wildlife. Intentional displacement refers to the harvesting of fauna either dead or alive for medicinal or commercial purposes (i.e., poaching for pet trade).

	Without mitigation	**With mitigation**
Extent	Low (2)	Very Low (1)
Duration	Medium-term (3)	Very Short Duration (1)
Magnitude	Low (4)	Very Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (45)**	**Low (9)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	

Mitigation:

- All workers need to undergo an induction prior to entering the site that educates them on wildlife that they may encounter in the field with the goal of mitigating fear associated with these animals. Specific attention should be brought to animals that have a substantial amount of stigma associated with them (i.e., snakes, toads, owls).
- Faunal experts should be approached to produce educational material about the animals associated with the area and where necessary, awareness talks should be given to workers to minimize human-animal conflict (i.e., snake awareness and snakebite talks).
- Signs need to be erected around the property that stipulate that faunal harvesting is illegal and that legal action will be sought if workers are caught harvesting or poaching wildlife.
- A select cohort of workers should be given specialized snake handling courses to ensure all on-site interactions with potentially dangerous wildlife are appropriately and safely handled.

Residual Impacts:

Complete adherence to the proposed mitigations will result in the complete resolution of the above impact. However, given the fear, stigma, and superstition associated with certain animals, there will always be some degree of impact. Adherence to the mitigations, even partially, will substantially mitigate this impact.

3.7.3 Operational Phase

Table 3.14. Impact 1: Habitat degradation.

Nature: The planned infrastructure will require maintenance and upkeep to ensure that negative effects are not exported into the adjacent environment following the construction process. Whilst the degree of habitat loss, degradation and fragmentation is lower than in the construction phase, the continued use of the infrastructure poses a threat to the immediate environment in the form of excess water run-off, soil, habitat destruction, and invasive species colonization.		
	Without mitigation	**With mitigation**

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