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Appendix D:
Specialist Studies

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Enviro INSIGHT
environmental impact assessments

Appendix D1:
Terrestrial Biodiversity Assessment

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Terrestrial Biodiversity and Sensitive Plant Species Specialist Assessment: Two Wind Energy Facilities and Two Solar Energy Facilities to be known as De Rust Situated South of Pofadder Northern Cape Province

12 April 2023

For

FE De Rust (Pty) Ltd

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PREPARED BY

Enviro-Insight CC

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Specialist Declaration

I, Corné Niemandt, declare that the work presented in this report is our own and has not been influenced in any way by the developer or the EAP. At no point has the developer asked me to manipulate the results in order to make it more favourable for the proposed development. I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP) and the EIA Regulations (2014, as amended). I have the necessary qualifications and professional expertise in conducting this specialist report.

Corné Niemandt
Pr. Sci. Nat. Ecological Science Reg. No. 116598
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Glossary

Critical Biodiversity Area (CBA): an area that must be maintained in a good ecological condition (natural or semi-natural state) in order to meet biodiversity targets. CBAs collectively meet biodiversity targets for all ecosystem types, as well as for species and ecological processes that depend on natural or semi-natural habitat that have not already been met in the protected area network. CBAs are identified through a systematic biodiversity planning process in a configuration that is complementary, efficient and avoids conflict with other land uses where possible.

Cumulative impact: in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

Ecosystem: a dynamic complex of animal, plant and micro-organism communities and their non-living environment interacting as a functional unit

Endemic: a species that is naturally restricted to a particular, well-defined region. This is not the same as the medical definition, which is 'occurring naturally in a region.

Extent of occurrence (EOO): the area contained within the shortest continuous imaginary boundary that can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy; and in short is the species' contemporary distribution range.

IUCN Red List Categories and Criteria: the threatened species categories used in Red Data Books and Red Lists have been in place for almost 30 years. The IUCN Red List Categories and Criteria provide an easily and widely understood system for classifying species at high risks of global extinction, so as to focus attention on conservation measures designed to protect them.

IUCN Red List status: the conservation status of species, based on the IUCN Red List categories and criteria.

Mitigation: means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.

Rehabilitation: in the context of EIA, this means the repairing of a habitat/ecosystem so that processes and productivity remain functional, but it does not specifically imply that the original condition of the habitat/ecosystem will be restored.

Species of conservation concern (SCC): includes all species that are assessed according to the IUCN Red List Criteria as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Data Deficient (DD) or Near Threatened (NT), as well as range-restricted species which are not declining and are nationally listed as Rare or Extremely Rare [also referred to in some Red Lists as Critically Rare].

Taxon: (plural taxa) a taxonomic group of any rank, such as a species, family, or class.

Threatened species: species that are facing a high risk of extinction. Any species classified in the IUCN categories Critically Endangered, Endangered or Vulnerable is a threatened species. In terms of section 56(1) of NEMBA, 'threatened species' means indigenous species listed under the Act as critically endangered, endangered or vulnerable species.

1 INTRODUCTION

1.1 PROJECT DESCRIPTION

Enviro-Insight CC was commissioned by FE De Rust (Pty) Ltd to perform a Terrestrial Biodiversity Assessment and Terrestrial Sensitive Plant Species Assessment for the proposed De Rust Wind Energy Facility (WEF) and De Rust Solar Energy Facilities (SEF) located south of Pofadder in the Northern Cape Province, South Africa.

The Applicant wishes to apply for environmental authorisations for the proposed development of two (2) WEFs and two (2) SEFs as well as the associated infrastructure (all four projects will be referred to as "the study area"). The De Rust WEFs will consist of up to 71 wind turbines, with a generation capacity of up to 7.5 MW per turbine. Each turbine will have a hub height of up to 150 m and a rotor diameter of up to 175 m. The final turbine model to be utilised will only be determined closer to the time of construction, depending on the technology available at the time. Additional ancillary infrastructures will include Battery Energy Storage System (BESS), internal road networks, workshop, storage room, office and laydown area for the construction period.

The four projects will be referred to as:

- De Rust North WEF
- De Rust South WEF
- De Rust PV 1 SEF
- De Rust PV 2 SEF

The turbine footprints and associated facility infrastructure (internal access roads, substations, construction compound, batching plant and operations building) for both De Rust WEFs will potentially cover total combined area of approximately 131 ha during the construction phase, of which approximately 56 ha will be rehabilitated post-construction, thereby reducing the operating development footprint to approximately 74.8 ha.

Table 1-1: Proposed Construction Footprint of the four De Rust Wind Energy Facilities.

Facility Component	De Rust North WEF	De Rust South WEF
Estimated number of turbines	39	32
Dimensions of turbine foundations (m^2)	124800	102400
BESS footprint (m^2)	22000	22000
Crane stands (m^2)	152100	124800
Compound (m^2)	22500	22500
Temporary laydown areas (m^2)	1170	960
Switchgear / transformer (m^2)	975	800
Internal roads (m^2)	386463	326542
Upgrade existing roads (m^2)	0	0
Rehabilitation - 4m of road (m^2)	128821	108847
Total Development Footprint (m^2)	710008	600002
Total Development Footprint (ha)	71	60
Rehabilitation post-construction (m^2)	304591	257107
Rehabilitation post-construction (ha)	**30.5**	**25.7**

The PV footprints and associated facility infrastructure (internal access roads, substations, construction compound, batching plant and operations building) for the two De Rust SEFs will potentially cover total combined area of approximately 964.57 ha during the construction phase, of which approximately 22.05 ha will be rehabilitated post-construction, thereby reducing the operating development footprint to approximately 942.51 ha (which is not significantly different compared to pre-rehabilitation).

Table 1-2: Proposed Construction Footprint of the two De Rust Solar Energy Facilities.

Facility Component	De Rust PV1 SEF	De Rust PV2 SEF
PV area (m2)	4621329	4470489
BESS footprint (m^2)	21500	21500
Temporary laydown areas (m^2)	39720	39720
Onsite Substation (m^2)	23995	23995
Operations and maintenance Building	9980	9980
Internal roads (m^2)	165096	198360
Rehabilitation - 4m of road (m^2)	55032	66120
Total Development Footprint (m^2)	4881620	4764044
Total Development Footprint (ha)	**488,16**	**476,40**
Rehabilitation post-construction (m^2)	104732	115820
Rehabilitation post-construction (ha)	**10,47**	**11,58**

All four renewable energy projects are not located within a Renewable Energy Development Zones (REDZ) and accordingly Scoping and Environmental Impact Assessment Reporting (S&EIR) processes will be followed for all four projects.

1.2 STUDY AEA

The proposed study area for is located approximately 13km south of Pofadder within the Khâi-Ma Local Municipality, in the Northern Cape. The site can be reached via the R358 which branches off the N14. The FE De Rust WEFs & SEFs project areas of approximately 16 400 ha are located on Portion 9 of the Farm Nouzees 148, the Remaining Extent of the Farm Houmoed 206, and Portion 1 of the Farm Samoep 147, in the Khâi-Ma Local Municipality (Figure 1-1).

The only land use in the area is sheep farming due to the lack of rainfall and nearby permanent water sources, and several farm smallholdings are present within the study area. The closest existing WEF is the Kangnas WEF, which is situated approximately 35 km west of the proposed De Rust study area.

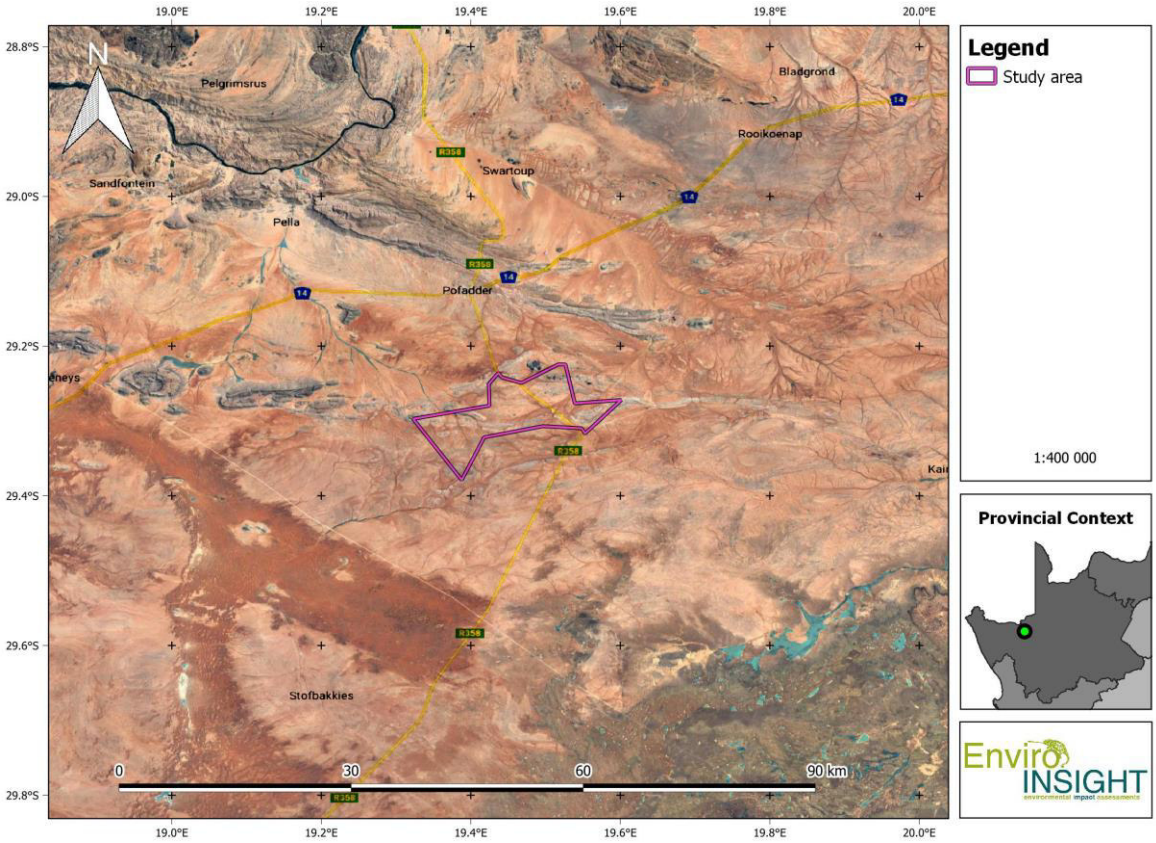


Figure 1-1: Location of the proposed De Rust Wind and Solar Farms.

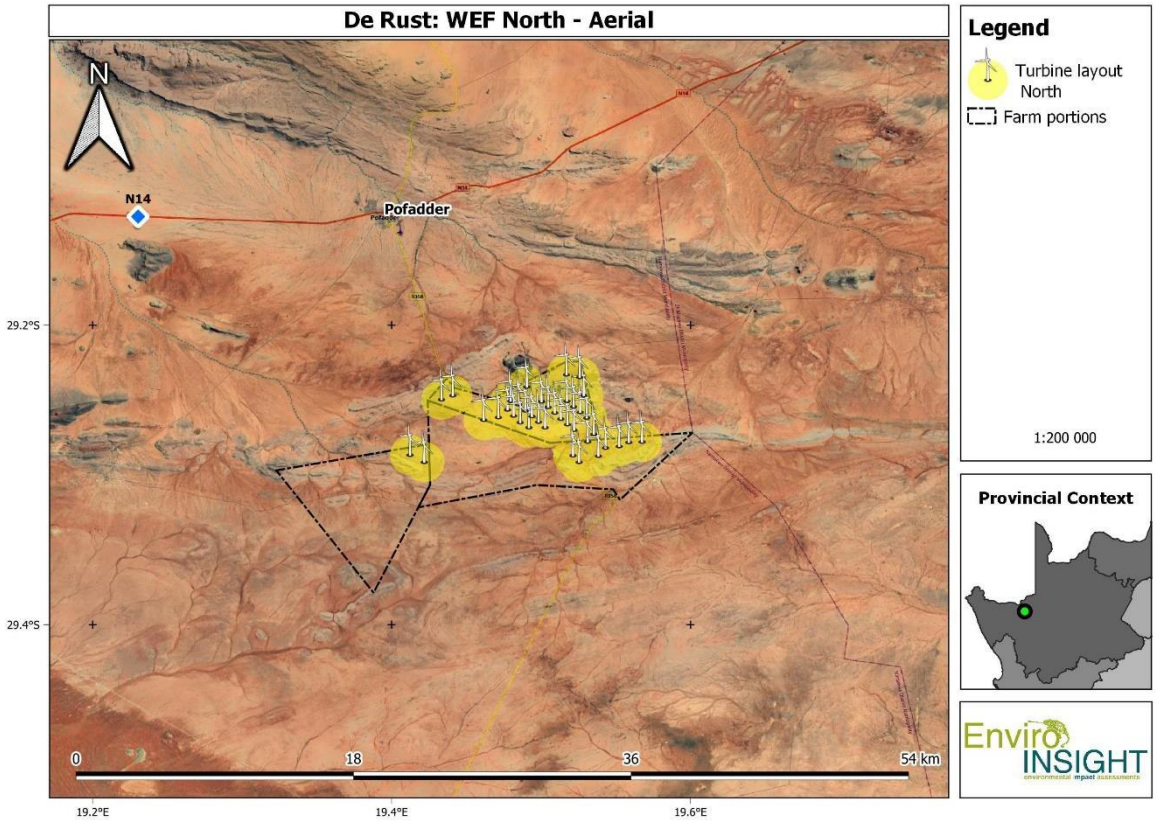


Figure 1-2: The proposed De Rust North WEF showing proposed turbine layouts and associated infrastructure.

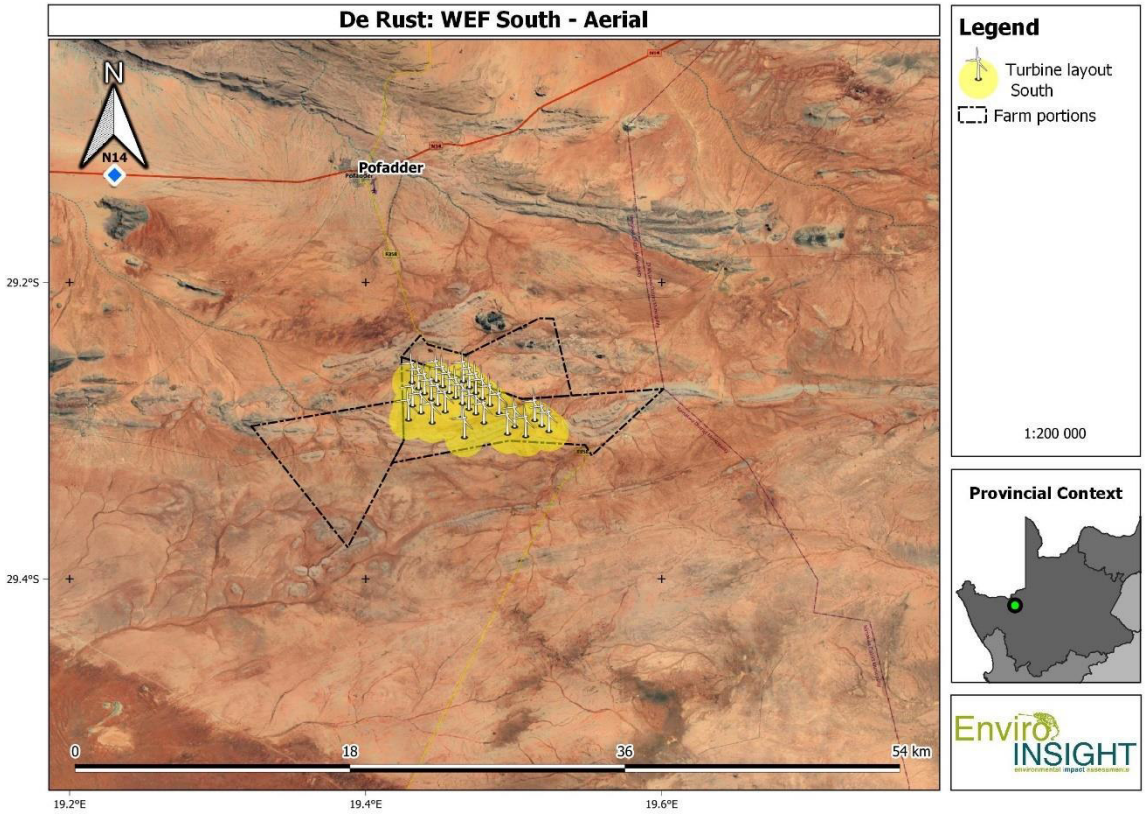


Figure 1-3: The proposed De Rust South WEF showing proposed turbine layouts and associated infrastructure.

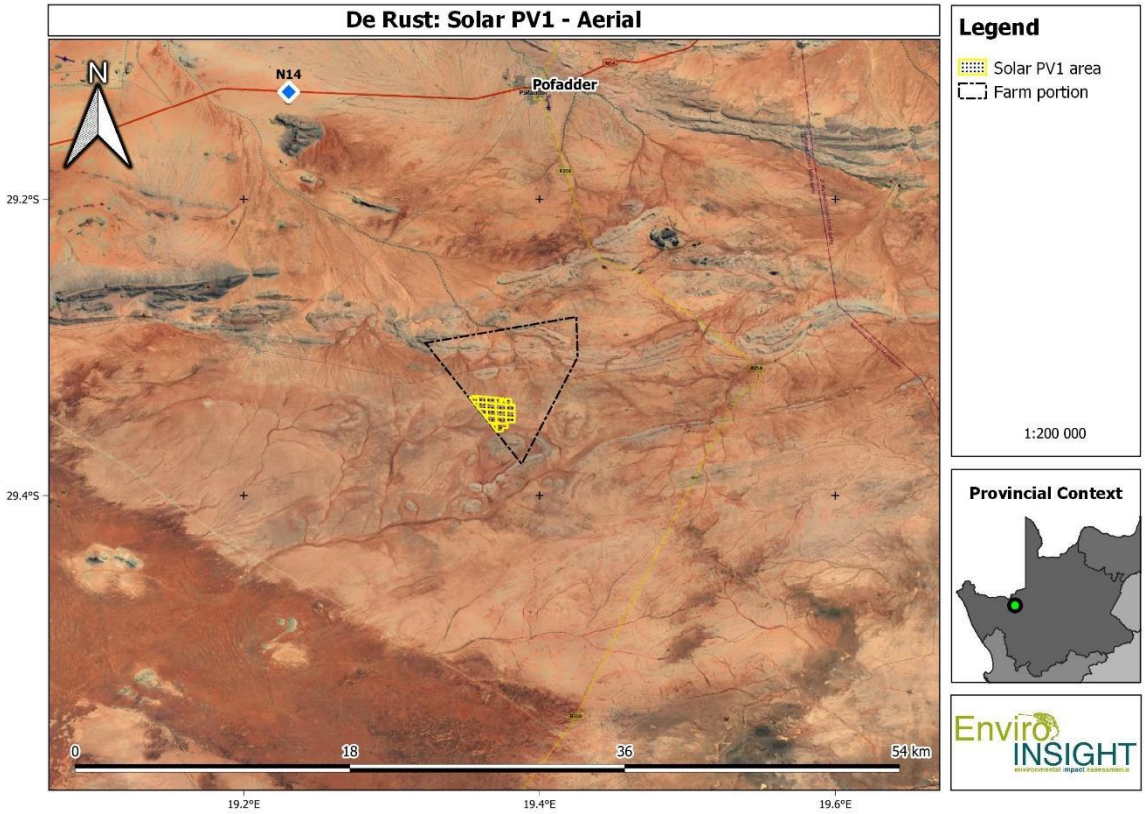


Figure 1-4: The proposed De Rust PV1 showing proposed array layouts and associated infrastructure.

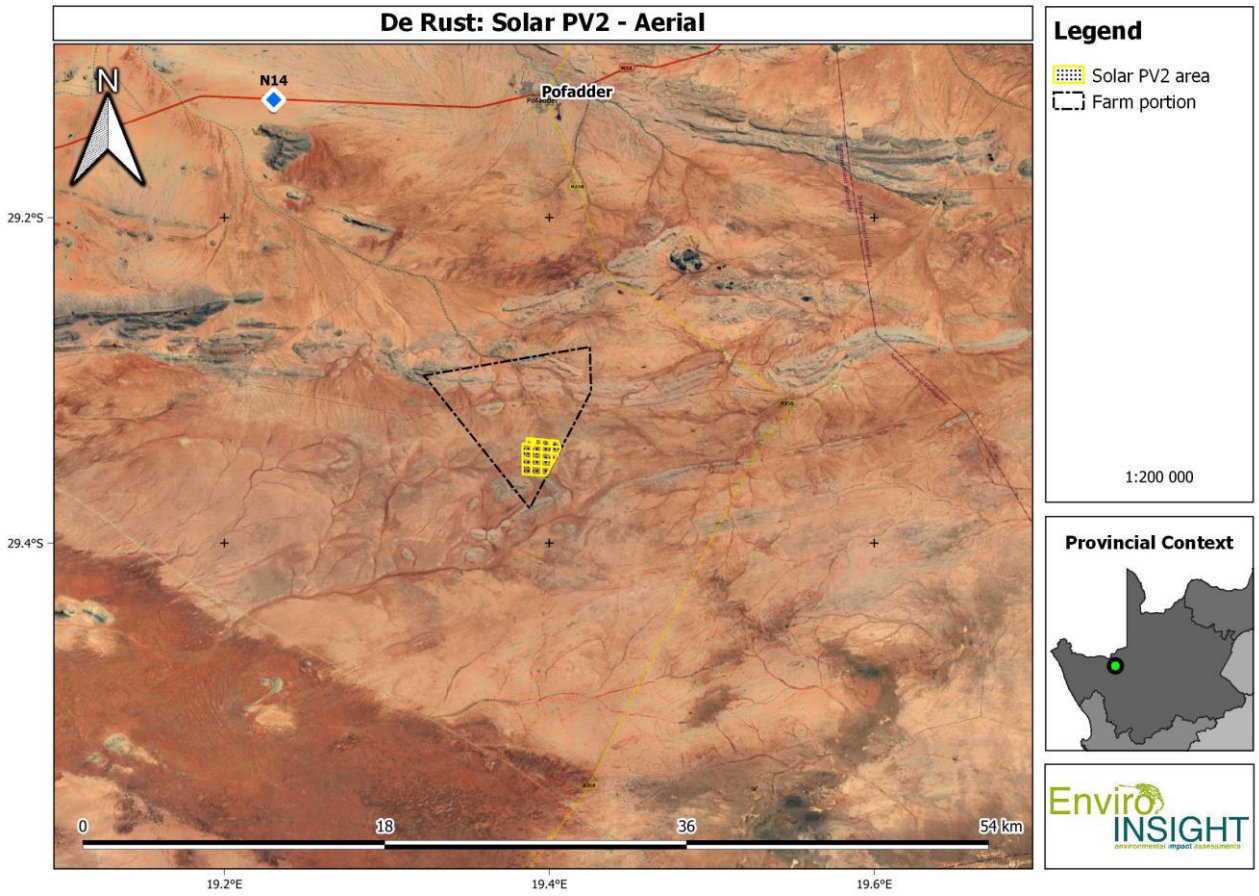


Figure 1-5: The proposed De Rust PV2 showing proposed array layouts and associated infrastructure.

1.3 STUDY AIMS & LEGAL CONTEXT

- This report contains the Terrestrial Biodiversity as well as Sensitive Plant Species Themes of the Environmental Impact Assessment report (EIAr) required for the environmental authorisation process for a proposed development.
- The terrestrial plant species protocol published on 30 October 2020 for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial plant species in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)[1], hereafter referred to as "species protocol".
- Guidance for the implementation of the above-mentioned species protocols is followed according to SANBI (2020), hereafter referred to as "the terrestrial species protocol guidelines".

2 METHODS

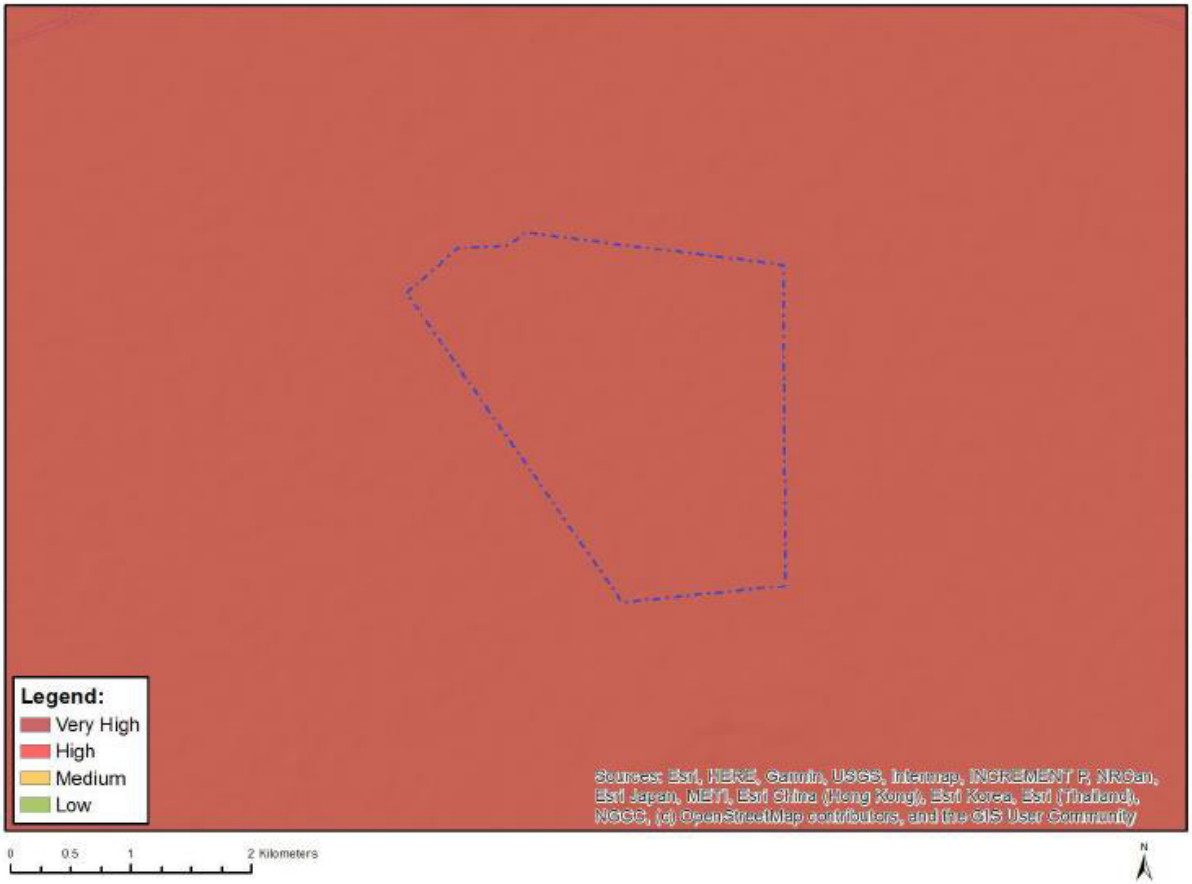
2.1 NATIONAL WEB BASED ENVIRONMENTAL SCREENING TOOL

The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool (screening tool). The requirements for

[1] GOVERNMENT GAZETTE, No. 43855, 30 OCTOBER 2020. Available from: http://www.gpwonline.co.za/Gazettes/Gazettes/43855_30-10_NationalGovernment.pdf

terrestrial biodiversity are for landscapes or sites which support various levels of biodiversity. The screening reports for all four projects were generated on 14 November 2022.

Based on the screening report generated, the Terrestrial Biodiversity Combined Sensitivity Theme is indicated as **Very High** sensitivity for all four De Rust projects (refer to Figure 2-1; Figure 2-2; Figure 2-3; Figure 2-4).

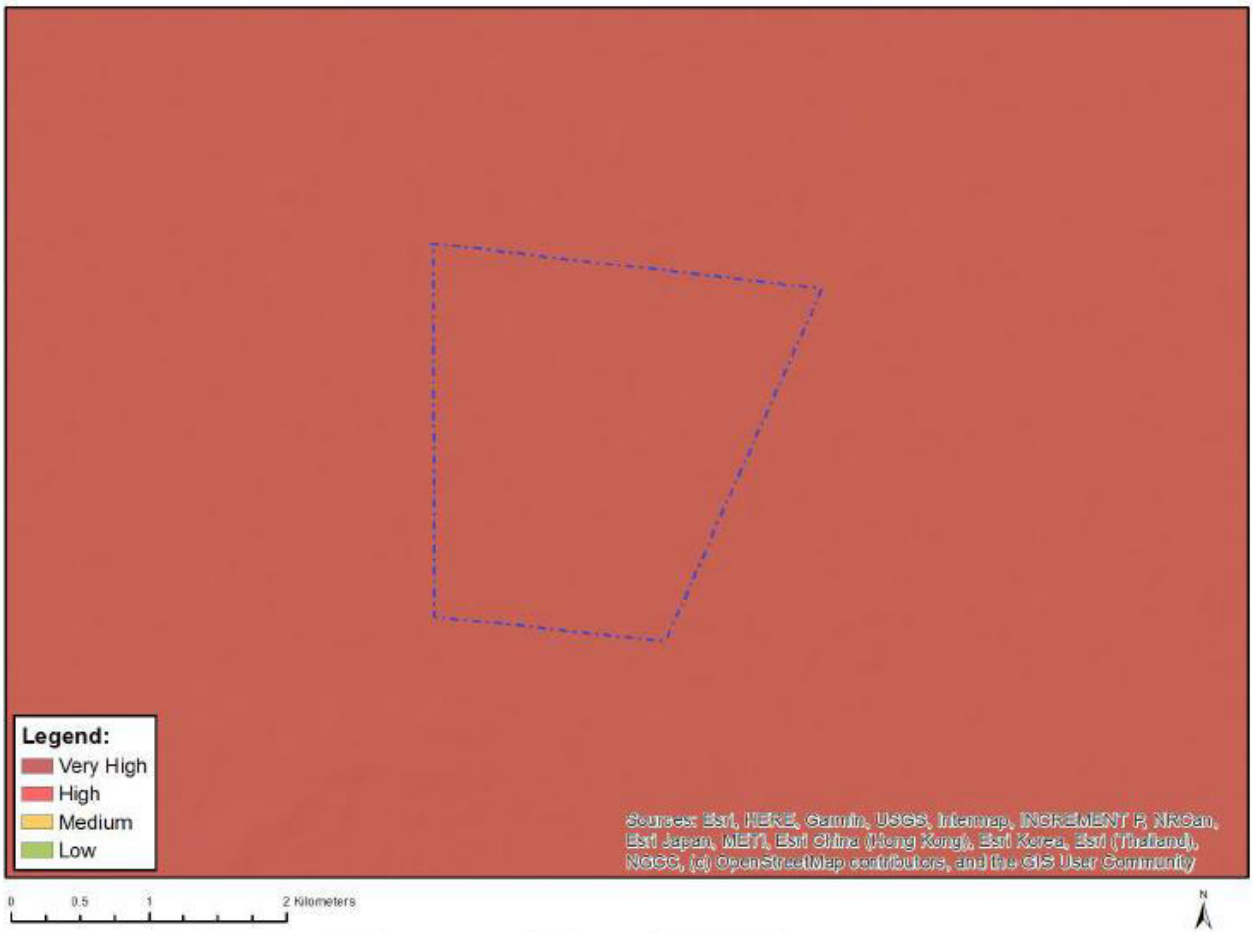


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 2
Very High	FEPA Subcatchments
Very High	Protected Areas Expansion Strategy

Figure 2-1: Screening Tool map of relative terrestrial biodiversity theme sensitivity for De Rust PV1 SEF.

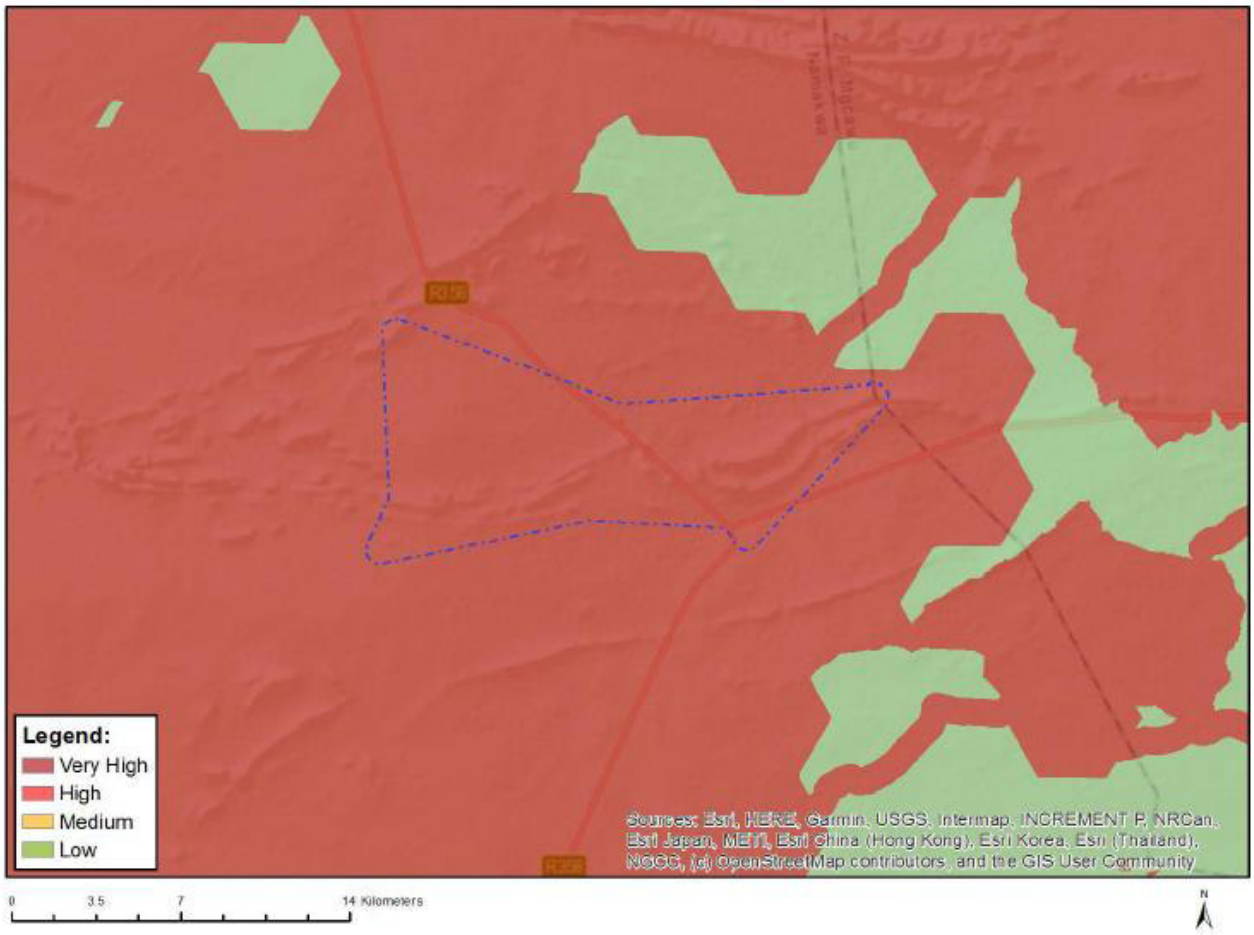


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 1
Very High	Critical biodiveristy area 2
Very High	FEPA Subcatchments
Very High	Protected Areas Expansion Strategy

Figure 2-2: Screening Tool map of relative terrestrial biodiversity theme sensitivity for De Rust PV2 SEF.

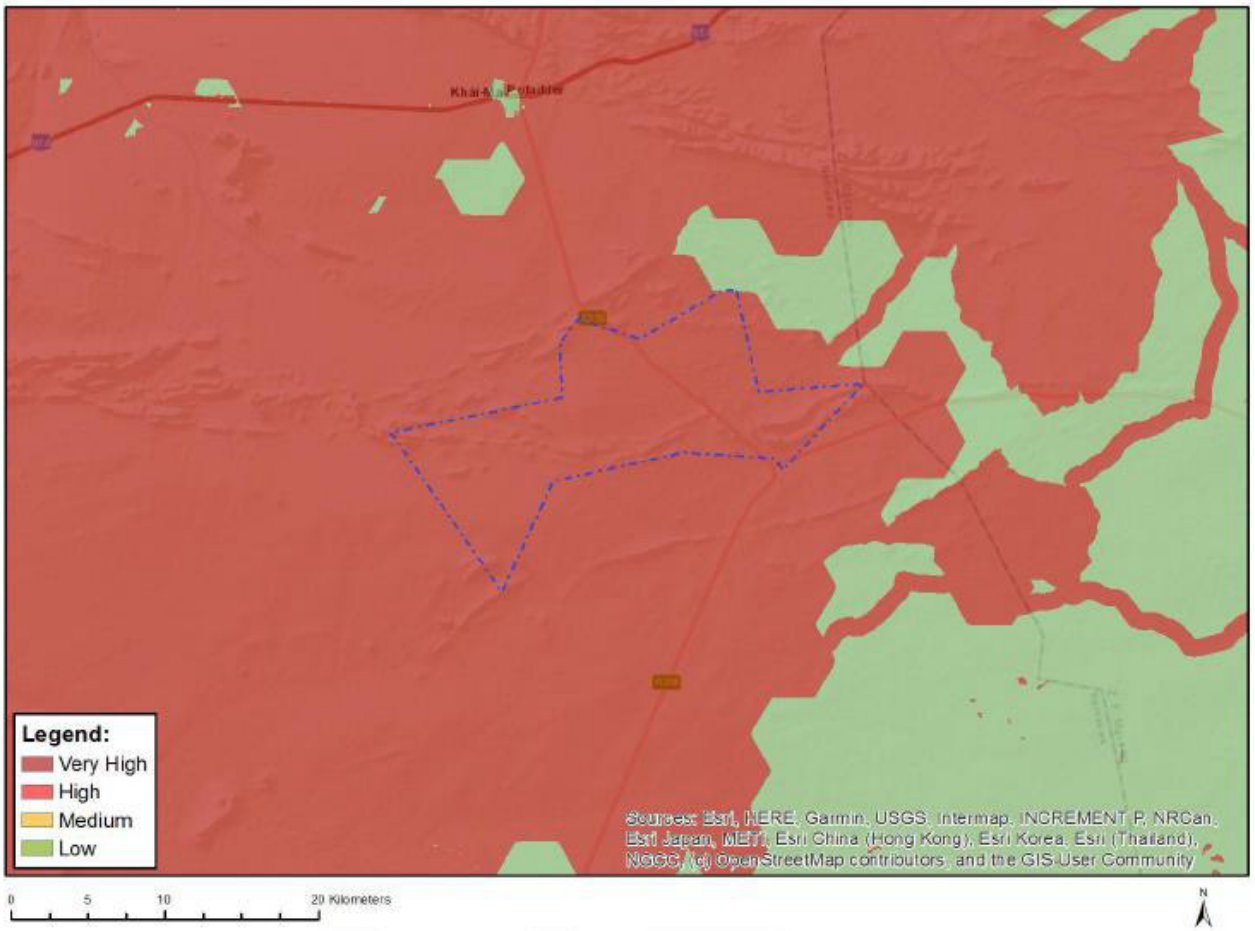


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 2
Very High	Ecological support area
Very High	Protected Areas Expansion Strategy

Figure 2-3: Screening Tool map of relative terrestrial biodiversity theme sensitivity for De Rust South WEF.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Critical biodiveristy area 1
Very High	Critical biodiveristy area 2
Very High	Ecological support area
Very High	FEPA Subcatchments
Very High	Protected Areas Expansion Strategy

Figure 2-4: Screening Tool map of relative terrestrial biodiversity theme sensitivity for De Rust North WEF.

Accordingly, a Terrestrial Biodiversity Specialist Assessment must be conducted for all four Projects based on the Protocols (published on 20 March 2020), and the site sensitivity verification (see below).

The plant species theme indicated Medium sensitivity due to suitable habitat for four species[2] (refer to list below; Figure 2-5). Accordingly, a site sensitivity verification (SSV) was required to confirm the presence of the species and determine suitable habitat. Refer to next section discussing the site sensitivity verification.

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 425
Medium	Cephalophyllum fulleri
Medium	Sensitive species 854
Medium	Sensitive species 144

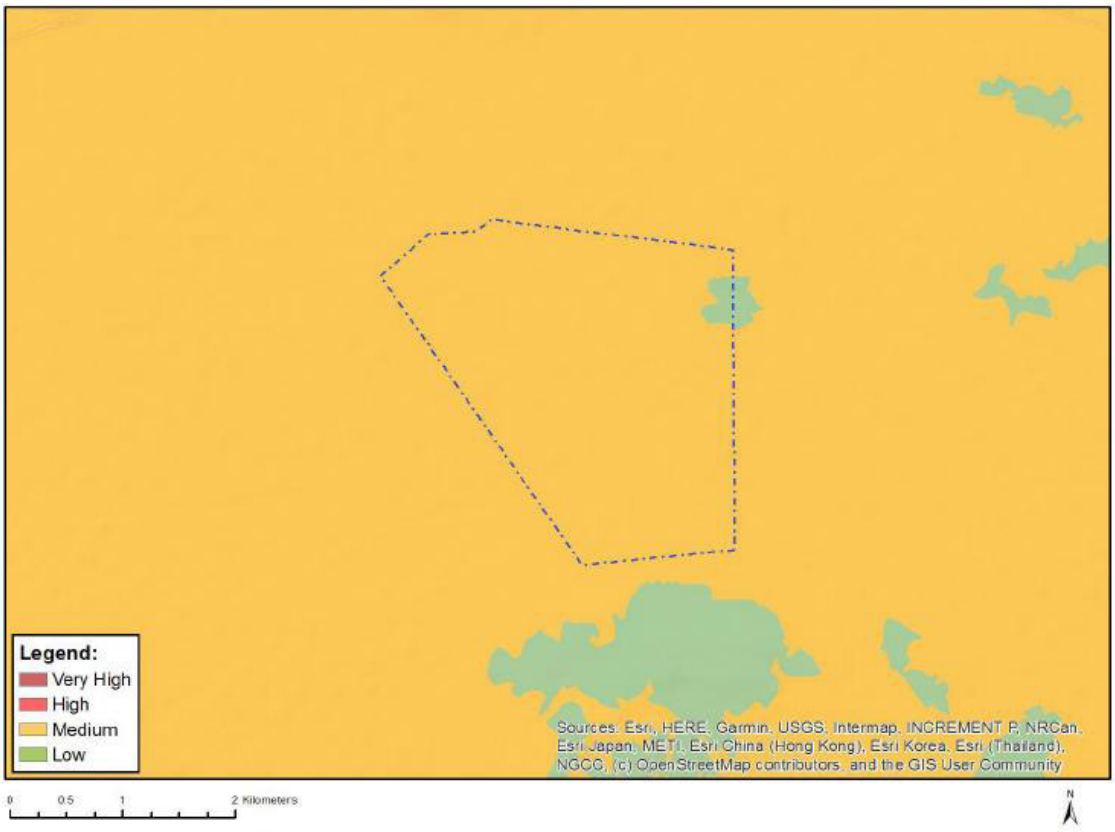


Figure 2-5: Screening Tool map of relative plant species theme sensitivity for De Rust PV1 SEF.

[2] Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

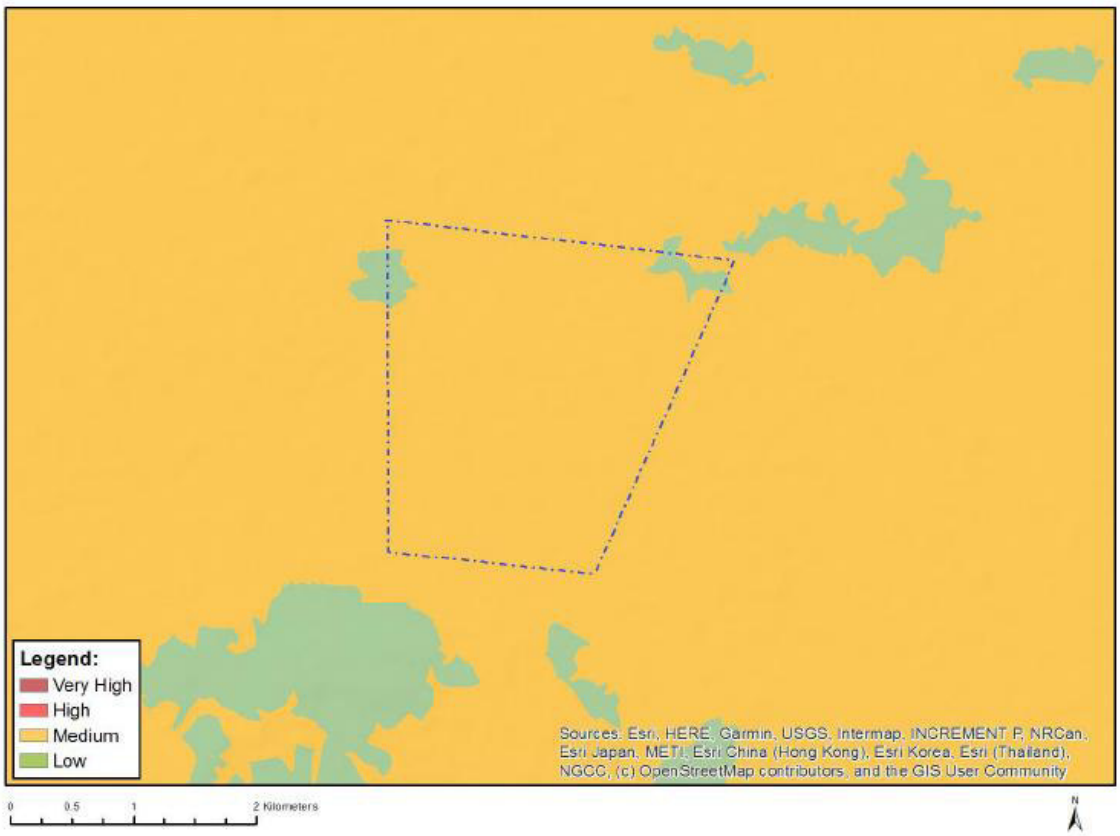


Figure 2-6: Screening Tool map of relative plant species theme sensitivity for De Rust PV2 SEF.

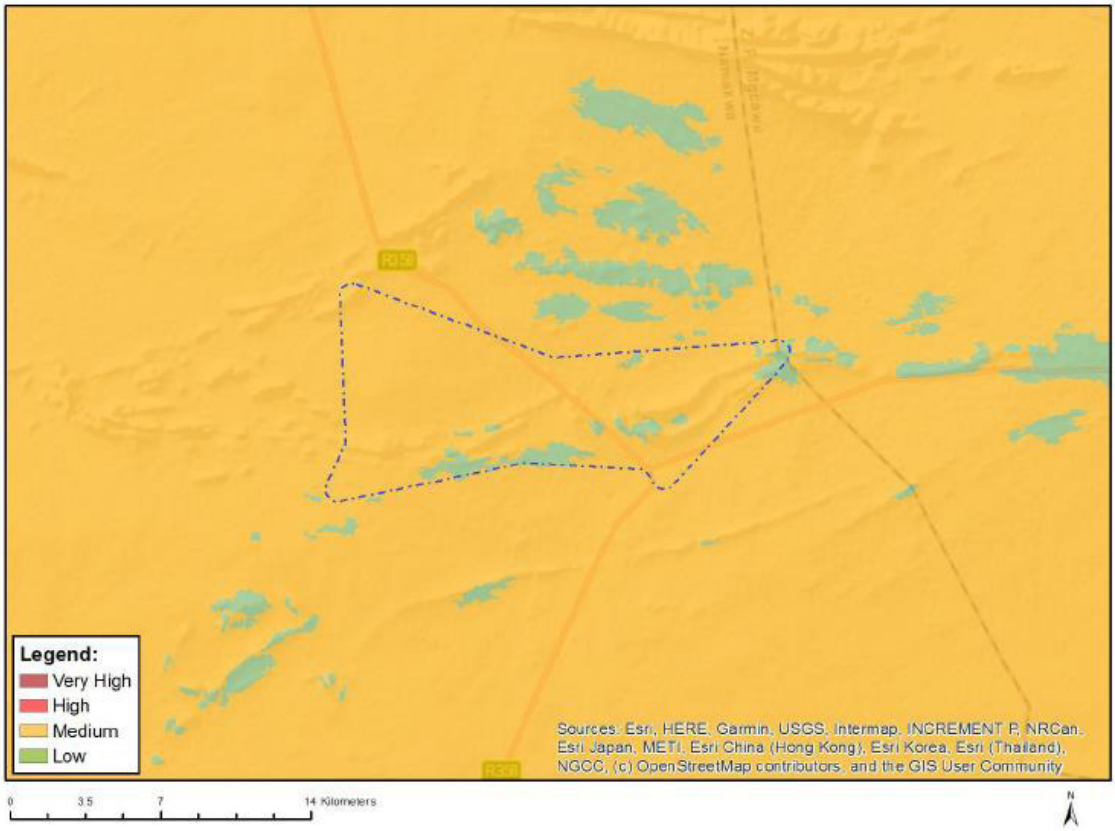


Figure 2-7: Screening Tool map of relative plant species theme sensitivity for De Rust South WEF.

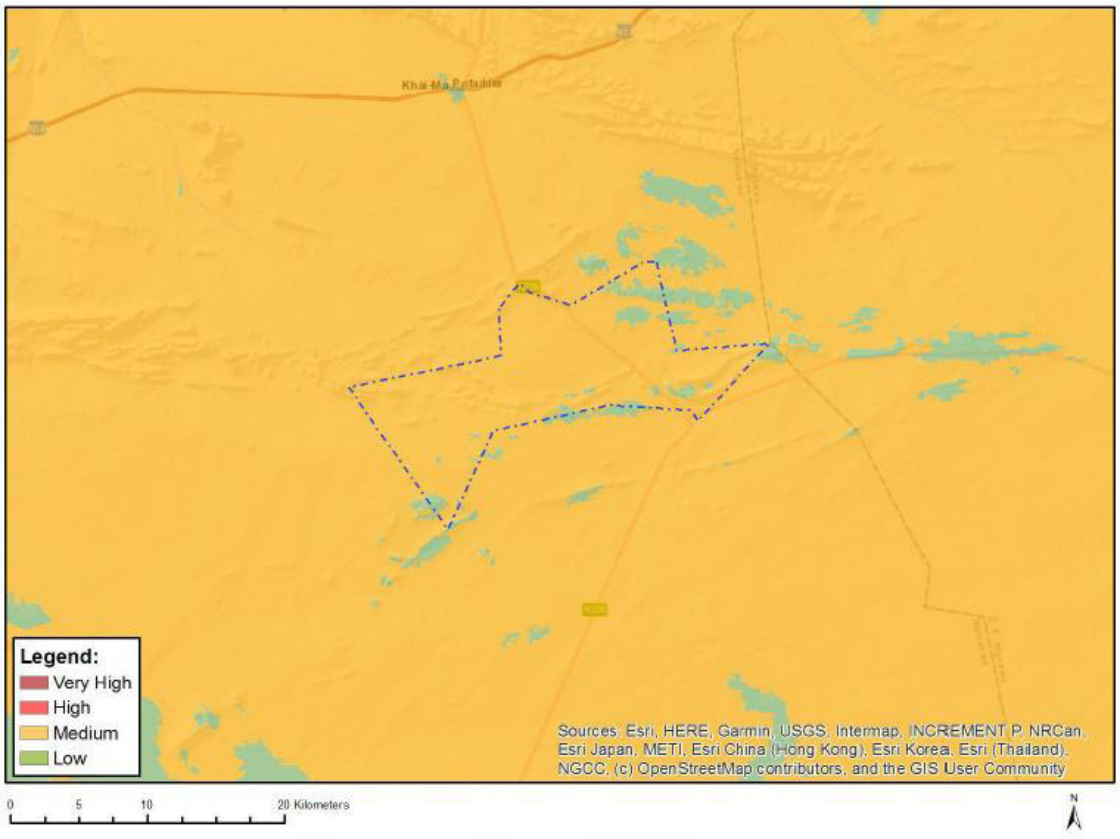


Figure 2-8: Screening Tool map of relative plant species theme sensitivity for De Rust North WEF.

The animal species theme indicated High sensitivity due to two avifauna sensitive species. However, avifauna as a taxon group is not addressed in this report but in separate avifauna reports for solar and wind; accordingly, all other taxon groups are regarded as low sensitivity for animals (Figure 2-9; Figure 2-10; Figure 2-11; Figure 2-12). Refer to Appendix B for more information in the Animal Compliance Statement.

Sensitivity	Feature(s)
High	Aves-Cursorius rufus
High	Aves-Neotis ludwigii
High	Aves-Falco biarmicus
High	Aves-Aquila verreauxii
Low	Subject to confirmation
Medium	Aves-Neotis ludwigii
Medium	Aves-Sagittarius serpentarius
Medium	Aves-Aquila verreauxii

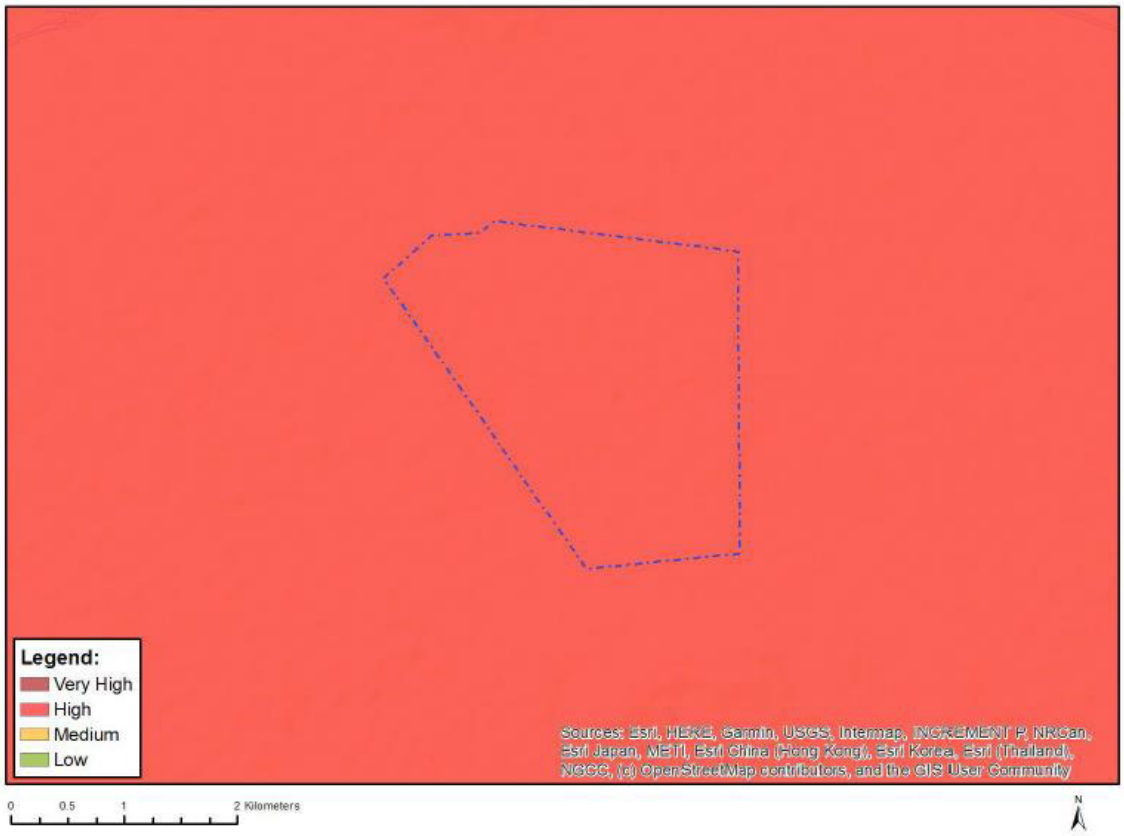


Figure 2-9: Screening Tool map of relative animal species theme sensitivity for De Rust PV1 SEF.

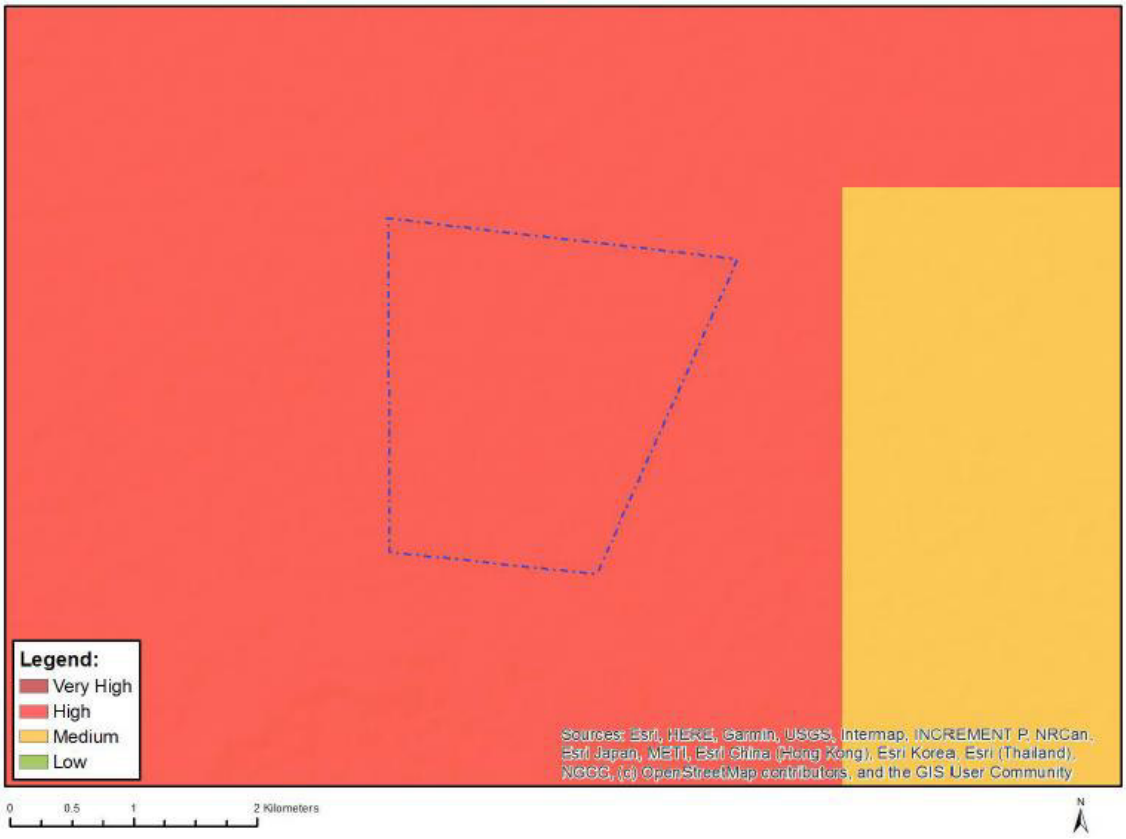


Figure 2-10: Screening Tool map of relative animal species theme sensitivity for De Rust PV2 SEF.

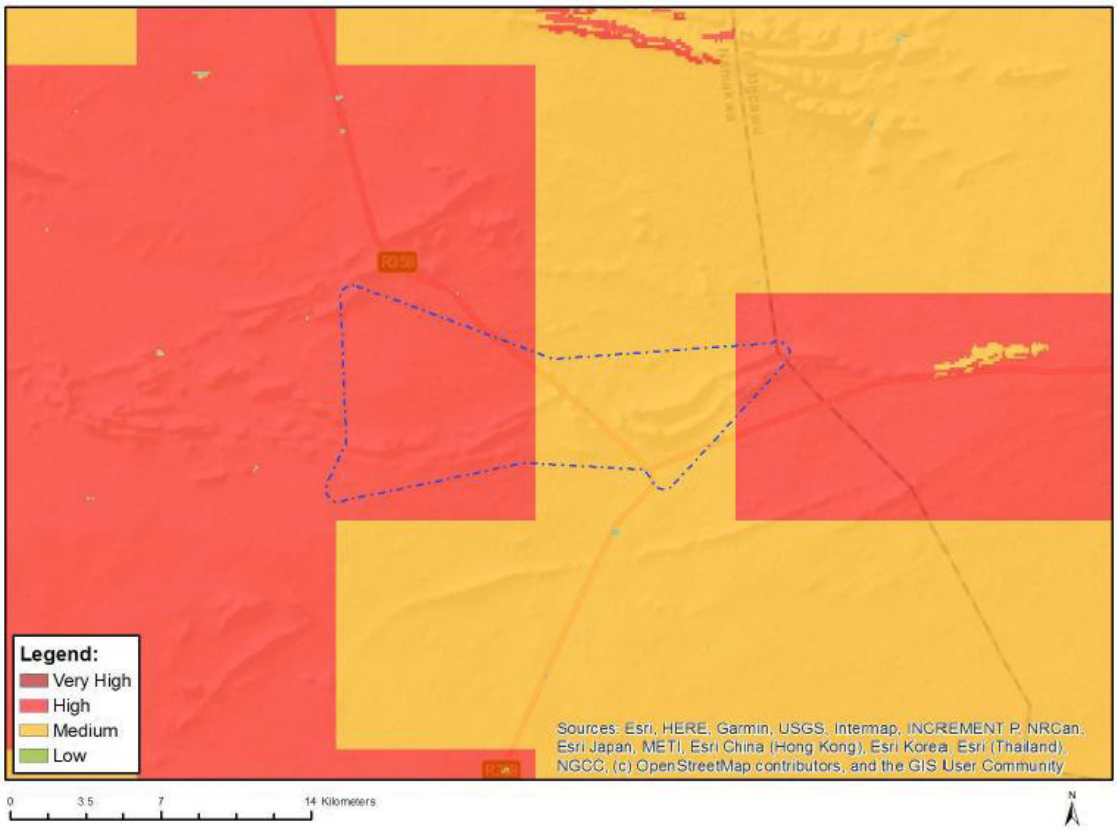


Figure 2-11: Screening Tool map of relative animal species theme sensitivity for De Rust PV2 SEF.

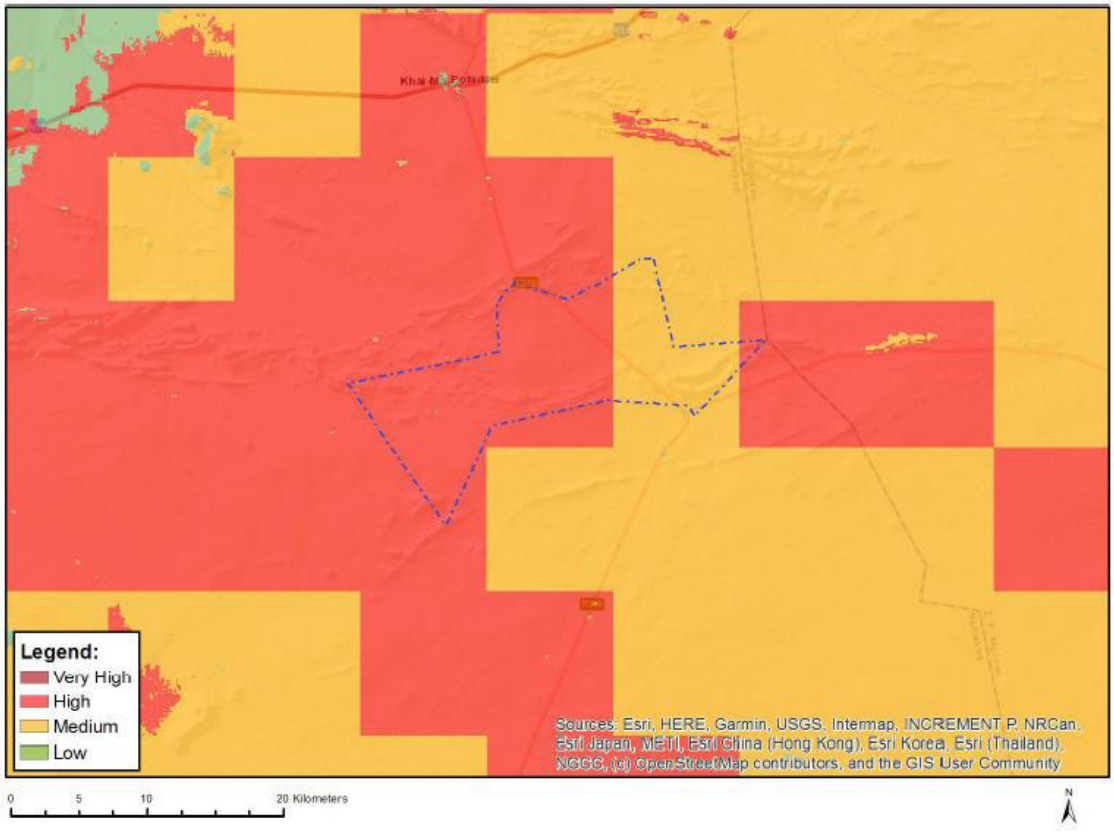


Figure 2-12: Screening Tool map of relative animal species theme sensitivity for De Rust PV2 SEF.

2.2 SITE SENSITIVITY VERIFICATION

Prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the screening tool must be confirmed by undertaking a site sensitivity verification. The purpose of this preliminary on-site inspection was to confirm the current use of the land and environmental sensitivities as identified by the screening tool.

Site verification was undertaken in March 2021 by a SACNASP registered ecologist and candidate zoologist. The peak rain period for this area is from February to April, so this was considered optimal when the site survey was planned. However, due to the ongoing drought the region, rain was very limited that season (the first sufficient rains arrived in October 2021 only).

Sensitive plant species could not be confirmed due to the lack of rains in the region which produced poor vegetation cover for several years (Figure 2-13). The initial desktop review focused mainly on the BRAHMS Online BODATSA database, producing a species list of 122 species recorder for the greater area (refer to section 2.3.3 for more details). The species lists generated from existing botanical reports for the surrounding wind farms were also scrutinised and included in the expected species list.

Sensitive species 144 occurs in the wider area but was recorded on the study area during the site verification survey, and suitable habitat was present throughout the site. Sensitive species 425, 854 and *Cephalophyllum fulleri* were not confirmed during the SSV, however, suitable habitat was present and accordingly the species were included in the surveys. Suitable habitat was also present for other species of conservation concern (SSC) and was included in the assessment.

The findings of the site verification, which included a desktop assessment and site survey, confirmed the **Very High** environmental sensitivity of the Terrestrial Biodiversity and Terrestrial Sensitive Plant Species themes. Accordingly full assessments were conducted for both themes.

Figure 2-13: Conditions on site during the March 2021 site verification survey.

2.3 DESKTOP SURVEY

2.3.1 GIS

Existing data layers were incorporated into a GIS to establish how the proposed study areas and associated activities interact with important terrestrial entities. Emphasis was placed on the following spatial datasets:

- Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018);
- Northern Cape Critical Biodiversity Areas (Northern Cape Department of Environment and Nature Conservation, 2016);
- Protected and Conservation areas of South Africa (South Africa Protected Areas Database-SAPAD; South Africa Conservation Areas Database-SACAD)[3]; and
- National List of Threatened Ecosystems (SANBI, 2011).

All mapping was performed using open-source GIS software (QGIS[4]).

2.3.2 Habitat mapping

Habitats were manually mapped within the PAOI and surrounding areas as structural units represent distinct habitats to flora (geology, topology, watercourses, vegetation structure and density) as determined from satellite imagery and on the ground verification. This mapping exercise was achieved through a combination of:

- the habitat characterisation performed on the ground during fieldwork;
- vegetation communities identified by botany fieldwork;
- the digital elevation model (obtained from Shuttle Radar Topography Mission [5]); and
- the most recent satellite imagery (courtesy of Google Corporation).

2.3.3 Flora Assessment

A literature review was conducted as part of the desktop study to identify the potential habitats and flora species of conservation concern (SCC) present within the study area. The South African National Biodiversity Institute (SANBI)

[3] http://dea.maps.arcgis.com/apps/MapTools/index.html?appid=2367540dd75148e8b6eaeab178a19d3a
[4] http://qgis.osgeo.org/en/site/
[5] https://earthexplorer.usgs.gov/

provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA) (SANBI, 2021[6]), to access distribution records on southern African plants[7]. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree grid cell (QDGC) resolution; however, the BODATSA database provides distribution data as point coordinates. The literature assessment, therefore, focussed on querying the database to generate species lists for the immediate study area and surroundings. A preliminary list was generated prior to the March 2021 site verification, but a more recent list generated in June 2022 was used. A larger list had to be generated for the indicated extent (WGS84 datum) in order to increase the likelihood of obtaining a representative species list for the proposed study area (Figure 2-14).

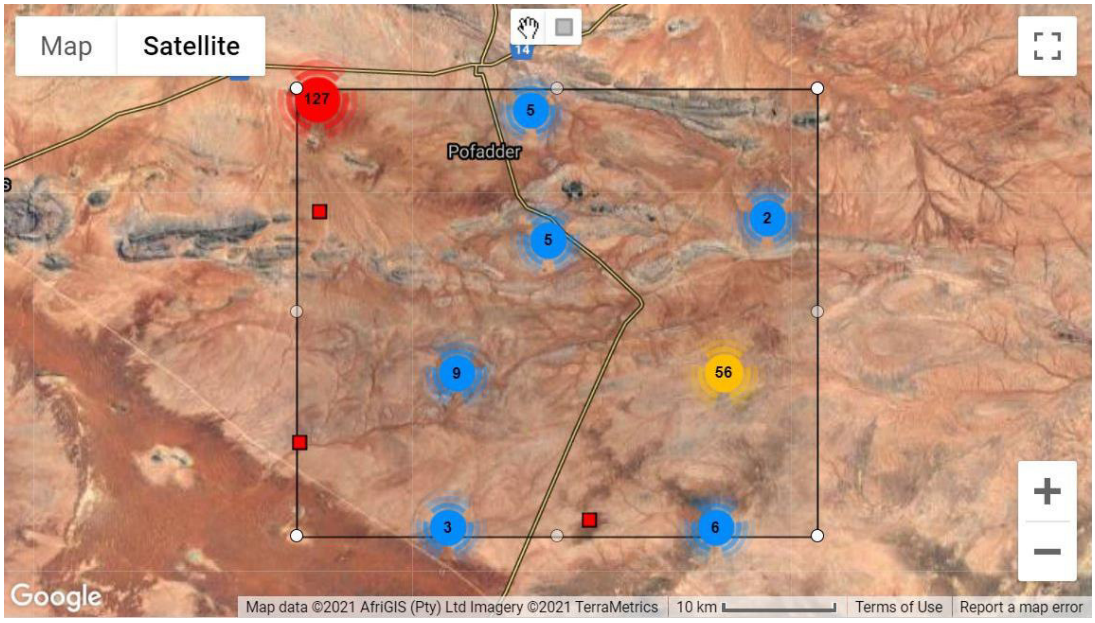


Figure 2-14: BODATSA database generated species list for specified extent which includes the PAOI.

The Red List of South African Plants website (SANBI, 2021)[8] was utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- Guide to grasses of southern Africa (Van Oudtshoorn, 2014);
- Field guide to succulents of southern Africa (Smith *et al*. 2017);
- Field guide to wild flowers of South Africa (Manning, 2019);
- Problem plants and alien weeds of South Africa (Bromilow, 2019);
- Namaqualand Wildflower Guide (Le Roux & Schelpe 1988) and
- Field guide to trees of southern Africa (Van Wyk & Van Wyk, 2013).

Additional information regarding ecosystems, vegetation types, and SCC included the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006 as amended); and
- Red List of South African Plants (Raimondo *et al*., 2009; SANBI, 2022).

[6] http://newposa.sanbi.org/
7 Data are obtained from the National Herbarium in Pretoria (PRE), the Compton Herbarium in Cape Town (NBG & SAM) and the KwaZulu-Natal Herbarium in Durban (NH)
[8] http://redlist.sanbi.org/

2.4 FIELD SURVEYS

Site visits were undertaken in March 2021 (dry conditions), October 2021 (sporadic wet conditions) and June 2022 (wet conditions) by an ecologist where the floral and the faunal aspects of the survey area were evaluated. The timing of the surveys represented both dry and wet season conditions in order to cover biophysical seasonal aspects. It must be noted that this area has not received good rains for almost 10 years prior to October 2021; accordingly, the March 2021 survey conditions were very dry and not optimal at all. The final site visit for this assessment (June 2022), was at a time where the study area has received above average rainfall and conditions were optimal (Figure 2-15).

During the field surveys performed, the habitats were evaluated on foot and a series of georeferenced photographs were taken of the habitat attributes. The field surveys focused on a classification of the observed fauna and flora, habitats as well as the actual and potential presence of species of conservation concern (either classified as Threatened by the IUCN (2022), protected by NEMBA (2007, as amended) or indeed other legislations applicable provincially or nationally). An analysis of the diversity and ecological integrity of the habitats present on site was also performed.

Figure 2-15: Wet conditions on the study area during the June 2022 survey.

2.5 SPECIES OF CONSERVATION CONCERN

The Red List of threatened species generated by the IUCN (http://www.iucnredlist.org/) provided the global conservation status of terrestrial flora. However, regional conservation status assessments performed for species of conservation concern (SCC) following the IUCN criteria were the most relevant and sourced from the Red List of South African plants version 2021 and Raimondo *et al*. (2009).

The conservation status categories defined by the IUCN (Figure 2-16), which are considered here to represent species of conservation concern, are the "threatened" categories defined as follows:

- **Critically Endangered (CR)** - Critically Endangered refers to species facing immediate threat of extinction in the wild.
- **Endangered (EN)** - Endangered species are those facing a very high risk of extinction in the wild within the foreseeable future.
- **Vulnerable (VU)** - Vulnerable species are those facing a high risk of extinction in the wild in the medium-term.

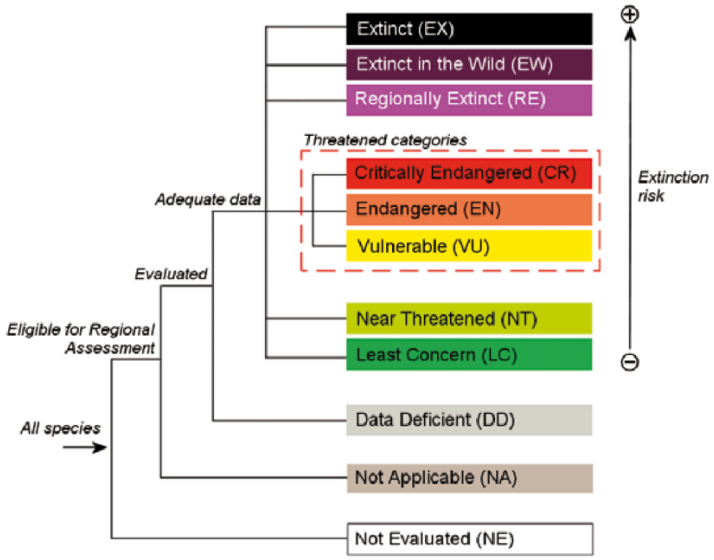


Figure 2-16: Schematic representation of the structure of the IUCN Red List Categories (IUCN 2012).

Other measures of conservation status include species listed under the following:

- Trade in Protected Species (TOPS; National)
- Convention on International Trade in Endangered Species (CITES; International).

2.6 SITE ECOLOGICAL IMPORTANCE (SEI)

The Terrestrial Plant Species Protocol requires specialists to identify:

- the nature and the extent of the potential impact of the proposed development on SCC occurring on the proposed development site;
- the potential impact of the proposed development on the habitat of the SCC; and
- any alternative development footprints within the preferred development site which would be of 'low' sensitivity as identified by the screening tool and verified through the site sensitivity verification.

While most of the features that will be included in the conservation importance (CI) will be provided by the screening tool, it is important to note that CI is evaluated at a **much finer spatial scale** and based on fieldwork data collection and comprehensive desktop analyses performed by the specialist during the Environmental Authorisation (EA) process.

SEI is a function of the biodiversity importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community or habitat type present on the site) and its resilience to impacts (receptor resilience [RR]) as follows: SEI = BI + RR

BI in turn is a function of CI and the functional integrity (FI) of the receptor as follows: BI = CI + FI

As BI is a function of CI and the FI of a receptor, BI can be derived from a simple matrix of CI and FI as follows:

Biodiversity importance		Conservation importance				
		Very high	High	Medium	Low	Very low
Functional integrity	Very high	Very high	Very high	High	Medium	Low
	High	Very high	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

From the successful evaluation of both BI and RR as described above, it is possible to evaluate SEI from the final matrix as follows:

Site ecological importance		Biodiversity importance				
		Very high	High	Medium	Low	Very low
Receptor resilience	Very low	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very high	Medium	Low	Very low	Very low	Very low

The SEI in relation to proposed development activities can be interpreted as follows:

- **Very High:** Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/ unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
- **High:** Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
- **Medium:** Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
- **Low:** Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.

- **Very Low:** Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

For a full breakdown of the SEI methodology please refer to SANBI (2020).

2.7 IMPACT ASSESSMENT

Once a potential impact has been determined it is necessary to identify which project activity will cause the impact, the probability of occurrence of the impact, and its magnitude and extent (spatial and temporal). This information is important for evaluating the significance of the impact, and for defining mitigation and monitoring strategies. Direct and indirect implications of the impacts identified during the specialist investigations were assessed in terms of five standard rating scales to determine their significance.

The rating system used for assessing impacts (or when specific impacts cannot be identified, the broader term issue should apply) is based on six criteria, namely:

- **Status** of impacts (Table 2-1) – determines whether the potential impact is positive (positive gain to the environment), negative (negative impact on the environment), or neutral (i.e. no perceived cost or benefit to the environment). Take note that a positive impact will have a low score value as the impact is considered favourable to the environment;
- **Spatial extent** of impacts (
- Table 2-2) – determines the spatial scale of the impact on a scale of localised to global effect. Many impacts are significant only within the immediate vicinity of the site or within the surrounding community, whilst others may be significant at a local or regional level. Potential impact is expressed numerically on a scale of 1 (site-specific) to 5 (global);
- **Duration** of impacts (Table 2-2) – refers to the length of time that the aspect may cause a change either positively or negatively on the environment. Potential impact is expressed numerically on a scale of 1 (project duration) to 5 (permanent);
- **Frequency of the activity** (Table 2-2) – The frequency of the activity refers to how regularly the activity takes place. The more frequent an activity, the more potential there is for a related impact to occur.
- **Severity** of impacts (Table 2-2) – quantifies the impact in terms of the magnitude of the effect on the baseline environment, and includes consideration of the following factors:
    - The reversibility of the impact;
    - The sensitivity of the receptor to the stressor;
    - The impact duration, its permanency and whether it increases or decreases with time;
    - Whether the aspect is controversial or would set a precedent;
    - The threat to environmental and health standards and objectives;
- **Probability** of impacts (Table 2-2) – quantifies the impact in terms of the likelihood of the impact occurring on a percentage scale of < 5% (improbable) to > 95% (definite).
- **Confidence** – The degree of confidence in predictions based on available information and specialist knowledge:
    - Low;
    - Medium; or
    - High.

In addition, each impact needs to be assessed in terms of reversibility and irreplaceability as indicated below:

- **Reversibility** of the Impacts - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):
    - High reversibility of impacts (impact is highly reversible at end of project life i.e. this is the most favourable assessment for the environment);
    - Moderate reversibility of impacts;
    - Low reversibility of impacts; or
    - Impacts are non-reversible (impact is permanent, i.e. this is the least favourable assessment for the environment).
- **Irreplaceability** of Receiving Environment/ Resource Loss caused by impacts/risks – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):
    - High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment);
    - Moderate irreplaceability of resources;
    - Low irreplaceability of resources; or
    - Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment).

Table 2-1: Status of Impacts

Rating	Description	Quantitative Rating
Positive	A benefit to the receiving environment (positive impact)	+
Neutral	No determined cost or benefit to the receiving environment	N
Negative	At cost to the receiving environment (negative impact)	-

Determination of Impact Significance

The information presented above in terms of identifying and describing the aspects and impacts is summarised below in Table 2-2 and significance is assigned with supporting rational.

Table 2-2: Consolidated Table of Aspects and Impacts Scoring

Spatial Scale	Rating	Duration	Rating	Severity	Rating
Activity specific	1	One day to one month	1	Insignificant/non-harmful	1
Area specific	2	One month to one year	2	Small/potentially harmful	2
Whole site/plant/mine	3	One year to ten years	3	Significant/slightly harmful	3
Regional/neighbouring areas	4	Life of operation	4	Great/harmful	4
National	5	Post closure	5	Disastrous/extremely harmful	5

Frequency of Activity	Rating	Probability of Impact	Rating
Annually	1	Almost never/almost impossible	1
6 monthly	2	Very seldom/highly unlikely	2
Monthly	3	Infrequent/unlikely/seldom	3
Weekly	4	Often/regularly/likely/possible	4
Daily / Regularly / Once-off	5	Daily/highly likely/definitely	5

Significance Rating of Impacts	Timing
Very Low (1-25)	Pre-construction
Low (26-50)	Construction
Low – Medium (51-75)	Operation
Medium – High (76-100)	Decommissioning
High (101-125)	
Very High (126-150)	

The environmental significance rating is an attempt to evaluate the importance of a particular impact, the consequence and likelihood of which is assessed by the relevant specialist. The description and assessment of the aspects and impacts is presented in a consolidated table with the significance of the impact assigned using the process and matrix detailed below.

The sum of the first three criteria (spatial scope, duration and severity) provides a collective score for the consequence of each impact. The sum of the last two criteria (frequency of activity and frequency of impact) determines the likelihood of the impact occurring. The product of consequence and likelihood leads to the assessment of the significance of the impact (Significance = Consequence X Likelihood), shown in the significance matrix below in Table 2-3.

Table 2-3: Significance Assessment Matrix.

Likelihood (Frequency of Activity + Probability of Impact) \ Consequence (Severity + Spatial Scope + Duration)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	4	6	8	10	12	14	16	08	20	22	24	26	28	30	
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	
5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	
6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	
7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	
8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	
9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	

Table 2-4: Positive and Negative Impact Mitigation Ratings.

Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very High	126-150	Avoidance – consider alternatives	Optimal contribution from Project
High	101-125	Avoidance as far as possible; implement strict mitigation measures to account for residual impacts	Positive contribution from Project with scope to improve
Medium-High	76-100	Where avoidance is not possible, consider strict mitigation measures	Moderate contribution from Project with scope to improve
Low-Medium	51-75	Mitigation measures to lower impacts and manage the project impacts appropriately	Improve on mitigation measures
Low	26-50	Appropriate mitigation measures to manage the project impacts	Improve on mitigation measures; consider alternatives to improve on
Very Low	1-25	Ensure impacts remain very low	Consider alternatives to improve on

The model outcome is then assessed in terms of impact certainty and consideration of available information. Where a particular variable rationally requires weighting or an additional variable requires consideration the model outcome is adjusted accordingly.

2.8 STUDY LIMITATIONS

- It is assumed that all third-party information acquired is correct (e.g. GIS data and scope of work).
- Avifauna - and Bat assessments are not part of this assessment and is dealt with under the relevant theme which requires a 12-month pre-construction monitoring assessment.
- Due to the nature of most biophysical studies, it is not always possible to cover every square metre of a given study area. Due to the large study area, it is possible that small individual plant species of conservation concern (SCC) may have been overlooked even though care has been taken to search for specific SCC.
- The literature review for plant species identified several limitations in the use of online data platforms, and for this specific area was not considered to be very reliable. Furthermore, as this is an extremely remote part of the country where limited surveys have been conducted, data is underrepresented for this area.
- Seasonality plays a major role in the timing of surveys, and accordingly several visits were required to cover the flowering period of plants.
- Due to the sporadic rain events, which has seen an increase in rainfall between October 2021 and June 2022, this has had significant impacts on the vegetation conditions as well as fauna activity. The general condition of the vegetation was heavily impacted by rainfall during the site verification and in the wet season.

3 TERRESTRIAL BIODIVERSITY RESULTS

The results are presented according to the requirements for undertaking SSV and for protocols for the assessment and minimum report content requirements of environmental impacts for environmental themes for activities requiring environmental authorisation dated 20 March 2020 (Government Gazette No. 43110, GN 320). To simply this, each required aspect is indicated in Table 3-1 below, and where triggered it is discussed in more detail in the sections below.

Table 3-1: Terrestrial Biodiversity theme aspects required to be assessed.

Environmental Theme Aspect	Triggered for proposed activities	Section in report
Vegetation unit (Mucina and Rutherford, 2006, as amended)	Yes – Aggeneys Gravel Vygieland, Bushmanland Arid Grassland, Bushmanland Basin Shrubland and Bushmanland Inselberg Shrubland vegetation types.	Section 3.1
Threatened Ecosystems	No – not located within any listed threatened ecosystem	-
Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)	Yes. Study areas intersect with CBA and ESA as per the screening tool report and confirmed during the SSV.	Section 3.2
Protected Areas	No – not located in any protected area but is located in Protected Areas Expansion Strategy.	Section 3.3
Ecology of the system	Main landscape features, habitats, dominant species recorded. The watercourse and red sand dunes are the main ecological systems on the study area.	Section 3.4

3.1 REGIONAL VEGETATION

The study area is situated within the Nama-Karoo Biome, a landlocked region in the central plateau of the western half of South Africa that represents the second largest biome, comprising approximately 248,284km². It is essentially a grassy, dwarf shrubland, dotted with characteristic koppies, most of which lies between 1,000 and 1,400 meters above sea level. Eastwards, the ration of grasses to shrubs increases progressively, until the Nama Karoo eventually merges with the Grassland Biome. On the northern fringes the dwarf shrubland often has an overstory of shrubs and trees. It does not have a unique or species rich flora, with only 2.147 plants of which 386 (18%) are endemic and 67 are threatened. Despite the relatively low diversity, the Nama-Karoo vegetation has a high diversity of plant life forms. These include coexisting ephemerals, annuals, geophytes, C3 and C4 grasses, succulents, deciduous and evergreen chamaephytes and trees.

Natural disturbance factors that drive many vegetation dynamics include many that are linked to human actions and many disturbances interact to modify effects. Factors include grazing by livestock and wild herbivores, fire, rainfall and runoff and other episodic events such as hailstorms. Very little of the NamaKaroo has been transformed from natural vegetation to crops, dams, industry or other forms of land use that threaten natural diversity. The dominant land use is the ranching of small stock, cattle and game farming with indigenous antelope. Only 0.7% of land is statutorily conserved in national parks (Karoo and Augrabies Falls).

Natural vegetation distribution patterns are linked to variations in geology and associated soils, and a distinction exists between plant communities requiring moister soils, and those requiring higher nutrient status soils. Vegetation is also adapted to saline or calcareous soil conditions, where the incidence of non-succulent dwarf shrubs is higher, and is virtually absent on saline soils, where succulent-leaved dwarf shrubs and succulent predominate. Some plants survive because they are able to store water in their thick leaves or root systems, and other may become deciduous in response to the high frequency of drought-like conditions.

An adaptation shown by many plants is that of mimicry and camouflage. For example, *Titanopsis schwantesii* (Kalkvygie) has whitish tubercles that resemble the calcrete nodules on which it grows. Various Lithops species are known as "flowering stones" or stone plants because they look like the pebbles around them. In this dry, low-production ecosystem, fire is not an important feature.

The following vegetation types (Mucina & Rutherford, 2006, as amended) will be affected by the proposed development:

- Aggeneys Gravel Vygieveld;
- Bushmanland Arid Grassland;
- Bushmanland Basin Shrubland; and
- Bushmanland Inselberg Shrubland.

Aggeneys Gravel Vygieveld

This vegetation type is situated on flat or slightly sloping plains (appearing as distinctly white surface quartz layers against the background of red sand or reddish soil), supporting sparse, low growing vegetation dominated by small to dwarf lead-succulents of the families Aizoaceae, Crassulaceae, Euphorbiaceae, Portulacaceae and Zygophyllaceae, with some perennial components. *Eragrostis nindensis* (resurrection grass) is the dominant perennial graminoid. It is strongly associated with Gneisses and Quartzites, which are the primary determinants of the location of the different types of gravel patches usually found on summits or foothills of inselbergs or on open plains associated with the base of inselbergs or low ridges amongst the gently undulating plains.

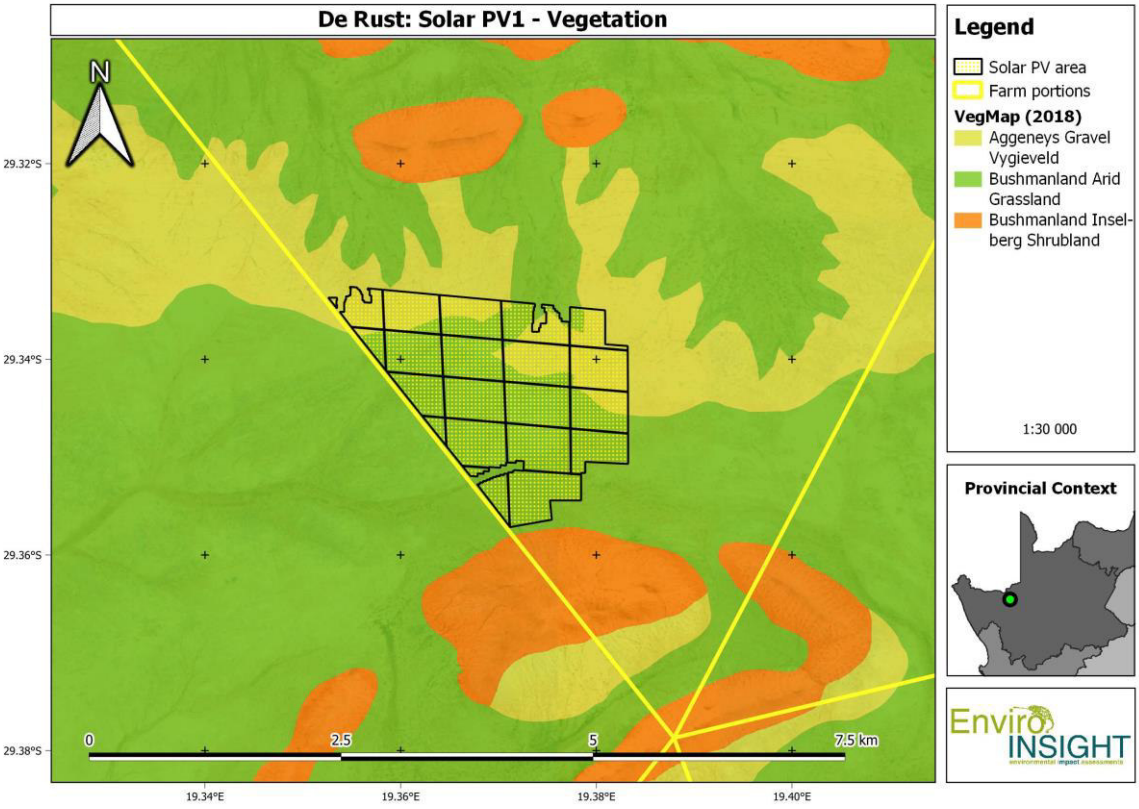


Figure 3-1: Regional vegetation types in relation to De Rust PV1 SEF (SANBI, 2018).

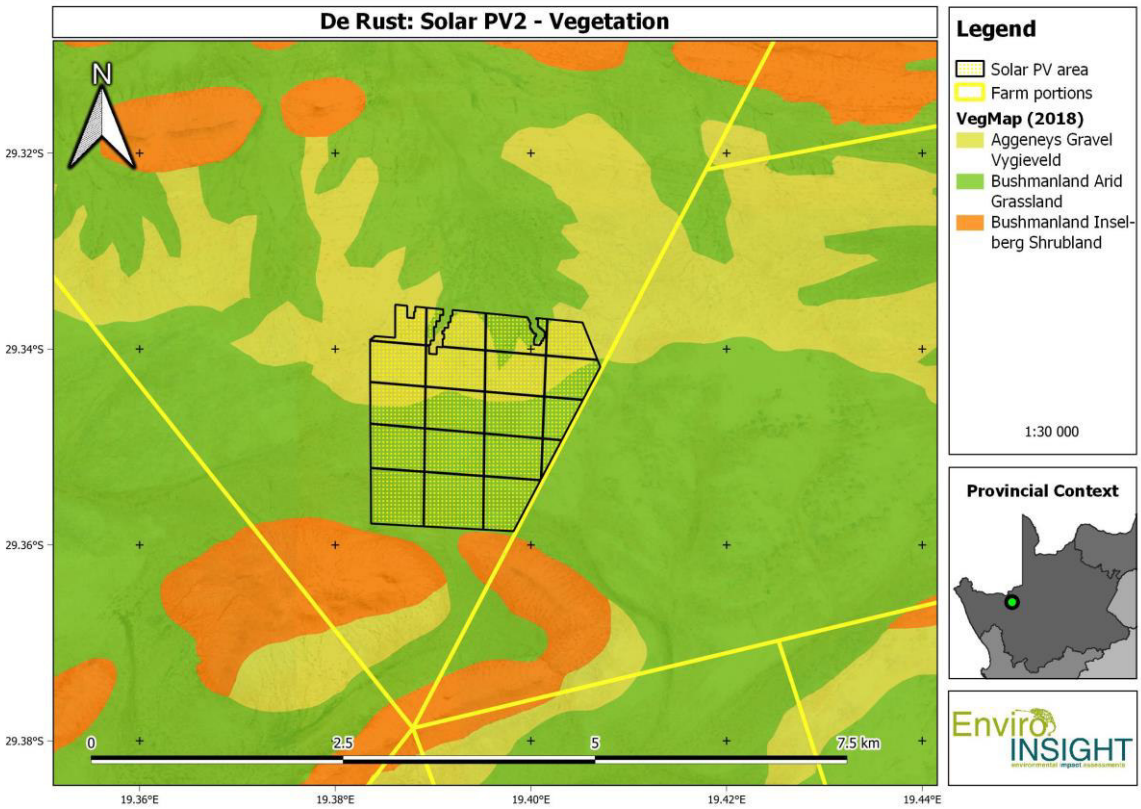


Figure 3-2: Regional vegetation types in relation to De Rust PV2 SEF (SANBI, 2018).

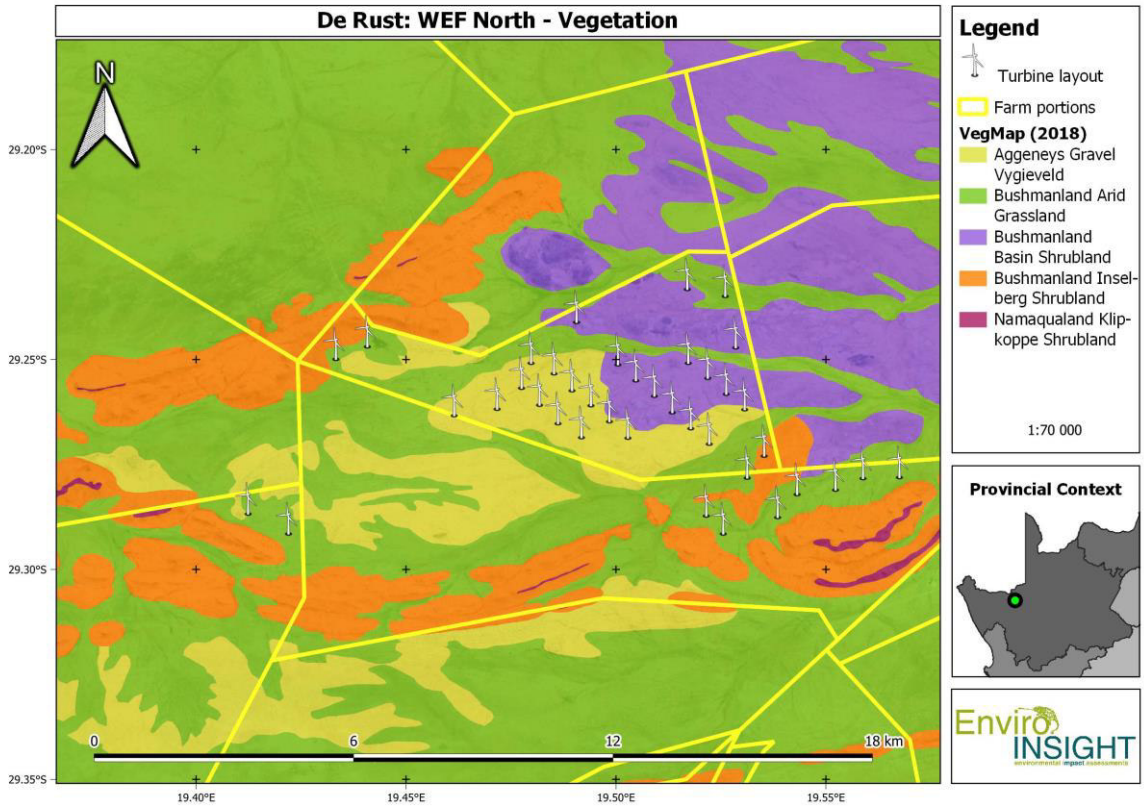


Figure 3-3: Regional vegetation types in relation to De Rust North WEF (SANBI, 2018).

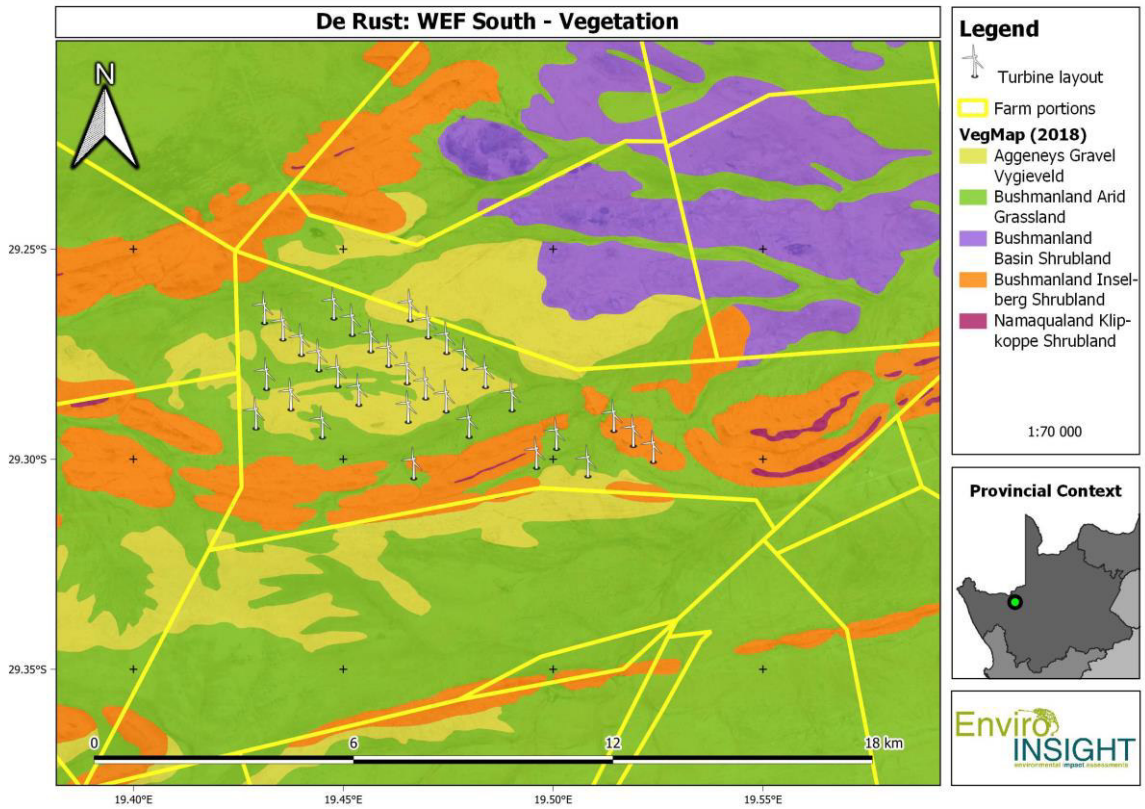


Figure 3-4: Regional vegetation types in relation to De Rust South WEF (SANBI, 2018).

Table 3-2: Attributes of the Aggeneys Gravel Vygieveld vegetation type (Mucina and Rutherford, 2006 as amended).

Name of vegetation type	Aggeneys Gravel Vygieveld
Code as used in the Book	SKr19
Conservation Target (percent of area) from NSBA	18%
Protected (percent of area) from NSBA	-
Remaining (percent of area) from NSBA	99.1%
Description of conservation status from NSBA	Least threatened
Description of the Protection Status from NSBA	Not protected
Area (sqkm) of the full extent of the Vegetation Type	62.22
Name of the Biome	Succulent Karoo
Name of Group and Bioregion	Richtersveld

The conservation status is set as Least Threatened and none is conserved in statutory conservation areas. The conservation target was set at 18%. Due to low vegetation cover, the gravel patches are not targeted for grazing and no serious alien plant incursions are observed. These gravel patches are not well defined in the landscape and there are probably more gravel patches of considerable extent ion the region of Pofadder and Aggeneys that are currently featured. The low precipitation explains why the biomass of plants occurring on the gravel patches is low, but can be considered a true Succulent Karoo vegetation type and forms the easternmost extent of the Succulent Karoo Biome in Bushmanland.

Common species occurring in the region include *Boscia albitrunca, Ruschia divaricata, Euphorbia gariepina, E. gregaria, E. mauritanica, Hypertelis salsoloides, Kleinia longiflora, Lycium cinereum, Psilocaulon subnodosum, Sarcocaulon crassicaule, Senecio sarcoides, Titanopsis hugo-schlechteri, Pegolettia retrofracta, Aptosimum spinescens, Eriocephalus ambiguus, Euphorbia spinea, Fagonia capensis, Galenia fruticosa, Helichrysum pumilio subsp. pumilio, Hermannia spinosa, Microloma incanum, Monechma spartioides, Crassula coralline subsp. macrorrhiza, C. deltoidea* and *Stipagrostis ciliata*.

Biogeographically important species occurring in this vegetation type include the following: *Antimima vanzylii, Ceraria fruticulosa, C. namaquensis, Stomatium alboroseum, Berkheya canescens, Anacampseros filamentosa subsp. namaquensis, Avonia papyracea subsp. namaensis, A. papyracea subsp. papyracea, Crassula sericea var. sericea, Mesembryanthemum inachabense, Phyllobolus latipetalus* and *Adenoglossa decurens.*

Endemic taxa occurring in this vegetation *Adromischus nanus, Dintherus puberulus, D. vanzylii, Lapidaria margaretae, Anacampseros bayeriana, Conophytum achabense, C. angelicae subsp. angelicae, C. burgeri, C. maughamii, C. praesectum, C. ratum, Lithops dorotheae and L. julii subsp. fulleri.*

Bushmanland Arid Grassland

The southern border of the unit is formed by edges of the Bushmanland Basin while in the northwest this vegetation unit borders on desert vegetation (northwest of Aggeneys and Pofadder). The northern border (in the vicinity of Upington) and the eastern border (between Upington and Prieska) are formed with often intermingling units of Lower Gariep Broken Veld, Kalahari Karroid Shrubland and Gordonia Duneveld.

It is the second most extensive vegetation type in South Africa and occupies an area of 45 478 km^2. This vegetation type comprises extensive to irregular plains on a slightly slope plateau. Sparse grassland vegetation is dominated by white grasses (*Stipagrostis* species) giving this vegetation type the character of semidesert „steppe". In places low shrubs of Salsola change the vegetation structure. In abundant rainfall years rich displays of annual herbs can be expected. A Least Threatened status is ascribed to this vegetation type and only small patches is statutorily conserved in the Augrabies Falls National Parks and Goegap Nature Reserve, very little of the area has been transformed and erosion is very low.

Important taxa include:

Graminoids: *Aristida adscensionis, A. congesta, Enneapogon desvauxii, Eragrostis nindensis, Schmidtia kalahariensis, Stipagrostis ciliata, S. obtusa, Cenchrus ciliaris, Enneapogon scaber, Eragrostis annulata, E. porosa, E. procumbens, Panicum lanipes, Setaria verticillata, Sporobolus nervosus, Stipagrostis brevifolia, S. uniplumis, Tragus berteronianus and T. racemosus.*

Small Trees: *Acacia mellifera subsp. detinens and Boscia foetida subsp. foetida.*

Tall Shrubs*: Lycium cinereum, Rhigozum trichotomum, Cadaba aphylla* and *Parkinsonia africana*.

Low Shrubs: *Aptosimum spinescens, Hermannia spinosa, Pentzia spinescens, Aizoon asbestinum, A. schellenbergii, Aptosimum elongatum, A. lineare, A. marlothii, Barleria rigida, Berkheya annectens, Blepharis mitrata, Eriocephalus ambiguus, E. spinescens, Limeum aethiopicum, Lophiocarpus polystachyus, Monechma incanum, M. spartioides, Pentzia pinnatisecta, Phaeoptilum spinosum, Polygala seminuda, Pteronia leucoclada, P mucronata, P sordida, Rosenia humilis, Senecio niveus, Sericocoma avolans, Solanum capense, Talinum arnotii, Tetragonia arbuscula* and *Zygophyllum microphyllum.*

Succulent Shrubs: *Kleinia longiflora, Lycium bosciifolium, Salsola tuberculata and S. glabrescens.*

Herbs: *Acanthopsis hoffmannseggiana, Aizoon canariense, Amaranthus praetermissus, Barleria lichtensteiniana, Chamaesyce inaequilatera, Dicoma capensis, Indigastrum argyraeum, Lotononis platycarpa, Sesamum capense, Tribulus pterophorus, T terrestris, Vahlia capensis, Gisekia pharnacioides, Psilocaulon coriarium* and *Trianthema parvifolia.*

Geophytic Herb: *Moraea venenata.*

Biogeographically important taxa include *Tridentea dwequensis.*

Endemic species include *Dinteranthus pole-evansii, Larryleachia dinteri, L. marlothii, Ruschia kenhardtensis, Lotononis oligocephala* and *Nemesia maxii*.

Table 3-3: Attributes of the Bushmanland Arid Grassland vegetation type (Mucina and Rutherford, 2006 as amended).

Name of vegetation type	Bushmanland Arid Grassland
Code as used in the Book	NKb3
Conservation Target (percent of area) from NSBA	21%
Protected (percent of area) from NSBA	0.4%
Remaining (percent of area) from NSBA	99.4%
Description of conservation status from NSBA	Least threatened
Description of the Protection Status from NSBA	Hardly protected
Area (sqkm) of the full extent of the Vegetation Type	45478.96
Name of the Biome	Nama-Karoo Biome
Name of Group and Bioregion	Bushmanland Bioregion

Bushmanland Basin Shrubland

A section of De Rust North WEF (Figure 3-3) is embedded in the Bushmanland Basin Shrubland. Bushmanland Basin Shrubland occurs on the extensive basin centered on Brandvlei and Van Wyksvlei, spanning Granaatboskolk in the west to Copperton in the east, and Kenhardt in the north to around Williston in the south (Table 3-4). The area is characterised by slightly irregular plains dominated by a dwarf shrubland, with succulent shrubs or perennial grasses in places. The geology consists largely of mudstones and shales of the Ecca group and Dwyka tillites with occasional dolerite intrusions. Soils are largely shallow to non-existent, with calcrete present in most areas. Rainfall ranges from 100-200 mm and falls mostly during the summer months as thunderstorms. As a result of the arid nature of the area, very little of this vegetation type has been affected by intensive agriculture and it is classified as Least Threatened. None of the unit is conserved in statutory conservation areas. According to Mucina and Rutherford no signs of serious transformation are present for the vegetation type, but scattered individuals of *Prosopis* sp. occur in some areas (e.g. in the vicinity of the Sak River drainage system), and some localised dense infestations form closed 'woodlands' along the eastern border of the unit with Northern Upper Karoo (east of Van Wyksvlei) (Mucina & Rutherford, 2006 as amended).

There are few endemic and biogeographically important species present at the site and only *Tridentea dwequensis* is listed by Mucina and Rutherford as biogeographically important while *Cromidon minimum*, *Ornithogalum bicornutum* and *O. ovatum* subsp. *oliverorum* are listed as being endemic to the vegetation type (Mucina & Rutherford, 2006 as amended).

Table 3-4: Attributes of the Bushmanland Basin Shrubland vegetation type (Mucina and Rutherford, 2006 as amended).

Name of vegetation type	Bushmanland Basin Shrubland
Code as used in the Book	NKb6
Conservation Target (percent of area) from NSBA	21%
Protected (percent of area) from NSBA	
Remaining (percent of area) from NSBA	99.5%
Description of conservation status from NSBA	Least threatened
Description of the Protection Status from NSBA	Not protected
Area (km^2) of the full extent of the Vegetation Type	34690.68
Name of the Biome	Nama-Karoo
Name of Group and Bioregion	Bushmanland Bioregion

Bushmanland Inselberg Shrubland

Regional Distribution: Northern Cape Province: system of prominent "inselbergs" (solitary mountains) and smaller koppies exposed over surrounding flat plains between 850 and 1150 m alt. centred on the town of Aggeneys. Most important inselbergs include (from east to west) Namies, Achab, Gamsberg, Aggeneysseberg, Witberg, Haramoep, and Naip. Total area covered by the vegetation type is approximately 78 000ha of which 2545ha occurs in the study area or 3.2% of the regional extent.

Study Area Distribution and habitats: This vegetation unit occurs on the slopes of the inselbergs and koppies within the study area. The vegetation of the Gamsberg plateau is considered as Aggeneys Gravel Vygieveld. The upper south-facing slope of the Gamsberg on quartzite scree (above approximately 900m) is considered here as Namaqualand Klipkoppe Shrubland. This unit is mapped in the Anderson (2000) but not the Desmet et al. (2005) map. Two main habitats can be distinguished: Mountains slopes and Rocky Plains.

Table 3-5: Attributes of the Bushmanland Inselberg Shrubland vegetation type (Mucina and Rutherford, 2006 as amended).

Name of vegetation type	Bushmanland Inselberg Shrubland
Code as used in the Book	SKr18
Conservation Target (percent of area) from NSBA	34%
Protected (percent of area) from NSBA	-
Remaining (percent of area) from NSBA	99.8%
Description of conservation status from NSBA	Least threatened
Description of the Protection Status from NSBA	Not protected
Area (km^2) of the full extent of the Vegetation Type	637.52
Name of the Biome	Succulent Karoo
Name of Group and Bioregion	Richtersveld

Vegetation characteristics: Sparse to dense vegetation of variable composition; mixture of lowgrowing grasses (*Eragrostis, Aristida, Digitaria, Enneapogon and Panicum*); leaf-succulent karoo shrubs (*Ruschia, Antimima, Drosanthemum, Psilocaulon*), microphyllous and spinescent karoo shrubs (Acanthaceae, Asteraceae), succulent trees (*Aloe, Ceraria, Euphorbia*).

Common Taxa: *Eragrostis nindensis, Enneapogon desvauxii, Aristida congesta subsp. congesta, Oropetium capense, Digitaria eriantha, Aristida adscensionis, Chascanum garipense, Hermannia stricta, Aptosimum spinescens, Pappea capensis, Ceraria namaquensis, Ceraria fruticulosa, Dyerophytum africanum, Rogeria longiflora, Ficus ilicina, Ruschia robusta, Hereroa puttkameriana, Drosanthemum godmaniae, Nymania capensis, Hibiscus elliottiae, Pelargonium xerophyton, Pelargonium spinosum, Euphorbia spinea, Euphorbia gregaria, Euphorbia gariepina, Euphorbia avasmontana, Cucumis rigidus, Tylecodon rubrovenosus, Crassula sericea var. sericea, Crassula namaquensis var. namaquensis, Crassula garibina, Cotyledon orbiculata var. orbiculata, Adromischus trigynus, Salsola aphylla, Boscia foetida subsp. foetida, Boscia albitrunca var. albitrunca, Commiphora gracilifrondosa, Ehretia rigida, Rhigozum trichotomum, Helichrysum tomentosum subsp. aromaticum, Osteospermum armatum, Lopholaena cneorifolia, Kleinia longiflora, Hirpicium alienatum, Helichrysum herniarioides, Geigeria vigintisquamea, Eriocephalus scariosus, Eriocephalus pauperrimus, Eriocephalus microphyllus var. pubescens, Eriocephalus ambiguus, Dicoma capensis, Aloe gariepensis, Aloe dichotoma, Hoodia gordonii, Rhus undulata, Ozoroa dispar, Hermbstaedtia glauca, Tetragonia reduplicata, Galenia fruticosa, Galenia cf. meziana, Aizoon asbestinum, Monechma spartioides, Blepharis pruinosa, Blepharis mitrata, Blepharis micra, Acanthopsis hoffmannseggiana*.

Important Taxa: *Brunsvigia comptonii, Pachypodium namaquanum* (not present in the study area), *Euphorbia virosa* (not preset in the study area).

Endemic Taxa: *Avonia recurvata subsp. minuta, Conophytum friedrichiae* (not present in the study area), *Conophytum fulleri, Conophytum marginatum var. karamoepense, Conophytum praesectum, Dinteranthus vanzylii var. vanzylii* (not present in study area), *Schwantesia pillansii*.

Notes: This unit shows intermediate floristic similarities between the Succulent and Nama Karoo biomes and the Gariep Stony Desert. With the removal the upper south-facing slopes and plateau communities from this vegetation unit many important and endemic taxa have been removed from this vegetation unit. Generally, all the species of conservation concern that occur on the Gamsberg are associated with the Aggeneys Gravel Vygieveld, Namaqualand Klipkoppe Shrubland and Azonal (Kloof) vegetation units.

Inselbergs have long been known to harbour unique plant species, which is why the Leslie Hill Succulent Karoo Trust (LHSKT) first identified these solitary mountains as a top priority for conservation. The reserves fall within the Succulent Karoo biome in the arid western part of South Africa which was recently described by UNESCO as the "most biologically diverse arid area in the world".

But until March 2020, these Bushmanland Inselbergs of the Northern Cape were unprotected. Now, with the declaration of four new provincial reserves this is no longer the case. The four new reserves – Areb, Karas, Marietjie van Niekerk and Smorgenskadu Nature Reserves – adjoin each other and form the greater "Karrasberge Protected Area". Combined, they represent around 5 700 hectares of two previously unprotected vegetation types: Bushmanland Inselberg Shrubland and "Aggeneys Gravel Vygieveld, in addition to another poorly protected vegetation type, Bushmanland Arid Grassland, thus contributing to national and international conservation targets.

3.2 NORTHERN CAPE CRITICAL BIODIVERSITY AREAS

The Northern Cape CBA Map (2016) identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of landscape as a whole (Holness & Oosthuysen, 2016). Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas (NFEPA) were incorporated.

CBA's and ESA's are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services. The primary purpose of CBA's is to inform land-use planning in order to promote sustainable development and protection of important natural habitat and landscapes. Biodiversity priority areas are described as follows:

- CBA's 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. For CBA's the impact on biodiversity of a change in land-use that results in a change from the desired ecological state is most significant locally at the point of impact through the direct loss of a biodiversity feature (e.g. loss of a populations or habitat). All FEPA prioritized wetlands and rivers have a minimum category of CBA1, while all FEPA prioritised wetland clusters have a minimum category of CBA2.
- ESA's are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or 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. For ESA's a change from the desired ecological state is most significant elsewhere in the landscape through the indirect loss of biodiversity due to a breakdown, interruption or loss of an ecological process pathway (e.g. removing a corridor results in a population going extinct elsewhere). All natural non-FEPA wetlands and larger rivers have a minimum category of ESA.

According to the CBA Map, the study area is mainly located in the category Ecological Support Areas (ESA). CBA2 and ESA is located on De Rust North WEF (Figure 3-5) and De Rust South WEF (Figure 3-6), while De Rust PV1 (Figure 3-7) and De Rust PV2 (Figure 3-8) are completely located in a CBA2. Four and eight turbines for North WEF and South WEF, respectively, are located within the CBA2 area. The CBA2 is listed due to recorded presence of threatened species, which was highlighted in the screening report, desktop studies and SSV. Some sections of the area are considered having a high biodiversity value, especially the Inselbergs and sections of the Vygieveld. The ESA are due to the large rivers running through the site and other natural non-FEPA Wetlands.

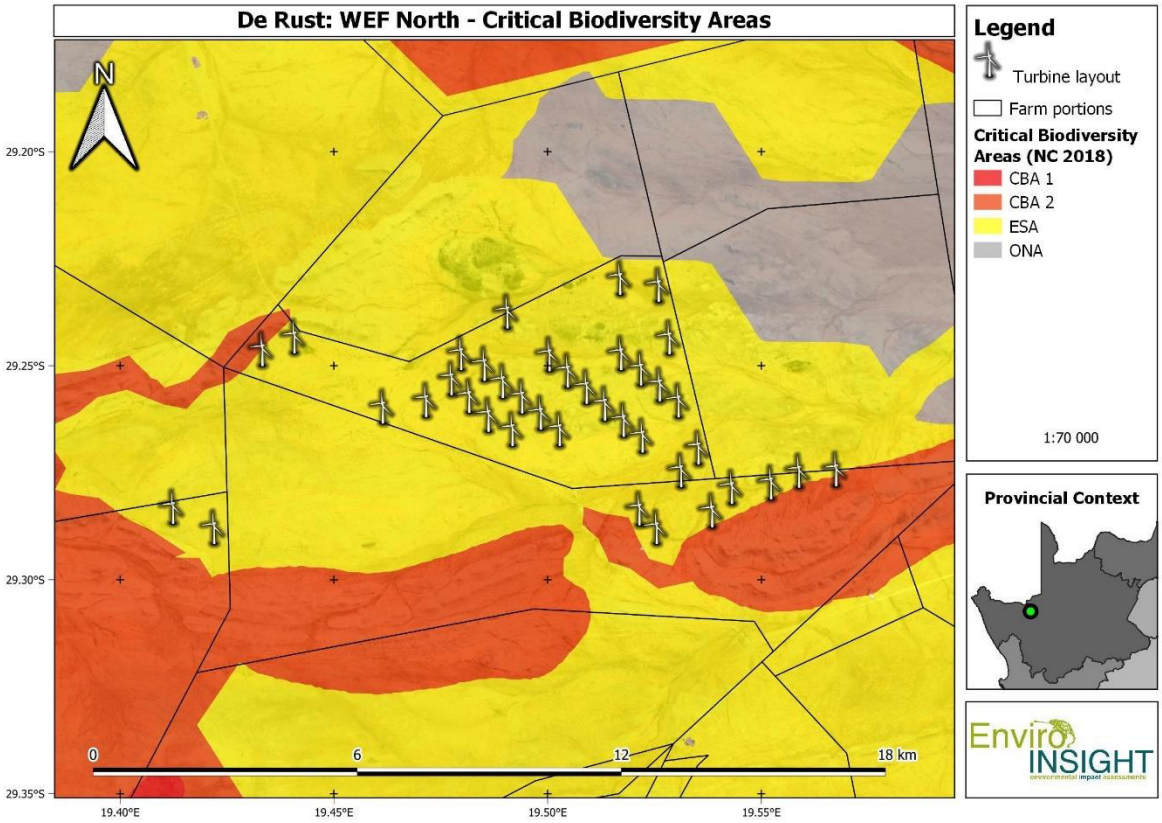


Figure 3-5: De Rust North WEF in relation to the Northern Cape Critical Biodiversity Areas (2016).

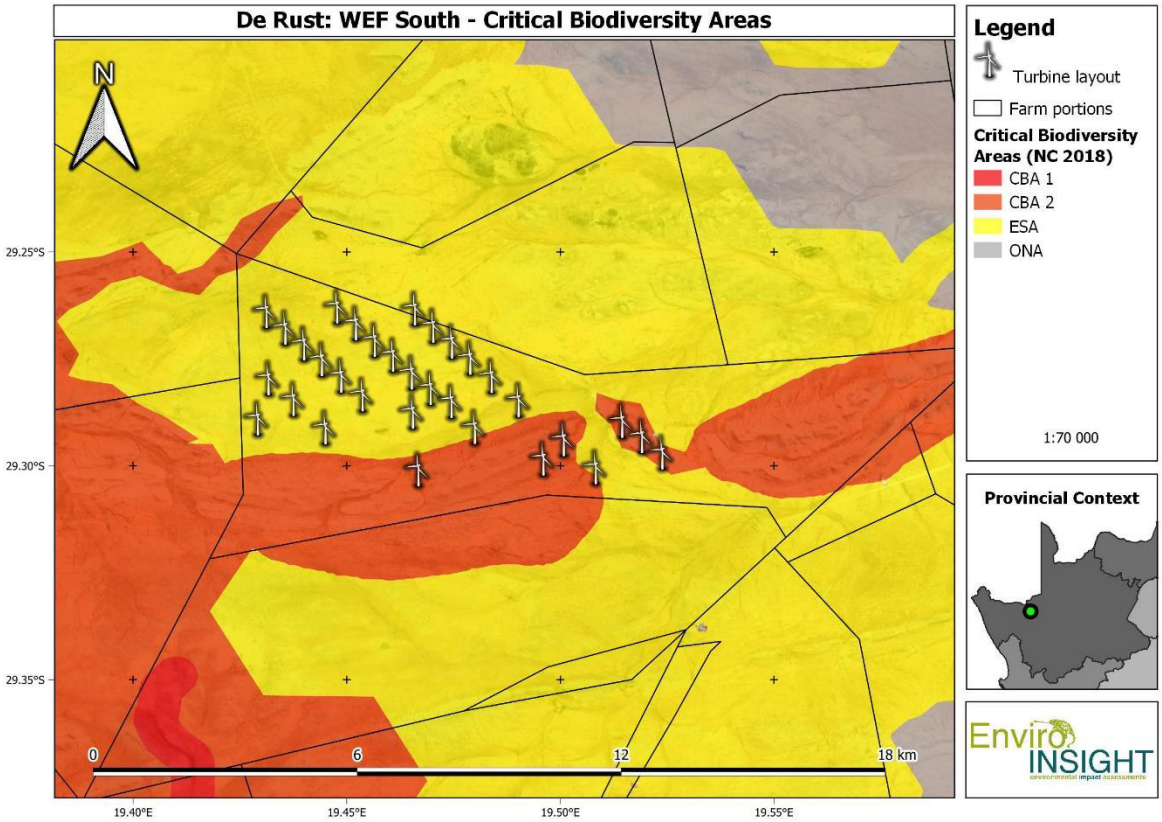


Figure 3-6: De Rust South WEF in relation to the Northern Cape Critical Biodiversity Areas (2016).

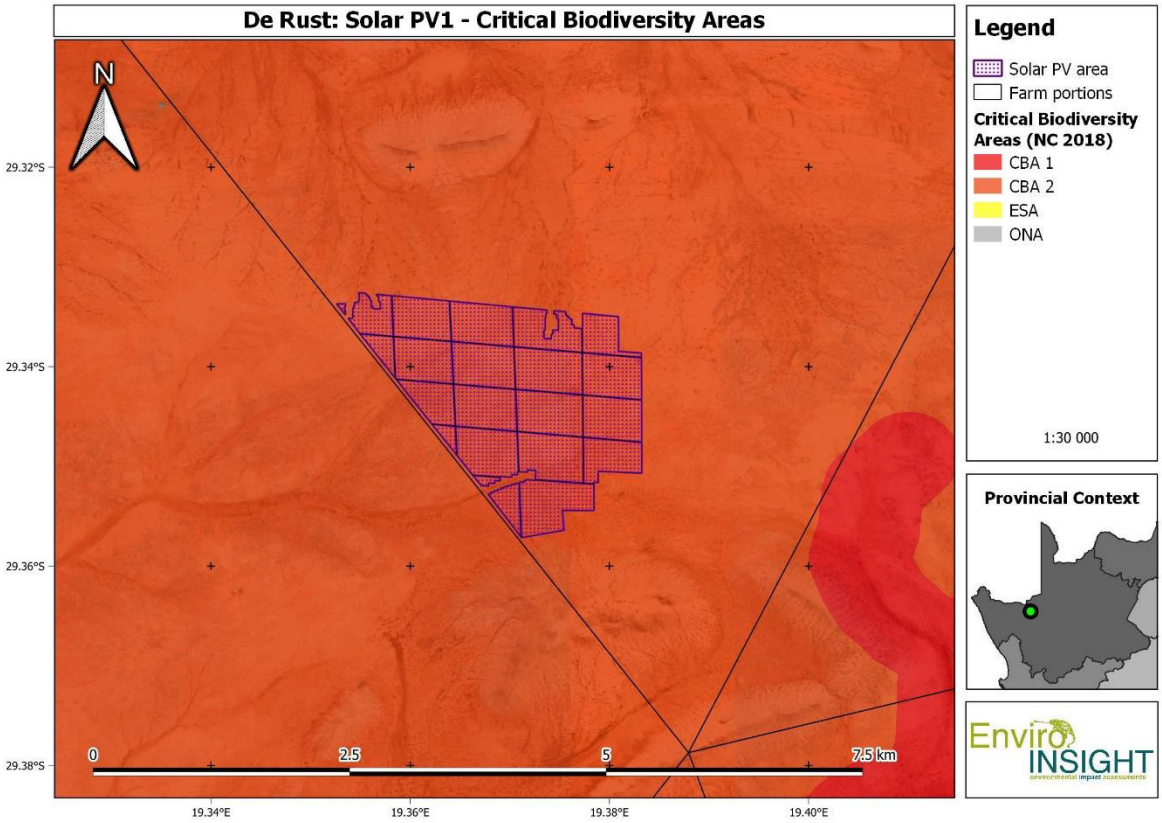


Figure 3-7: De Rust PV1 SEF in relation to the Northern Cape Critical Biodiversity Areas (2016).

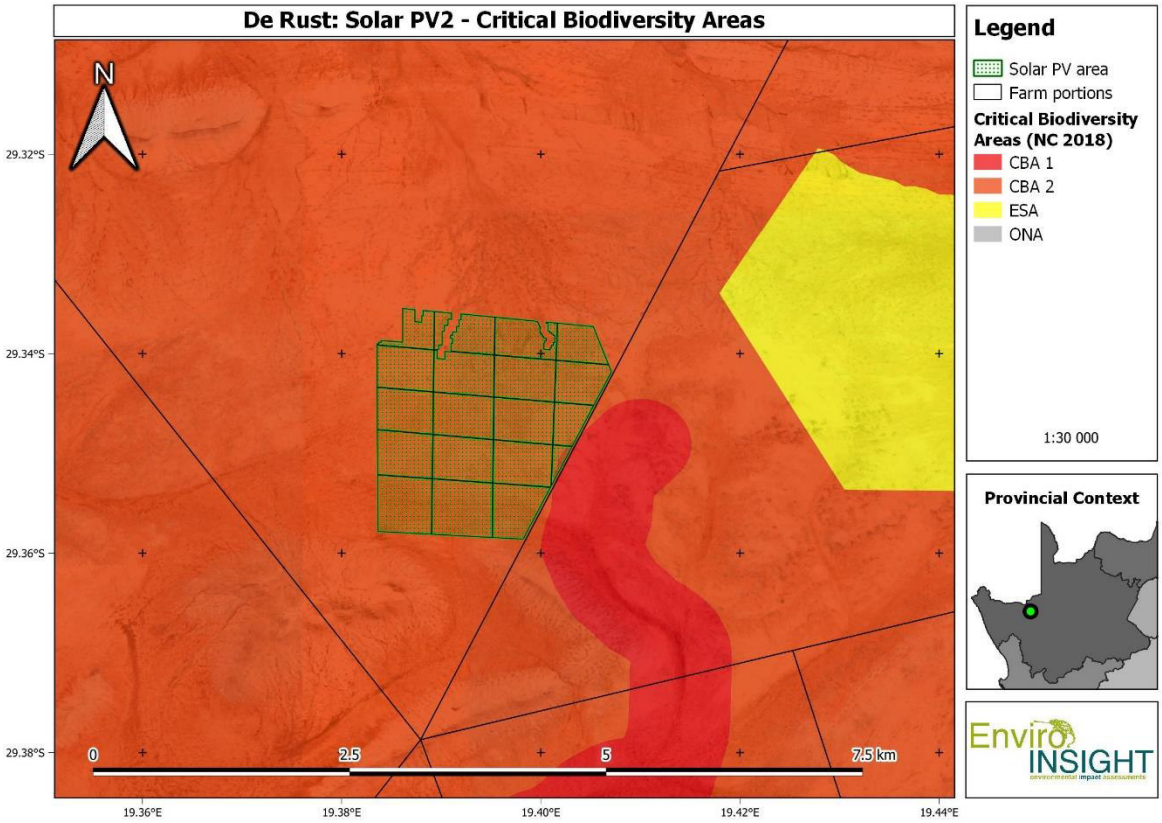


Figure 3-8: De Rust PV2 SEF in relation to the Northern Cape Critical Biodiversity Areas (2016).

3.3 PROTECTED AREAS AND EXPANSION AREAS

The study area is not located in a protected area but is within a protected area expansion. The closest protected area is the Gamsberg Nature Reserve located west of the Project Area.

Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large, protected areas. The national focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy 2008[9] (NPAES). They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine-scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities. The common set of targets and spatial priorities provided by the NPAES enable co-ordination between the many role players involved in protected area expansion.

As landscapes become fragmented, we are rapidly losing the ability to create large protected areas, which are especially important from the point of view of adaptation to climate change. It is important to grasp opportunities to create viable large protected areas in currently intact landscapes.

In the NPAES, an area is considered important for the expansion of the land-based protected area network if it contributes to one or more of the following:

- meeting biodiversity thresholds for terrestrial or freshwater ecosystems,
- maintaining ecological processes,
- resilience to climate change

The NPAES identifies 42 focus areas for land-based protected area expansion. These are large, intact and unfragmented areas suitable for the creation or expansion of large, protected areas. The study area intersects the Kamiesberg Bushmanland Augrabies (KBA) focus area (#15) in the Northern Cape, which represents the largest remaining natural area for the expansion of the protected area network. Specifically, the full extent of De Rust PV1 and PV2 are located in the KBA, while two turbines of De Rust North WEF are also located in the KBA (Figure 3-9). This represents <0.2% of the KBA extent, which is not considered significant. KBA provides an opportunity to protect 22 Desert, Nama Karoo and Succulent Karoo vegetation types, mostly completely unprotected, several river types that are still intact but not protected, and important ecological gradients and centres of endemism. These renewable energy projects further assist by protecting the land cover from being transformed due to mining operations.

[9] https://www.dffe.gov.za/sites/default/files/docs/nationalprotected_areasexpansion_strategy.pdf

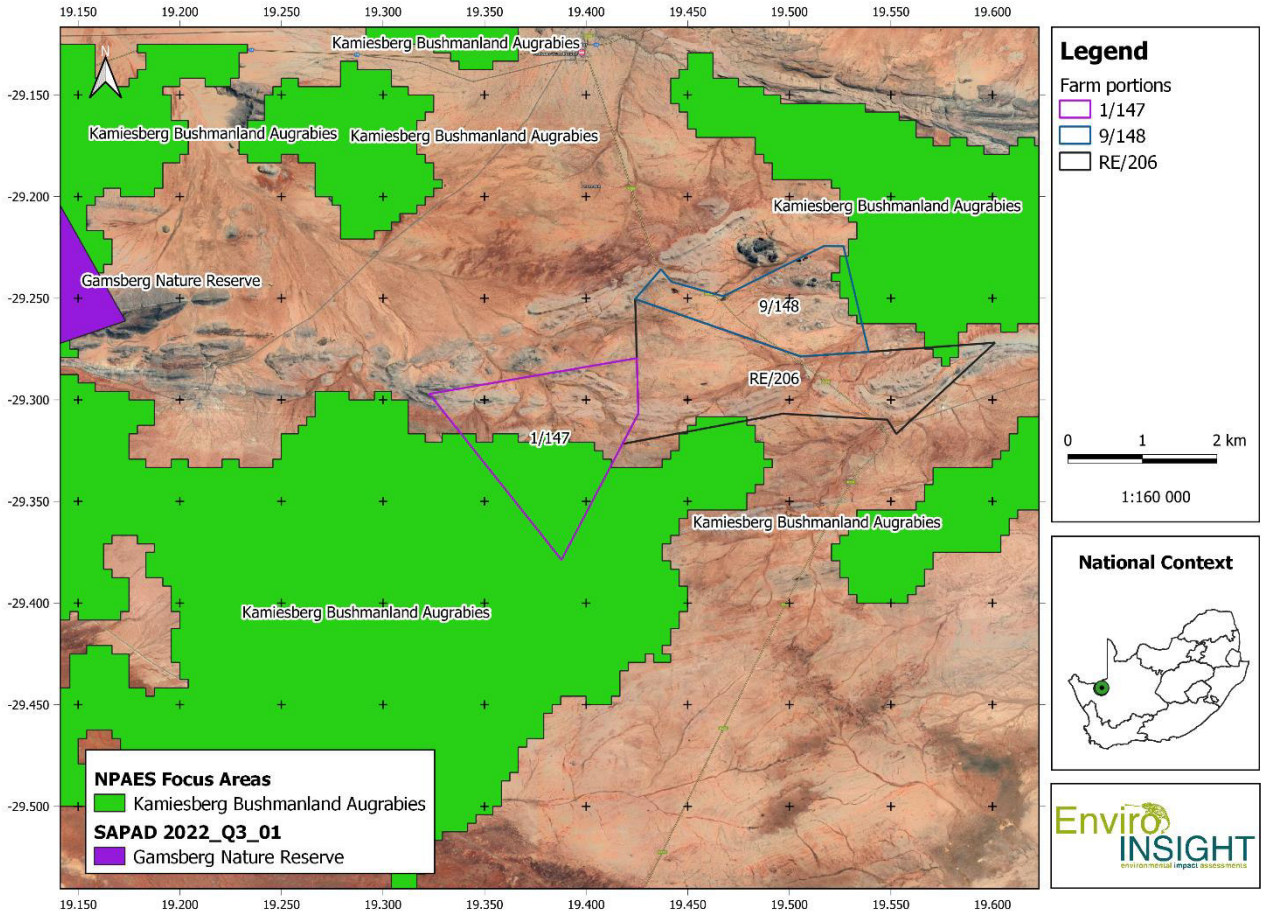


Figure 3-9: The four projects in relation to Protected Areas and Expansion Areas.

3.4 ECOLOGY OF THE SYSTEM

3.4.1 Ecological drivers and significant terrestrial landscape features

The hydrological setting of the project is within the D81G and D82B quaternary catchments of the Orange River water management area. Several depressions and rivers exist within this region which attracts multiple fauna species.

Changes in vegetation structure and composition are mainly driven by overgrazing and the introduction of alien invasive species such as *Prosopis* sp. Transformation in the vegetation types are minimal and has increased mainly due to mining activities in the area and the construction of renewable energy facilities, both wind and solar since 2012. Information with regards to this is unfortunately limited.

3.4.1.1 National Freshwater Ecosystem Priority Areas (NFEPA), 2011

The National Freshwater Ecosystem Priority Areas (NFEPA) project provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports sustainable use of water resources. These priority areas are called Freshwater Ecosystem Priority Areas, or 'FEPAs'.

FEPAs were identified based on:

- Representation of ecosystem types and flagship free-flowing rivers
- Maintenance of water supply areas in areas with high water yield
- Identification of connected ecosystems

- Representation of threatened and near-threatened fish species and associated migration corridors
- Preferential identification of FEPAs that overlapped with:
  - Any free-flowing river
  - Priority estuaries identified in the National Biodiversity Assessment 2018
  - Existing protected and focus areas for expansion identified in the National Protected Area Expansion Strategy.

The assessment revealed the presence of multiple depression systems as well as the identified river systems as defined by the SQR database. The specific Area of Interest (AoI) for this project was drainage within the D81G-03996, D81G-03813 and D82B-04162 Sub Quaternary Reaches (SQR). The watercourses do not reach the Orange River and typically terminate before reaching the river. Only under significant rainfall is the D81G-03996 SQR expected to reach the Orange River via the Goob se Laagte non-perennial watercourse. In addition, the NBA (2018) dataset indicated the presence of a Channelled Valley Bottom (CVB) wetland unit which was associated with the D81G-03996 SQR.

3.4.2 Ecological functioning and processes

The Watercourses, Vygieveld and Inselbergs represent the most important ecological features in the region, and if not protected it could lead to reduced ecosystem services and could impact negatively on important terrestrial biodiversity features. Not one of the vegetation units are considered threatened, but there are sensitive or important landscape features that, if disturbed or transformed, could result in a catastrophic collapse of the system. (Note: Please refer to the Aquatic Biodiversity, Avifauna and Bat Assessments for more information).

The two proposed De Rust WEFs do not represent a significant impact on the ecosystem processes and services due to their small development footprint and by avoiding sensitive features. The main river courses, wetland pans and inselbergs located on the study area will be excluded from construction activities, and where linear infrastructure such as roads and powerlines need to cross, the appropriate mitigation measures need to be applied.

3.4.3 Ecological corridors and connectivity

An ecological corridor is a clearly defined geographical space that is governed and managed over the long-term to maintain or restore effective ecological connectivity.

The main watercourses and inselbergs act as corridors for the movement of fauna across the landscape. The proposed turbine layout will not impact on connectivity within the landscape if the turbines and associated infrastructure is located outside main watercourses. Where roads and powerlines cross watercourses, the necessary mitigation measures need to be implemented to reduce fauna mortality, and not restrict movement of fauna.

3.4.4 Species, distribution, and important habitats

This area generally receives very limited rain, sporadic rainfall. Accordingly, plant diversity is generally low. Five main habitats were identified based on species composition and structure (Figure 3-10; Figure 3-11). The main driver of vegetation pattern in the area is substrate. Georeferenced photographs were taken to assist in both the site characterisation as well as the sensitivity analysis and provide lasting evidence for future queries. The specialist coverage is considered optimal as every habitat was surveyed, taking into consideration the large study area. Furthermore, all areas of the study area were clearly visible, but not completely accessible due to the extent of the study area and road access limitations.

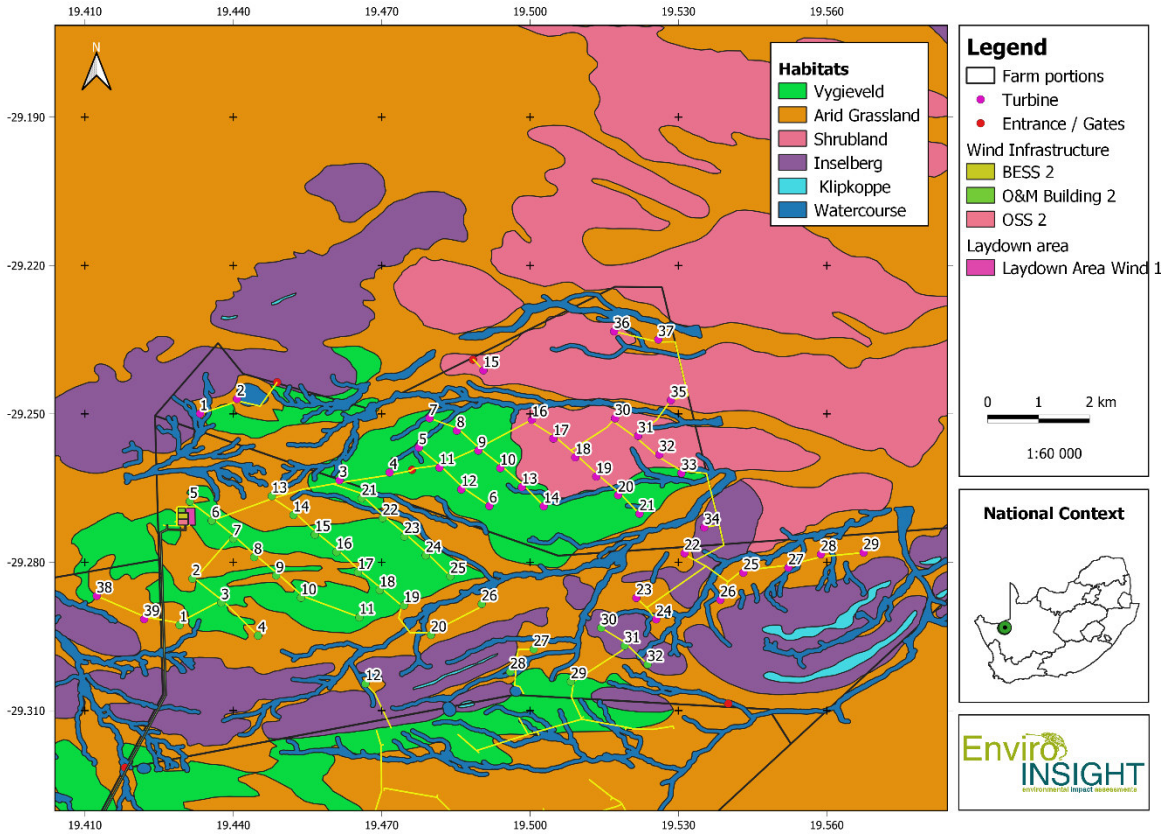


Figure 3-10: Habitats identified for the two De Rust WEFs.

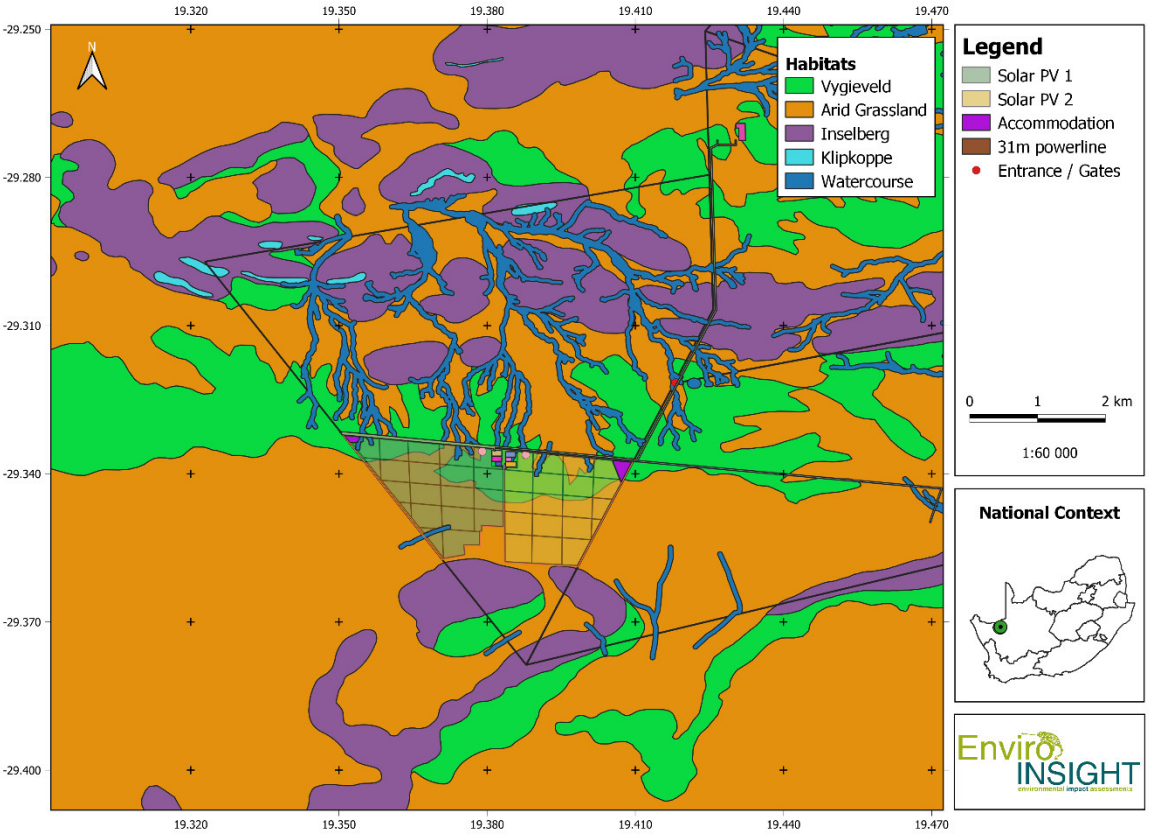


Figure 3-11: Habitats identified for the two De Rust SEFs.

3.4.4.1 Arid Grassland

The major habitat for all four projects is the Arid Grassland, where perennial grasses with scattered shrubs occur on shallow, relatively coarse open plains (Figure 3-12). The grassland has a highly distinctive appearance due to the dominance of white grasses, namely *Stipagrostis* spp.

Dominant species recorded include: *Aristida adscenionis*, *A. congesta*, *Eragrostis nindensis, Stipagrostis ciliate, S. obtusa, S. uniplumis, Aptosimum spinescens, Cadaba aphylla, Lycium cinereum, Pentzia spinescens, Pteronia sordida, Plinthus karooicus, Rhigozum trichotomum, Salsola tuberculate, Solanum capense, Zygophyllum microphyllum, Acanthopsis hoffmannseggiana*, *Amaranthus praetermissus*, *Dicoma capensis*, *Sesamum capense, Tribulis terrestris,* Sensitive species 144 (nationally and provincially protected), *Hoodia gordonii* (provincially protected), *Euphorbia cf. lignose* (provincially protected).

Figure 3-12: Vegetation and landscape features of arid grassland.

The abundance of listed or protected species within this habitat is moderate with confirmed records of two SCC. As the habitat is not listed as threatened and is widely available in the area, it is however considered sensitive owing to the presence of endemic species, confirmed records of two SCC and important ecosystem services. The impacts of the WEF are considered to be medium to low, however the transformation due to the SEF and permanent infrastructure will be high. Vegetation clearing will be localised to the turbine sites, expanded roads and associated infrastructure, as well as the limited clearing during the construction phase, which will be rehabilitated post-construction activities.

3.4.4.2 Shrubland

This habitat is situated to the east of the PAOI and only De Rust North WEF is located within it. The shrubland habitat is characterised by shrubs, forbs and succulent's characteristic of the Bushmanland Basin Shrubland, while tussock-grass-dominate areas on sandy soils (Figure 3-13). Overall diversity within this vegetation type at the site is considered medium to low, which can be ascribed to the aridity of the area and the poorly developed soils. Dominant species include *Lycium cinereum, Rhigozum trichotomum, Stripagrostis uniplumis, S. ciliata, S. obtusa, Oncosiphon grandiflorum, Oxalis sp., Aptosimum spinescens, Pentzia incana, Ruschia intricata, Monsonia sp.* and *Salsola tuberculata.*

Provincially protected species (for which a permit for removal will be required) include *Aloe claviflora*, *Hoodia gordonii, Euphorbia dregeana, Oxalis sp.,* and *Mesembryanthemum crystallinum.*

Figure 3-13: Vegetation and landscape features of the shrubland.

3.4.4.3 Vygieveld

The habitat can be characterised as sparse, low-growing vegetation with the perennial component dominated by small to very small succulent plants, including *Lithops* spp. Trees and grasses are generally absent or have low abundance and are confined to drainage lines (Figure 3-14). Gravel patches are characterised by a fairly uniform and dense layer (lag) of small quartz pebbles with rock and boulders absent or in low density.

Dominant species recorded include:

Acanthopsis hoffmannseggiana, Albuca spiralis, Sensitive species 144, Aptosimum spinescens, Aristida adscensionis, Avonia papyracea, Boscia foetida, Brunsvigia comptonii, Conophytum sp., Conophytum friedrichiae, Cotyledon orbiculata, Crassula corallina, Digitaria eriantha, Dinteranthus puberulus, Drosanthemum cf. hispidum, Eriocephalus ambiguus, Euphorbia gariepina, Felicia muricata, Galenia fruticosa, Gazania lichtensteinii, Helichrysum pumilio, Kleinia longiflora, Lithops julii subsp. fulleri, Mesembryanthemum sp., Microloma incanum, Ornithogalum sp., Osteospermum sp., Othonna cf. protecta, Oxalis sp., Pteronia mucronate, Ruschia sp., Salsola aphylla, Sarcocaulon crassicaule, Sericocoma avolans.

Figure 3-14: Vegetation and landscape features of the Vygieveld.

3.4.4.4 Inselbergs

A group of prominent inselbergs and smaller koppies. The vegetation comprises shrubland with both succulent and non-succulent elements and with sparse grassy undergrowth on steep slopes of the inselbergs. In terms of physical habitat and floristic composition and structure the plateau and rocky slopes are similar (Figure 3-15). There are, however, several species that are restricted to the cooler plateau habitat that are not encountered elsewhere in the landscape. These species point to the important "climate refuge" role that the plateau plays locally and hence very high conservation importance by providing an edaphically similar habitat to the rocky plains but with a moderated climate allowing species to persist locally where they could not do so on the plains below the plateau.

Plateau "climate refuge" species include: *Adromischus diabolicus*, *Avonia recurvata, Conophytum fulleri, Crassula sericea*, *Euphorbia spinea, Haworthiopsis tessellata, Sarcostemma pearsonii*, *Stapelia similis*, *Sarcocaulon salmoniflorum*. At the base of the inselbergs on the pebble plains, *Dinteranthus vanzylii* occurs.

Figure 3-15: Vegetation and landscape features of the Inselbergs.

3.4.4.5 Watercourse

The Watercourse habitat is not well defined due to limited active channels which limits the presentation of defined zonation typically present in riparian zones. It is largely associated with the Bushmanland Arid Grassland vegetation type, which include typical grasses of *Stripagrostis* and *Schmidtia* species (Figure 3-16). Larger specimens of *Rhigozum trichotomum* were noted to occur in denser stands within the valley bottom and within depression systems, while *Stripagrostis uniplumis, S. ciliata and S. obtusa* grew in dense stands in the riparian zones. Dominant species include *Rhigozum trichotomum, Stripagrostis uniplumis, S. ciliata, S. obtusa, Prosopis glandulosa, Salsola aphylla.*

Figure 3-16: Vegetation and landscape features of the Watercourse.

4 PLANT SPECIES THEME RESULTS

4.1 NATIONAL SENSITIVE SPECIES

The plant species theme indicated Medium sensitive due to the possible presence of sensitive species 144, sensitive species 854, sensitive species 425 and *Cephalophyllum fulleri* (Table 4-1) owing to suitable habitat. Sensitive species 144 as well as three data deficient species were recorded during the site sensitivity verification and subsequent seasonal surveys. Accordingly, a full assessment was incorporated for this theme to account for all possible sensitive species likely to occur on site.

Table 4-1: Expected and Observed list of Sensitive Plant Species for De Rust WEF. Species highlighted in bold were recorded during this survey.

Species	National Status	Provincially Protected	Endemic (1) RSA (2) Northern Cape	Observed or likely to occur within the study area
Sensitive species 144	**Vulnerable A3ce**	**Yes**	**No**	**Several individuals were recorded on site.**
Cephalophyllum fulleri L.Bolus	Rare[10]	Yes	Yes (1) & (2)	Not recorded. Suboptimal habitat on site. Moderate probability of occurrence.
Sensitive species 425	Vulnerable A4cd[11]	Yes	Yes (1) & (2)	Not recorded. Suitable habitat on site. High probability of occurrence.
Sensitive species 854	Vulnerable D2[12]	Yes	Yes (1) & (2)	Not recorded. Suitable habitat on site.

[10] The species is likely to have a restricted range, or be highly habitat specific, or have small numbers of individuals, all of which makes it vulnerable to extinction should it lose habitat. Recommend no loss of habitat.
[11] If the species has a restricted range, EOO < 2 000 km^2, recommend no further loss of habitat. If range size is larger, the species is possibly long-lived but widespread, and limited habitat loss may be considered under certain circumstances.
[12] This species either constitutes less than 1 000 individuals or is known from a very restricted range. No further loss of habitat should be permitted as the species' status will immediately become either Critically Endangered or Endangered, should habitat be lost.

Species	National Status	Provincially Protected	Endemic (1) RSA (2) Northern Cape	Observed or likely to occur within the study area
				High probability of occurrence.
Dinteranthus vanzylii (L.Bolus) Schwantes	**Data Deficient - Taxonomically Problematic[13]**	**Yes**	**Yes (1) & (2)**	**Two individuals observed at two separate locations**
***Hoodia gordonii* (Masson) Sweet ex Decne.**	**Data Deficient – Insufficient Information[14]**	**Yes**	**No**	**Observed within the study area and on neighbouring properties. Refer to section below for more details.**
Adromischus diabolicus Toelken	**Data Deficient - Taxonomically Problematic**	**Yes**	**Yes (1) & (2)**	**Observed within the study area.**

***Sensitive species 144* – Vulnerable A3ce**

This species occurs from Nieuwoudtville east to Olifantsfontein and northwards to the Brandberg in Namibia and is therefore not endemic to South Africa. It is known to occur on north-facing rocky slopes (particularly dolomite) in the south, and any slopes and sandy flats in the central and northern parts of its range. The main threats to this species include climate change, harvesting and trampling by livestock. Damage by baboons, scale insects and fungus has been observed, but none of these seem to cause mortality. Some social birds make large nest on the species, sometimes causing it to fall over due to the weight of the nests and its owners. Climate change models project a 36% decline in its range in 100 years, assuming dispersal into newly suitable areas. Patterns of modelled declines have been supported by field and repeat photo studies. However, no colonization of newly suitable areas has yet happened (Foden 2018). Without dispersal, the models predict a 73% decline in 100 years, qualifying the species as EN.

Several individuals were recorded within the study area (Figure 4-1) and should be excluded from the proposed development and a 200 m will be implemented as per the SEA Guideline (SANBI 2022). The species will be protected *in situ* as per the Provincial gazette No 968 of 1 April 2005 in terms of the Nature and Environmental Conservation Ordinance, 1974 (Ordinance No. 19 of 1974) which prohibits the harvesting of this species.

[13] There is uncertainty regarding the taxonomic status of this species, but it is likely to be threatened.
[14] This species is very poorly known, with insufficient information on its habitat, population status, or distribution to assess it. However, it is highly likely to be threatened. If a Data Deficient species will be affected by a proposed activity, the subpopulation should be well surveyed.

Figure 4-1: Sensitive species 144 recorded within the PAOI.

***Dinteranthus vanzylii (L.Bolus) Schwantes* – DDT**

The species was recorded at two locations within the PAOI with only one individual recorded at each site. The species is taxonomically problematic (Raimondo *et al*., 2009) and has been listed as data deficient.

The species grow in fine sand and gravel among quartz stones, in a very dry area with sporadic rain. They both in colour and shape, resemble the stones and pebbles found in their natural habitat (see Figure 4-2). The form and colour of the Dinteranthus have developed in order to allow them to live in the harsh conditions of their natural environment where they are able to stand extended periods of drought.

D. vanzylii is an intriguing solitary or clumping plant with attractive bodies and flowers that is very similar to Lithops in shape and colours but with no apparent dormant period. Its sunken growth form is understood as a development parallel to that in Lithops.

The leaf pair forming a cone or a funnel with the leaf tips broad, flat, but sometime with a thin horny keel near the fissure. It is smooth, chalky white to clear paste or greyish (rarely yellowish green) with obscure brownish patterning and irregular red or dark brown dots which coalesce into distinct lines similar to that of a Lithops. The intensity of marking varies greatly from plant to plant and comprises both completely chalky white plant without any marking and plant with brown markings and lines. It has a solitary, bright yellow to orange flower which blooms in autumn.

The species and suitable habitat have been excluded from development.

Figure 4-2: D. vanzylii recorded within the PAOI.

***Hoodia gordonii* (Masson) Sweet ex Decne.**

Within and surrounding the PAOI, the species is abundant (Figure 4-3). Where the proposed development requires the removal or destruction of the species, the necessary permit from the Provincial Department for its relocation is required.

Individuals were recorded throughout the De Rust proposed development. Prior to commencement of construction activities, a walk through the site needs where the final infrastructure will be located is required. Only individuals impacted on by development activities requires a permit for relocation.

The species occurs in a wide variety of arid habitats from coastal to mountainous, also on gentle to steep shale ridges, found from dry, rocky places to sandy spots in riverbeds. It is a widespread species (EOO 850,000 km²) but has undergone decline since 2001 as a result of indiscriminate harvesting for its appetite suppressant properties. International and national demand was particularly high between 2004 and 2006 and as a result of the high economic value of this species (price range between R500 and R1200 per kilogram at this time); even remote areas of its distribution range are suspected to have been harvested. Unfortunately, data do not exist to quantify the degree of decline to the population and as this species is widespread and can be locally common it is not possible to estimate overall population decline. Research on population recovery post harvesting and degree of impact of the harvesting over the past 10 years is required before this species can be accurately assessed. As a result of a decrease in demand for Hoodia internationally and the strict enforcement of new legislation to protect this species wild harvesting has declined in South Africa (Raimondo *et al*., 2008).

Figure 4-3: Hoodia gordonii recorded within the PAOI.

Sensitive species 425 – Vulnerable A4cd

This taxon is endemic to western Bushmanland in South Africa and has an extent of occurrence (EOO) of 3726 km². It is known from between 15 and 20 small, scattered subpopulations. It occurs in quartz patches within Succulent Karoo and Nama Karoo, often on Bushmanland Inselbergs. This habitat is present within the PAOI and has been excluded from development. This slow growing taxon is under heavy demand by succulent collectors. A 30 to 40% decline over a moving three generation time period of thirty years starting from 2010 is projected based on observed loss of habitat and degradation of habitat at certain subpopulations and as a result of the marked increase in illegal collecting taking place since 2016. With this taxon being highly popular with collectors, ongoing declines are predicted to continue. Furthermore, there are scattered mines within this taxon's range, and prospecting and mining expansion is ongoing affecting a number of subpopulations. It is also vulnerable to habitat degradation, particularly trampling by livestock when rangelands are overstocked. Some parts of its range, particularly low-lying flats, are heavily grazed (Young & Raimondo, 2020).

Even though not recorded, care must be taken to avoid suitable habitat and areas where the species has been observed. Prior to the construction phase and once the layout has been finalised, a walk down must be done for all planned infrastructure to ensure no individuals are recorded. If recorded, the necessary mitigation measures must be applied.

Sensitive species 854 – Vulnerable D2

A habitat specialist (AOO <20 km²) occurring on quartzite gravel in Aggeneys Gravel Vygieveld and Bushmanland Inselberg Shrubland. It is potentially threatened by grazing and trampling by livestock and possibly by harvesting for the specialist succulent horticultural trade.

The species has been recorded within a 10 km radius from the nearest infrastructure, and the screening report has highlighted suitable habitat for the species, which was confirmed during the SSV. The species is generally associated with the Aggeneys Gravel Vygieveld, which occurs in the PAOI.

Even though not recorded, care must be taken to avoid suitable habitat and areas where the species has been observed. Prior to the construction phase and once the layout has been finalised, a walk down must be done for all planned infrastructure to ensure no individuals are recorded. If recorded, the necessary mitigation measures must be applied.

***Cephalophyllum fulleri L.Bolus* – Rare**

A habitat specialist known from three subpopulations but is not threatened (Klak & Raimondo 2008). It occurs in Quartz pebble fields overlaying sandstone or dolomite. The species has not been recorded in close proximity to the study area but the screening report has highlighted suitable habitat within the PAOI. During the SSV, no individuals were recorded and accordingly the species has not been confirmed on site.

Even though not recorded, care must be taken to avoid suitable habitat and areas where the species has been observed. Prior to the construction phase and once the layout has been finalised, a walk down must be done for all planned infrastructure to ensure no individuals are recorded. If recorded, the necessary mitigation measures must be applied.

4.2 PROVINCIALLY PROTECTED SPECIES

In addition to the above species, there are several provincially protected species under the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) that occur on the study area which require permits for their removal from the Provincial Department. Prior to construction activities, all individuals of these species that will be directly impacted on by the proposed development, needs to be enumerated and marked with a GPS. A permit application for their relocation needs to be submitted to the Northern Cape Department Agriculture, Environmental Affairs, Rural Development and Land Reform and the necessary species needs to be removed or relocated prior to the commencement of construction activities.

The following family groups include provincially protected species recorded within the PAOI:

Schedule 1 species:

- *Hoodia gordonii*
- *Sutherlandia spp.*

Schedule 2 species:

- All species within the Aizoaceae family, which includes *Ruschia, Drosanthemum spp.*
- All *Euphorbia spp.*
- All *Mesembryanthemum sp.*
- All Crassulaceae spp.
- All *Colchicaceae spp.*
- All species within the Anacampserotaceae family, including *Anacampseros* spp.
- All species within the Oxalidaceae family, including *Oxalis* spp.
- All species within the Apocynaceae family
- All species within the Asphodelaceae family

4.3 SITE ECOLOGICAL IMPORTANCE (SEI)

The results of the SEI are indicated in the Tables below for each habitat. While most of the features that will be included in the conservation importance (CI) will be provided by the screening tool, it is important to note that CI is evaluated at a much finer spatial scale and based on fieldwork data collection and comprehensive desktop analyses performed by the

specialist during the Environmental Authorisation (EA) process. The reasons indicated below are based on the criteria in the guidelines selected for each relevant habitat.

Conservation importance (CI)

Habitat	Criteria	CI
Watercourse	> 50% of receptor contains natural habitat with potential to support SCC including Rare and DDT species.	Medium
Arid Grassland	Confirmed occurrence in development footprint of sensitive species 144 listed as VU, however, does not trigger High as it is listed under criterion A and has more than 10 locations remaining. > 50% of receptor contains natural habitat with potential to support SCC including Rare and DDT species	Medium
Shrubland	> 50% of receptor contains natural habitat with potential to support SCC including Rare and DDT species. Suitable habitat for sensitive species 144.	Medium
Vygieveld	Confirmed occurrence in development footprint of sensitive species 144 listed as VU, however, does not trigger High as it is listed under criterion A and has more than 10 locations remaining. > 50% of receptor contains natural habitat with potential to support SCC including Rare and DDT species.	Medium
Inselbergs	Confirmed occurrence in development footprint of sensitive species 144 listed as VU, however, does not trigger High as it is listed under criterion A and has more than 10 locations remaining. > 50% of receptor contains natural habitat with potential to support SCC including Rare and DDT species. Sensitive species recorded within development footprint.	Medium

Functional integrity (FI)

Habitat	Criteria	FI
Watercourse	Good habitat connectivity with functional ecological corridors. Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.	Medium
Arid Grassland	Good habitat connectivity with functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.	High
Shrubland	Good habitat connectivity with functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.	High

Vygieveld	Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.	High
Inselbergs	Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.	High

Receptor Resilience (RR)

Habitat	Criteria	RR
Watercourse	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.	Medium
Arid Grassland	Grassland is prone to rapid invasion by alien and invasive flora that prevents the restoration of this habitat following major disturbance. It requires active management and restoration attempts are not always successful. Flora endemic to this vegetation type is unlikely to adapt to major change, even after a long period. Certain species, mostly succulents, have a low likelihood of returning to a site when a disturbance or impact is occurring and once the disturbance or impact has been removed.	Low
Shrubland	Has the potential to be restored over time, and most flora species have a moderate likelihood of returning to a site once the disturbance or impact has been removed.	Medium
Vygieveld	This is a unique habitat which harbours many endemic and range restricted species, which cannot survive elsewhere. Most flora species have a low likelihood of remaining at a site even when a disturbance or impact is occurring or have a low likelihood of returning to a site once the disturbance or impact has been removed.	Low
Inselbergs	This habitat harbours many endemic and range restricted species, which cannot survive elsewhere. Most flora species have a low likelihood of remaining at a site even when a disturbance or impact is occurring or have a low likelihood of returning to a site once the disturbance or impact has been removed.	Low

Table 4-2: Determination of Site Ecological Importance (SEI).

Habitat	CI	FI	BI = CI+FI	RR	SEI= BI+RR
Watercourse	Medium	Medium	Medium	Medium	Medium
Arid Grassland	Medium	High	Medium	Low	High
Shrubland	Medium	High	Medium	Medium	Medium
Vygieveld	Medium	High	Medium	Low	High
Inselbergs	Medium	High	Medium	Low	High

It is very important to note that SEI is specific to the proposed development activities and cannot be meaningfully compared between different proposed projects with different associated activities on the same spatial location.

Summary of the SEI:

- The Watercourse and Shrubland are considered to have Medium sensitivity regarding Plant SCC;
- The Arid Grassland overall is considered to have High sensitivity regarding Plant SCC; however, this is not applicable for the entire habitat as micro-habitats exist which present favourable habitat for specialist plants to thrive in. Accordingly, only the habitat-specific sites have been included as highly sensitive habitat, and the remaining extent is considered medium sensitive from a Plant SCC perspective.
- Both the Vygieveld and Inselbergs are considered to have High sensitivity regarding Plant SCC.

5 OVERALL SENSITIVITY

The sensitivity map generated for the study area is based on both the Terrestrial Biodiversity as well as the Sensitive Plant Species themes. The sensitivity maps are indicated in Figure 5-1, Figure 5-2, Figure 5-3, Figure 5-4, where medium sensitivity (indicated in orange) can be considered for development with appropriate mitigation measures applied and highly sensitive areas (indicated in red) must be avoided (i.e. No-Go areas). The development footprint has moderate flora diversity, with three confirmed observations of plant SCC, and suitable habitat for at least two more species.

The final development footprint must take the overall sensitivity into account, with the aim of avoiding areas with high conservation value, including areas where ecosystem services and processes require protection. There are several highly significant biodiversity features within the development footprint, and impacts associated with the development activities that cannot be appropriately mitigated to an acceptable level. Avoidance is therefore the best option for the Inselbergs, as well as recorded plant SCC, suitable habitat and their associated buffers. The following buffers have been applied and incorporated into the sensitivity maps:

- Sensitive species 144 (must be protected in situ): 200m buffer for WEF, and 100m buffer for SEF.
- *D. vanzylii*: suitable habitat mapped which must be excluded from development. No buffer was applied as it is a DDT species; however, the WEF does not impact on it and all infrastructure has avoided these areas.

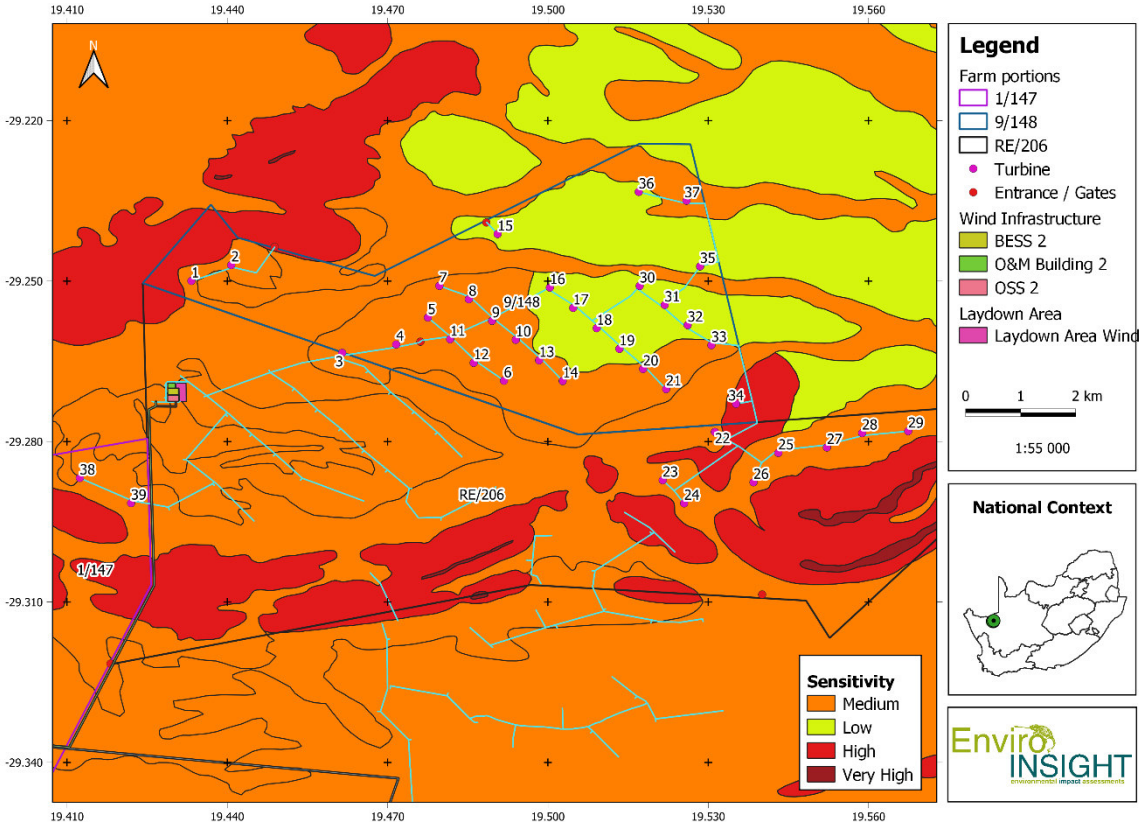


Figure 5-1: Combined sensitivity features including Terrestrial Biodiversity and Sensitive Plant Species for De Rust North WEF.

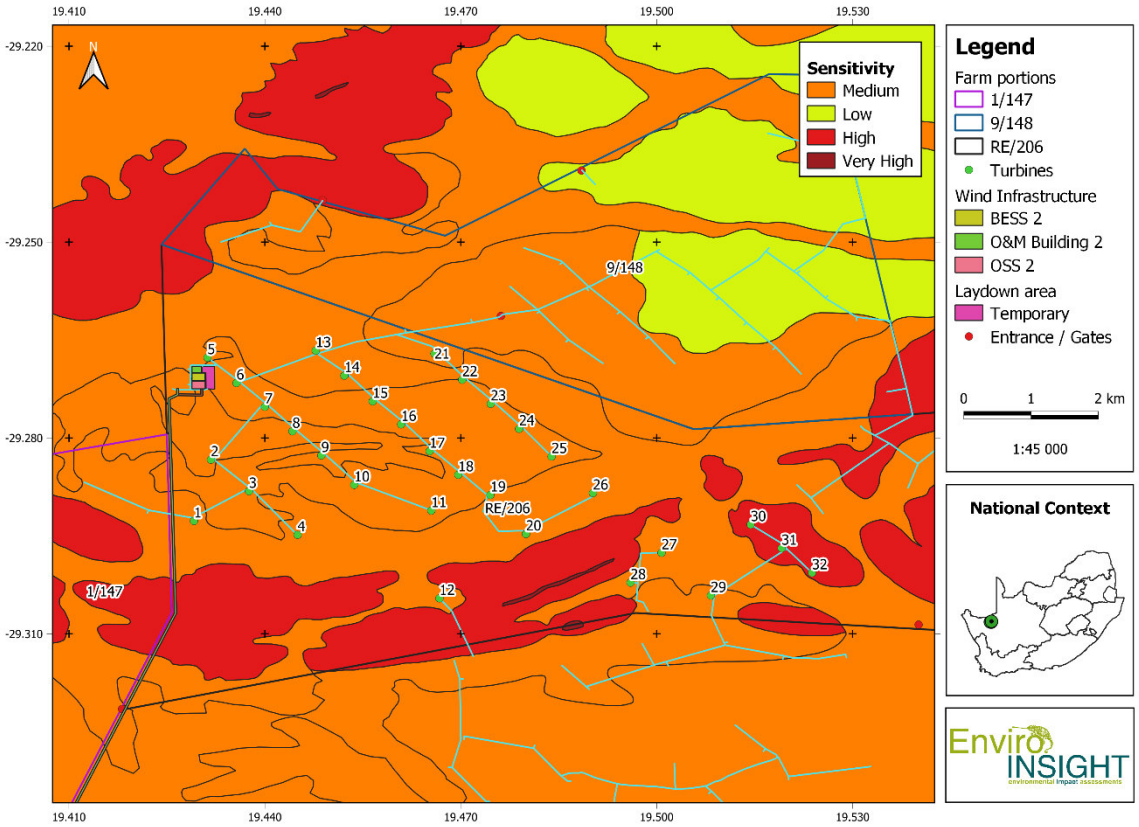


Figure 5-2: Combined sensitivity features including Terrestrial Biodiversity and Sensitive Plant Species for De Rust South WEF.

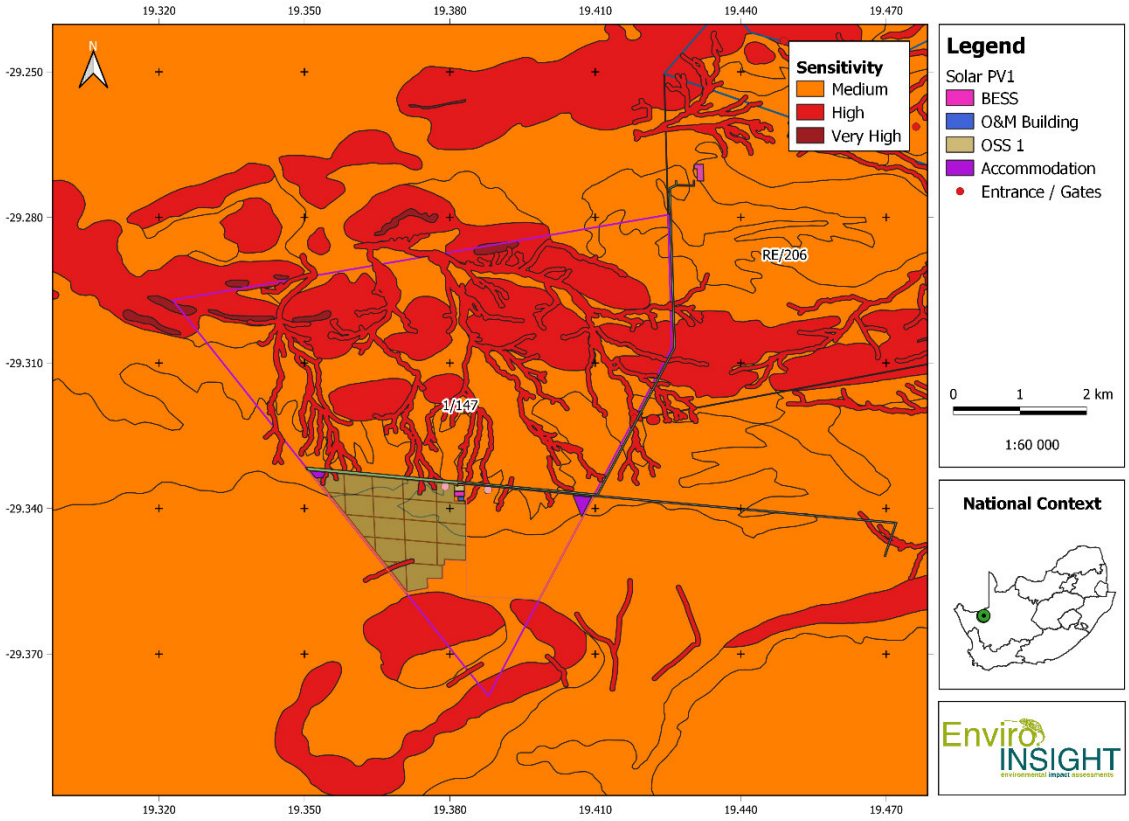


Figure 5-3: Combined sensitivity features including Terrestrial Biodiversity and Sensitive Plant Species for De Rust PV1 SEF.

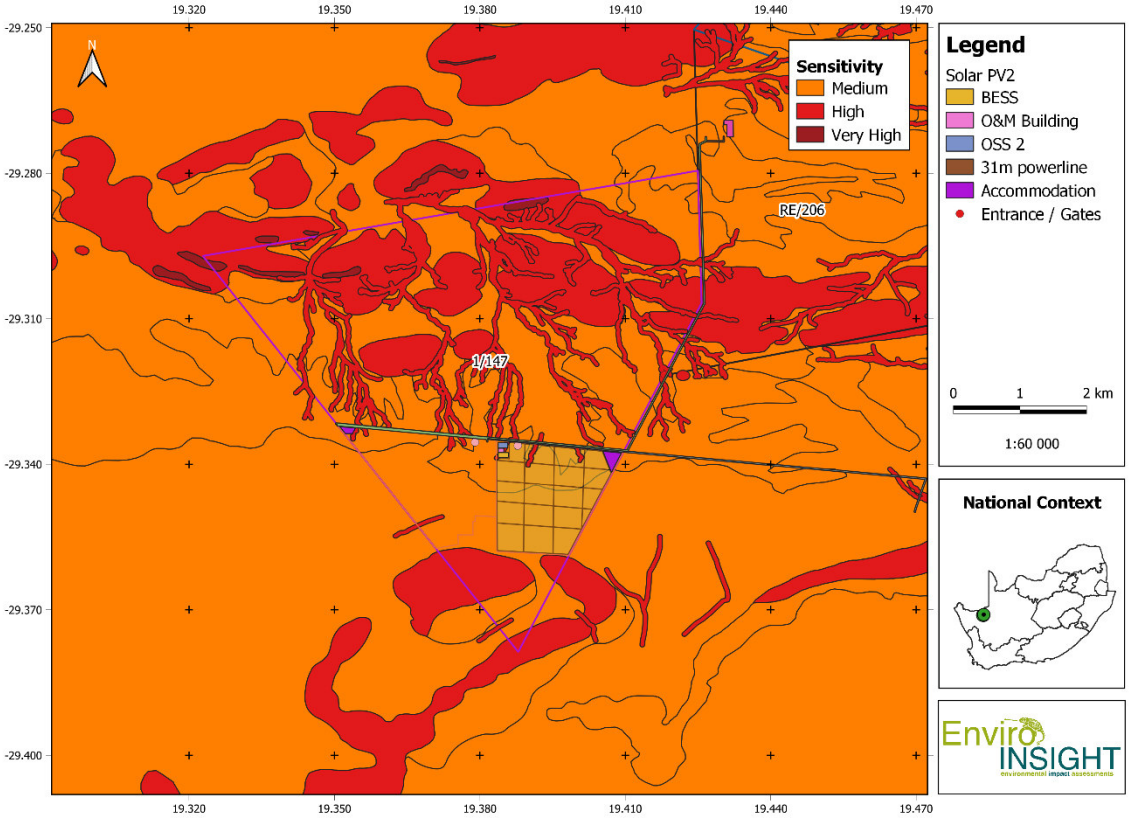


Figure 5-4: Combined sensitivity features including Terrestrial Biodiversity and Sensitive Plant Species for De Rust PV2 SEF.

6 IMPACT ASSESSMENT

The development of the De Rust WEFs is likely to result in a variety of impacts, associated largely with the disturbance and transformation of intact vegetation and faunal habitat to hard infrastructure such as turbine foundations and associated infrastructure such as service areas, access roads, operations buildings, and laydown areas.

For the two Solar Facilities, the impacts are more direct due to vegetation clearing for the PV arrays, which will transform approximately 488.2 ha for De Rust PV1 and 476.4 ha for De Rust PV2. Additional transformation will result from construction of associated infrastructure such as service areas, access roads, operations buildings, and laydown areas.

The overall impacts associated with the current layout of the proposed De Rust WEFs and SEFs as well as the "no-go alternative" will be assessed to evaluate the significance of the "as predicted" ecological impacts (prior to mitigation) and the "residual" ecological impacts (that remain after mitigation measures are considered). The following impacts are identified as the major impacts that are likely to be associated with the development during the construction and operational phases of the development.

6.1 POTENTIAL IMPACTS

Potential impacts associated with the proposed development include:

- Habitat loss due to placement of infrastructure,
- Habitat fragmentation,
- Reduced connectivity within the landscape,
- Loss of sensitive flora including SCC and provincially protected species,
- Increased alien invasive plant species due to soil disturbance and movement during the construction phase,
- Reduced ecosystem functioning due to construction within watercourse, pans and other sensitive features,
- Animal mortality due to construction phase activities,
- Fire and explosion hazard due to BESS, and
- Increased erosion due to removal of vegetation.

Currently, no anticipated fatal flaws exist as avoidance is possible and where not, appropriate mitigation measures can reduce impacts to low levels. Theses impacts are assessed and discussed in more detail below.

6.2 PLANNING AND DESIGN PHASE

No direct, indirect or cumulative ecological impacts have been identified for the Planning and Design Phase of the proposed De Rust WEF and Solar facilitates because no tangible alterations to the environment will occur within the proposed site during this phase, although the current layout plan shows turbines and infrastructure within Critical Biodiversity Areas for De Rust Southwest WEF, but no threatened species were triggered by the screening report or recorded during the site surveys. It therefore does not represent a fatal flaw.

6.3 CONSTRUCTION PHASE

Impact 1: Habitat Loss and Fragmentation

The habitats within the proposed study area and those of the surrounding areas form part of a functional ecosystem. An ecosystem can be defined as "a dynamic complex of animal, plant and micro-organism communities and their non-living environment interacting as a functional unit" (Ecosystem Environmental Assessment Guideline Draft, 5 July 2021). The

functional component or ecological functioning can be defined as “the roles, or functions, that species (of plants, animals, and microbes) and the effects of their activities (e.g., feeding, growing, moving, excreting waste etc.) play in the community or ecosystem in which they occur. In this approach, physiological, anatomical, and life history characteristics of the species are emphasised. The term "function" is used to emphasize certain physiological processes rather than discrete properties, describe an organism's role in a trophic system, or illustrate the effects of natural selective processes on an organism” (Ecosystem Environmental Assessment Guideline Draft, 5 July 2021). Considering the interactions between living and the non-living component of the environment requires an understanding of the processes that drive these interactions. These processes are crucial for maintaining healthy ecosystems and supporting the long-term persistence of biodiversity. Ecological processes include, amongst others, population abundance, range shifts (e.g. season or long-term migration), community structure and species turnover, trophic interactions, pollination, invasive species, shrub expansion/loss, forest expansion/loss, fire (frequency, severity, timing, extent), pathogens, pest outbreaks, acidification, succession, nutrient cycling, herbivory, phenology, and primary productivity/biomass. Various anthropological, atmospheric, biogeochemical, geomorphic, hydrological, and oceanographic processes also exist, but these are not ecological in nature.

The proposed De Rust WEFs and SEFs are not located in a threatened ecosystem. It is located in five vegetation types as mentioned in section 3.1. There is a CBA2 located on all four De Rust projects, and ESA located on the two WEFs (but not the solar facilities). The CBA2 is due to confirmed plant SCC as well as important features such as ridges. Avoidance will not be possible for all linear activities (roads and grid connections), but the turbine placement, laydown areas and other permanent structures must not be placed within CBA2 areas. Motivation can be made for development within ESA with appropriate implementation of mitigation measures. The two planned solar facilities are located completely in a CBA2. If the plant SCC are protected in situ with appropriate buffers, development can proceed.

The proposed development will require vegetation clearing for turbines, PV arrays, roads and other hard infrastructure (refer to Table 1-1 and Table 1-2, for WEFs and SEFs respectively), which will also impact on faunal habitat. The development footprints and associated facility infrastructure (internal access roads, substations, construction compound, batching plant and operations building) for the two De Rust WEFs and two De Rust SEFs will potentially cover total combined area of approximately 1096,467 ha during the construction phase. Of this, approximately 78,225 ha will be rehabilitated post-construction for all four projects.

For specific vegetation type habitat loss, refer to Table 6-1 below. The Bushmanland Arid Grassland will experience the most transformation and impacts as an expected 678,54 ha will be transformed, followed by the Aggeneys Gravel Vygieveld at 382,89 ha. However, taking into account thew remaining extent of natural vegetation compared to the planned transformation, the Aggeneys Gravel Vygieveld will experience a 6.21% reduction due to the proposed development while the other three vegetation types < 0.01 %. This is not considered a significant loss of the vegetation types, considering that the ecosystem services will remain intact, and certain areas will be rehabilitated post-construction. As the Aggeneys Gravel Vygieveld conservation target is set at 18% and approximately 92-96% of the full extent still remain, it is not under immediate threat. However, considering the number of prospecting and renewable energy applications in this area, the remaining extent might be lower.

Table 6-1: Extent of development within the respective vegetation types for the two De Rust WEFs and the two De Rust SEFs.

	North WEF	South WEF	PV1	PV2	Total	Transformed
Bushmanland Basin Shrubland	**ha**	**ha**	**ha**	**ha**	**ha**	**%**
Total Development Footprint	13,13	0	0	0	**13,13**	**0,00029**
Rehabilitation post-construction	3,31	0	0	0	**3,31**	
Bushmanland Arid Grassland						
Total Development Footprint	17,71	17,58	343,78	299,47	**678,54**	**0,0197**
Rehabilitation post-construction	3,69	0,34	5,14	4,3	**13,47**	
Bushmanland Inselburg Shrubland						
Total Development Footprint	4,74	5,07	0	0	**9,81**	**0,0154**
Rehabilitation post-construction	1,34	0,98	0	0	**2,32**	
Aggeneys Gravel Vygieveld						
Total Development Footprint	29,70	31,88	144,38	176,93	**382,89**	**6,21**
Rehabilitation post-construction	4,18	4,62	6,73	8,68	**24,21**	

Vegetation loss is usually accompanied by the loss of food sources and/or shelter but may also include the loss of sensitive features including wetlands, breeding habitat and rocky outcrops. It must be noted that only portions of vegetation on the study area will be transformed and not the entire property. Accordingly, habitat fragmentation will be higher compared to habitat loss. Furthermore, the cumulative impacts for this vegetation unit will be high due to existing wind farms in the area (two existing, one approved for construction and another four who has approved environmental authorisations but not yet received preferred bidder status). In addition, there is a solar farm being constructed and several mines within the area which increases the cumulative impact on vegetation clearing.

Sensitive features must be avoided during the construction phase. In order to minimise the loss of vegetation and faunal habitat, several mitigation measures are proposed. Prior to mitigation the impact is considered High, which can be reduced to low-medium after the application of appropriate mitigation.

Table 6-2: Impacts associated with Habitat Loss and Fragmentation of the two De Rust WEFs.

Nature: Habitat Loss and Fragmentation during construction phase of the wind energy facilities.				
	De Rust North WEF		De Rust South WEF	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	2	1	2	1
Duration	5	5	5	5
Severity	5	3	5	3
Probability	5	4	5	4
Frequency of Activity	5	4	5	4
Significance	**120**	**72**	**120**	**72**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Non-reversible	Low	Non-reversible	Low
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low
Can impacts be mitigated?	To an extent - vegetation loss will have to occur for the development to proceed. If development is limited to only the footprints, then large sections of natural vegetation will remain intact.			
Residual Impacts:	Minor. Once the construction ceases and the mitigation measures are implemented limited residual impacts are expected as the loss of vegetation can only be restored through rehabilitation efforts, and even then, the species composition and richness could be altered. Rehabilitation of roads after the construction phase, as well as laydown areas, is required.			

Table 6-3: Impacts associated with Habitat Loss and Fragmentation of the De Rust SEFs.

Nature: Habitat Loss and Fragmentation during construction phase of the solar energy facilities.				
	De Rust PV1		De Rust PV2	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	2	1	2	1
Duration	5	5	5	5
Severity	5	4	5	4
Probability	5	4	5	4
Frequency of Activity	5	4	5	4
Significance	**120**	**80**	**120**	**80**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Non-reversible	Low	Non-reversible	Low
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low

Can impacts be mitigated?	To an extent - vegetation loss will have to occur for the development to proceed. For solar facilities, vegetation removal is guaranteed for large sections of the area, but rehabilitation and protection of ecosystem services are possible.
Residual Impacts:	Once the construction ceases and the mitigation measures are implemented limited residual impacts are expected as the loss of vegetation can only be restored through rehabilitation efforts, and even then, the species composition and richness could be altered. Rehabilitation of roads after the construction phase, as well as laydown areas, is required.

Proposed mitigation measures:

- Placement of turbines within the High Sensitivity areas, including Inselbergs should be avoided.
- Ensure that lay-down and other temporary infrastructure is within low and medium sensitivity areas, preferably previously transformed areas if possible.
- This impact can also be greatly mitigated if the development in natural vegetated areas do not completely remove the existing vegetation and natural cover, with the removal of vegetation to be restricted to the minimum as possible. For the WEFs this is possible, but for the SEFs vegetation clearing and soil disturbance is more significant. Even though species can continue to exist between and underneath PV arrays, the layout of the arrays need to take this into consideration.
- The number of roads should be reduced to the minimum possible and routes should also be adjusted to avoid areas of high sensitivity as far as possible. Where possible, existing roads must be used to avoid additional habitat loss and fragmentation.
- Movements of machinery, vehicles and persons should be restricted to the existing roads and avoid the existing natural areas.
- Solar panels placement can be the cause for the loss of areas with natural vegetation, so care should be taken to limit the placement of solar panels to already disturbed areas or within medium sensitivity areas.
- Demarcate all areas to be cleared with construction tape or other appropriate and effective means. However, caution should be exercised to avoid using material that might entangle fauna.
- Rehabilitate disturbed areas that are no longer required by the operational phase of the development. Inadequate rehabilitation could result in limited revegetation and/or an invasion of alien vegetation which will result in long term ecological degradation and damage.
- Temporary infrastructure will be rehabilitated post-construction as these sections were only required during the construction phase. This includes laydown areas and the widening of internal roads.
- A Rehabilitation Management Plan must be developed and implemented during the construction phase as construction is complete at each site.
- An Environmental Control Officer (ECO) must be employed to monitor the clearing of vegetation for the construction of roads and hardstands.

Impact 2: Loss of species of conservation concern (SCC), including national and provincial protected species and protected trees.

Apart from the direct loss of vegetation within the development footprint, listed plant SCC could be impacted on. Four plant SCC were recorded on site as well as numerous provincially protected species. The appropriate buffers need to be applied to protect the SCC in situ. Where the turbines, PV arrays and associated infrastructure are located the necessary permits for their removal/relocation of provincially protected species are required prior to the commencement of construction activities.

Prior to mitigation the impact is considered medium-high, which can be reduced to low after the application of appropriate mitigation.

Table 6-4: Loss of species of conservation concern for the two SEFs.

Nature: Loss of species of conservation concern for the two SEFs.				
	De Rust PV1		De Rust PV2	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	1	1	1	1
Duration	5	3	5	3
Severity	4	3	4	3
Probability	4	2	2	1
Frequency of Activity	5	4	5	4
Significance	**90**	**42**	**90**	**42**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Moderate	High	Moderate	High
Irreplaceable loss of resources?	High	Low	High	Low
Can impacts be mitigated?	Yes - avoidance is the best approach. Only one SCC is expected to occur on the SEF.			
Residual Impacts:	If sensitive species are avoided and the necessary permits are obtained for provincially protected species removal, there should be no residual impacts.			

Proposed mitigation measures:

- Sensitive species 144 needs to be protected in situ and requires a 200m buffer for WEF and 100m buffer for SEF.
- Three data deficient species were recorded on site. Even though no specific buffers are required as per the SEA Guidelines (SANBI 2020), *D. vanzylli* and *A. diabolicus* should ideally be protected in situ and accordingly the layout should avoid the habitats where these species occur. *Hoodia gordonii* can be relocated and require a permit from the provincial government.
- A comprehensive Plant Search and Rescue must be undertaken by a suitably qualified botanical specialist prior to vegetation clearance. This is applicable for provincially protected species which could be removed from site with the relevant permit.

- Avoidance of drainage lines is necessary for the protection of suitable habitat for sensitive species 12.
- All relevant plant permits must be obtained from the provincial authority prior to the removal or relocation of SCC, including provincially protected species.
- Plant SCC found within the proposed site must either be housed in an onsite nursery for use during rehabilitation or be relocated to suitable areas where vegetation clearance will not occur.

Table 6-5: Loss of species of conservation concern for the two WEFs.

Nature: Loss of species of conservation concern.				
	De Rust North WEF		**De Rust South WEF**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Spatial Scale	1	1	1	1
Duration	5	3	5	3
Severity	5	3	5	3
Probability	4	2	2	1
Frequency of Activity	5	4	5	4
Significance	**99**	**42**	**99**	**42**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Moderate	Moderate	Moderate	Moderate
Irreplaceable loss of resources?	High	Moderate	High	Moderate
Can impacts be mitigated?	Yes - avoidance is the best approach.			
Residual Impacts:	If sensitive species are avoided and the necessary permits are obtained for provincially protected species removal, there should be no residual impacts.			

Impact 3: Alien and invasive plant species

The disturbance associated with the construction phase of the project could see an increase of alien invasive plant species at disturbed areas. Some alien plant invasion is inevitable and regular alien plant clearing activities would be required to limit the extent of this problem. Once the natural vegetation has returned to the disturbed areas through rehabilitation efforts post-construction, the site will be less susceptible to alien plant invasion. Roadsides and turbine service areas will remain focal points of alien plant invasion for the project's operational duration, and likely during the decommissioning phase. This impact would manifest towards the end of the construction phase, and accordingly the required measures to reduce this impact are required early on.

Prosopis sp. are the only dominant alien invasive plant in the study area which is mainly confined to watercourses. A few individuals may occur in the larger study area. The removal of these individuals will have a positive outcome by improving the indigenous biodiversity as there will be less competition and more favourable habitat for indigenous fauna.

Proposed mitigation measures:

- A site-specific Alien Invasive Species (AIS) Management Plan must be implemented during the construction phase and continued monitoring and eradication needs to take place throughout the life of the project.
- Alien vegetation, within the development footprints, should be removed from the site and disposed of at a registered waste disposal site.
- The development footprints and immediate surroundings should be monitored for the growth/regrowth of alien vegetation throughout the construction and operation phases of the project.

Table 6-6: Alien and invasive plant species in the two de Rust SEFs.

Nature: Alien and invasive plant species.				
	De Rust PV1		De Rust PV2	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	3	2	3	2
Duration	4	3	4	3
Severity	4	2	4	2
Probability	3	2	3	2
Frequency of Activity	4	2	4	2
Significance	**77**	**28**	**77**	**28**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	High	Low	High
Irreplaceable loss of resources?	Moderate	Replaceable	Moderate	Replaceable
Can impacts be mitigated?	Yes - an Alien Invasive Species Management Plan needs to be developed			
Residual Impacts:	Some residual impact is likely as the containment of alien invasive species are never 100% possible.			

Table 6-7: Alien and invasive plant species for the wind energy facilities.

Nature: Alien and invasive plant species.				
	De Rust North WEF		De Rust South WEF	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	3	2	3	2
Duration	5	5	5	5
Severity	3	2	3	2
Probability	3	2	3	2
Frequency of Activity	4	2	4	2
Significance	**77**	**36**	**77**	**36**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Low	Moderate
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low
Can impacts be mitigated?	Yes - an Alien Invasive Species Management Plan needs to be developed.			
Residual Impacts:	Some residual impact is likely as the containment of alien invasive species are never 100% possible.			

Impact 4: Increased risk of erosion and flash floods

Disturbance created during construction would leave the site vulnerable to wind and water erosion. Soil disturbance associated with the development such as earth works, laying foundations, and expansion of roads, will render the impacted areas vulnerable to soil erosion, especially when crossing watercourses. Appropriate measures to limit erosion will need to be implemented. This impact is mainly limited to the construction phase and could persist into the operational phase.

Proposed mitigation measures:

- Soil erosion and Rehabilitation Plan to be part of the EMPr.
- The clearance of vegetation, at any given time, must be kept to a minimum to reduce the possibility of soil erosion.
- Rehabilitation of eroded areas on a regular basis during the construction period.
- All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.

Table 6-8: Increased risk of erosion and flash floods for the two De Rust SEFs.

Nature: Increased risk of erosion and flash floods.				
	De Rust PV1		De Rust PV2	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	2	1	2	1
Duration	5	5	5	5
Severity	4	2	4	2
Probability	3	2	3	2
Frequency of Activity	4	2	4	2
Significance	**77**	**32**	**77**	**32**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Low	Moderate
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low
Can impacts be mitigated?	Yes - limited vegetation removal during the construction phase and rehabilitation will be done post-construction			
Residual Impacts:	Some level of erosion is currently visible on site. Accordingly, only impacts from the development should be mitigated and rehabilitated.			

Table 6-9: Increased risk of erosion and flash floods for the two De Rust WEFs.

Nature: Increased risk of erosion and flash floods.				
	De Rust North WEF		De Rust South WEF	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	2	2	2	2
Duration	5	5	5	5
Severity	4	2	4	2
Probability	3	2	3	2
Frequency of Activity	4	2	4	2
Significance	**77**	**36**	**77**	**36**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Low	Moderate
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low
Can impacts be mitigated?	Yes - limited vegetation removal during the construction phase and rehabilitation will be done post-construction.			
Residual Impacts:	Some level of erosion is currently visible on site. Accordingly, only impacts from the development should be mitigated and rehabilitated.			

Proposed mitigation measures:

- Ground clearing and the digging of trenches should ideally take place at the end of the dry season, prior to the first rains in order to minimise the impacts of dust.
- Newly cleared and exposed areas must be managed for dust and landscaped with indigenous vegetation to avoid soil erosion. Where necessary, temporary stabilisation measures must be used until vegetation establishes.
- Avoid the presence of people and vehicles in highly sensitive areas, including riverine areas and natural vegetation, as far as possible.
- Stormwater management plan is required.
- Avoid construction within watercourses, and where roads crossing occur, the appropriate mitigation measures as indicated by the aquatic specialist must be implemented.

6.4 OPERATIONAL PHASE

Impact 1: Direct faunal impacts due to operation

Operational phase has a longer duration (approximately 15-20 years) in comparison to the construction phase (approximately 18-24 months). The most negative and significant impacts will likely be the displacement and/or disturbance of fauna communities. Fences around the proposed WEFs and SEFs, if not fauna-friendly, may limit fauna movement and dispersal. Importantly, mitigation measures should be put in place to assure that ecological flow and genetic exchange is not interrupted or fragmented by the infrastructure.

Additionally, the presence of human and vehicle-movements through the area (associated with maintenance movements) has the potential to negatively affect the fauna community, especially during the night-time when most fauna species are active and can get killed by moving vehicles. However due to the short duration of these impacts and especially if mitigation measures are implemented, this is considered to be a low-significance impact.

Table 6-10: Direct faunal impacts due to operation of the WEFs.

Nature: Direct faunal impacts due to operation of the WEFs.				
	De Rust North WEF		**De Rust South WEF**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Spatial Scale	2	2	2	2
Duration	4	3	4	3
Severity	3	2	3	2
Probability	3	2	3	2
Frequency of Activity	4	3	4	3
Significance	**63**	**35**	**63**	**35**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Low	Moderate
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low
Can impacts be mitigated?	Yes			
Residual Impacts:	General disturbance will persist			

Table 6-11: Direct faunal impacts due to operation of the SEFs.

Nature: Direct faunal impacts due to operation.				
	De Rust PV1		De Rust PV2	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	2	2	2	2
Duration	4	3	4	3
Severity	4	3	4	3
Probability	4	3	4	3
Frequency of Activity	4	3	4	3
Significance	**80**	**48**	**80**	**48**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Low	Moderate
Irreplaceable loss of resources?	The impact will persist for the lifespan of the facility			
Can impacts be mitigated?	Yes. Refer to section below.			
Residual Impacts:	General disturbance will persist			

Proposed mitigation measures:

- reduce the presence of human activity on the project area as far as possible by only focusing on the areas where operational tasks are required,
- avoid the presence of people and vehicles in highly sensitive areas as far as possible,
- no unauthorised persons should be allowed onto the operational sites,
- any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be left alone to allow them to move away or, if necessary, safely moved away from the area of activity to a nearby location,
- lower the levels of noise whenever possible and use equipment with low noise emissions must be used to not disrupt ecological life cycles (breeding, migration, feeding) of animals. Do not unnecessarily disturb faunal species, especially juvenile or during the breeding season.
- reduce exterior lighting to that necessary for safe operation and implement operational strategies to reduce spill light. Use down-lighting from non-UV lights where possible, as light emitted at one wavelength has a low level of attraction to insects. This will reduce the likelihood of attracting insects and their predators.
- illegal collection, hunting or harvesting of any plants or animals at the site by contractors should be strictly forbidden except by individuals (Project developer, Manager or ECO) with the appropriate permits,

- all hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill,
- driving should be limited to an acceptable speed limit by all employees and contractors, such as 40 km, to reduce collisions with fauna,
- road kills need to be monitored and if required, a roadkill monitoring programme (inclusive of wildlife collisions record keeping) should be established. Where needed, Animex fences must be installed to direct animals to safe road crossings. Finally, mitigation should be adaptable to the onsite situation which may vary over time.
- reduce direct mortalities by allowing for fauna to cross the roads. Where applicable, this can be achieved by constructing fauna underpasses under the roads (large culverts or large open-ended concrete pipes laid into the raised roads). These underpasses should be used in conjunction with "fauna barriers" which prevent the most susceptible small fauna from crossing the roads on the surface by directing them towards the underpasses where they can cross under the roads safely. It is important to note that utilization of underpasses is strongly dependent on animal body size (larger culverts are more successful) and the surrounding habitat.
- all staff operating motor vehicles must undergo an environmental induction training course that includes instruction on the need to comply with speed limits, to respect all forms of wildlife and, wherever possible, prevent accidental road kills of fauna. Drivers not complying with speed limits should be subject to penalties.
- all potential pitfalls (trenches, excavations) must have escape points with an angle of less than 45° to allow for trapped animals to escape.
- fences should be constructed in such a way so that burrowing animals can still gain access, which will allow other animals to also utilise the holes dug under fences to increase connectivity in the area. Fences should have mesh size large enough to allow small animals to pass through, if not (e.g. EasyView), regular holes must be cut at the base to allow movement of these animals.

Impact 2: Alien and invasive plant species

The clearance of vegetation associated with the development of the De Rust WEFs and SEFs and associated infrastructure will create open patches which are likely to be colonised by pioneer plant species. While this is partly a natural revegetation/regeneration process, which would ultimately lead to the re-establishment of secondary vegetation cover, it also favours the establishment of alien species. The density and abundance of alien species are low and the impact is not considered significant as it can be mitigated to acceptable low risk levels.

Table 6-12: Alien and invasive plant species during the operation phase of SEFs.

Nature: Alien and invasive plant species during the operation phase of SEFs.				
	De Rust Solar West		De Rust Solar East	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	3	2	3	2
Duration	5	5	5	5
Severity	4	2	4	2
Probability	3	2	3	2
Frequency of Activity	4	3	4	3
Significance	**84**	**45**	**84**	**45**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	High	Low	High
Irreplaceable loss of resources?	Moderate	Replaceable	Moderate	Replaceable
Can impacts be mitigated?	Yes - an Alien Invasive Species Management Plan needs to be developed			
Residual Impacts:	Some residual impact is likely as the containment of alien invasive species are never 100% possible.			

Proposed mitigation measures:

- The site-specific AIS Management Plan must be implemented for the first year of the operational phase. Thereafter, alien vegetation must continue to be monitored and eradicated annually throughout the life of the project.
- Soil should not be brought in from outside the study area, or if absolutely necessary, should be sourced from an area with no alien plant species which may contain seeds.
- Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as Prosopis are already present in the area and are likely to increase rapidly if not controlled.
- Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.
- Alien vegetation, within the development footprints, should be removed from the site and disposed of at a registered waste disposal site.

Table 6-13: Alien and invasive plant species during the operation phase of the WEFs.

Nature: Alien and invasive plant species.				
	De Rust North WEF		De Rust South WEF	
	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	3	2	3	2
Duration	5	5	5	5
Severity	4	2	4	2
Probability	3	2	3	2
Frequency of Activity	4	3	4	3
Significance	**84**	**45**	**84**	**45**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Low	Moderate
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low
Can impacts be mitigated?	Yes - an Alien Invasive Species Management Plan needs to be developed.			
Residual Impacts:	Some residual impact is likely as the containment of alien invasive species are never 100% possible.			

6.5 BATTERY ENERGY STORAGE SYSTEM

A Lithium-Ion BESS and Vanadium Redox Flow (VRF) BESS are possible technologies utilised for renewable energy projects[15]. For Redox Flow BESS, various chemical compositions are likely, such as Vanadium.

With Lithium-Ion BESS, the most significant hazard with battery units is the possibility of thermal runaway and the generation of toxic and flammable gases. The flammable gases generated may ignite leading to a fire which accelerates the runaway process and may spread the fire to other infrastructure and possibly set the vegetation and surrounding infrastructure ablaze which could cause a run-a-way fire and cause extensive damage in the area if not controlled. Thermal runaway could happen at any point during transport to the facility, during construction or operation at the facility or during decommissioning and safe making for disposal.

No BESS should be located in a sensitive area. Accordingly, the necessary measures need to be put in place to limit potential fires, including a fire break around each De Rust BESS facility (this is a worst-case scenario). If a containerised approach including the usual good practice of separation between containers are applied for this project, the impacts are likely restricted to events to one container at a time, the main risks being close to the containers i.e., to transport drivers, employees at the facilities and first responders to incidents.

[15] It must be stated that the type of technology was not indicated as part of the assessment but in order to indicate potential BESS impacts a summary is provided in this report.

For Redox Flow BESS, the most significant hazard with VRF battery units is the possibility of spills of corrosive and environmentally toxic electrolyte. Several preventative and mitigative measures need to be included in the design and operation phase, e.g., full secondary containment, level control on tanks, leak detection on equipment, in order to contain potential spillage.

The type of BESS technology could have some impact on terrestrial biodiversity; but should the appropriate preventative measures be applied during the design, transportation and construction phase of the project, both could be considered viable options.

6.6 DECOMISSIONING PHASE

When the two WEFs and two SEFs reaches the end of its lifespan, all machinery and related installations must be dismantled and removed, and the site should, as far as is reasonably possible, be restored to its original condition. It is only if the developer decides to extend the life of the wind farm and repowering the site, that only the top section of the turbines (mainly the blades and operating mechanism) must be replaced. As decommissioning of large-scale wind farms in South Africa are new, the regulatory framework and impacts associated with this phase are based on assumptions. Perhaps the most important assumption is that decommissioning a wind farm is straight forward and simple, compared to the problems associated with decommissioning a nuclear power station, or a coal or gas fired plant. The major issues are the physical removal and the disposal of the used parts. Where possible, all recyclable materials must be repurposed in an environmentally friendly way. The concrete hardstands of the turbines will need to be broken up and removed for restoration to occur. For the SEF, active restoration will be required since it will be a large area filled with mostly weedy grasses.

It is expected that the dismantling of turbines, the PV arrays and associated infrastructure can lead to disturbance of fauna community, in all ways similar to that resulting from the construction phase. The ecological impacts associated with the decommissioning phase will be similar to those listed in the construction phase and the associated mitigations measures must be updated and implemented to reduce potential adverse impacts.

6.7 CUMULATIVE IMPACTS

Where other renewable energy developments occur within the surrounding area of the proposed development, a cumulative impact assessment is required. This includes a general assessment of cumulative impact as well as an assessment of different potential cumulative impact sources and an indication of the size or extent of the identified cumulative impact.

REEA Q3 (2022[16]) was used to assess the potential cumulative impacts. The proposed De Rust WEF and SEF developments are surrounded by four approved WEF projects within a 30 km radius, 'Paulputs' to the north, and 'Namies', 'Poortjies' and 'Korana' to the west. There are also two approved solar PV projects, 'Paulputs PV1&2' to the north and Khai-Mai to the west, in addition to the proposed Red Sands PV area. Only the latest versions of approved and unique technologies are thus considered in the calculations below (Figure 6-1).

[16] https://egis.environment.gov.za/data_egis/data_download/current

The main cumulative impact anticipated from renewable energy developments, especially solar projects, is increased habitat loss and loss of plant SCC. Assuming that the total areas represented by the WEFs developments shown in Figure 6-1 will contain turbines, Table 6-14 shows that the maximum transformed area from the WEF development boundaries (REEA Q3, 2022) within a 30 km radius of the proposed WEF development cluster is expected to amount to 11.2% of the total land area. The proposed De Rust North WEF and South WEF itself only represents 2.1% (10 435,17 ha) of the 30 km radius area, indicating a small proportion of transformation in the regional context. The maximum transformed area from the SEF development boundaries (REEA Q3, 2022) within a 30 km radius of the proposed development cluster is expected to amount to 4.6% of the total land area. The proposed De Rust PV1 and PV2 itself only represents 0.3% (1 387,625 ha) of the 30 km radius area, indicating a small proportion of transformation in the regional context.

The combined transformed area for all renewable energy projects (including the proposed De Rust WEF cluster) is expected to represent 13.0% of the 30 km radius area. The combined loss of habitat from the De Rust WEF and SEF projects is estimated to be less than 2% of the maximum transformed area for all renewable energy projects within a 30km radius.

The cumulative impacts from the two WEFs and the two SEFs on one another will probably be greater compared to the other renewable energy facilities, due to their close proximity to one another, and currently no existing facilities surrounding the proposed projects. The large amount of renewable energy developments in the area would potentially generate significant cumulative impact in terms of habitat loss and potential disruption of landscape connectivity.

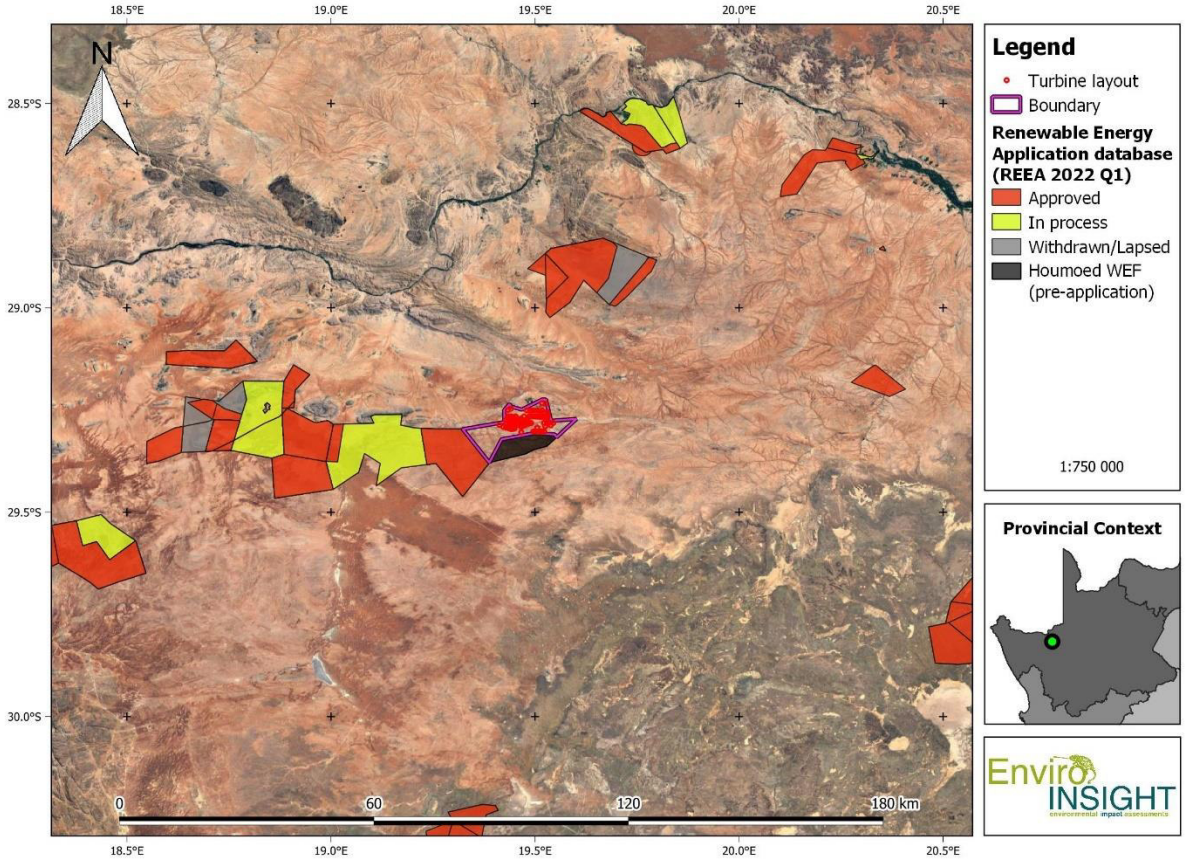


Figure 6-1: Location of known regional renewable energy technologies (REAA Q3, 2022[17]) in relation to the Combined Project Area.

Table 6-14: Spatial summary of approved renewable developments in the region.

Elements	Area (ha)	Proportion of total area
Total area of 30 km buffer surrounding (and including) the proposed De Rust WEF cluster.	507 807	100.0%
Total area[18] of approved renewable energy projects within the 30 km buffer	65 960	13.0%
Solar CSP	0	0.0%
Solar PV	23 697	4.6%
Wind	56 774	11.2%

[17] https://egis.environment.gov.za/data_egis/data_download/current
[18] Combined solar PV and wind areas calculated separately per technology.

It is difficult to assess the cumulative impact when regarding interactions between impacts. It must be noted that not all these areas will be transformed by the proposed developments and mitigation recommendations made in this report will ensure that the most sensitive habitats will be avoided by infrastructure placement. The PV panels and associated infrastructure are expected to have a moderate cumulative impact due to increased habitat loss and fragmentation, as larger areas are cleared during the construction period. With appropriate mitigation applied as suggested in this report, the anticipated cumulative impacts to vegetation are expected to be slightly higher than the anticipated impacts, but still result in a Low-Medium significance (Table 6-15). Accordingly, it is unlikely that any cumulative impact assessment will, under the current *status quo*, result in a fatal flaw.

Some of the main cumulative impacts of renewable energy developments in the region will include:

- Vegetation and habitat loss,
- Increased habitat fragmentation,
- Loss of critical habitat for flora SCC as well as endemic species,
- Loss of provincially protected species which require a permit,
- Surface water impacts and associated ecological processes,
- Increased erosion due to flooding (not a yearly event but longer term),
- Increased alien flora and fauna species.

Table 6-15: Summary of potential negative cumulative impacts evaluated pre-mitigation and post-mitigation.

Impact	Pre-mitigation Significance	Post-mitigation Significance	Confidence level	Residual impacts	Potential Fatal Flaw
Habitat loss	High	Low-Medium	Moderate	Potentially	No – not in threatened ecosystem or threatened vegetation type
Loss of flora SCC	Very High	Low-Medium	Moderate	Potentially	No – if all projects avoid sensitive areas and protect in situ with appropriate buffers
Loss of provincial protected species	Medium-High	Low-Medium	Moderate	Potentially	No – if the relevant permit applications were obtained for removal
Alien vegetation	Medium-High	Low	Moderate	Potentially	No – if the relevant management plan is drafted and implemented

Table 6-16: Habitat loss cumulative impact assessment of the De Rust projects.

Nature: Habitat loss.		
	Without mitigation	**With mitigation**
Spatial Scale	4	3
Duration	5	4
Severity	4	3
Probability	4	3
Frequency of Activity	4	3
Significance	**High (104)**	**Low-Medium (60)**
Status (positive or negative)	Negative	Negative
Reversibility	With appropriate mitigation the impact can be ameliorated, but some residual impacts will remain (loss of vegetation).	
Irreplaceable loss of resources?	Possible	Possible
Can impacts be mitigated?	To a degree	
Residual Impacts: *Loss of vegetation is unavoidable, but since the proposed development and surrounding developments are not located in a threatened vegetation type and all sensitive areas are avoided, the impacts are not considered significant with about 13% of the cumulative affected area potentially transformed.*		

Table 6-17: Loss of plant SCC cumulative impact assessment of the De Rust projects.

Nature: Loss of plant SCC		
	Without mitigation	**With mitigation**
Spatial Scale	4	3
Duration	5	4
Severity	5	3
Probability	5	3
Frequency of Activity	4	3
Significance	**Very High (126)**	**Low-Medium (60)**

Status (positive or negative)	Negative	Negative
Reversibility	With appropriate mitigation the impact can be ameliorated, but some residual impacts will remain (loss of vegetation).	
Irreplaceable loss of resources?	Possible	Possible
Can impacts be mitigated?	To a degree	
Residual Impacts: *Loss of vegetation is unavoidable, but since the proposed development and surrounding developments are not located in a threatened vegetation type and all sensitive areas are avoided, the impacts are not considered significant with about 13% of the cumulative affected area potentially transformed.*		

7 CONCLUSION AND PROFESSIONAL OPINION

The study areas for the two wind facilities and two solar facilities are located within five vegetation types, namely the Aggeneys Gravel Vygieveld, Bushmanland Arid Grassland, Bushmanland Basin Shrubland, Namaqualand Klipkoppe Shrubland, and Bushmanland Inselberg Shrubland vegetation types, all listed as Least Threatened. None of the facilities are located in a threatened ecosystem or protected area, but both SEFs and a portion of North WEF is located in a national protected expansion area.

Based on the SSV and further surveys, the Terrestrial Biodiversity theme was confirmed to have Very High sensitivity, while the Sensitive Plant Species theme was confirmed to have High sensitivity owing to presence of protected species. The Sensitive Animal Species theme was confirmed to have Low sensitivity for all taxa groups except for avifauna, which is addressed in a sperate report.

All four De Rust projects intersect a CBA2 while both De Rust WEFs intersect an ESA. The CBA2 is mainly triggered for threatened species. Sensitive species 144 was recorded on site, along with three data deficient plant SCC and suitable habitat for two additional SCC. As long as the development of De Rust WEF project ensures that the overall functioning of the CBA2 is not compromised and the proposed development avoids the recorded SCC, development can continue. It is not anticipated that the development will lead to a significant loss of a population or habitat, as SCC are avoided by the development and appropriately buffered. The ESAs are mainly due to watercourses on site and should be avoided as far as possible and the appropriate mitigation measures should be in place to reduce impacts to acceptable levels.

Most of the De Rust WEFs and SEFs consist of grasslands on flat plains and gently sloping hills that are considered moderately sensitive. The watercourses and inselbergs are considered sensitive and should be avoided during the construction period for placement of turbines, PV arrays, laydown areas and associated infrastructure. Roads and cables will cross watercourses, and the impacts can be mitigated by reducing it to acceptable levels since avoidance is not possible.

Large sections of the PAOI are considered sensitive due to the Inselbergs and Klipkoppe habitats. There are specific features of the affected area which indicate that it is of broad-scale significance for faunal movement or landscape connectivity. For

other provincially listed species which are affected by the proposed development, a permit application for their removal must be applied for with the provincial authority prior to the commencement of construction activities.

Considering the above-mentioned information, no fatal flaws are evident for the proposed project should the latest layout be incorporated which has taken sensitivities into account. It is the opinions of the specialists that the project, may be considered for authorisation, on condition all prescribed mitigation measures and supporting recommendations are implemented. Should the layout be amended and significant changes occur which impacts on sensitive features, all necessary protocols need to be followed to ensure all highly sensitive areas are avoided.

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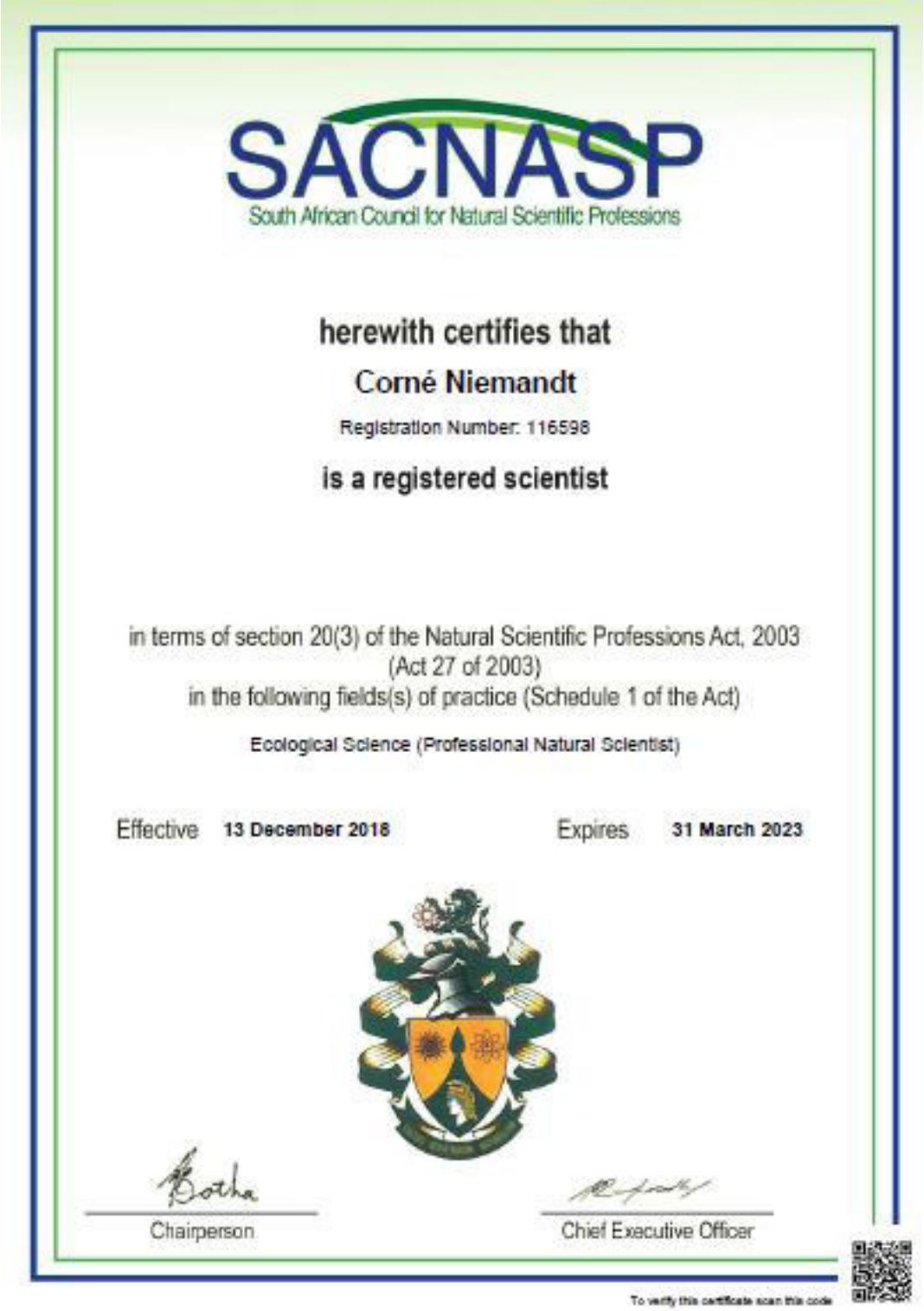
APPENDIX A: SACNASP PROFESSIONAL CERTIFICATE



SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Corné Niemandt

Registration Number: 116598

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Ecological Science (Professional Natural Scientist)

Effective 13 December 2018 Expires 31 March 2023

Chairperson

Chief Executive Officer

To verify this certificate scan this code

APPENDIX B: ANIMAL COMPLIANCE STATEMENT

Site Inspection Details

A site visit was undertaken by two zoologists, Sam Laurence and Alex Rebelo (sam@enviro-insight.co.za; alex@enviro-insight.co.za), to confirm the low sensitivity for terrestrial animal species (excluding avifauna), and to confirm that the proposed development will have no significant impact on Species of Conservation Concern (SCC).

The following information is applicable to the site verification:

- Date: March 2021, June 2022 and August 2022
- Duration: Overall six days
- Season/s: Dry and wet seasons
- Season Relevance: Conditions were adequate in the latter period following good rains.

Methodology

Desktop Study

Relevant databases, field guides and texts were consulted for the literature study which included the following:

- The online Virtual Museum (VM) facility of the Animal Demography Unit (ADU) of the University of Cape Town (http://vmus.adu.org.za) and iNaturalist[19] was queried for the presence of mammal (MammalMAP, 2023), reptile (ReptileMAP, 2023) and amphibian (FrogMAP, 2023) SCC within the QDGC in which the proposed development resides and the surrounding QDGC's containing similar habitat (2919CA, 2919AC,2919CB, 2919AD, 2919AB, 2919BC, 2919BA);
- The International Union for Conservation of Nature (IUCN[20]) was queried for threatened mammal species in the Northern Cape, as distribution data (MammalMAP, 2023) were limited for the selected QDGCs.
- National Red List status and threat information was obtained from SANBI[21]; and
- Additional Reptile SCC information was obtained from Bates *et al.,* (2014).

Species nomenclature follows the aforementioned references.

Field survey

- The specialist investigated the study area on foot and by vehicle for a total of 6 days.
- The study area was investigated for *ad hoc* animal signs and sightings.
- Since no SCC (excluding avifauna) were flagged by the screening report or desktop assessment, the survey was brief.

[19] https://www.inaturalist.org/
[20] https://www.iucnredlist.org/
[21] http://speciesstatus.sanbi.org/

- All fauna observed during the site survey were photographed (where possible).

Assumptions and limitations

- It is assumed that all third-party information used (e.g. GIS data and satellite imagery) is correct at the time of generating this report.
- The Avifauna and Bat assessments are not part of this report and is dealt with under the relevant theme and presented in a separate report. Where relevant from a Terrestrial Biodiversity perspective, short descriptions are included. For instance, to describe the functionality of a habitat.

Results

Desktop

The following Threatened and Near-Threatened species, as per the National Red List, are expected to occur within the project area:

- Black-footed Cat (*Felis nigripes*) – Vulnerable
- Littledale's Whistling Rat (*Parotomys littledalei*) – Near-Threatened

Although the Endangered tortoise *Chersobius signatus* was listed for the QDGCs (ReptileMAP, 2023), this single record has been disregarded in all red listing activities and represents a questionable record.

Sampling

Random walk transects were done, covering all major habitats on site within each of the project development footprints. Habitat photographs were taken and the likelihood of any SCC being present was evaluated. Habitats are described in detail in the Terrestrial Biodiversity report.

Proposed impact management actions:

The impact mitigation and management actions have been integrated into the Terrestrial Biodiversity report.

Conclusion

This compliance statement is applicable to all two WEFs and the two SEFs. The study area is in a natural or semi-natural state (due to grazing), with the only potential SCC being the widespread and Vulnerable Black-footed Cat (*Felis nigripes*). The proposed development is not expected to have a significant impact on this SCC, if it should occur on site. The site is thus a low sensitivity for terrestrial animal species (excluding birds and bats - see relevant reports). No fauna species may be intentionally injured, killed, hunted or traded during any phase of the project. The management actions provided in the Terrestrial Biodiversity report should be included in the Environmental Management Programme to reduce fatalities and minimise impacts on animals that do occur on the study area.

References

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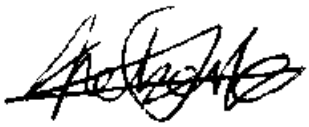
Specialist Declaration

I, Sam Laurence and Alex Rebelo, declare that the work presented in this report is our own and has not been influenced in any way by the developer or the EAP. At no point has the developer asked me to manipulate the results in order to make it more favourable for the proposed development. I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP) and the EIA Regulations (2014, as amended). I have the necessary qualifications and professional expertise in conducting this specialist report.



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herewith certifies that

Samuel David Laurence

Registration Number: 400450/13

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in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Ecological Science (Professional Natural Scientist)
Zoological Science (Professional Natural Scientist)

Effective **20 November 2013** Expires **31 March 2023**

Chairperson

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herewith certifies that

Alexander Douglas Rebelo

Registration Number: 124030

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
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