BIOLOGICAL PRE-CONSTRUCTION WALKTHROUGH ASSESSMENT:

Final Layout

140MW Sutherland Wind Energy Facility (DFFE Ref: 12/12/20/1782/2/AM6) and Grid Connection Infrastructure (DFFE Ref: 14/12/16/3/3/1/2077/AM2; 14/12/16/3/3/1/2457/AM1 & 14/12/16/3/3/1/2458) near Sutherland in the Northern & Western Cape Provinces.

Environmental consultant: **Nala Environmental (Pty) Ltd**

Client: **Sutherland Wind Farm (Pty) Ltd**

29 November 2022

BIOASSETS
biological assessments

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EXECUTIVE SUMMARY

- During the walk through, numerous small patches of sensitive areas (e.g. rocky outcrops, ridges and bedrock sheets) have been identified within the footprint of proposed infrastructure development (turbine positions, powerline corridor and the road layout).
- The importance of sensitive habitats are accentuated within the area and include the rocky outcrops, bedrock sheets, ridges and low lying areas (drainage lines).
    - The sensitivity is linked to habitats for vegetation and animals in the area.
    - The reason for the high sensitivity of these habitat types are related to the diversity for plants, specifically red data and protected species.
    - It was noted that although lower densities of plants were recorded, the diversity on the rocky areas were generally higher.
    - Many of the geophytes known from the vegetation unit are associated with the wetter, deeper soils associated with the drainage lines and the sandy patches around the rocky areas.
    - It is therefore important to protect these areas that form part on the mosaic pattern of the landscape.
- The dynamic landscape with its mosaic pattern makes it difficult to map each individual area and therefore it is not possible to indicate all these areas on a sensitivity map.
    - It will be important to take this feature of the environment into consideration when planning the final layout of the facility and placement of pylons related to the authorised powerlines.
    - Limited information and available data from the area results in low confidence in a detailed species list of plants present on the study site. It is therefore important to limit impacts outside of the final approved footprint during the development of the facilities.
    - The current presence and distribution of the protected plant species are affected by the historic land use practices in the area that include heavy grazing pressure and trampling. Selective grazing pressure on palatable species resulted in the decline of certain plants species over the last decades.
    - The relationship between species and the importance of diversity within the plant community is critical and can result in the loss of sensitive species (e.g. loss of cover). Heavy grazing may not be the only impact on geophytes diversity decline, but the feeding of rodents on the bulbous parts are considered an additional impact (especially during dry periods).
- Another factor that can't be ignored is the changes in the climatic conditions.
    - A number of the species listed as rare and endangered (e.g. the Species of Conservation Concern - SCC) prefer more moist conditions and habitats. With the changes in the rainfall patterns, these plants will experience additional pressure in the ecosystem for example the recent extended drought experienced in the larger Karoo region.
    - It was noted by van der Merwe et al (2008) that lower rainfall and a decrease in snowfall (one light event compared to 6 over a 24-year period) were noted during their study in 2004. Linked to this are changes in precipitation patterns that include localised rain events. These differences across the area will have an effect on the

growth of some plants, i.e. time of the year related to its natural growth and flowering regime.

- Table 5.1 is a brief summary of the comments related to the final layout of turbine positions and grid connection (as applicable) and comments and recommendations (mitigation) to be considered and included within the relevant Environmental Management Programmes (EMPrs).
    - The layout for the roads related to the wind energy facility (WEF) is confirmed and for most sections as per the road layout and buildable areas provided by the Developer. It is important that a spring survey of the approved layout must be conducted in order to finalise the applications for permits (red data and protected species) prior to the commencement of construction and site clearing related activities.
    - This assessment will be on the full final approved layout in order to ascertain the presence and/or absence of the protected plants in the footprint of the final approved layout. It is important to apply for the applicable permits from the conservation authorities before construction related activities can commence.
    - The mitigation recommendations are captured in detail in Table 4.1. The main issues are as follows:
        - The maintenance of the basal layer during construction. This will entail that all low vegetation (<300mm) is kept. This will ensure that there is a ground cover that will lower the risk of erosion and act as a source of organic material and seeds to assist with regrowth in the wet season.
        - Erosion is a concern and traffic must be limited at all times. The use of smaller vehicles where possible is preferred. Unnecessary travel with large vehicles and cranes must be avoided. Plan construction and deliveries to ensure that single trips achieve maximum activity.
        - Make use of single entry and exit routes.
        - All activities must take place within the final approved footprint – no activities outside these areas are allowed and must be enforced rigorously.
        - Where possible, rocky areas must be avoided during construction and travel – these areas are important habitat for animals and plants. It is accepted that animals will move away during construction, but if the habitat is protected, recolonization after construction is probable.
- It is important to note that permits for the removal and destruction of red data and protected plants must be acquired prior to construction related activities commencing.

Final Statement – acceptance of layout

- As noted in Table 5.1, **the layout for the WEF and its associated infrastructure is accepted**.
- The **corridor for the grid power line to the Koring MTS is accepted**.
- The **area for the proposed Koring MTS is accepted in relation to the vegetation assessment**.
- In all the above areas, a spring walk down of the approved layout must be done to finalise the plant species present after the rains. This must be done in order to finalise the permit applications for the removal/destruction of the red data and protected plant species in the final approved layout of the WEF, the roads associated with the area and the associated

infrastructure which include the substation and internal power grids (both aerial and subterranean).

Contents

DECLARATION OF INDEPENDENCE

The Environmental Impact Assessment Regulations (Regulation 17 of Government Notice No R354 of 2010), requires that certain information is included in specialist reports. The terms of reference, purpose of the report, methodologies, assumptions and limitations, impact assessment and mitigation (where relevant to the scope of work) and summaries of consultations (where applicable) are included within the main report. Other relevant information is set out below:

Expertise of author:

- Working in the field of ecology (fauna and flora) since 1996.
- Worked in the field of freshwater ecology and wetlands since 2000.
- Involved with visual assessments since 2009.
- Is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (Reg. No. 400109/95).

Declaration of independence:

BioAssets CC in an independent consultant and hereby declare that it does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). In addition, remuneration for services provided by BioAssets CC is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

Disclosure:

BioAssets CC undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and will provide the competent authority with access to all information at its disposal regarding the application, whether such information is favourable to the applicant or not.

Based on information provided to BioAssets CC by the client and in addition to information obtained during the course of this study, BioAssets CC present the results and conclusion within the associated document to the best of the author's professional judgement and in accordance with best practise.

_____ 29 November 2022

Dr Wynand Vlok Date

1 INTRODUCTION

1.1 Project Background and Description of the Activity

Sutherland Wind Farm (Pty) Ltd received an Environmental Authorisation (EA) (DFFE Ref: 12/12/20/1782/2) dated (22/02/2012), for the development of a 140MW Sutherland Wind Energy Facility (WEF) and associated infrastructure near Sutherland and located within the Komsberg Renewable Energy Development Zone (REDZ) in the Northern and Western Cape Provinces, with further amendments to the EA as stated below:

- Replacement of the first issue EA Reference: 12/12/20/1782/2 issued on 10 November 2016;
- First Amendment - Amendment of Listed activities on the EA Reference: 12/12/20/1782/2/AM1 issued on 25 November 2016;
- Second Amendment – Amendment of turbine specifications & change of technical details of the proposed facility EA Reference: 12/12/20/1782/2/AM2 issued on: 25 August 2017;
- Third Amendment – Change in contact details of the holder of the EA & selected project description changes EA Reference: 12/12/20/1782/2/AM3 issued on 10 March 2020;
- Fourth Amendment - Name correction EA Reference: 12/12/20/1782/2/AM4 issued on 08 June 2020;
- Fifth Amendment – Extension and name change to SPV EA Reference 12/12/20/1782/2/AM5 issued on 20 July 2021;
- Sixth Amendment - Amendment to the co-ordinates of the access road EA Reference: 12/12/20/1782/2/AM6 issued on 06 December 2021.

The project will include (as authorised):

- Up to 34 wind turbines with a height of up to 200m and rotor diameter of up to 200m.
- The wind turbines will be connected to another by means of medium voltage cable.
- An internal gravel road network will be constructed to facilitate movement between turbines on site. These roads will include drainage and cabling.
- A hard standing laydown area of a maximum of 10 000m^2 will be constructed; and
- A temporary site office will be constructed on site for all contractors, this would be approximately 5 000m^2 in size.
- A 10 km portion of the existing access road will be upgraded and widened to a width of 7m to facilitate abnormal loads to the Sutherland WEF site.

The properties associated with the Sutherland WEF include:

- Portion 1 of Beeren Valley Farm 150;
- Remaining Extent of Beeren Valley Farm 150;
- Portion 1 of Boschmanskloof Farm 9;
- Remaining Extent of Nooitgedacht Farm 148.

The Sutherland Wind Farm (Pty) Ltd also received EAs for a new proposed onsite substation and associated electrical grid infrastructure to support issued on 14 March 2022 for the Sutherland WEF in the Northern Cape Province of South Africa. The EA for the onsite substation has been split into an

Independent Power Producer (IPP) Portion EA Reference 14/12/16/3/3/1/2458, Switching Station Portion and 132 kV powerline EA Reference 14/12/16/3/3/1/2457.

The infrastructure associated with the IPP Portion of the on-site substation is located on Remaining Extent of Nooitgedacht Farm 148 and includes:

- An IPP portion of the on-site substation (Acrux);
- Laydown area;
- Operation & Maintenance (O&M) Building;
- Fencing of the proposed on-site substation; and
- Battery Energy Storage Infrastructure (BESS).

The infrastructure associated with the Switching Station Portion of the on-site substation and 132kV powerline is located on Remaining Extent of Nooitgedacht Farm 148 (DFFE Ref: 14/12/16/3/3/1/2457/AM1) includes:

- Switching Station portion of the on-site substation;
- Fencing;
- 132 kV distribution line from the proposed Sutherland WEF on-site substation to the Koring Main Transmission Substation (MTS) third party substation including tower/pylon infrastructure and foundations;
- Connection to the Koring MTS third party substation; and
- Service road below the powerline.

The Sutherland Wind Farm (Pty) Ltd has also been issued with an EA for Electrical Grid Infrastructure that supports the Sutherland, Sutherland 2 and Rietrug WEF, Northern & Western Cape Provinces (Ref; 14/12/16/3/3/1/2077/AM2) authorised within a 500 m grid corridor.

The infrastructure associated with the project includes:

- Koring Main Transmission Substation (MTS) including O&M building and laydown area;
- Fencing of the proposed on-site substation;
- Overhead 132 kV powerline from the Sutherland WEF on-site substation to the Koring MTS;
- Overhead 400 kV powerline connecting to the proposed 400 kV Koring MTS and an existing 400 kV Eskom powerline: and
- Service roads will be constructed below the powerline (jeep tracks).

The properties associated with the Electrical Grid Infrastructure to support the Sutherland WEF includes:

- Remaining extent of Hartebeeste Fontein Farm 147;
- Remaining Extent of Nooitgedacht Farm 148;
- Remaining Extent of Beeren Valley Farm 150;
- Portion 1 of Farm 219;
- Remaining extent of Farm 219;
- Remaining extent of Farm 280;
- Portion 1 of Rheebokkenfontein Farm 4;

- Portion 2 of Rheebokkenfontein Farm 4;
- Portion 2 of De Molen Farm 5;
- Portion 6 of Hamelkraal Farm 16;
- Portion 7 of Hamelkraal Farm 16; and
- Remainder of Spitzkop Farm 20.

The Sutherland WEF has been awarded preferred bidder status in Round 5 of the Renewable Energy IPP Procurement Programme (REIPPPP) and in order to meet financial close requirements and comply with the requirements of the EAs (as amended), as per conditions 16 and 18 which specifies that the applicant must submit a Final Layout plan and EMPr to DFFE for written approval prior to commencement of the activity.

Nala Environmental (Pty) Ltd has been commissioned to undertake the Final Layout plan and EMPr associated with the authorised WEF and its authorised grid infrastructure. As per the conditions of the relevant EAs various specialist pre-construction walkthroughs have been undertaken to inform the placement of infrastructure for the Final Layout.

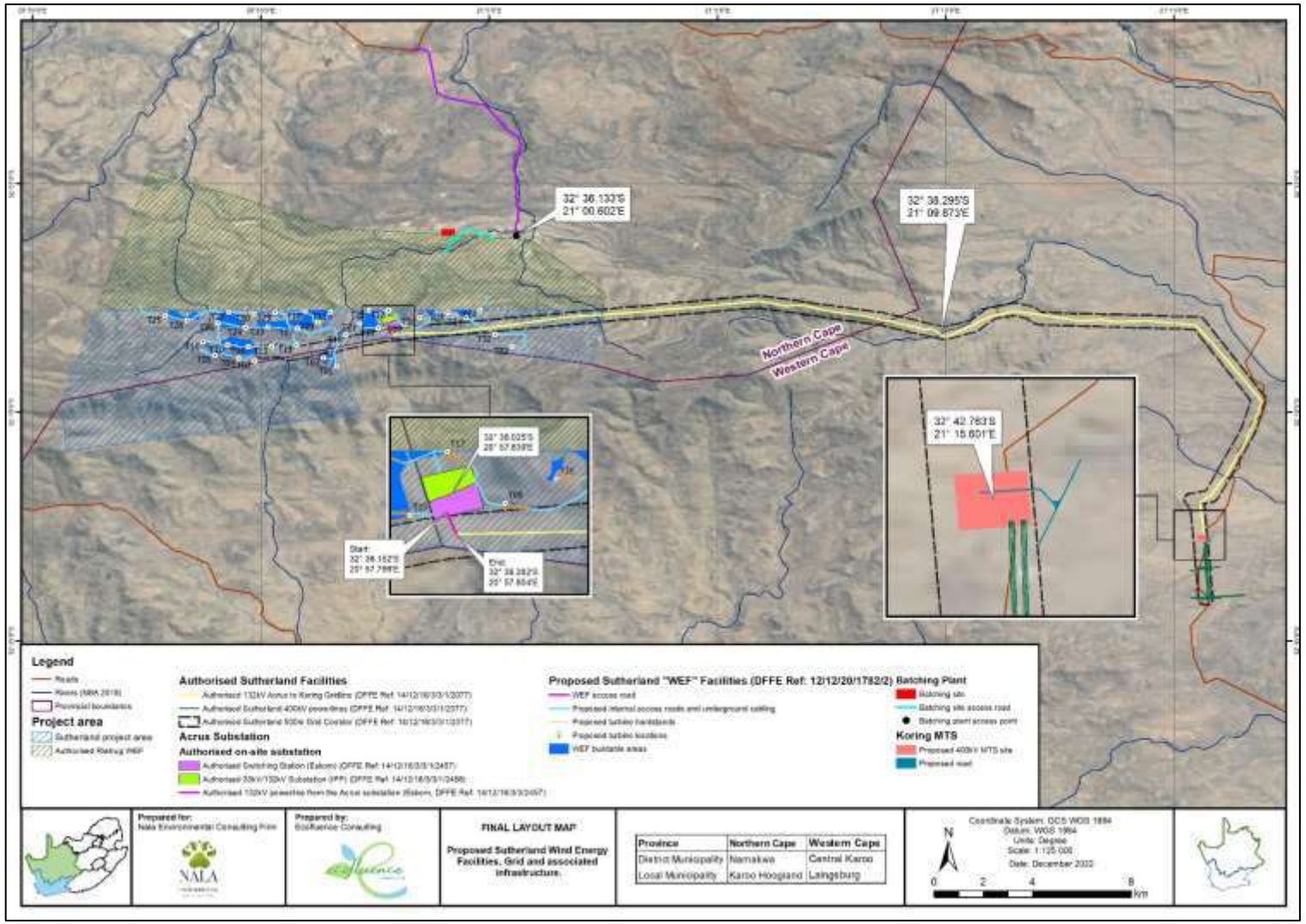


Figure 1.1: Proposed layout of the turbines for the Sutherland WEF project.

1.2 Terms of Reference

This verification report includes the following:

- A detailed walk through survey of the proposed infrastructure associated with the Sutherland WEF and grid connection infrastructure in relation to ecological sensitivities previously identified during the EIA and Basic Assessments for the project. Turbine positions, internal roads and cable crossings, substation inverters and transformer sites and connection routes to the distribution and transmission networks (as provided by the proponent and depicted in Figure 1.1) were investigated on foot to confirm the occurrence of sensitive species and habitats.
- The findings of the detailed walk through identified any potential areas of concern or fatal flaws and sensitive and “no-go” areas.
- Recommendations whether any additional buffer zones will be required to be added to the buffer zones previously determined.
- Recommend whether any approvals and permits are required from the relevant authorities.
- Recommend whether any changes to the proposed layout are required, due to the presence of sensitive and “no-go” areas.
- The identification of changes or additions to mitigation measures required to avoid, manage or alleviate the impacts associated with the proposed project and an indication of any additional mitigation measures and recommendations for inclusion in the EMPr’s or specific conditions to be included in the Amended EA (should this be granted by the DFFE). Screening Tool Reports (STRs) were produced for the proposed development intentions in the context of the project layout (Figure 1.2, 1.3, 1.4, 1.5, 1.6 and 1.7).
- The pre-construction terrestrial walkthrough and assessment will include a rapid faunal and floral survey within the areas indicated in Figure 1.1, however, important features adjacent to these areas are included in the assessments.

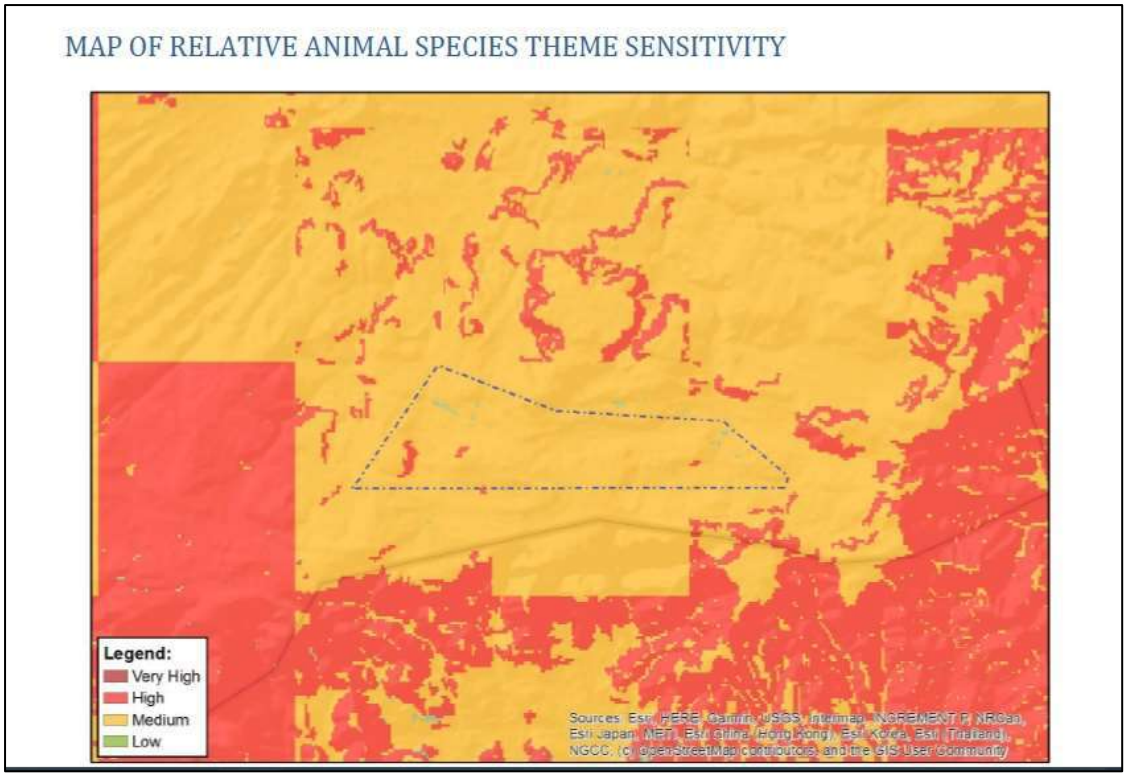


Figure 1.2: Terrestrial Animal Sensitivity Theme for the proposed Rietrug WEF project as reflected in the Screening Tool report.

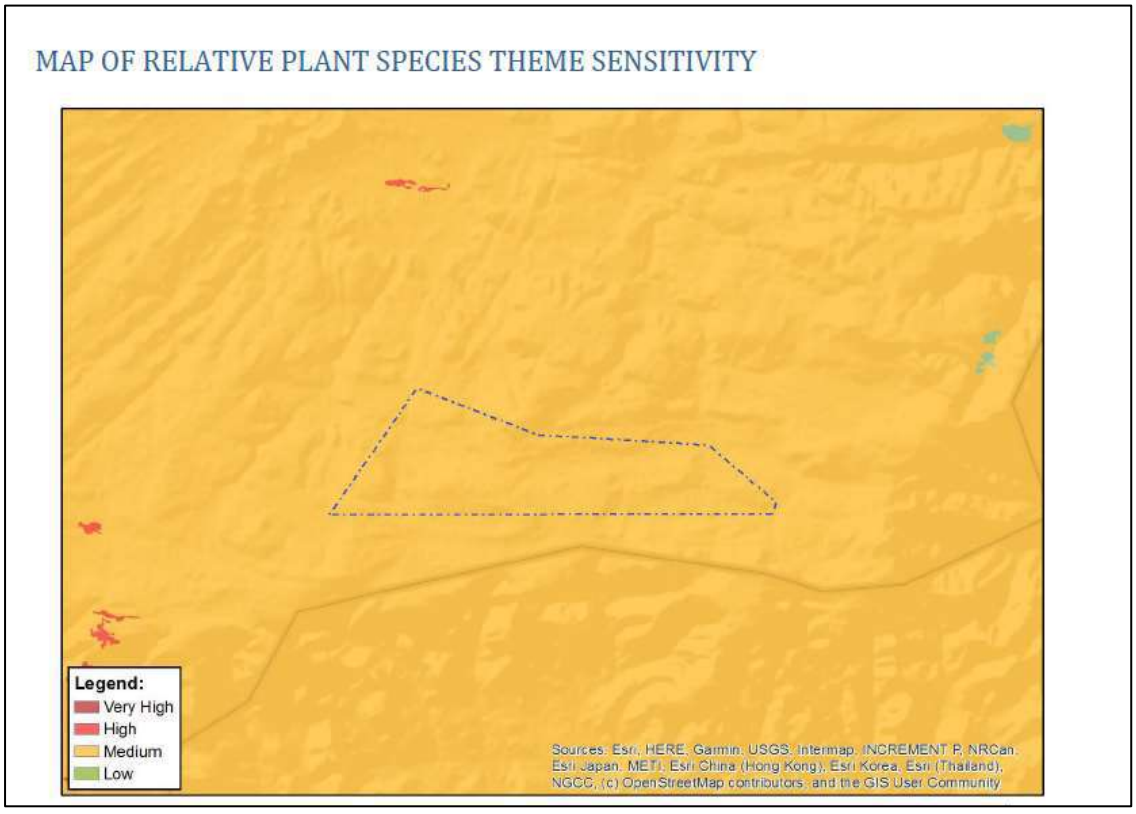


Figure 1.3: Terrestrial Plant Theme for the proposed Rietrug WEF project as reflected in the Screening Tool report.

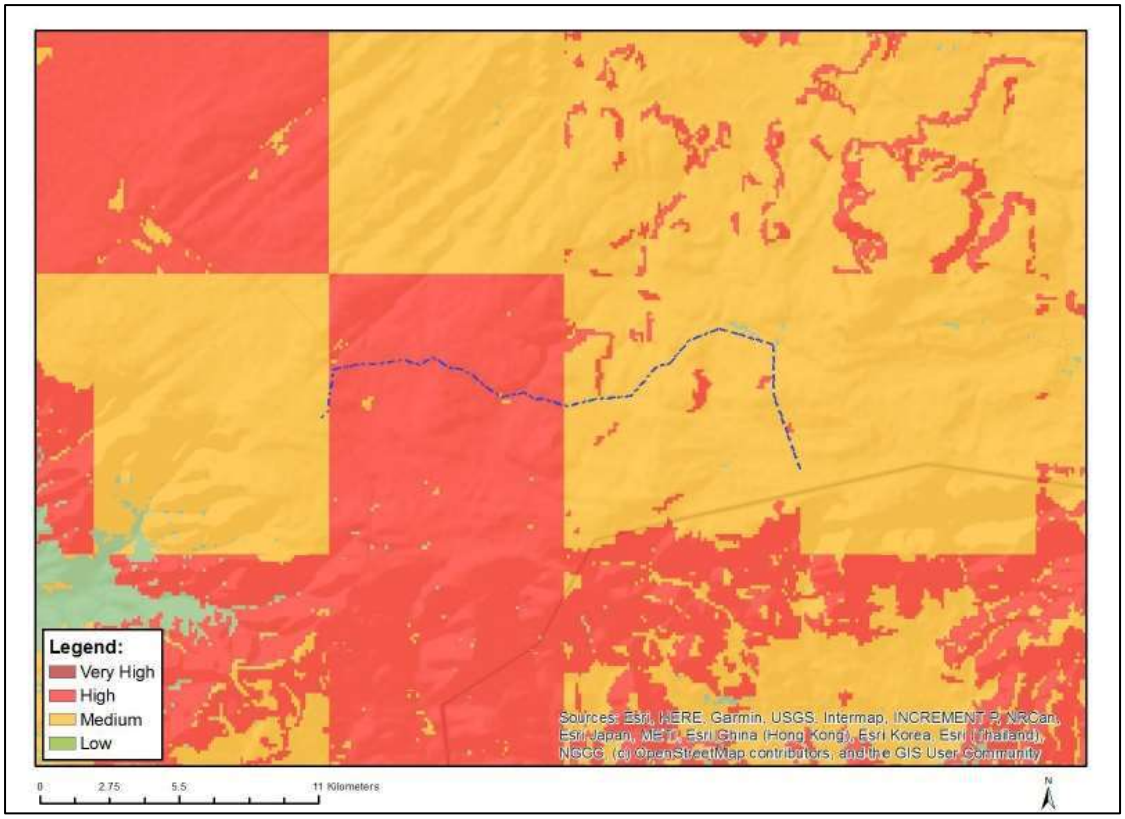


Figure 1.4: Terrestrial Animal Sensitivity Theme for the proposed 132kV power line grid between Rietrug WEF and Koring MTS project as reflected in the Screening Tool report.

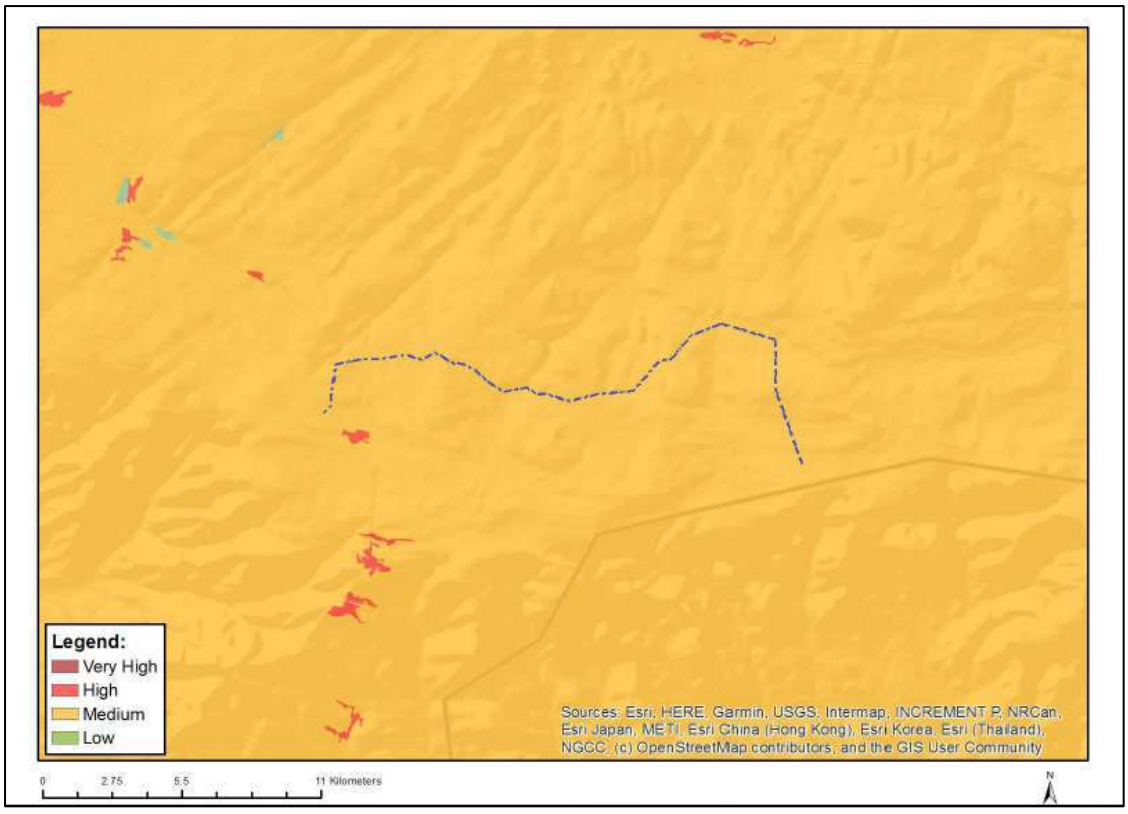


Figure 1.5: Terrestrial Plant Theme for the proposed 132kV power line grid between Rietrug WEF and Koring MTS project as reflected in the Screening Tool report.

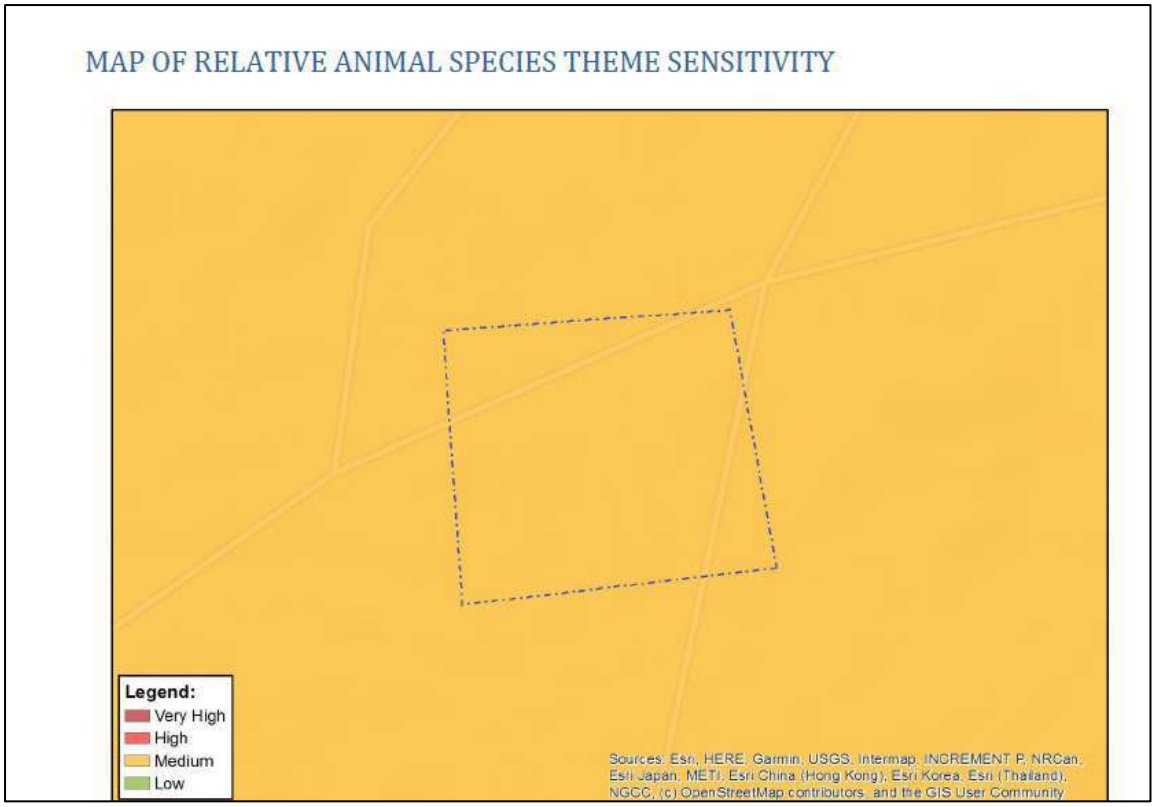


Figure 1.6: Animal Theme for the Koring MTS project as reflected in the Screening Tool report.

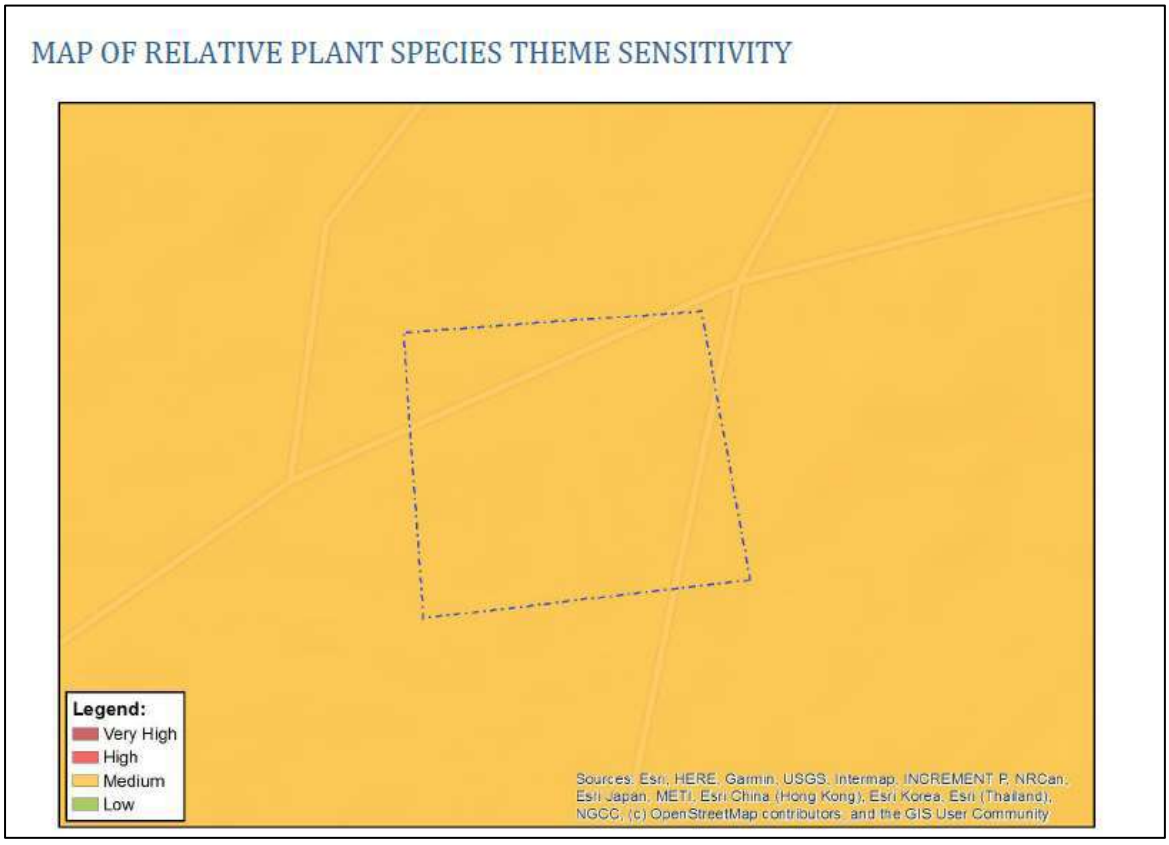


Figure 1.7: Terrestrial Plant Theme for the proposed Koring MTS project as reflected in the Screening Tool report.

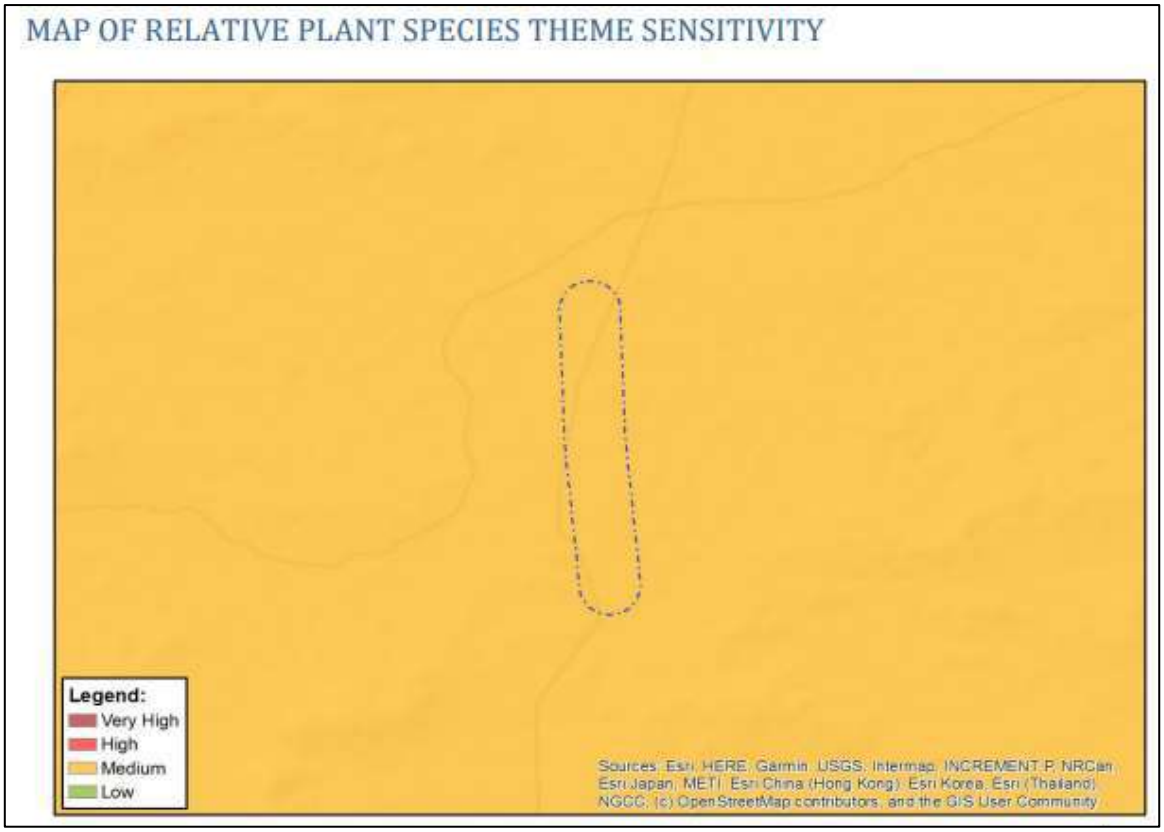


Figure 1.8: Terrestrial Plant Theme for the proposed 400kV powerline as reflected in the Screening Tool report.

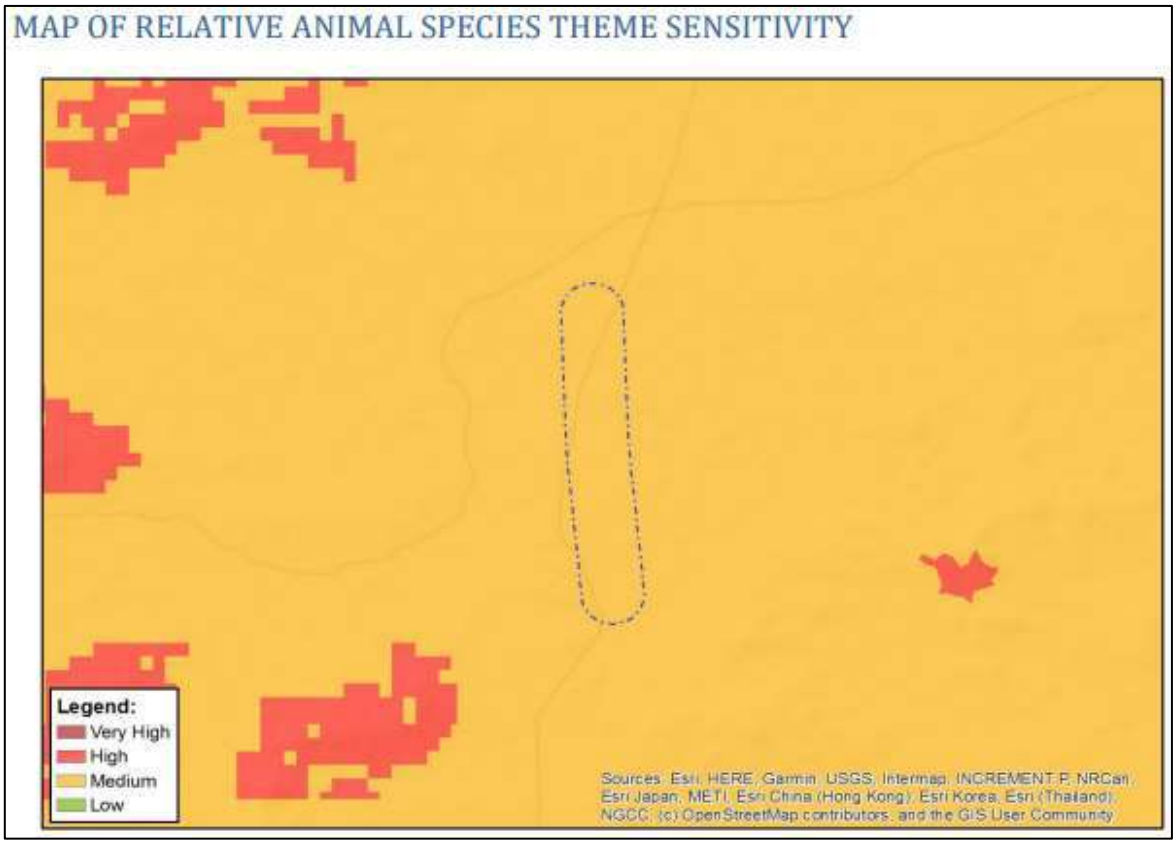


Figure 1.9: Animal Theme for the proposed 400kV powerline as reflected in the Screening Tool report.

2 METHODOLOGY

The site walk down was undertaken in March and April 2022 (27 March to 1 April and 19 and 20 April). The entire footprint of the infrastructure layout, as received from the client (assume to be correct), was walked on foot.

The assessment was conducted in two phases, the first phase was a desktop assessment evaluating existing information, including reports and assessments that forms part of the earlier EIA processes and amendments, whilst the second phase included the physical pre-construction walkthrough assessment. The EIA reports were used as the latest on-site assessments and were augmented by making use of other relevant data sets (Table 2.1).

Once the important information from the desktop assessment was known, it was used to compile red data and protected species lists that were used as guidelines during the walkthrough assessment. During the walkthrough, transects across the areas indicated in Figure 1.1 were investigated and included important habitat features identified during the desktop assessment. The rapid survey was used to identify the dominant features, general species assessment and any red data or protected plant and animal species encountered. This information was used to identify sensitive areas (including "no-go" zones).

In addition to the EIA reports consulted, additional data sources from the literature and GIS spatial information have been consulted and used, where applicable, in the study.

Google Earth Imagery (Google Earth ©) have been utilised to identify and delineate habitat and ecosystem features and units.

Additional existing data layers that were incorporated into this assessment, in order to determine important (sensitive) terrestrial and freshwater entities, are summarised in Table 2.1.

Table 2.1: Data coverages used to inform the ecological and freshwater resource assessment.

Data/Coverage Type	Relevance	Source
South African Vegetation Map (GIS Coverage)	Classify vegetation types and determination of reference primary vegetation.	SANBI (2018)
South African Biodiversity Institute (New POSA database)	Specimens collected on site and its immediate vicinity.	SANBI (2016)
National Biodiversity Assessment – Threatened Ecosystems (GIS Coverage)	Determination of national threat status of local vegetation types.	SANBI (2011)
The Virtual Museum (Online search)	Online and literature sources such as MammalMap, ReptileMap, FrogMap and the ReptileAtlas.	FitzPatrick Institute of African Ornithology (2022)
National Biodiversity Assessment – Threatened Ecosystems (GIS Coverage)	Determination of national threat status of local vegetation types.	SANBI (2011)
SAPAD – South Africa Protected Areas Database (GIS Coverage)	Shows the location of protected areas within the region	http://egis.environment.gov.za DEA (2020)
SACAD – South Africa Conservation Areas Database (GIS Coverage)	Shows the location of conservation areas within the region	http://egis.environment.gov.za DEA (2020)

The Botanical Database of Southern Africa (BODATSA) has been consulted in order to obtain a list of species recorded within the area (Table 2.2). This species list provided an indication of the potential diversity expected, the potential presence of range restricted species and other Species of Conservation Concern (SCC). The "Screening Reports for an Environmental Authorisation", as required

by the 2014 EIA Regulations, were done to determine the sensitivity of the terrestrial animal and plant species for the study area. Based on this analysis of available floristic and faunal literature and the identification and delineation of habitat units, a list of SCC likely to occur within the project area was generated (SANBI, 2022).

Additional information regarding ecosystems, vegetation types, animal species and SCC include the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford: The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19, 2018).
- The Mammals of the southern African Subregion (Skinner and Chimimba, 2005), A Guide the Reptiles of southern Africa (Alexander and Marais, 2007), Atlas and Red Data book of the Reptiles of South Africa, Lesotho and Swaziland (Minter *et al*., 2004) and A Complete Guide to the Frogs of southern Africa (Du Preez and Carruthers, 2009).
- Historic specialist reports for the proposed infrastructure to support the Sutherland, Sutherland 2 and Rietrug Wind Energy Facilities (WEFs).

Table 2.2: The list compiled of verified collections associated from the study area and its immediate surrounding area (SANBI, 2016).

Family	***Genus and species***	Family	***Genus and species***
Aizoaceae	*Antimima sp.*	Hyacinthaceae	*Massonia sp.*
Aizoaceae	*Cleretum lyratifolium*	Hypoxidaceae	*Pauridia aquatica*
Aizoaceae	*Drosanthemum sp.*	Iridaceae	*Lapeirousia montana*
Aizoaceae	*Malephora crassa*	Iridaceae	*Moraea ciliata*
Aizoaceae	*Mesembryanthemum nitidum*	Iridaceae	*Romulea diversiformis*
Aizoaceae	*Mesembryanthemum oubergense*	Iridaceae	*Romulea eburnea*
Aizoaceae	*Mesembryanthemum tetragonum*	Iridaceae	*Romulea hallii*
Aizoaceae	*Ruschia sp.*	Iridaceae	*Romulea komsbergensis*
Aizoaceae	*Stomatium villetii*	Iridaceae	*Romulea multifida*
Anacardiaceae	*Searsia burchellii*	Iridaceae	*Romulea subfistulosa*
Asphodelaceae	*Bulbine abyssinica*	Iridaceae	*Romulea syringodeoflora*
Asteraceae	*Arctotis diffusa*	Iridaceae	*Romulea tetragona*
Asteraceae	*Dicerothamnus rhinocerotis*	Iridaceae	*Romulea tortuosa*
Asteraceae	*Euryops marlothii*	Iridaceae	*Syringodea unifolia*
Asteraceae	*Helichrysum hamulosum*	Molluginaceae	*Pharnaceum aurantium*
Asteraceae	*Hertia ciliata*	Oxalidaceae	*Oxalis odorata*
Asteraceae	*Leysera tenella*	Poaceae	*Chaetobromus involucratus*
Asteraceae	*Oedera oppositifolia*	Poaceae	*Ehrharta delicatula*
Asteraceae	*Osteospermum scariosum*	Poaceae	*Pentameris aristifolia*
Boraginaceae	*Amsinckia menziesii*	Poaceae	*Poa bulbosa*
Brassicaceae	*Heliophila seselifolia*	Poaceae	*Schismus barbatus*
Brassicaceae	*Hornungia procumbens*	Poaceae	*Tribolium hispidum*
Caryophyllaceae	*Scleranthus annuus*	Poaceae	*Tribolium purpureum*
Caryophyllaceae	*Stellaria media*	Polygalaceae	*Muraltia horrida*
Colchicaceae	*Colchicum volutare*	Polygonaceae	*Rumex cordatus*
Crassulaceae	*Crassula deltoidea*	Rosaceae	*Cliffortia arborea*
Crassulaceae	*Crassula dependens*	Santalaceae	*Thesium sonderianum*
Crassulaceae	*Crassula expansa*	Scrophulariaceae	*Cromidon varicalyx*
Crassulaceae	*Crassula roggeveldii*	Scrophulariaceae	*Manulea diandra*
Crassulaceae	*Crassula subaphylla*	Scrophulariaceae	*Selago crassifolia*
Ebenaceae	*Diospyros austroafricana*	Scrophulariaceae	*Zaluzianskya bella*
Euphorbiaceae	*Euphorbia mauritanica*	Scrophulariaceae	*Zaluzianskya minima*
Fumariaceae	*Cysticapnos spp.*	Scrophulariaceae	*Zaluzianskya peduncularis*
Hyacinthaceae	*Lachenalia congesta*	Solanaceae	*Solanum tomentosum*
Hyacinthaceae	*Lachenalia ensifolia*	Urticaceae	*Urtica urens*
Hyacinthaceae	*Lachenalia longituba*		

2.1 Site visit limitations

2.1.1 General and sampling assumptions and limitations

The following assumptions, limitations and uncertainties are listed regarding the walk down survey of the Rietrug Wind Energy Facility and its associated infrastructure:

- This report deals exclusively with the defined areas and the impacts upon the vegetation, animals and natural habitat in that area and its immediate surrounding landscape (Figure 1.1).
- It is assumed that all relevant project information provided by the proponent and engineering design team to the ecological specialist was correct and valid at the time that it was provided.
- Additional information used to inform the assessment was limited to data and GIS coverage available for the Northern Cape and Western Cape provinces at the time of the assessment.
- **The study excludes Bats, Avifauna, Aquatic Ecology and Invertebrates as covered under other specialist assessments.**

2.1.2 Sampling and baseline habitat assessment – assumptions and limitations

- This report deals exclusively with the defined areas and the impacts upon the vegetation, animals and natural habitat in that area and its immediate surrounding landscape (Figure 1.1).
- It is assumed that all relevant project information provided by the proponent and engineering design team to the ecological specialist was correct and valid at the time that it was provided.
- Additional information used to inform the assessment was limited to data and GIS coverage available for the Northern Cape Province at the time of the assessment.

2.1.3 Sampling assumptions and limitations

- While disturbance and transformation of habitats can lead to shifts in the type and extent of ecosystems, it is important to note that the current extent and classifications are reported on here.
- The accuracy of the delineation is based solely on the recording of the relevant onsite indicators using a handheld Global Position System (GPS). GPS accuracy will therefore influence the accuracy of the mapped sampling points and the resource boundaries and an error of 3 to 5m can be expected. All vegetation and terrain sampling points were recorded using a Garmin Montana 610 GPS and captured using Geographical Information Systems (GIS) for further processing.
- Infield vegetation and animal assessments were undertaken within a specific focal area in the vicinity of the proposed development (Figure 1.1).
- Sampling by its nature means that generally not all aspects of ecosystems can be assessed and identified.
- This largely restricted the assessment to transects, but allowed for focussing on areas that stood out.
- With ecology being dynamic and complex, there is the likelihood that some aspects (some of which may be important) may have been overlooked e.g. where dense patches of vegetation obscured the view or simply where it falls outside transects walked during the assessment.
- All vegetation information recorded outside of the immediate development footprint was based on the onsite observations of the author and no formal in-depth vegetation sampling was undertaken. Furthermore, the vegetation information provided for the development footprint and the immediate adjacent areas, only gives an indication of the dominant and indicator species and only provides a general indication of the composition of the vegetation

communities. Thus, the vegetation information provided for these areas is somewhat limited in terms of true botanical applications i.e. accurate and detailed species list, phytosociological classification and rare, red data and protected species identification. It is assumed the reports reviewed included detailed surveys that were conducted during the initial EIA process for the project.

- The area received a reasonable amount of early summer rain but this has not significantly contributed to the recent growth in the area with regards to seeding and flowering of the natural vegetation (for identification purposes to species level). There was however a lack of geophytes, but the other vegetation had some good growth earlier in the year (well represented, but indistinguishable due to a lack of seeds and flowers) during the time of the assessment.
- The footprint was covered in some detail and the results are considered highly reliable. It is likely that there are species present that were not recorded.

- The assessment of the mammals, reptiles and amphibians covered the larger portion of the proposed development footprint and all signs of activity (namely scat, paw-prints and burrows) and actual observations were noted. This include observations in the area just outside the footprint area, as the animals move actively in the landscape and can therefore reside within the area.
    - Transects covered for the vegetation were used for the animal assessment and as noted, the cooler temperature had an impact on the activity of some animals. Many of the animals are nocturnal by nature and no night surveys were conducted. In addition, no trapping for small mammals and reptiles were conducted (limited period for the survey).

2.1.4 Baseline Ecological Assessment – assumptions and limitations

- All assessment tools utilised within this study were applied only to the resources and habitats located within the survey area (Figure 1.1) and which are at risk of being impacted by the proposed development. Any resources located outside of the areas and which is not a risk of being impacted were not assessed.
- It should be noted that the most appropriate assessment tools (under the conditions and timeframes) were selected for the analysis of the specific features and resources that may potentially be impacted by the proposed development. The selection was based on the assessment practitioner's knowledge and experience of these tools and their attributes and shortcomings.
    - It is important to note that no active trapping for small mammals or reptiles were conducted (time constraint).

During the walkthrough, an active search approach was employed for sightings of animals or signs of activity e.g. burrows, droppings and scat or shed skin or quills.

3 LITERATURE ASSESSMENT

3.1 The Importance of Biodiversity and Conservation

The term "Biodiversity" is used to describe the wide variety of plant and animal species occurring in their natural environment or habitat. Biodiversity encompasses not only all living things, but include a series of interactions that sustain the biota, which are termed ecological processes. South Africa's biodiversity provides an important basis for economic growth and development and keeping our biodiversity intact is vital to ensure the on-going provision of ecosystem services i.e. the supply of clean water through good catchment management and aesthetical values to the people. The role of biodiversity in combating climate change is well recognised and further accentuates the key role that biodiversity management plays on a global scale (Driver et al., 2012).

Typical pressures that natural ecosystems face from human activities include the loss and degradation of the natural habitat, invasive alien species, pollution and waste and climate change (Driver et al., 2012). High levels of infrastructural and intensive agricultural development typically restrict the connectivity of natural ecosystems and maintaining this connectivity is considered critical for the long-term persistence of both ecosystems and species, in the face of human development and global climatic changes. The loss of biodiversity puts aspects of our economy and quality of life at risk and reduces socio-economic options for future generations. In essence, that scenario makes it clear that sustainable development is then not possible.

3.2 Natural Vegetation Units Associated with the Study Area

The entire footprint of the project, as shown in Figure 1.1, was investigate and specific attention was paid to turbine locations and connecting roads, as well as the laydown area, substation site and grid corridor. General habitat photographs were taken for each turbine site, the substation site, laydown area and along the grid corridor.

The study area falls within the **Roggeveld Shale Renosterveld** (FRs 3), with the **Roggeveld Karoo** (SKt 3) to the north and the **Central Mountain Shale Renosterveld** (FRs 5) on the escarp to the south and the **Gamka Karoo** (NKl 1) southeast towards the Koring MTS (Figure 3.1) (Mucina and Rutherford, 2006).

3.2.1 Roggeveld Shale Renosterveld

According to Mucina and Rutherford (2006), the Roggeveld Shale Renosterveld (FRs 3) comprises of an undulating, slightly sloping plateau landscape, with low hills and broad shallow valleys (sandy soils). The natural vegetation is characterised by the moderately tall shrublands dominated by *Elytropappus rhinocerotis* and where the more moist and rocky habitats are present, it supports a rich geophytic community.

With regards to the broad geology, the vegetation unit overlies mudrocks and sandstones of the Adelaide Subgroup (Beaufort Group of the Karoo Supergroup), with some intrusions of the Karoo Dolerite Suite. The vegetation unit is regarded to have a **moderate** erosion potential (Mucina and Rutherford, 2006), but on the steeper sloped areas devoid of vegetation, the impact can be **high**.

It is noted that the study area forms part of the core of the Hantam Roggeveld Centre of Endemism (Mucina and Rutherford, 2006; van Wyk and Smith, 2001), where it is distributed across the Northern

and Western Cape provinces, largely bordered by the edge of the Great Escarpment above the Tanqua Basin to the west and the Hantam Plateau region to the south, with isolated high plateaus dispersed in the landscape.

According the Mucina and Rutherford (2006), the vegetation unit is considered as **Least Threatened** with a conservation target of 27%, but none was conserved in statutory or private conservation areas. Only a small part has been transformed (1%), but local overgrazing presents a high risk. When looking at the broad climatic patterns, it is noted that the rainfall is evenly distributed throughout the year, with a slight peak in March (ranging between 180mm and 430mm). The mean daily maximum and minimum temperatures varies between 29.3°C and 0.2°C for January and July and the area has a high frost incidence of approximately 30 to 70 days per year (Mucina and Rutherford, 2006) with snow a regular feature.

According to Mucina and Rutherford (2006), the more important vegetation species include shrubs i.e. *Euryops lateriflorus, Asparagus capensis var. capensis, Chrysocoma oblongifolia, Dimorphotheca cuneata, Diospyros austro-africana, Elytropappus rhinocerotis, Eriocephalus africanus var. africanus, E. ericoides subsp. ericoides, E. eximius, Euryops cuneatus, E. imbricatus, E. marlothii, E. microphyllus, E. trifidus, Felicia filifolia subsp. filifolia, F. muricata subsp. cinerascens, F. scabrida, Helichrysum hamulosum, H. lucilioides, Hermannia multiflora, Lessertia fruticosa, Nenax microphylla, Passerina nivicola, Pteronia erythrochaeta, Rosenia oppositifolia, Selago articulata, S. saxatilis, Ursinia pilifera* and *Zygophyllum spinosum.* The succulent shrub *Stomatium rouxii* is present with a number of herbs such as *Cotula microglossa, Diascia parviflora, Lasiopogon muscoides, Pharnaceum croceum* and *Senecio hastatus.* The variety of geophytic herbs include *Drimia intricata, Geissorhiza heterostyla, Hesperantha cucullata, Oxalis obtusa, Romulea atrandra, R. diversiformis, R. rosea, R. tetragona, R. tortuosa* and *Spiloxene capensis.* The succulent herbs and climbers present are *Crassula corallina subsp. coralline* and *Crassula roggeveldii.* The graminoides are not abundant but *Ehrharta calycina, Pentaschistis aristifolia, P. patula, Schismus inermis* and *S. scaberrimus* are known from the area.

3.2.2 Central Mountain Shale Renosterveld

The vegetation unit (least concerned) is associated with the Northern and Western Cape provinces on the southern and south-eastern slopes of the Klein-Roggeveldberge and Komsberg. It is known for the slopes and broad ridges of low mountains and escarpments where the renosterbos dominates as tall shrubs and the non-succulent karoo shrubs and geophytic flora forming the basal layers in more open, wetter or rocky habitats (Mucina and Rutherford, 2006).

The clayey soils overlying Adelaide Subgroup (Beaufort Group of the Karoo Supergroup) mudstones and subordinate sandstones are prominent in the vegetation unit which is dominated by the arid and semi-arid climate with a MAP raging between 180 and 410 mm (Mucina and Rutherford, 2006).

The authors (Mucina and Rutherford, 2006) list the following important plant groups i.e. shrubs including *Elytropappus rhinocerotis*, *Amphiglossa tomentosa*, *Asparagus capensis* var. *capensis*, *Chrysocoma ciliata*, *C. oblongifolia*, *Diospyros austro-africana*, *Eriocephalus africanus* var. *africanus*, *E. ericoides* subsp. *ericoides*, *E. eximius*, *E. grandiflorus*, *E. microphyllus* var. *pubescens*, *E. pauperrimus*, *E. purpureus*, *Euryops imbricatus*, *Exomis microphylla*, *Felicia filifolia* subsp. *filifolia*, *F. muricata* subsp. *muricata*, *F. ovata*, *Galenia africana*, *Helichrysum dregeanum*, *H. lucilioides*, *Hermannia multiflora*, *Lessertia fruticosa*, *Lycium cinereum*, *Nenax microphylla*, *Pelargonium abrotanifolium*, *Pentzia incana*, *Pteronia ambrariifolia*, *P. glauca*, *P. glomerata*, *P. incana*, *P. sordida*, *Rosenia glandulosa*, *R. humilis*,

R. oppositifolia, *Selago albida*, *Tripteris sinuate* and *Zygophyllum spinosum*, succulent shrubs such as *Delosperma subincanum*, *Drosanthemum lique*, *Euphorbia stolonifera*, *Trichodiadema barbatum*, *Tylecodon reticulatus* subsp. *reticulatus* and *T. wallichii* subsp. *wallichii,* some woody climbers that include *Asparagus aethiopicus* and the herbs such as *Dianthus caespitosus* subsp. *caespitosus*, *Heliophila pendula*, *Lepidium desertorum*, *Osteospermum acanthospermum*, and *Senecio hastatus*, geophytic herbs including *Bulbine asphodeloides*, *Drimia intricata*, *Othonna auriculifolia* and *Oxalis obtusa* the succulent herbs *Crassula deceptor*, *C. muscosa*, *C. tomentosa* var. *glabrifolia* and *Senecio radicans* and the graminoids such as *Ehrharta calycina*, *Karroochloa purpurea* and *Merxmuellera stricta*.

3.2.3 Gamka Karoo

This unit (Least Threatened) is present in the Western Cape and Eastern Cape provinces and marginally into the Northern Cape Province and is known as being extremely irregular to slightly undulating plains covered with dwarf spiny shrubland dominated by Karoo dwarf shrubs (e.g. *Chrysocoma ciliata, Eriocephalus ericoides*) with rare low trees (e.g. *Euclea undulata*). Dense stands of drought-resistant grasses (*Stipagrostis* and *Aristida*) cover (especially after abundant rains) broad sandy bottomlands (Mucina and Rutherford, 2006).

This vegetation unit is known as one of the most arid units of the Nama-Karoo Biome with limited rainfall (100 – 240 mm) in autumn and summer (peak in March) (Mucina and Rutherford, 2006).

Important taxa include shrubs *Lycium cinereum, L. oxycarpum*, *Rhigozum obovatum*, *Vachellia karroo*, *Cadaba aphylla*, *Lycium schizocalyx*, *Searsia burchellii*, *Sisyndite spartea,* low shrubs i.e. *Chrysocoma ciliata*, *Eriocephalus ericoides* subsp. *ericoides*, *E. spinescens*, *Felicia muricata*, *Galenia fruticosa*, *Limeum aethiopicum*, *Pentzia incana*, *Pteronia adenocarpa*, *Rosenia humilis*, *Aptosimum indivisum*, *Asparagus burchellii*, *Blepharis mitrata*, *Eriocephalus microphyllus* var. *pubescens*, *Felicia filifolia* subsp. *filifolia*, *F. muricata* subsp. *cinerascens*, *Galenia secunda*, *Garuleum bipinnatum*, *G. latifolium*, *Gomphocarpus filiformis*, *Helichrysum lucilioides*, *Hermannia desertorum*, *H. grandiflora*, *H. spinosa*, *Melolobium candicans*, *Microloma armatum*, *Monechma spartioides*, *Pentzia pinnatisecta*, *Plinthus karooicus*, *Polygala seminuda*, *Pteronia glauca*, *P. sordida*, *P. viscosa*, *Selago geniculata*, *Sericocoma avolans*, *Zygophyllum microcarpum*, *Z. microphyllum*, succulent shrubs i.e. *Ruschia intricata*, *Aridaria noctiflora* subsp. *straminea*, *Crassula muscosa*, *Drosanthemum lique*, *Galenia sarcophylla*, *Kleinia longiflora*, *Ruschia spinosa*, *Salsola tuberculata*, *Sarcocaulon patersonii*, *Trichodiadema barbatum*, *Tripteris sinuata* var. *linearis*, a semi-parasitic shrub, *Thesium lineatum*, herbs i.e. *Gazania lichtensteinii, Chamaesyce inaequilatera*, *Dicoma capensis*, *Galenia glandulifera*, *Lepidium africanum* subsp. *africanum*, *L. desertorum*, *Lessertia pauciflora* var. *pauciflora*, *Leysera tenella*, *Osteospermum microphyllum*, *Sesamum capense*, *Tetragonia microptera*, *Tribulus terrestris*, *Ursinia nana*, geophytic herbs i.e. *Drimia intricata*, *Moraea polystachya* and the graminoids *Aristida congesta*, *A. diffusa*, *Fingerhuthia africana*, *Stipagrostis ciliata*, *S. obtusa*, *Aristida adscensionis*, *Cenchrus ciliaris*, *Digitaria argyrograpta*, *Enneapogon desvauxii*, *E. scaber*, *Eragrostis homomalla*, *E. lehmanniana*, *E. obtusa*, *Tragus berteronianus* and *T. koelerioides* (Mucina and Rutherford, 2006).

The authors (Mucina and Rutherford, 2006) list the following biogeographically important taxa (*Endemic to Great Karoo Basin): *Hereroa latipetala**, *H. odorata**, *Pleiospilos compactus, Rhinephyllum luteum**, *Stapelia engleriana**, *Tritonia tugwelliae*, Felicia lasiocarpa*, Piaranthus comptus*, Tridentea parvipuncta* subsp. *parvipuncta** and *Oropetium capense* with the endmics:

Chasmatophyllum stanleyi, *Hereroa incurva*, *Hoodia dregei, Ruschia beaufortensis*, *Jamesbrittenia tenuifolia*, *Manulea karroica* and *Piaranthus comptus*.

Biogeographically Important Taxa that are highlighted include the Hantam-Roggeveld endemics *Zaluzianskya violacea* and *Colchicum hantamense* and other endemics such as *Euryops sulcatus, Lasiospermum poterioides, Manulea diandra, Daubenya aurea, Gladiolus marlothii, Ixia thomasiae, Polyxena longituba, Romulea hallii, R. komsbergensis, R. multifida, R. subfistulosa,* and *R. syringodeoflora* (Mucina and Rutherford, 2006).

The following protected species were listed (Botha, 2021):

- All species of the Genus *Pelargonium (*Family*:* Geranaceae):
    - *Pelargonium abrotanifolium*
- All species of the family Mesembryanthemaceae:
    - *Stomatium suaveolens, S. difforme, Ruschia cradockensis, Mesembryanthemum nodiflorum, Antimima* spp. (prolongata?), *A. ivory, Drosanthemum hispidum* and *D. eburneum*
- All species of the genus *Colchicum* (Family: Colchicaceae):
    - *Colchicum eucomoides* and *Colchicum volutare*
- All species of the family Crassulaceae:
    - *Crassula columnaris, C. deltoidei* and *C. nudicaulis*
- All species of the family Iridaceae:
    - *Babiana cuneata*
- All species of the family Lachenalia (no Hyacinthaceae):
    - *Lachenalia attenuata*
- All species of the Genus *Pectinaria* (Family: Apocynaceae):
    - *Pectinaria articulata*

Botha (2021) was of the opinion that the entire project footprint can be associated with a singular vegetation community, namely ***Rosenia humilis – Elytropappus rhinocerotis*** **Mountain Renosterveld**. The area is dominated by the fairly flat plateau sections near the escarp with some small micro variations within this landscape. The vegetation community is dominated by dwarf shrubs such as *Chrysocoma ciliata, Eriocephalus ericoides, Felicia filifolia subsp. filifolia, Pentzia dentata, Pteronia glomerata, P. glauca, Rosenia humilis, Asparagus capensis var. capensis, E. rhinocerotis* and the grass species *Tenaxia stricta, Pentameris airoides* and *Ehrharta calycina*.

Furthermore, within this community, three variations are noted i.e. a *Chrysocoma ciliata* variation, *Tenaxia stricta* variation and a *Stomatium difforme* variation. Edaphic factors are the main driving force of these variation, mainly soil depth and rockiness (Botha, 2021).

The author (Botha, 2021) is of the opinion that the *Chrysocoma ciliata* variation dominates the areas with slightly deeper soil profiles, although the soils still tend to be relative shallow and is typically fine sand derived from the weathering of sandstones. Species that dominate (moderate to moderate-low density) include low growing dwarf shrub vegetation cover with *C. ciliata, Elytropappus rhinocerotis, Ehrharta calycina, Pentameris airoides, Felicia oppositifolia, Selago distance* and *Pentzia dentata, Lachenalia attenuata, Osteospermum glabrum, Hyobance sanguinea, Asparagus capensis, Muraltia spinosa* and *Gnidia geminiflora* regarded as the key and diagnostic species of this variation.

The *Tenaxia stricta* variation is associated with sandstone boulder and rocky outcrops and is characterised by a denser and taller mixed dwarf shrubland. Dominant species within this variation include *Ehrharta calycina, Festuca scabra, T. stricta, C. ciliata, E. rhinocerotis, Eriocephalus ericoides, Pentzia dentata* and *Rosenia humulis*. Key and diagnostic species of this variation include *Colchicum eucomoides, Tetraria cuspidata, Pentameris pyrophila, Dolichotrix ericoides, Diospyros austro-africana, Selago aspera, Passerina truncata* and *Pteronia glauca*. The key species noted include *D. rhinocerotis, T. stricta, Selago saxatilis, Hebenstretia robusta, Moraea cookie, Tetraria cuspidate, Diospyros austroafricana, Colchicum volutare, Gnidia geminiflora, Passerina truncata* and *Pteronia incana* (Botha, 2021).

The last variation, the *Stomatium difforme* variation, is associated with the exposed flat bedrock sheets. These sheets are sparsely covered by vegetation, which is typically associated with shallow, sand filled cracks, crevices, pockets of deeper soil at the outer peripheries of these bedrock sheets. Even though species density and cover abundance is much lower within this variation when compared to the other variations, this variation contains a higher number of habitat specialists which are restricted to these areas. This variation is characterised by a mixture of low growing shrubs and succulents and dominated by *Pentameris pyrophila, E. rhinocerotis, Rosenia humilis* and *Euryops lateriflorus*. Key and diagnostic species of this variation are considered to be *Anacampseros marlothii, Stomatium difforme, S. suaveolens*, *Antimima ivory, Ruschia cradockensis, Drosanthemum hispidum, Babiana cuneata, Pelargonium abrotanifolium* and *Helichrysum rosum* (Botha, 2021).

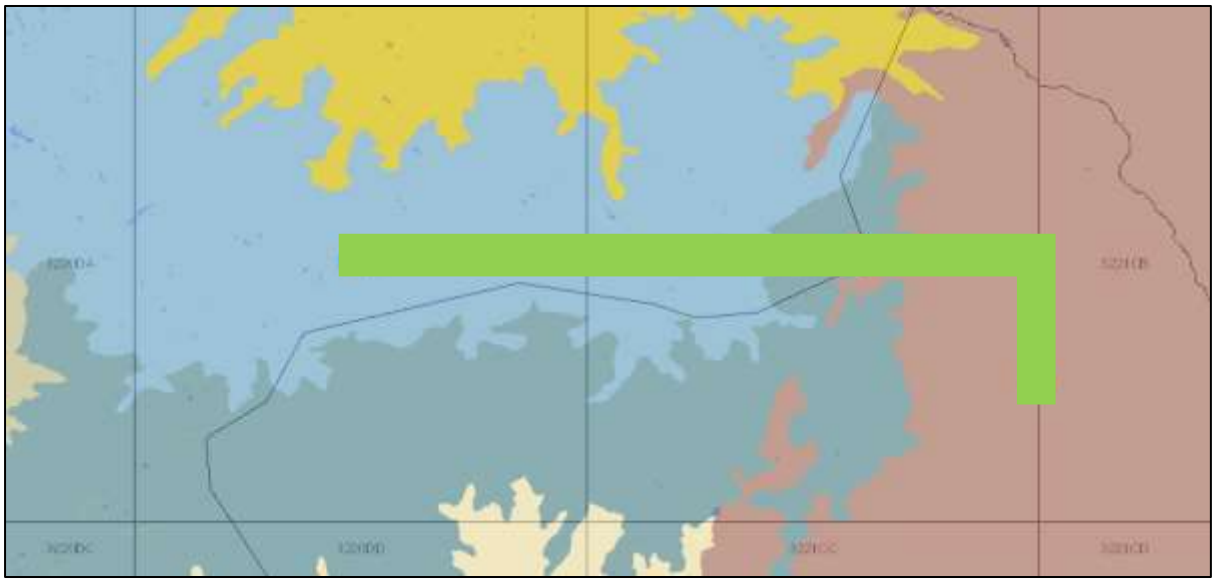


Figure 3.1: The vegetation map of the study area (circled) with the Roggeveld Shale Renosterveld (light blue), the Roggeveld Karoo (yellow), the Gamka Karoo (brown) and the Central Mountain Shale Renosterveld (dark blue) and the general study area marked in green (Mucina and Rutherford, 2006).

3.3 Critical Biodiversity Areas (CBAs) and Broad Scale Ecological Processes

3.3.1 The Northern Cape Biodiversity Areas

Systematic conservation assessment is the technical, often computer-based, identification of priority areas for conservation. This assessment informs conservation planning and decision-making (Figure 3.2).

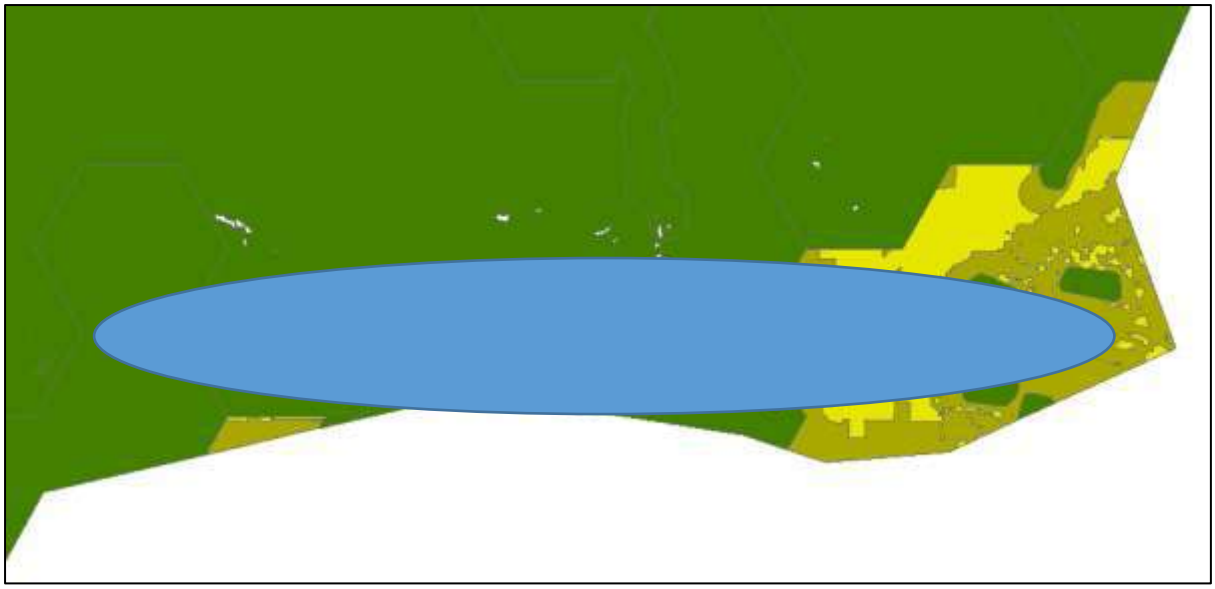


Figure 3.2: The map indicating the Northern Cape Conservation Plan. The CBA (green areas) and ESA (yellow) with the outline of the Rietrug WEF and grid to the east indicated in blue (broad outline only).

In the conservation strategies the **Critical Biodiversity Areas** (CBAs) (including Protected Areas (PAs) are defined as terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI 2007). Linked to the CBA are other classifications i.e. the Ecological support areas (ESAs).

- Critical biodiversity areas (CBAs) are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses (SANBI 2007).
- Ecological support areas (ESAs) are areas that are not essential for meeting biodiversity representation targets or thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas (SANBI 2007).

The PA and CBA 1 or natural landscapes are viewed as:

- Ecosystems and species fully intact and undisturbed.
- These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met.

- These are landscape that are at or past their limits of acceptable change (SANBI 2007).

The second category is the CBA 2 or near-natural landscapes:

- Ecosystems and species largely intact and undisturbed.
- Areas with intermediate irreplaceability or some flexibility in terms of area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising our ability to achieve targets.
- These are landscapes that are approaching but have not passed their limits of acceptable change (SANBI 2007).

The third category is the Ecological Support Areas (ESA) or functional landscapes:

- Ecosystems moderately to significantly disturbed, but still able to maintain basic functionality.
- Individual species or other biodiversity indicators may be severely disturbed or reduced.
- These are areas with low irreplaceability with respect to biodiversity pattern targets only (SANBI 2007).

The fourth category is the Other Natural Areas (ONA) and Transformed:

- These are the production landscapes with a need to manage the land to optimise sustainable utilisation of the resources (SANBI 2007).

3.3.2 The Western Cape Biodiversity Areas

In the Western Cape Biodiversity Spatial Plan the protection areas are defined as follows:

- Protected Area
    - Areas that are proclaimed as protected areas under national or provincial legislation.
    - Must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity. A benchmark for biodiversity.
- Critical Biodiversity Area (CBA) 1
    - Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.
    - Maintain in a natural or near natural state, with no further loss of habitat.
    - Degraded areas should be rehabilitated.
    - Only low-impact, biodiversity-sensitive land-uses are appropriate.
- Critical Biodiversity Area (CBA) 2
    - Areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.
    - Maintain in a functional, natural or near-natural state, with no further loss of natural habitat.
    - These areas should be rehabilitated.
- Ecological Support Area (ESA) 1
    - Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services.
    - Maintain in a functional, near natural state.
    - Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.
- Ecological Support Area (ESA) 2

- Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services.
- Restore and/or manage to minimize impact on ecological infrastructure functioning; especially soil and water-related services.

- ONA: Natural to Near-Natural
  - Areas that have not been identified as a priority in the current systematic biodiversity plan, but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions.
  - Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem.
  - Minimize habitat and species loss and ensure ecosystem functionality through strategic landscape planning.
  - Offers flexibility in permissible land-uses, but some authorisation may still be required for high-impact land-uses.

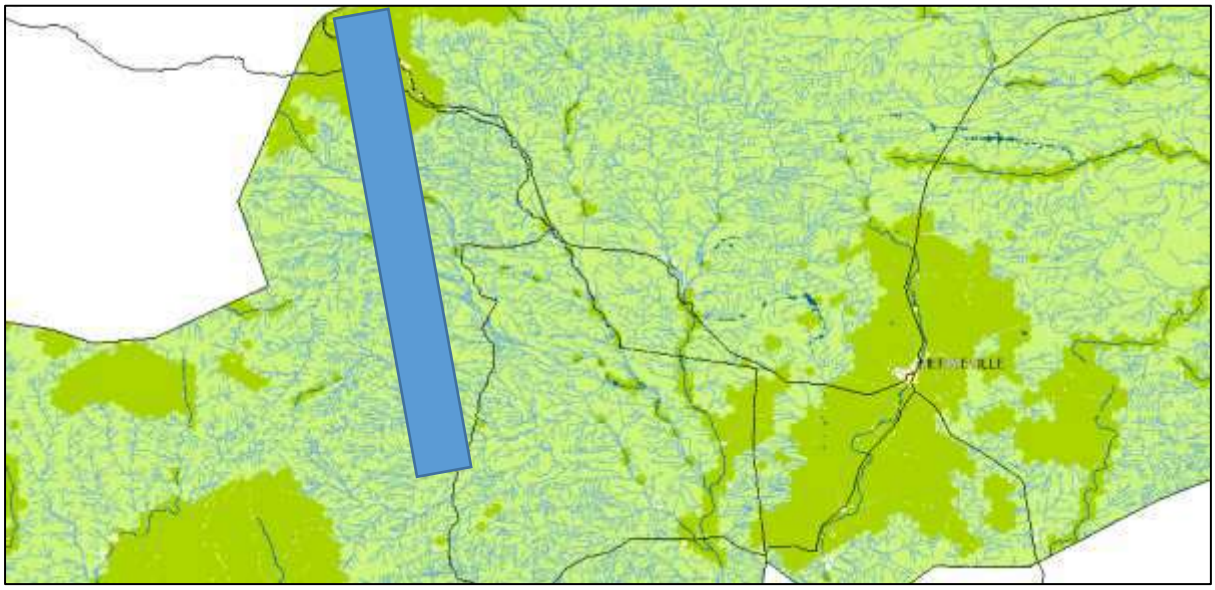


Figure 3.3: The map indicating the Western Cape Conservation Plan. The CBA (green areas) and ESA (yellow) with the outline of the Rietrug grid and Koring MTS (south) to the east indicated in blue (broad outline only).

3.4 Species of Conservation Concern (SCC) - Plants

The screening tool report (STR) generated include seven (8) sensitive plant species (SCC) and eight (8) species with a medium sensitivity with a probability to occur within the vegetation unit associated with the project area (the Rietrug WEF site and the power line to the Koring MTS).

When looking at the probability of the SCC occurring on the WEF study area, four (4) of the seven (7) species have been recorded in the larger footprint area, but **none recorded in the proposed layout areas recommended for the turbine areas**. **None of the species were observed during the recent assessment within the areas demarcated for the proposed development**. This is however not a clear indication that the species are not present. It will be important to evaluate the area during the final walkthrough (following layout approval and prior to construction related activities commencing) and

ensure the survey is conducted in the season that will ensure possible flowering plants present. It is noted that three (3) of the species were collected in 1953 and 1954 (no subsequent samples in the area) and the fourth in 2016 (only sample in the area).

The following species are listed in the STR (excluding the sensitive spp.): *Romulea multifida* (high) and the medium sensitive species i.e. *Antimima androsacea, Antimima emarcescens, Delosperma sphalmanthoides, Helictotrichon barbatum, Helictotrichon namaquense, Romulea hallii, Romulea multifida, Romulea eburnea, Adromischus phillipsiae, Asparagus mollis, Hesperantha flava, Eriocephalus grandiflorus, Cliffortia arborea* and *Octopoma nanum* (Table 3.1).

Table 3.1: List of the STR species (excluding the SCC sensitive spp.) with information of habitat types where it was collected (New POSA, 2022) to determine the probability of occurring on the study site (SANBI, 2016).

Family	*Genus and species*	Known habitat preference	Status	Known occurrence
Aizoaceae	*Antimima androsacea*	Rocky slopes, 1200-1800 m	CR	North of Sutherland
Aizoaceae	*Antimima ivori*	This species is endemic to the Roggeveld Escarpment in the Northern Cape, where it occurs from Sutherland to Fraserburg. It is localized to crevices in exposed sandstone.	Rare	North and NE of study area, including power line (low probability)
Aizoaceae	*Delosperma sphalmanthoides*	Shallow soils over shale rocks between 1 500 to 1 600 m.	VU	No record near site
Aizoaceae	*Peersia frithii*	Nama Karoo	VU	Well to the south of the Koring MTS
Iridaceae	*Tritonia florentiae*	Nama and Succulent Karoo	Rare	West to the Tankwa Karoo National Park
Iridaceae	*Romulea eburnea*	Shale soils.	VU	SW of site, low probability
Iridaceae	*Romulea hallii*	Roggeveld Plateau southwest of Sutherland.	VU	SW of site, low probability
Iridaceae	*Romulea multifida*	Roggeveld Plateau. Damp clay flats, 1500 m.	VU	Near site - probability to the western part of the site

When looking at the information in Table 3.1, there are eight (8) of the species that can occur in the study area, but the detailed maps show only two with a low probability i.e. *Antimima ivori* and *Romulea multifida*. This is based on the Plants of South Africa (POSA) maps and distribution information (SANBI, 2016) for the study area and the immediate surrounding areas. The other species have a low to very low probability of being present (but not excluded) when looking at the known distribution and samples collected on the POSA database.

3.5 Species of Conservation Concern (SCC) – Animals

According to the DFFE screening tool report generated as part of this survey, two (2) animals are listed with a medium sensitivity that may occur in the study area. These are *Bunolagus monticularis* (Riverine Rabbit) (CR) and *Chersobius boulengeri* (Karoo Padloper) (EN).

Historic reports (initial Basic Assessments (BAs) and Environmental Assessments (EAs) referred to as the Komsberg Renewable Energy Project in the Western Cape and Northern Cape (McDonald, 2011)) indicate that **the habitat for *Bunolagus monticularis* is not optimum**. It is known that *B. monticularis* prefer habitat in the deeper soils and specific riparian vegetation is not found along the smaller drainage lines on site (Sutherland WEF project) (Todd, 2011). The suitable habitat is associated with the larger stream of the Riet River to the east of the site (Sutherland and Rietrug project). The species is known to occur in the lower reaches of the system and it is therefore possible to occur in the upper reaches on the northern aspect of the Komsberg, where it drops off to the north (Todd, 2011). **There is no confirmed siting within the project site of the species.**

According to Collins et al. (2016), the expanded project between 1999 and 2013 has improved the distribution knowledge of *Bunolagus monticularis* and has been recorded in the vicinity of the site during the Endangered Wildlife Trust (EWT) Riverine Rabbit Project of 2010 (McDonald, 2011). When evaluating the specific habitat requirements, Skinner and Chimimba (2005) described their needs as being "*confined to riparian bush on the narrow alluvial fringe of seasonally dry watercourses in the central Karoo*". In their assessment, Collins et al., (2016) reported that a number of populations and subpopulations of *B. monticularis* were recorded in the Little Karoo and near Touws River during work in 2002, and this has therefore questioned the validity of the known habitat requirements and distribution of the species. According to McDonald (2011), there was no published research at that stage to confirm the distribution of the species or its habitat requirements outside of the traditional distribution range.

The assessment by Collins et al. (2016) noted that the current broad vegetation associated with the species in the larger Karoo biome (including the Succulent and Nama Karoo regions) refer to "*broad habitat types and that some of the recently discovered subpopulations in the northern part of the distribution range are always associated with alluvial floodplains and narrow belts of riverine vegetation adjacent to seasonal rivers*". The authors are of the opinion that this association with the floodplains in this part of its distribution range indicate a specific connotation with floodplains and is not necessarily holding true for all the vegetation types in its distribution range. This is illustrated by the fact that some specimens have been found in old cultivated fields.

The species is known to occur in the Riet River drainage system to the northwest of the site from where it drains northwards from the north-eastern sections of the area (Komsberg WEF area). One can therefore deduct that *B. monticularis* is present in this area. According to the McDonald (2011), it "*makes use of the riparian fringe[s] in the lower Riet system*". The author speculates that it is reasonable to assume where the turbines and connecting road systems are placed outside the sensitive areas (e.g. drainage lines), impacts would probably be low. It must be remembered that Desmet and Marsh (2008) regarded the riparian buffers as CBAs in the Namakwa Biodiversity Sector Plan. The habitat for breeding for *B. monticularis* is known as burrows of between 200 – 300 mm deep (Duthie, 1989). The remaining areas of the site to the west do not appear to represent suitable habitat and the nearest other localities where it has been recorded are to the west of Sutherland and just to the north of Matjiesfontein, both of which some distance from the site (McDonald, 2011).

The possibility of *Chersobius boulengeri* being present within the project site is low and no individuals were noted during the recent survey undertaken in 2022. The altitude and the lack of suitable habitat must be noted. *Chersobius boulengeri* occurs in association with dolerite ridges and rocky outcrops of the southern Succulent and Nama Karoo biomes and peripherally in the Albany Thicket biome in the southeast, at altitudes of approximately 800 to 1,500 m. Annual rainfall is low (approximately 150 to 400 mm over the species' range) and relatively unpredictable with a coefficient of variation between 35 and 40%. The species occurs in dwarf shrubland that often contains succulent and grassy elements. The tortoises usually take shelter under rocks in vegetated areas or in rock crevices, but few rocky sites over the range offer suitable retreats for the species (Hofmeyer et al., 2017).

3.6 General animal lists

The general animal lists (mammals, reptiles and amphibians) are presented in Table 3.2 – 3.4.

Table 3.2: List of Amphibians recorded in the QDSs associated with the study area (3220DB, 3221 CA/CB - FitzPatrick Institute of African Ornithology, 2022).

Family	*Genus and species*	Common name	Conservation status
Bufonidae	*Vandijkophrynus gariepensis*	Karoo Toad (subsp. gariepensis)	Least Concern
Pipidae	*Xenopus laevis*	Common Platanna	Least Concern
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	Least Concern
Pyxicephalidae	*Amietia poyntoni*	Poynton's River Frog	Least Concern
Pyxicephalidae	*Tomopterna delalandii*	Cape Sand Frog	Least Concern
Pyxicephalidae	*Tomopterna tandyi*	Tandy's Sand Frog	Least Concern

Table 3.3: List of Mammals recorded in the QDSs associated with the study area (3220DB, 3221 CA/CB - FitzPatrick Institute of African Ornithology, 2022).

Family	*Genus and species*	Common name	Conservation status
Bathyergidae	*Cryptomys hottentotus*	Southern African Mole-rat	Least Concern
Bovidae	*Connochaetes taurinus taurinus*	Blue wildebeest	Least Concern
Bovidae	*Oreotragus oreotragus*	Klipspringer	Least Concern
Bovidae	*Oryx gazella*	Gemsbok	Least Concern
Bovidae	*Pelea capreolus*	Vaal Rhebok	Near Threatened
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	Least Concern
Canidae	*Otocyon megalotis*	Bat-eared Fox	Least Concern
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern
Cercopithecidae	*Papio ursinus*	Chacma Baboon	Least Concern
Gliridae	*Graphiurus (Graphiurus) ocularis*	Spectacled African Dormouse	Least Concern
Herpestidae	*Herpestes pulverulentus*	Cape Grey Mongoose	Least Concern
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	Least Concern
Leporidae	*Bunolagus monticularis*	Riverine Rabbit	Critically Endangered
Leporidae	*Lepus capensis*	Cape Hare	Least Concern
Leporidae	*Lepus saxatilis*	Scrub Hare	Least Concern
Leporidae	*Pronolagus rupestris*	Smith's red rock hare	Least Concern
Macroscelididae	*Elephantulus rupestris*	Western Rock Elephant Shrew	Least Concern
Macroscelididae	*Macroscelides proboscideus*	Short-eared Elephant Shrew	Least Concern
Muridae	*Acomys (Subacomys) subspinosus*	Cape Spiny Mouse	Least Concern
Muridae	*Aethomys granti*	Grant's Rock Mouse	Least Concern
Muridae	*Aethomys namaquensis*	Namaqua Rock Mouse	Least Concern
Muridae	*Gerbilliscus paeba*	Paeba Hairy-footed Gerbil	Least Concern
Muridae	*Otomys unisulcatus*	Karoo Bush Rat	Least Concern
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Grass Rat	Least Concern
Nesomyidae	*Petromyscus collinus*	Pygmy Rock Mouse	Least Concern
Nesomyidae	*Saccostomus campestris*	Southern African Pouched Mouse	Least Concern
Soricidae	*Crocidura cyanea*	Reddish-gray Musk Shrew	Least Concern
Soricidae	*Crocidura hirta*	Lesser Red Musk Shrew	Least Concern
Soricidae	*Myosorex varius*	Forest Shrew	Least Concern
Vespertilionidae	*Neoromicia capensis*	Cape Serotine	Least Concern
Viverridae	*Genetta tigrina*	Cape Genet	Least Concern

Table 3.4: List of Reptiles recorded in the QDSs associated with the study area (3220DB, 3221 CA/CB - FitzPatrick Institute of African Ornithology, 2022).

Family	*Genus and species*	Common name	Conservation status
Agamidae	*Agama atra*	Southern Rock Agama	Least Concern
Cordylidae	*Cordylus minor*	Western Dwarf Girdled Lizard	Least Concern
Cordylidae	*Karusasaurus polyzonus*	Karoo Girdled Lizard	Least Concern
Cordylidae	*Pseudocordylus microlepidotus namaquensis*	Nuweveldberg Crag Lizard	Least Concern
Elapidae	*Aspidelaps lubricus lubricus*	Coral Shield Cobra	Least Concern
Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern
Gekkonidae	*Chondrodactylus bibronii*	Bibron's Gecko	Least Concern
Gekkonidae	*Pachydactylus capensis*	Cape Gecko	Least Concern
Gekkonidae	*Pachydactylus geitje*	Ocellated Gecko	Least Concern
Gekkonidae	*Pachydactylus kladaroderma*	Thin-skinned Gecko	Least Concern
Gekkonidae	*Pachydactylus mariquensis*	Marico Gecko	Least Concern
Gekkonidae	*Pachydactylus oculatus*	Golden Spotted Gecko	Least Concern
Gekkonidae	*Pachydactylus purcelli*	Purcell's Gecko	Least Concern
Lacertidae	*Pedioplanis burchelli*	Burchell's Sand Lizard	Least Concern
Lacertidae	*Pedioplanis lineoocellata pulchella*	Common Sand Lizard	Least Concern
Lamprophiidae	*Boaedon capensis*	Brown House Snake	Least Concern
Lamprophiidae	*Prosymna sundevallii*	Sundevall's Shovel-snout	Least Concern
Scincidae	*Trachylepis variegata*	Variegated Skink	Least Concern
Testudinidae	*Chersina angulata*	Angulate Tortoise	Least Concern
Testudinidae	*Homopus areolatus*	Parrot-beaked Tortoise	Least Concern
Testudinidae	*Homopus femoralis*	Greater Padloper	Least Concern
Testudinidae	*Psammobates tentorius*	Tent Tortoise	Least Concern

4 RESULTS and DISCUSSION – Terrestrial biodiversity baseline assessment

The biodiversity assessment will focus on the proposed WEF development, grid corridor to the Koring MTS and the MTS site. A general plant list (Table 4.1) was compiled (not a detailed list) as the focus was on red data and protected species, the habitat diversity and sensitivity in the footprint area and the animals observed (including signs of activity).

During the assessment, it was noted that the natural vegetation conformed to the classification as noted by Van der Merwe *et al.* (2008) and McDonald (2011) i.e. the *Euryops lateriflorus—Dicerothamnus rhinocerotis* Mountain Renosterveld. This can be linked to the time of the survey towards the end of summer, where the herbs and geophytes tend to be absent (e.g. as a result of grazing) and the impact of the recent drought. For this assessment (and the small difference between the comment from Botha (2021)), it was clear that **the current natural vegetation composition associated with the unit described by Van der Merwe *et al.* (2008)**.

4.1 Sensitive habitats, plant species of conservation concern (SCC), protected plants and plant communities and animals

4.1.1 Plants

To define and map the sensitive habitat for the extent of this project is not a viable option, as the landscape is a complex mosaic of alternating microhabitats. It is therefore important that micro-siting must be done on-site for the final approved layout at the fine scale level to ensure that the sensitive areas are not impacted. According to Botha (2021) there are four habitat units associated with the

study area i.e. the sandy to loamy sand plains, the boulder and rocky outcrops, flat sandstone bedrock sheets and the drainage lines in the landscape.

Most of the protected species (genus level) were observed, but identification to species level was not always possible as no flowers were present to be able to do a definitive identification.

The sandy to loamy sand plains are dominated by shallow to moderate-shallow fine to course gravel and fine sandy soils. The *Elytropappus rhinocerotis* veld covering the sandy to loamy-sand plains are regarded as of **Medium to Low** sensitivity (overall combined assessment for the plant and animal components) as this area contains mainly natural vegetation, although some encroaching of less palatable karroid shrubs have occurred due to long term selective grazing. When evaluating the protected plants and the species of conservation concern (SCC) the plant diversity are considered to be of relative **low sensitivity** (Botha, 2021).

When the screening tool report (STR) (DFFE, 2022) was generated, it was noted that five (5) plant species of conservation concern (SCC) are present in the larger study area. **The protocol require that these species can't be listed in this report, as SANBI is concerned that poaching of plants may result.** When evaluating the species listed, it must be noted that none of the species are listed on the POSA or iNaturalist databases on the site. It doesn't exclude the presence of the species being present in the study area.

The **habitat requirements for the species listed are mostly related to areas outside the proposed footprint of the development of the WEF project**. To illustrate this, it is noted that one occur in the Succulent Karoo on clays in depressions and the other prefer areas with heavy clays, on slopes of the escarp or being found on the lowland landscape south of the escarp.

Botha (2021) reported that no SCC plants and only one (1) protected species have been recorded in this micro habitat. As for the animals in the landscape, this area provides the best forage potential and some valuable refuge (e.g. burrows) areas for species that need deeper soil for burrows. In addition, **none of the five species (SCC) were recorded during the 2022 surveys**. As mentioned, there is no confirmed siting of *Bunolagus monticularis* on the project site, while the possibility of *Chersobius boulengeri* being present, is low.

The boulder and rocky outcrops dispersed in the plains are regarded as of **Medium** sensitivity (overall combined assessment for the plant and animal components) and consists of good natural vegetation cover. When evaluating the plant diversity and plant SCC, Botha (2021) considered it to be of relative **low sensitivity**. **No plant SCC, but four protected species has been recorded within this micro habitat**. From a faunal perspective, the rocky outcrops are mixed with rocky refugia (which provide structural complexity) to provide a moderately sensitive habitat, especially for small mammals (Botha, 2021) and reptiles. Furthermore, the overall diversity and connectivity to other habitats are considered to be **moderate sensitivity** (Botha, 2021) and fragmentation can have a higher cumulative affect (if taken with impacts from nearby WEF developments).

The third habitat type is the **flat sandstone bedrock sheets** characterised by the exposed sandstone bedrock sheets that are regarded as of overall **medium** sensitivity due to the natural and relative unique vegetation cover restricted to these patches (Botha, 2021). According to the author, the plant

SCC component can be considered to be of relative **low sensitivity**, as n**o plant SCCs were recorded within this micro habitat**.

There was a total of 16 protected plant species, mainly succulents and geophytes, recorded within these patches of exposed bedrock sheets. From a faunal perspective this micro-habitat mainly shows poor potential for larger mammal species due to the low availability of forage (large bare areas) and refuge (Botha, 2021), but it is utilised by small reptiles and rodents for habitation and foraging. Botha (2021) is of the opinion that when taking the floral component as a unit, the exposed sandstone bedrock sheets can be regarded as slightly more sensitive (**medium sensitivity)** than the other two micro-habitats. This is true despite the fact that the plant species density, cover and abundance is much lower compared to the other habitat types and this habitat contains a higher number of habitat specialists which is restricted to these areas (Botha, 2021).

The last habitat identified was **the drainage lines** (Botha, 2021). The habitat type forms a complex network of drainage lines and landscape depressions and it is important to note that water drainage occur over the extensive networks across the larger landscape (very discreet in areas, but with moderate to high sensitivity). **The aquatic and wetland issues will be addressed in a separate standalone assessment report.**

4.1.2 Animals

Very little animal activity was noted during the 2022 survey. A number of *Pronolagus rupestris* and *Lepus saxatilis* were observed during the survey. A small group of *Pelea capreolus* and some *Herpestes pulverulentus* and *Antidorcas marsupialis* were seen and at some occasion the *Papio ursinus* were heard. In addition numerous dens of mice, mole rates gerbils and other smaller rodents (active) were seen and some quills of *Hystrix africaeaustralis* were noted cross the survey area.

Pelea capreolus is associated with rocky hills, grassy mountain slopes and plateau grasslands in the eastern extent of their distribution. In the south and southwest, their distribution is associated with the rocky hills of mountain fynbos and the little Karoo. They are predominantly browsers, often feeding on ground-hugging forbs and largely water independent, obtaining most of their water requirements from their food (Avenant, 2013). Numerous animals were observed during the 2010 survey (Todd, 2011) and the author of the report noted that the conservation status at the time was least concern (IUCN), but that the impact of the WEF development on the animals is not known. In general, the development will have a short-term impact on the resident animals, as they will move away during the increase in activity, but can return after the construction phase. A potential concern will be illegal hunting with snares during the construction phase and operational phase (lower incidence).

Felis nigripes (VU) are predominantly ground-dwellers and will not readily take to trees and lead a solitary existence except when with kittens or during brief mating periods. They are extremely secretive in nature and strictly crepuscular and nocturnal and are active throughout the night, even hunting at temperatures of –8˚C (Olbricht and Sliwa, 1997). During the day, the cats make use of dens. The species prefers hollowed out abandoned termite mounds when available (especially for the kittens), but will use dens dug by other animals such as Springhares (*Pedetes capensis*), Cape Ground Squirrels (*Xerus inauris*) and Aardvark (*Orycteropus afer*). It is a specialist of open, short grass areas with an abundance of small rodents and ground-roosting birds. It inhabits dry, open savannah, grasslands and Karoo semi-desert with sparse shrub and tree cover and a mean annual rainfall of

between 100 and 500mm at altitudes up to 2 000m asl. It is not found in the driest and sandiest parts of the Namib and Kalahari Deserts (Sliwa, 2013).

Panthera pardus has a wide habitat tolerance, including woodland, grassland savannah and mountain habitats, but also occur widely in coastal scrub, shrubland and semi-desert. Densely wooded and rocky areas are preferred as choice habitat types and they have a highly varied diet, ranging from arthropods to large antelope up to the size of adult male *Tragelaphus oryx*. Densities of the species vary with habitat, prey availability, and threat severity, from less than one individual per 100km² to over 30 individuals per 100km². Within the assessment region, the lowest densities are in the Kalahari and Western Cape mountains i.e. Western Cape densities range from 0.25 – 2.3 individuals per 100km² (Swanepoel et al., 2016).

4.2 General comments on Botanical walk-down – Rietrug WEF and Grid Infrastructure Project

This is a short summary of concerns and comments related to the walk-down (undertaken in March and April 2022). This applies to the whole project area and must be taken into consideration when planning the final tower positions and the access roads between the turbines from the entry point to each of the turbine towers and other related infrastructure e.g. sub-terrain cables and placement of pylons related to the grid connection infrastructure - as indicated in the final layout (Figure 1.1).

4.2.1 Habitat and landscape

1. The landscape in the area is regarded as an important drainage system (to rivers north and south of the mountain rage).
    a. This means that the water drains over a large area (from the total landscape) to supply the downstream areas.
2. The area has many small but diverse habitat areas (mosaic pattern), making the compilation of a sensitivity map near impossible.
3. The undulating landscape consists of sloped areas (more homogenous, less diversity) with the rock outcrops, bedrock sheets (with rock strewn fields) and rock ridges – all very diverse habitats that are important living and feeding areas to plants, birds, small mammals, bats and reptiles.
    a. These areas are important migrations corridors for animals and birds.
    b. In addition, it is used by many animals for feeding, roosting, burrows and dens.
    c. Some of the resident specimens will be disturbed and move away during construction, but animals can return during the operational phase.
    d. As noted from the literature, the bedrock sheets have a higher diversity of vegetation (a number of protected species), although densities can vary (generally low on the exposed rock sheets).
    e. During this survey, it was noted that the sandy patches surrounding the bedrock sheets are important habitat for animals and plants as they utilise the deeper soils with cover potential, more water and nutrients.
    f. On the rock sheets the Mesembryanthemaceae, Colchicaceae, Crassulaceae and Apocynaceae were present and therefore these areas are sensitive and must be avoided. **It will be important to keep a 5m buffer around the outer edges to ensure no permanent damage results. No driving over these areas are permitted at any time.**
4. The landscape, with the drainage features, have a number of small drainage lines that congregate into larger streams. These area have a little different vegetation composition and plants tend to grow larger in the deeper soils and wetter areas. **These areas must be avoided**

as far as possible and limited crossing is recommended (refer to the standalone wetland/aquatic ecology assessment for detailed comments and recommendations in this regard).

5. The slopes are sensitive to erosion (soils moderately erodible, but will be high on steep exposed slopes). These area have a little different vegetation composition and plants tend to grow larger in the deeper soils and wetter areas. These areas must be avoided as far as possible and limited crossing is recommended (refer to the standalone wetland/aquatic ecology assessment for detailed comments and recommendations in this regard).
6. The rock and cobble strewn fields are important structure to stabilise soils (roughness), prevent erosion (dissipate flow velocity) and give substrate for vegetation to establish.
7. All hard surfaces (roads and turbine footprints) will contribute to the erosion potential with the accelerated flow velocities from roads, culverts and areas cleared of vegetation a concern.
    a. It will be important to monitor hard surfaces regularly, especially areas downstream of these areas, as accelerated flow is the big concern related to erosion.
8. A concern is the "cutting" and "filling" of crests and drainage channels for the construction of the access roads for construction and delivery vehicles.
    a. This will have a long-term impact on the habitat for animals and plants (crests and ridges) and the drainage systems (erosion and siltation).

4.2.2 Roads (internal road layout)

1. For the assessment of the access roads, a general corridor of 15 to 20m wide was evaluated.
2. It is very important to **stay within the 8/10m corridor of roads during construction.**
    a. This is to protect the vegetation and sensitive habitats in the project area and insure no undisturbed habitat and natural vegetation is affected.
    b. No activity must occur outside the designated road margins.
3. The current road layout is in straight lines between the turbine positions and it is assumed that the **road layout will follow less steep inclines to limit access on steep and sensitive slopes (high/very high erosion potential).**
4. During the permitting process, the walk through of the final approved layout will assess the impact on all plants present.
5. It is important to note that the roads (compacted surfaces) will act as "blockages" of water movement, both on the surface and subsurface.
    a. As noted above, the water drains over the broad landscape and this water is important to sustain the plants further down the slope (many of the plants have shallow root systems to maximise absorption of surface flow in the water scarce area).
    b. The compacted areas (roads) will act as small "weirs", forcing water to penetrate below the root zones of the indigenous natural vegetation. This may have an impact over the long-term operational period for the project on the natural vegetation.
    c. No driving over the sensitive bedrock sheets are allowed at any time during the construction, operational or decommissioning phases. This include any driving into the veld outside any demarcated corridors or footprint areas.

4.2.3 Turbine footprints and hardstand areas

1. Areas investigated covered an approximate 250m^2 area at each turbine site.
    a. All activities during construction must be restricted to take place within the turbine footprint area.

b. This will lower the risk of further loss of undisturbed habitat and natural vegetation and will result in increased erosion from the landscape.
c. Storm water flow during rain events are the main concern from the hard surfaces and exposed soils.
d. No laydown areas were mapped in the initial layout (a buildable area and road layout was provided for surveying purposes).

2. If there is a recommendation to move the position of a turbine, the new proposed area was viewed as part of the survey (undertaken in March/April 2022).
3. **The exposed areas must be rehabilitated to prevent erosion and to ensure no alien species establish in these areas**.
    a. It is known that the plants associated with the vegetation unit are slow to recover.
    b. It is therefore very important to lower the "clearing footprint" to the absolute minimum e.g. leave a 300 mm basal layer.

4.2.4 Grid Corridor

1. The areas of the grid line within the WEF footprint was assessed during the walk through on the site (undertaken in March/April 2022).
2. The vegetation and sensitivities therefore correspond with the larger WEF study area.
3. **Limited clearing for the corridor must be done – leave the basal cover layer at 300 mm as it is recommended for the rest of the project area.**
4. **Limited travel must be allowed on the corridor – the steep slopes is a concern related to erosion.**
5. The spring survey of the final approved layout for the red data and protected plants will cover the full grid area and permitting will include the corridor.
6. The area to the east and south to the Koring MTS have a good plant cover.
7. The area is generally steeply sloped and erosion is the main concern.

4.2.5 Koring MTS area

1. The Koring MTS site has varied vegetation cover and sensitivity (refer to the detailed report).
2. The red data and protected species on site is low, but during the spring walk through of the final approved layout, the areas will be included in the survey that will be used for the permit applications.

4.2.6 Vegetation

1. The vegetation in the area is sensitive to impacts and once areas are cleared, recovery is slow and will be dominated by indigenous pioneer species and alien plants.
    a. The current impacts (long-term grazing) has lowered the plant diversity and the loss of the iconic *Secale strictum subsp. africanum*, which almost went extinct and is currently listed as Critically Endangered (Mucina and Rutherford, 2006), is a good example.
2. Lost vegetation, e.g. cleared patches will have a very slow recovery rate, due to the dry environment and grazing pressure. Linked to this is the changes in the vegetation community structures as a result of changes in the global weather and rainfall patterns.

3. The areas below roads will be vulnerable due to the cut-off effect of the roads (see para 4.2.2 in the "Roads" section).
4. Although no Species of Conservation Concern (SCC) were observed by Botha (2021) and the recent 2022 survey, the area has a rich variety of sensitive and protected species (33 species were noted in the sensitive areas).

Table 4.1: Species recorded within the project footprint. Species highlighted in yellow are regarded as key/diagnostic species for the specific habitat unit whilst those highlighted in green are the dominant species for that specific habitat unit (Botha, 2021). Species with (**) recorded in March/April 2022 and those with (*), observed, but species not confirmed due to lack of flowers and/or seeds.

Family	*Genus and species*	Sandy/Loamy Sand Plains	Boulder/ rocky outcrops	Flat Sandstone Bedrock Sheets	Drainage Lines
Aizoaceae	*Antimima ivory***			X	
Aizoaceae	*Antimima spp. (prolongata?)***			X	
Aizoaceae	*Drosanthemum eburneum***			X	
Aizoaceae	*Drosanthemum hispidum***			X	
Aizoaceae	*Galenia africana***	X			X
Aizoaceae	*Mesembryanthemum nodiflorum***			X	
Aizoaceae	*Ruschia cradockensis**	X		X	X
Aizoaceae	*Stomatium difforme***			X	
Aizoaceae	*Stomatium suaveolens***			X	
Amaranthaceae	*Caroylon tuberculata*	X		X	
Anacampserotaceae	*Anacampseros marlothii***			X	
Anacardiaceae	*Searsia undulata*				X
Apocynaceae	*Pectinaria articulate***			X	
Asparagaceae	*Asparagus burchellii***		X		X
Asparagaceae	*Asparagus capensis***	X	X		
Asteraceae	*Amellus tridactylus*	X			
Asteraceae	*Berkheya spinosa**	X	X	X	X
Asteraceae	*Chrysanthemoides incana***	X			
Asteraceae	*Chrysocoma ciliata***	X	X	X	X
Asteraceae	*Chrysocoma valida*	X			
Asteraceae	*Conyza microglossa*				X
Asteraceae	*Curio acaulis***			X	
Asteraceae	*Dimorphotheca cuneata*		X		
Asteraceae	*Dolichotrix ericoides***		X		
Asteraceae	*Elytropappus rhinocerotis***	X	X	X	X
Asteraceae	*Eriocephalus ericoides**	X	X	X	X
Asteraceae	*Eriocephalus eximius*	X			
Asteraceae	*Eriocephalus grandifloras**		X	X	
Asteraceae	*Euryops imbircatus*			X	
Asteraceae	*Euryops lateriflorus***			X	X
Asteraceae	*Felicia filifolia***	X			

Asteraceae	*Gazanai krebsiana*	X	X	X	
Asteraceae	*Gorteria spp.*				X
Asteraceae	*Helichrysum rosum*			X	
Asteraceae	*Oedera genistifolia***				X
Asteraceae	*Osteospermum glabrum*	X			X
Asteraceae	*Osteospermum sinuatum*	X	X		
Asteraceae	*Pentzia dentata***	X	X	X	X
Asteraceae	*Pteronia glauca*		X		
Asteraceae	*Pteronia glomerata***			X	X
Asteraceae	*Pteronia paniculata*		X		
Asteraceae	*Rosenia humilis**	X	X	X	
Asteraceae	*Senecio abrutus*	X			
Brassicaceae	*Heliophila variabilis***	X			
Colchicaceae	*Colchicum eucomoides***		X		
Colchicaceae	*Colchicum volutare*			X	
Crassulaceae	*Crassula columnaris***			X	
Crassulaceae	*Crassula deltoidea***			X	
Crassulaceae	*Crassula nudicaulis***			X	
Cyperaceae	*Tetraria cuspidata*		X		
Ebenaceae	*Diospyros austro-africana***		X		X
Gentianaceae	*Sabaea pentandra*	X			
Geraniaceae	*Monsonia crassicaulus*			X	
Geraniaceae	*Pelargonium abrotanifolium*		X	X	
Hyacinthaceae	*Albuca cooperi*	X	X		
Hyacinthaceae	*Albuca viscosa*	X			
Hyacinthaceae	*Lachenalia attenuata*	X			
Iridaceae	*Babiana cuneata*		X	X	
Iridaceae	*Moraea cookii*		X		
Iridaceae	*Moraea miniata**	X	X		
Malvaceae	*Hermannia cuneifolia*			X	
Malvaceae	*Hermannia spinosa***			X	X
Molluginaceae	*Hypertelis spp.*	X			
Orobanchaceae	*Hyobanche sanguinea*	X			
Oxalidaceae	*Oxalis obtusa*	X			
Poaceae	*Bromus pectinatus*				X
Poaceae	*Chaetobromus involucratus*	X	X		
Poaceae	*Ehraharta calycina**	X	X	X	
Poaceae	*Enneapogon scaber*			X	
Poaceae	*Eragrostis curvula***	X			
Poaceae	*Festuca scabra*		X		X
Poaceae	*Pantameris pallida*	X			X
Poaceae	*Pentameris airoides*	X	X	X	X
Poaceae	*Pentameris pyrophila*		X	X	
Poaceae	*Tenaxia stricta*	X	X	X	X

Poaceae	*Tribolium acutiflorum*	X			
Polygalaceae	*Muraltia spinosa*	X	X		
Polygonaceae	*Rumex cordatus*	X		X	
Rubiaceae	*Anthospermum spp.*	X			
Scrophulariaceae	*Chaenosoma aethiopicum*		X		
Scrophulariaceae	*Diascia spp.*		X		
Scrophulariaceae	*Hebenstretia robusta***	X	X	X	
Scrophulariaceae	*Nemesia fruticans*	X		X	
Scrophulariaceae	*Selago aspera*		X		X
Scrophulariaceae	*Selago distance*	X	X		
Scrophulariaceae	*Selago spp.***				
Scrophulariaceae	*Zuluzianskya villosa*		X		
Solanaceae	*Lycium horridum*				X
Thymelaeaceae	*Gnidia geminiflora**	X	X		
Thymelaeaceae	*Passerina truncate***		X		

Below is a selection of photographs depicting the habitats present and impacts noted during the recent survey undertaken in 2022.

4.2.7 Animals

It must be noted that the survey only focussed on visual observation of animals and no formal trapping was conducted. All surveys were conducted during the day and included the vehicle travel between areas on the farms over the survey period.

It is important to note that the proposed activity will have a negative impact on the resident animals of the study area. During pre-construction (e.g. clearing of roads and drilling of geotechnical surveys) and construction many of the resident animals (reptiles and mammals) will move out of the activity zone and those that use the area for foraging will also avoid it. After the construction is completed and the lower activities related to maintenance commence, animals will slowly return. The timeframe for this is very difficult to predict and different animals will return at different intervals. Those that are less secretive and skittish will take longer, but one can assume that they will return over time.

A concern during construction is the potential that animals can get trapped in excavation areas and will be killed by the construction teams, unless there is a clear policy to rescue the animals. An additional threat is the illegal hunting (e.g. snares) and road kills that will occur.

4.2.8 Protected areas – CBAs and ESAs

The area include some protected areas within the two provinces, i.e. the Northern Cape and the Western Cape. When evaluating the impacts, it is clear that the majority of the changes will be associated with the portion of the project in the Northern Cape. This is where the WEF will be constructed and will include the associated infrastructure. This include the substation in the WEF, the associated internal power line and cables and the 132kV line grid to the Koring MTS.

The area is currently designated as a Critical Biodiversity Area 1 (CBA 1 – 3.3.1) and this is related to the water resources (important catchments) and the *Equus zebra zebra* (**not present on the site**). It is

important to note that the current land use practices is having a marked impact on the ecosystem and habitat. Over the decades, the grazing by livestock has modified the vegetation composition and the loss of the iconic *Secale strictum subsp. africanum*, which almost went extinct and is currently listed as Critically Endangered (Mucina and Rutherford, 2006), is a good example.

The general vegetation composition for the study area is considered to comprise mainly of one plant community. As stated by Botha (2021), "*the entire project footprint can be associated with a singular vegetation community, namely the Rosenia humilis – Elytropappus rhinocerotis Mountain Renosterveld. The area is dominated by the fairly flat plateau sections near the escarp with some small micro variations within this landscape. The vegetation community is dominated by dwarf shrubs such as Chrysocoma ciliata, Eriocephalus ericoides, Felicia filifolia subsp. filifolia, Pentzia dentata, Pteronia glomerata, P. glauca, Rosenia humilis, Asparagus capensis var. capensis, E. rhinocerotis and the grass species Tenaxia stricta, Pentameris airoides and Ehrharta calycina".*

Although the larger study area falls within the CBA 1 area, the projects have received authorisation from the DFFE and appropriate mitigation measures have been provided to reduce impacts to acceptable levels. These have been incorporated into the EMPrs (along with appropriate management plans) and will be strictly adhered to.

The areas to the east and south following the grid power line to the Koring MTS falls mainly in the Western Cape and the CBA 1 designation is noted. Along the corridor for the power line and the footprint of the MTS, impacts will be limited to the smaller footprint of the infrastructure. In this section, the water resources are considered very important and the *Equus zebra zebra* and the Gamka Karoo vegetation unit is included in the sensitivity listing. Current and historic land use (mainly livestock grazing) has negatively impact on the habitat and the natural resources.

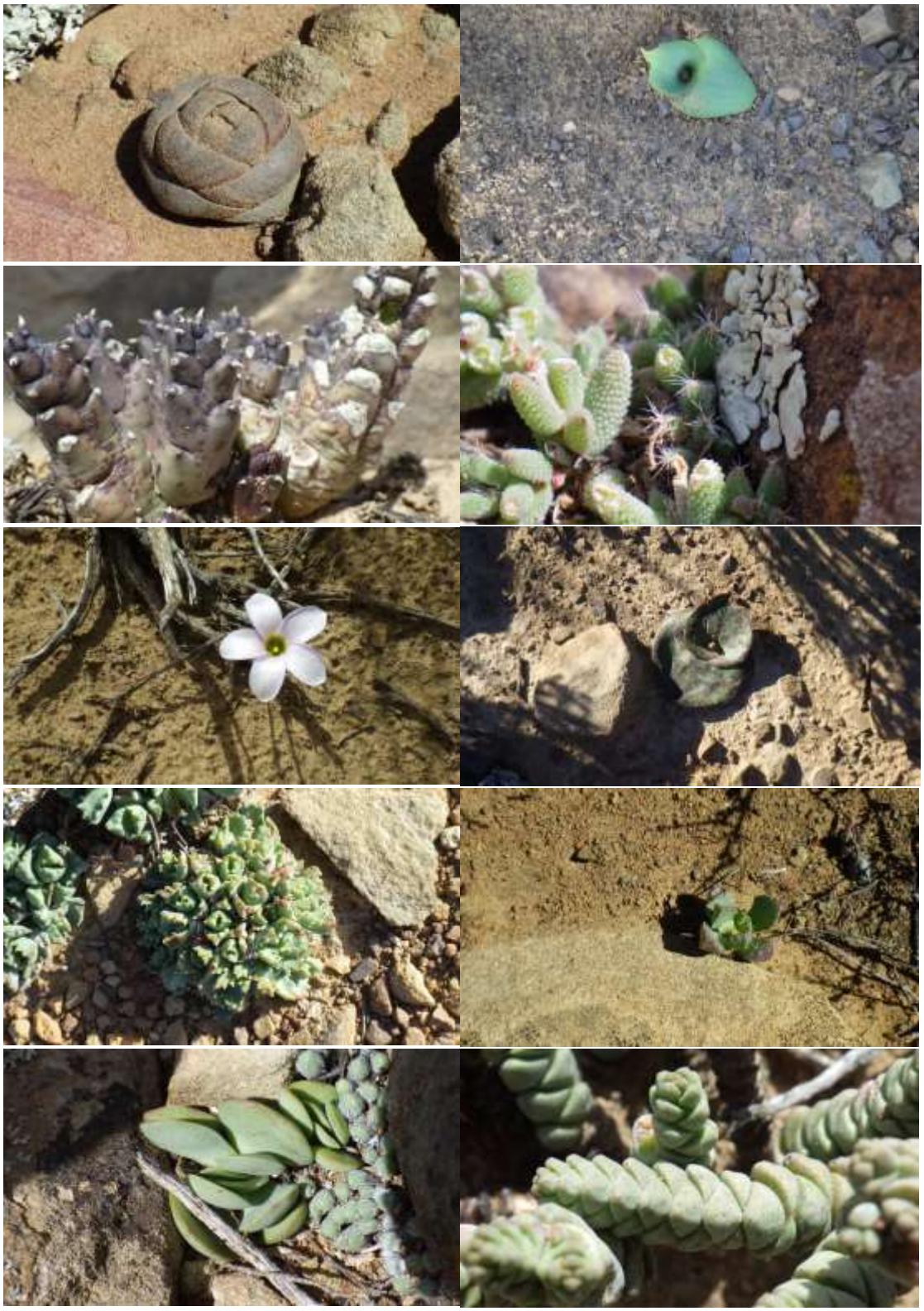
As is the case with the WEF portion of the development, the corridor and MTS have been approved for development by the DFFE and therefore the strict mitigating measurements and monitoring must be rigorously employed to ensure that the impacts are limited.

Rocky outcrops and bedrock sheets - sensitive habitats - outcrops and ridges – sensitive for habitat for plants, animals, birds and bats

Drainage of landscape, slopes and streams

Sensitive pans and stone structures

Examples of some of the sensitive and protected species associated with the rocky habitats



Koring MTS site and grid corridor

5 FINAL LAYOUT (turbine positions) and COMMENTS

Table 4.1: The tower number, coordinates investigated and the recommended options to lower the impacts to the sensitive habitats (HS = habitat sensitivity, Veg = vegetation sensitivity, EP = erosion potential, with rating low, medium or high or combinations e.g. low/medium).

Turbines	Comments	Additional comments	Mitigation measures
1	Only the turbine position, laydown outside buildable area. Noted the ***Aquila verreauxii*** on site with visit - 250m away.	Undulating, sensitive area. Slopes, vegetation = M, habitat = M/H.	Limit clearing on basal layer of vegetation. Limit all traffic to prevent erosion.
2	On sloped area to south, high erosion potential.		Limit clearing on basal layer of vegetation. Limit all traffic to prevent erosion.
3	Turbine in sensitive zone, escarp, habitat = M/H, Veg = M.	Access road to turbine 1 and 3 on steep slopes.	Limit clearing on basal layer of vegetation. Limit all traffic to prevent erosion – specifically i.e. the access roads.
4	Very sensitive with very high impacts (habitat, animals and plants)		Limit clearing on basal layer of vegetation. Limit all traffic to prevent erosion.
5	Roads only, no turbine in original layout.	Undulating, sensitive area. Slopes, vegetation = M, habitat = M/H.	Limit clearing on basal layer of vegetation. Limit all traffic to prevent erosion.
6	Undulating and undisturbed area.	Undulating, sensitive area. Slopes, vegetation = M, habitat = M/H.	Limit clearing on basal layer of vegetation. Limit all traffic to prevent erosion. Roads east and west sensitive.
7	Laydown on steep slopes. Access roads sensitive	Undulating, sensitive area. Slopes, vegetation = M, habitat = M/H, erosion potential = L/M.	High erosion potential, limit clearing of basal layer of vegetation and traffic.
8	Undulating area with access roads on steeper slopes.	Undulating, sensitive area. Slopes, vegetation = L/M, habitat = L/M.	High erosion potential, limit clearing of basal layer of vegetation and traffic.
9	Undulating, with laydown on steep slopes. Narrow flat footprint.	Undulating, sensitive area. Slopes, vegetation = L/M, habitat = L/M, erosion potential = L/M.	Limit clearing on basal layer of vegetation. Limit all traffic to prevent erosion. Roads east and west sensitive.
10	Steep slopes and access with undulating area at position.	Undulating, sensitive area. Slopes, vegetation = M, habitat = M/H.	High impacts related to clearing of vegetation and vehicles – limit traffic and leave basal vegetation intact.
11	Marginally undulating, but access roads more sensitive.	Undulating, sensitive area. Slopes, vegetation = L/M, habitat = L/M, erosion potential = L/M.	Limit traffic and vegetation clearance.
12	Sensitive, rocky area - plants, reptiles and mammals.	Undulating, sensitive area. Slopes, vegetation = M, habitat = M/H, erosion potential = M.	Access roads with steep inclines – limit traffic and basal layer clearing of vegetation.
13	Low impact on area.	Undulating. Veg = L, HS = L, EP = L.	Limit activities and keep basal layer intact.
14	Sensitive area. Steep slope of access road from the north.	Undulating, sensitive area. Slopes, vegetation = M, habitat = M/H, erosion potential = M.	High impacts related to clearing of vegetation and vehicles – limit traffic and leave basal vegetation intact.
15	Low vegetation impact.	Undulating. Veg = L, HS = L, EP = L.	Keep basal layer intact. Manage roads for erosion.
16	Low vegetation impact.	Undulating. Veg = L, HS = L, EP = L.	Keep basal layer intact. Manage roads for erosion.
17	Sensitive, rocky area - plants, reptiles and mammals.	Undulating, sensitive area. Slopes, vegetation = M, habitat = M/H, erosion potential = M.	Rocky area must be avoided with traffic, keep basal layer intact, limit traffic, especially on roads.

18	Sensitive area – rocky outcrops, higher protected plant diversity.	Outcrops sensitive - plants and all animals. Southern section of WEF with high presence of ***Pronolagus saundersiae***, as the rock crevices and overhanging slabs are important habitat. HS = M/H, Veg = L/M, EP = M.	Limit traffic, place activities away from the rocky areas if possible. Keep basal layer intact. Need permit for the protected species – apply for the whole project.
19	Sensitive and protected plant families present.	HS = H, Veg = H, EP = L/M.	Limit traffic, place activities away from the rocky areas if possible. Keep basal layer intact. Need permit for the protected species – apply for the whole project.
20	Sensitive for protected plants and animals.	In general area - sensitive rocky areas (reptiles and plants). HS = M+, Veg = M, EP = M/H. Slopes on laydown between 10% and 14% - high erosion.	Rocky area must be avoided with traffic, keep basal layer intact, limit traffic, limit traffic on access roads.
21	Near impoundment.	HS = H, Veg = M, EP = L/M.	Limit clearing of all vegetation. Limit activities and traffic, note possible erosion.
22	Undulating, steeper slopes to east along access road.	HS = L+, Veg = L/M, EP = M+.	Limit traffic and keep basal layer intact. Access road with erosion potential.
23	Undulating and roads steep access.	Protected plants and sensitive habitat, undisturbed vegetation and drainage lines. HS = M/H, Veg = M+, EP = M.	Must take caution with vegetation clearing – keep rocky areas vegetated.
24	Fairly moderate impact potential on vegetation.	Sensitive, rocky area - plants, reptiles and mammals. HS = M/H, Veg = M+, EP = M.	Minimum clearing of vegetation with low impacts on sensitive rocky areas.
25	Undulating and sensitive, small footprint.	Area with sensitive ridges. HS = M/H, Veg = M+, EP = M.	Access roads with steep gradients, high sensitivity, erosion a concern, leave basal plant layer.
26	Vegetation in general low sensitivity, higher in rocky areas.	Undulating, some sensitive rocky areas. HS = L/M, Veg = L, EP = L/M.	Keep vegetation layer, limit traffic and avoid the rocky areas.
27	Undulating, slopes and sensitive rocky areas.	Undulating, some sensitive rocky areas. HS = L/M, Veg = L, EP = L/M.	Rocky areas must be avoided with traffic, keep basal layer intact, limit traffic, limit traffic on access roads.
28	Undulating, slopes and sensitive rocky areas.	Slopes, sensitive. HS = M, Veg = L/M, EP = L/M.	Rocky areas must be avoided with traffic, keep basal layer intact, limit traffic, limit traffic on access roads.
29	Undulating, slopes and sensitive rocky areas.	Undulating, some sensitive rocky areas. HS = M, Veg = L/M, EP = L/M.	Rocky areas must be avoided with traffic, keep basal layer intact, limit traffic, limit traffic on access roads.
30	Undulating, slopes and sensitive rocky areas.	Undulating with ridges and rocky areas in the vicinity. Assume HS = M/H, Veg = M, EP = M+	Rocky areas must be avoided with traffic, keep basal layer intact, limit traffic, limit traffic on access roads.
31	Undulating, slopes and sensitive rocky areas.	Undulating with ridges and rocky areas in the vicinity. HS = M/MH, Veg = M+, EP = M/MH	Rocky areas must be avoided with traffic, keep basal layer intact, limit traffic, limit traffic on access roads.
32	Sloped area - laydown slopes up to 28% (side slope).	Sensitive slopes - HS = M/H, Veg = M, EP = M/H.	Limit all traffic at all times, steep slopes. Manage vegetation layer to prevent erosion.
33	Sensitive, undisturbed area.	Sensitive slopes - HS = M/H, Veg = M, EP = M/H.	Rocky areas must be avoided with traffic, keep basal layer intact, limit traffic, limit traffic on access roads.
34	Sensitive, undisturbed area.	Sensitive, protected plants, ridges, rocky areas. HS = M/MH, Veg = M+, EP = M/MH.	Rocky areas must be avoided with traffic, keep basal layer intact, limit traffic, limit traffic on access roads.

6 CONCLUSIONS and RECOMMENDATIONS

During the walk through, numerous small patches of sensitive areas (e.g. rocky outcrops, ridges and bedrock sheets) have been identified within the footprint of proposed infrastructure development (turbine positions and the road layout).

The importance of sensitive habitats are accentuated within the area and include the rocky outcrops, bedrock sheets, ridges and low lying (drainage lines). The sensitivity is linked to habitats for vegetation and animals in the area. The reason for the high sensitivity of these habitat types are related to the diversity for plants, specifically red data and protected species. It was noted that although lower densities of plants were recorded, the diversity on the rocky areas were generally higher. Many of the geophytes known from the vegetation unit are associated with the wetter, deeper soils associated with the drainage lines and the sandy patches around the rocky areas. It is therefore important to protect these areas that form part on the mosaic pattern of the landscape.

The dynamic landscape with its mosaic pattern makes it difficult to map each individual area and therefore it is not possible to indicate all these areas on a sensitivity map. It will be important to take this feature of the environment into consideration when planning the micro siting the final approved layout of the facility. Limited information and available data from the area results in low confidence in a detailed species list of plants present on the study site. It is therefore important to limit impacts outside of the final approved footprint during the development of the facility and associated infrastructure. The current presence and distribution of the protected plant species are affected by the historic land use practices in the area that include heavy grazing pressure and trampling. Selective grazing pressure on palatable species resulted in the decline of certain plants species over the last decades. The relationship between species and the importance of diversity within the plant community is critical and can result in the loss of sensitive species (e.g. loss of cover). Heavy grazing may not be the only impact on geophytes diversity decline, but the feeding of rodents on the bulbous parts are considered an additional impact (especially during dry periods).

The area associated with the grid corridor associated with the WEF area are similar when evaluating the vegetation, animals and habitat and impact from the development will be the same. Therefore the mitigation and monitoring will be the same. The section down the escarp to the Koring MTS is steeper and therefore more prone to erosion, especially for a powerline corridor (in-line construction). This will need more active planning to lower the risk i.e. clearing of the vegetation and traffic during construction and stringing. On very steep areas it is recommended that the pylons are carried I by hand and that aerial stringing is done down the escarp area.

Once on the lower areas near the MTS site, the slopes are not severe and the impacts will be lower. It is still recommended to minimise clearing of vegetation (i.e. keep the basal layer intact) in order to stabilise the soil and promote regrowth in the wet season.

Another factor that can't be ignored is the changes in the climatic conditions. A number of the species listed as rare and endangered (e.g. the Species of Conservation Concern) prefer more moist conditions and habitats. With the changes in the rainfall patterns, these plants will experience additional pressure in the ecosystem for example the recent extended drought experienced in the larger Karoo region. It was noted by van der Merwe et al (2008) that lower rainfall and a decrease in snowfall (one light event compared to 6 over a 24-year period) were noted during their study in 2004. Linked to this are changes

in precipitation patterns that include localised rain events. These differences across the area will have an effect on the growth of some plants, i.e. time of the year related to its natural growth and flowering regime.

Table 4.1 is a brief summary of the comments related to the final layout of turbine positions and comments and recommendations (mitigation) to be considered. The layout for the roads were confirmed and for most sections. It is important that a spring survey must be conducted for the final approved layout prior to construction and/or site clearing related activities commencing, in order to finalise the applications for permits (red data and protected species). This recommended survey will be on the full approved layout in order to ascertain the presence or/and absence of the protected plants in the footprint of the final approved layout. It is important to apply for the applicable permits from the conservation authorities before construction related activities can commence.

Final Statement – acceptance of layout

- As noted in Table 5.1, the layout for the WEF and its associated infrastructure is accepted.
- The corridor for the grid power line to the Koring MTS is accepted.
- The area for the proposed Koring MTS is accepted in relation to the vegetation assessment.
- In all the above areas, the spring walk down of the approved layout must be done to finalise the plant species present after the rains. This must be done in order to finalise the permit applications for the removal/destruction of the red data and protected plant species in the final approved layout of the WEF, the roads associated with the area, the associated infrastructure which include the substation, internal power grids (both aerial and subterranean).

7 REFERENCES

ADU, 2012. Animal Demography Unit, Department of Zoology, University of Cape Town. http://www.adu.org.za

BGIS: http://bgis.sanbi.org/website.asp

Botha G. 2021. 33KV/132KV Substation, Switching Station and Powerline for the Authorised Sutherland and Rietrug WEFs, Northern Cape Province - Terrestrial Ecological Study and Assessment.

Department of Environmental Affairs and Tourism, 2007. National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004): Publication of lists of Critically Endangered, Endangered, Vulnerable and Protected Species. Government Gazette, Republic of South Africa.

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

Raimondo, D., Von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C. Kamundi, D.A. & Manyama, P.A. (Eds.). 2009. Red list of South African plants 2009. Strelitzia 25:1-668.

Rouget, M., Reyers, B., Jonas, Z., Desmet, P., Driver, A., Maze, K., Egoh, B. & Cowling, R.M. 2004. South African National Spatial Biodiversity Assessment 2004: Technical Report. Volume 1: Terrestrial Component APPENDIX A. Pretoria: South African National Biodiversity Institute.

SANBI (South African Biodiversity Institute), 2010. Threatened Species: A guide to Red Lists and their use in conservation. Threatened Species Programme, Pretoria, South Africa. 28 pp.

8 SHORT CV

Tertiary academic qualifications (Dates refer to completion, dates on certificates when confirmed):

- BSc. (1984), BSc. (Hons) (1995), MSc. (1986), PhD (Zoology): Department of Zoology, Rand Afrikaans University, Johannesburg, South Africa
- Magister in Sustainable Agriculture (2003): Faculty of Agriculture, University of the Orange Free State, Bloemfontein, South Africa - emphasis on resource management and sustainable utilization thereof.

Experience

- BioAssets (owner of Consultancy CC) - 1/01/2007 - current
- University of Limpopo (formerly University of the North)
    - 1/10/1996 – 31/12/2006 - Senior lecturer: Department of Zoology/Biology
    - 1/1/1994 - 30/9/1996 - Lecturer: Department of Physiology (University of the North)
- Manager - 1992 - 1993 - Manager of a citrus farm
- Technikon RSA - 1989 - 1991- Lecturer: Nature Conservation
- Rand Afrikaans University - 1985 - 1988 - Research Assistant, 1987 – Technician, 1986 - 1992 - Researcher PhD studies, 1985 - 1988 - Student Demonstrator

BioAssets Consultancy

Owner of BioAssets consultancy - Environmental Impact Assessments (EIA's) and Environmental Management Plans (EMP's) completed for: ESKOM (Electricity Utility in South Africa), National Department of Environmental Affairs, Department of Water Affairs, Department of Minerals and Energy, various provincial conservation agencies and private consultants. In addition, the EIA/EMP work included acting as an Environmental/Ecological Control Officer (ECO).

Examples of biological surveys completed:

A Biophysical Framework for the Sustainable Management of Wetlands in the Limpopo Province with Nylsvley as a Reference Model, 2006. WRC Report No.: 1258/1/06.

Expansion of the existing Blinkwater Tailings Storage Facility (TSF) – wetland, habitat and biodiversity repots, Mogalakwena Mine, Anglo American, 2015.

Establishment of a new Waste Rock Dump (WRD) Facility, Witrivier site - wetland, habitat and biodiversity repots, Mogalakwena Mine, Anglo American, 2015.

Wetland and Toxicological Risk Assessment as part of the Water Use Licencing Process for the Proposed Polokwane Metallurgical Complex Expansion and Associated Infrastructure (Anglo American), Limpopo Province, March 2016.

KwaMhlanga Wetland and riparian delineation and assessments and the terrestrial biodiversity and habitat assessment report, July 2020.

Annual Water Use Licence External Audit and Wetland Assessment – Aerorand Switching Station and 88kV Powerlines (Eskom), March 2020.

Annual Water Use Licence External Audit and Wetland Assessment – Grootpan and Brakfontein Switching Station and 88kV Powerlines (Eskom), March 2020.

Annual Water Use Licence External Audit and Wetland Assessment – United/Bosch/ Kromklip Substations and associated 88kV Powerlines (Eskom), March 2020.

River and wetland audit and rehabilitation plan and monitoring – Villiers/Windfield Substations, power lines (Eskom), March 2020.

Habitat, Wetland and Biodiversity Assessment: Ingula Relocation Project (Eskom), July 2020

Highveld Exchange Yard Rail Siding: Wetland, biodiversity and habitat assessment report, September 2020.

An assessment of the Habitat, Biodiversity and Wetlands at the Gilead Substation – diversion power line (Eskom), February 2021.

Determination, review and implementation of reserve in the Olifants, Letaba and Shingwedzi river systems – project for the Department of Water and Sanitation (South Africa) – June 2015 – December 2016.

Determination of Resource Quality Objectives in the Mokolo, Matlabas and Crocodile (West) and Marico rivers Catchments - project for the Department of Water and Sanitation (South Africa) – August 2016 – January 2017.

Determination of Water Resource Classes and Associated Resource Quality Objectives in the Thukela Catchment - project for the Department of Water and Sanitation (South Africa) – August 2020 – to date.

Technical studies to support the water use authorisation for Simuma Complex, NPC Inter Cement, KwaZulu-Natal – January/February 2018.

The determination of Water Resource Classes and Associated Resource Quality Objectives in the Thukela River Catchment September 2020 – April 2021.

Habitat Assessment for the Mogalakwena Platinum Mine - Expansion of the existing Blinkwater Tailings Storage Facility (TSF), Farms Blinkwater 820 LR and Zwartfontein 818 LR, March 2015.

Rehabilitation programme - evaluating the general habitat along the Mohlosane River, June 2013 to August 2015.

Investigation of clearing of site after Platinum Concentrate Spill – N1, south of Polokwane, June 2015.

Wetland and Toxicological Risk Assessment as part of the Water Use Licencing Process for the Proposed Polokwane Metallurgical Complex Expansion and Associated Infrastructure, Limpopo Province, March 2016.

Dinokeng-Rust de Winter botanical walk through study (Limpopo).

Wolvekraal botanical walk through study (Limpopo).

Estcourt-Pietermaritzburg botanical walk through study (KZN).

Groblersdal-Witbank botanical walk through study (Limpopo).

Sishen-Saldana botanical walk through study, protected trees and plant rescue (Northern Cape)

Monitoring of the Critically Endangered *Bunolagus monticularis* (Riverine Rabbit) occurs along seasonal rivers in the Nama Karoo for a cluster of WEF's and Solar Farms – Richmond, South Africa. (A Green Ventures project for David Hoare Consulting, December 2020 and July to September 2021).

Animal Biodiversity Assessment for the proposed Kwana Solar PV project near Richmond, Northern Cape Province. (A Great Karoo Renewable Energy (Pty) Ltd project for David Hoare Consulting – May 2022.

Animal Biodiversity Assessment for the proposed Moriri Solar PV project near Richmond, Northern Cape Province. (A Great Karoo Renewable Energy (Pty) Ltd project for David Hoare Consulting – May 2022.

Animal Biodiversity Assessment for the proposed Nku Solar PV project near Richmond, Northern Cape Province. (A Great Karoo Renewable Energy (Pty) Ltd project for David Hoare Consulting – May 2022.

Animal Biodiversity Assessment for the proposed Merino Wind Farm project near Richmond, Northern Cape Province. (A Great Karoo Renewable Energy (Pty) Ltd project for David Hoare Consulting – May 2022.

Vegetation Assessment for the Dwarsrug WEF project, near Loeriesfontein in the Northern Cape (assessment of the WEF turbine layout, grid roads and grid connections). A Mainstream Renewable Power South Africa (Pty) Ltd, done for SLR – March 2022.

Vegetation Assessment for the Waaihoek WEF project, near Utrecht in the KZN (assessment of the WEF turbine layout, grid roads and grid connections). A Mainstream Renewable Power South Africa (Pty) Ltd, done for SLR – March/April 2022.

Vegetation Assessment for the Rietrug Sutherland WEF projects (2 separate projects), near Sutherland in the Northern Cape (assessment of the WEF turbine layout, grid roads and grid connections). A Mainstream Renewable Power South Africa (Pty) Ltd, done for SLR – March to May 2022.

Vegetation Assessment for the Traka and Beaufort WEF project, near Beaufort West in the Western Cape (assessment of the WEF turbine layout, grid roads and grid connections). A Mainstream Renewable Power South Africa (Pty) Ltd, done for SLR – March to May 2022.

Vegetation Assessment (Basic Assessment) for the Sutherland 2 WEF project, near Sutherland in the Western Cape (assessment of the WEF turbine layout, grid roads and grid connections). A Mainstream Renewable Power South Africa (Pty) Ltd, done for NALA Environmental – May/June 2022.

Vegetation Assessment for the Waaihoek WEF Substation and Grid connection to the Bloedrivier Substation WEF project, near Utrecht in the KZN (assessment of the 26km grid connections). A Mainstream Renewable Power South Africa (Pty) Ltd, done for NALA Environmental – May/June 2022.

Koring MTS DEA Ref. No: 14/12/16/3/3/1/2077 (near Merweville, Western Cape) – A Botanical Assessment for the Koring MTS (Sutherland, Sutherland 2 and Rietrug Wind Energy Facilities). A Mainstream Renewable Power South Africa (Pty) Ltd, done for SLR/NALA Environmental – April 2022.

Koring MTS DEA Ref. No: 14/12/16/3/3/1/2077 (near Merweville, Western Cape) – Wetland Buffer Assessment: Koring MTS (Sutherland, Sutherland 2 and Rietrug Wind Energy Facilities. A Mainstream Renewable Power South Africa (Pty) Ltd, done for SLR/NALA Environmental – April 2022.

Barrydale Huisrivier riparian vegetation rehabilitation project – A Riparian Zone Rehabilitation, Management and Bioremediation, Department of Environmental Affairs and Development Planning Western Cape Government project – December 2021 to February 2022.

Professional experience

- Supervisor for 5 PhD and 15 MSc students.
- Recent research/biomonitoring in: Letaba, Olifants, Luvuvhu, Shingwedzi, Nyl, Crocodile, Komati, Pongola, Sabie and Sand River systems.
- Involved with SAEON (Ndlovu Node) in the establishment of a long term monitoring project of the Lowveld Rivers.

Professional affiliation

- Member of "The South African Council for Natural Scientific Professions" (SACNASP – registered as a "Professional Natural Scientist: Registration number - 400109/95).
- Member of the South African Society for Aquatic Sciences.
- International collaboration and scientific visits to China, Singapore, Hong Kong, Japan, Mozambique and Kenya.
- Team leader for the UNESCO/Flemish Government FETWater project and development of the modules for the water related Master Degree programme (2003 – 2014).

List of recent publications

Vlok W en Van Vuren JHJ. 1986. Chemical composition of seminal plasma of the smallmouth yellowfish Barbus aeneus (Cyprinidae). Presentation at the joint symposium of the Zoological Society of southern Africa and the Parasitological Society of southern Africa, RAU, Johannesburg.

Vlok W, Van Vuren JHJ en Els HJ. 1987. Ultrastructure of the testis of Barbus aeneus (Cyprinidae). S.A. Journal of Science 83(8):511

Vlok W en Van Vuren JHJ. 1988. Physical composition of the semen of Barbus aeneus, the smallmouth yellowfish (Cyprinidae). Comp. Biochem. Physiol. 90A(3): 387-389

Vlok W en Van Vuren JHJ. 1988. Chemical composition of the blood and seminal plasma of Barbus aeneus (Cyprinidae). Comp. Biochem. Physiol. 90A(1): 49-51.

Vlok, W and Engelbrecht, J.S. 2000. Some aspects of the ecology of the Groot Letaba River in the Northern Province, South Africa. *Afr. J. of Aquatic Science* 25: 76 – 83.

Vlok, W. 2005. Histological studies to evaluate gonad development in *Barbus neefi* (Cyprinidae), the sidespot barb, from South Africa. *Afr. J. of Aquatic Science* 30(1): 85 – 88.

Mbajiorgu, E.F., Aire, T.A., Vlok, W., Alberts, M. and Debusho, L.K. 2007. Haematological profile of male rats treated with ethanol and/or chloroquine and fed normal or low protein diet. *The Int J Hematology.* **3**(1): 1 – 20.

Mbajiorgu, E.F., Aire, T.A., Vlok, W., Alberts, M. 2008. Low protein diet enhances the toxicity of combined ethanol and chloroquine administration on gonadal weight, seminiferous tubular diameter and epithelial height of male Sprague-Dawley rats: A morphometric study. *International J Health Sc* (*IJHS).* **1**(4): 120 – 126.

Mbajiorgu, E.F., Aire, T.A., Vlok, W., Alberts, M. 2009. Effects of ethanol and/or chloroquine with low protein dietary intake on some biochemical parameters in male rats. *Afr J Food Agr Nutr Dev* (*AJFAND).* **9**(4): 1021 – 1042.

Fouché, P.S.O. and Vlok, W. 2010. Water quality impacts on the instream biota of the Shingwedzi River, South Africa. *Afr. J. of Aquatic Science* **35** (1) 1 – 11.

Venter, J.A., Fouché, P.S.O. and Vlok, W. 2010. Current distribution of the southern barred minnow,

Opsaridium peringueyi (Pisces: Cyprinidae), in South Africa: Is there reason for concern? *African Zoology* **45**(2): 244–253.

ZCC Khoza, MJ Potgieter & W Vlok (2012): A preliminary survey of biotic composition of the Olifantspruit catchment, South Africa, *African Journal of Aquatic Science*, 37:2, 201-208

List of recent research reports

Vlok, W., Venter, J., Fouché, P.S.O. and Snyman, S. (2006). *Progress report on the macro-habitat study of the Southern barred minnow.* WRC PROJECT K5/1677 (The development of a conservation framework for threatened African fish using *Opsaridium peringueyi* as a reference species).

Vlok, W and Fouché, P.S.O (2006). *Progress report on the Yamorna Weir and Luvuvhu River Projects.* Interim Report to the WfW capacity building initiative.

Venter, J., Fouche, P.S.O., Vlok, W., Moyo, N. and Snyman, S. (2007). *Progress report on the macro-habitat study of the Southern barred minnow.* WRC PROJECT K5/1677*.*

Vlok, W. and Fouché, P.S.O. 2007. A preliminary survey of the Shingwedzi River Catchment – alien plant infestation, aquatic biota, geomorphology, and riparian zone integrity. *Progress report to the Kruger National Park.*

Venter, J., Fouché, P.S.O., Vlok, W., Moyo, N., Grobler P. and Theron, S. (2008). *Progress report of the project on the development of a conservation framework for threatened African fish using the Southern barred minnow as a reference species.* WRC PROJECT K5/1677*.* 4th March 2008.

Vlok, W., Fouché, P.S.O, Cook, C.L., Wepener, V. and Wagenaar, G.M. (2012). *An assessment of the current distribution, biodiversity and health of the frogs of the Kruger National Park in relation to physical and chemical factors*. WRC Report 1928/1/12.

Fouché, P.S.O, Vlok, W. Roos, J.C., Luus-Powell, W. and Jooste, A. *Establishing the fishery potential of Lake Nandoni in the Luvuvhu River, Limpopo Province*. WRC Report 1925/1/12.

Smit, N.J., Wepener, V., Vlok, W., Wagenaar, G.M. and van Vuren, J.H.J. Conservation of tigerfish, *Hydrocynus vittatus*, in the Kruger National Park with the emphasis on establishing the suitability of the water quantity and quality requirements for the Olifants and Luvuvhu rivers. WRC Report No.1922/1/13.

Smit NJ; Vlok W; van Vuren JHJ; du Preez L; van Eeden E; O'Brien GC and Wepener V. 2016. Socio-ecological system management of the lower Pongola River and floodplain using relative risk methodology. WRC Research Report No.2185/1/16.