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Appendix D:
Specialist Studies

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Appendix D1:
Terrestrial Biodiversity Assessment

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Terrestrial Biodiversity Specialist Assessment: Four Wind Energy Facilities and Two Solar Energy Facilities to be known as Red Sands Southwest of Aggeneys Northern Cape Province

September 2022

For

FE Red Sands (Pty) Ltd

PREPARED BY

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Professional Team

The technical team responsible for the Terrestrial Biodiversity Impact Assessment reporting is presented below.

Team member	Qualification	SACNASP	Role on project
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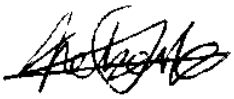
Specialist Declaration

We 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 us as specialists to manipulate the results in order to make it more favourable for the proposed development. We consider ourselves bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP) and the EIA Regulations (2014, as amended). We have the necessary qualifications and expertise in conducting this specialist report.

Sam Laurence *Pr. Sci. Nat.*

Corné Niemandt *Pr. Sci. Nat.*



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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.

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.

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].

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 Red Sands (Pty) Ltd to perform a Terrestrial Biodiversity Assessment for the proposed Red Sands Wind Energy Facility (WEF) and Red Sands Solar Energy Facilities (SEF) located southwest of Aggeneys in the Northern Cape Province, South Africa.

The Applicant wishes to apply for environmental authorisations for the proposed development of four (4) WEFs and two (2) SEFs as well as the associated infrastructure (all six projects will be referred to as "the study area"). The Red Sands WEFs will consist of up to 207 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 200 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.

The six projects will be referred to as:

- Red Sands Northwest WEF
- Red Sands Northeast WEF
- Red Sands Southeast WEF
- Red Sands Southwest WEF
- Red Sands Solar WEST
- Red Sands Solar EAST

The turbine footprints and associated facility infrastructure (internal access roads, substations, construction compound, batching plant and operations building) for all four Red Sands WEFs will potentially cover total combined area of approximately 3523,697 ha during the construction phase, of which approximately 1565,966 ha will be rehabilitated post-construction, thereby reducing the operating development footprint to approximately 2540,219 ha.

Table 1-1: Proposed Construction Footprint of the four Red Sands Wind Energy Facilities.

Facility Component	Northwest WEF	Northeast WEF	Southwest WEF	Southeast WEF
Estimated number of turbines	61	36	53	57
Dimensions of turbine foundations (m^2)	73200	43200	63600	68400
BESS footprint (m^2)	22000	22000	22000	22000
Crane stands (m^2)	237900	140400	206700	222300
Compound (m^2)	22500	22500	22500	22500
Temporary laydown areas (m^2)	1830	1080	1590	1710
Switchgear / transformer (m^2)	1525	900	1325	1425
Internal roads (m^2)	530652	299748	736848	420120
Upgrade existing roads (m^2)	192624	31208	0	67412
Rehabilitation - 4m of road (m^2)	176884	99916	245616	140040
Total Development Footprint (m^2)	1082231	561036	1054563	825867
Total Development Footprint (ha)	**1082,231**	**561,036**	**1054,563**	**825,867**
Rehabilitation post-construction (m^2)	439114	263896	476406	386550
Rehabilitation post-construction (ha)	**439,114**	**263,896**	**476,406**	**386,55**

The PV footprints and associated facility infrastructure (internal access roads, substations, construction compound, batching plant and operations building) for the two Red Sands SEFs will potentially cover total combined area of approximately 1515,747 ha during the construction phase, of which approximately 213,516 ha will be rehabilitated post-construction, thereby reducing the operating development footprint to approximately 1302,231 ha.

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

Facility Component	Red sands Solar West	Red sands Solar East
PV area (m2)	490200	461000
BESS footprint (m^2)	22000	22000
Temporary laydown areas (m^2)	10000	10000
Switchgear / transformer (m^2)	20000	20000
Internal roads (m^2)	202649,22	257897,94
Rehabilitation - 4m of road (m^2)	67549,74	85965,98
Total Development Footprint (m^2)	744849,22	770897,94
Total Development Footprint (ha)	**744,84922**	**770,89794**
Rehabilitation post-construction (m^2)	97549,74	115965,98
Rehabilitation post-construction (ha)	**97,54974**	**115,96598**

All six renewable energy projects are located within Zone 8 (Springbok) of the Renewable Energy Development Zones (REDZ) and accordingly BA processes will be followed as published on 16 February 2018 in GN113.

1.2 STUDY AEA

The proposed study area for the WEF development is located approximately 38 km southwest of Aggeneys in the Northern Cape. The site can be reached via the N14, which is ~11 km to the northwest of the project area (Figure 1-1). The WEF footprint is approximately 20 000 hectares (ha) and will be located on the Remaining Extent of the Farm Donkerduispraat 95 (Portion of this will be for solar), Remaining Extent of the Farm Rooi Duin 100, Remaining Extent of the Farm Kliphakskeen 98, Portion 1 of the Farm Kliphakskeen 98, Remaining Extent of the Farm Kraalbosch Vlei 99, Portion 1 of the Farm Kraalbosch Vlei 99, within the Nama-Khoi Local Municipality.

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, but many have been abandoned. The closest existing WEF is the Kangnas WEF, which is situated approximately 30 km west of the proposed Red Sands WEF study area.

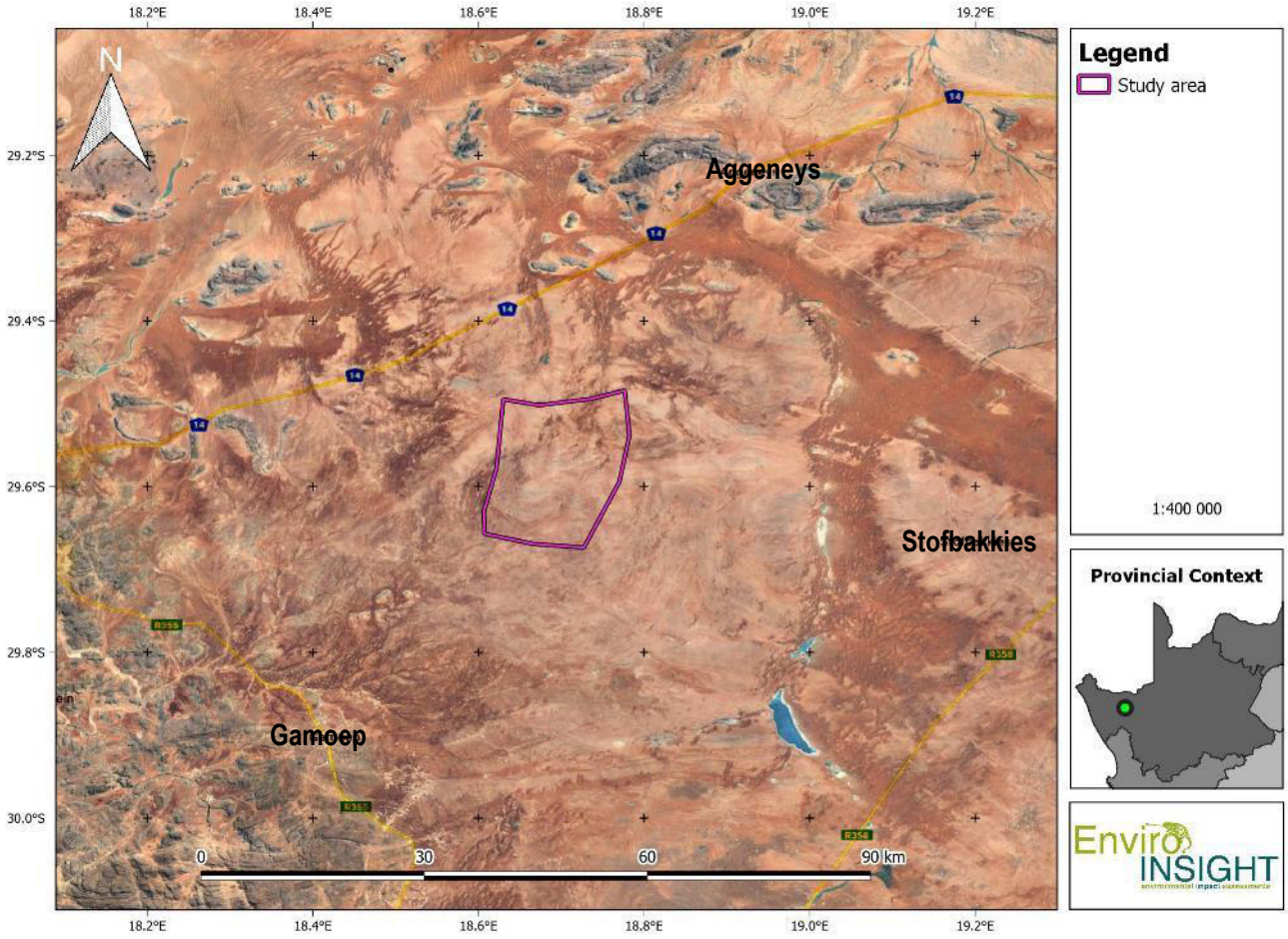

Figure 1-1: Location of the proposed Red Sands Wind and Solar Farms.

1.3 STUDY AIMS & LEGAL CONTEXT

- This report contains the Terrestrial Biodiversity as well as Sensitive Animal and Plant Species Themes of the Environmental Impact Assessment report (EIAr) required for the environmental authorisation process for a proposed development;
- The terrestrial animal and plant species protocol published on 30 October 2020 for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal and 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 animal species protocol guidelines".

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

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 terrestrial biodiversity are for landscapes or sites which support various levels of biodiversity. The screening report was generated on 4 February 2021.

Based on the screening report generated on 03/02/2021, the Terrestrial Biodiversity Combined Sensitivity Theme is indicated as **Very High** sensitivity for all four Red Sands WEF projects but not for the two Red Sands Solar projects (Figure 2-1). The sensitive features which trigger the Very High sensitivity include:

- Critical Biodiversity Area 1 for Red Sands Southwest WEF; and
- Ecological Support Area for Red Sands Northwest WEF, Northeast WEF and Southwest WEF.

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

The Animal species theme is indicated as High sensitivity due to the presence of sensitive avifauna species, while the remaining taxa groups are considered to be low (Figure 2-2). The avifauna component is addressed in a separate report based on the specific protocol and guidelines. Accordingly, only a compliance statement is required for the four WEFs and two Solar facilities.

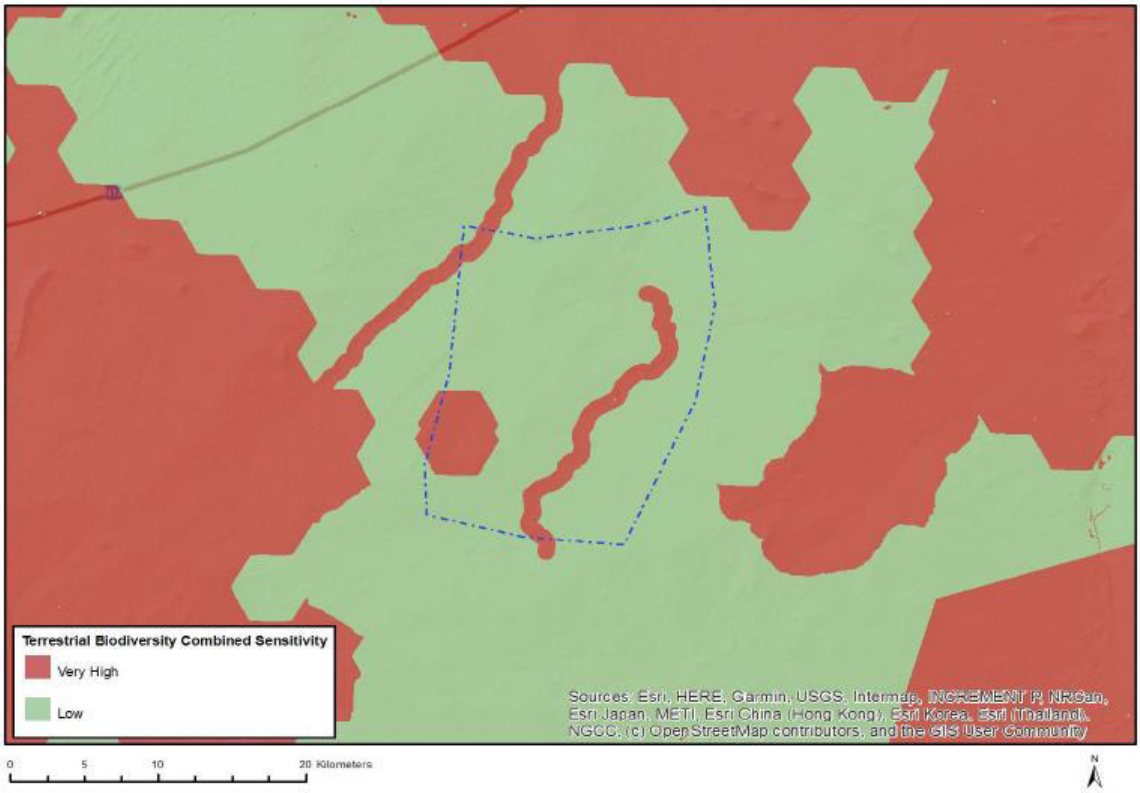

Figure 2-1: Screening Tool map of relative terrestrial biodiversity theme sensitivity.

Figure 2-2: Screening Tool map of relative animal species theme sensitivity.

The plant species theme indicated Medium sensitivity due to suitable habitat for sensitive species 144 and 12 (Figure 2-3). Refer to next section discussing the site sensitivity verification.

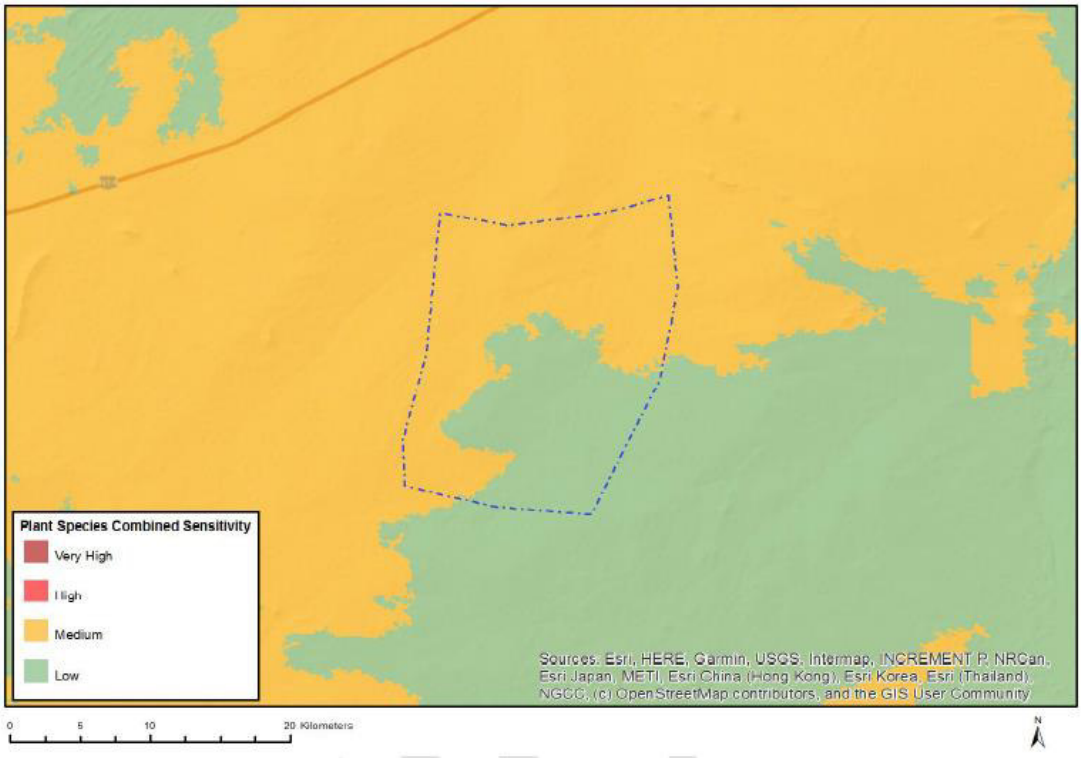

Figure 2-3: Screening Tool map of relative plant species theme sensitivity.

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, it did not rain 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 2-4). The initial desktop review focused mainly on the BRAHMS Online BODATSA database, producing a species list of 122 species recorder for the greater area. 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 not recorded on the study area during the site verification survey (with the exception of the few individuals planted at homesteads), and limited suitable habitat was present. Sensitive species 12 is known from the Concordia region, east of Springbok in Namaqualand. The study area presents the edge of its known distribution and was accordingly included in the survey, even though no individuals were recorded during the survey due to the ongoing drought conditions in the region at the time.

The findings of the site verification, which included a desktop assessment, confirmed the Very High environmental sensitivity of the Terrestrial Biodiversity theme and Low sensitivity for all other animal taxa groups, except for avifauna which is addressed in a separate report.

Figure 2-4: 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)[2]; and
- National List of Threatened Ecosystems (SANBI, 2011).

All mapping was performed using open source GIS software (QGIS[3]).

2.3.2 Habitat mapping

Habitats were manually mapped within the PAOI and surrounding areas as structural units that would be utilised differently by herpetofauna / mammals or represent distinct habitats to flora (geology, watercourses, vegetation 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[4]); 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) provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA) (SANBI, 2016[5]), to access distribution records on southern African plants[6]. 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 on 28 June 2022 was used. A larger list had to be generated for the xMin, yMin 19.30°, -29.10°: xMax, yMax 18.70°, -29.70° extent (WGS84 datum) in order to increase the likelihood of obtaining a representative species list for the proposed study area.

[2] http://dea.maps.arcgis.com/apps/MapTools/index.html?appid=2367540dd75148e8b6eaeab178a19d3a
3 http://qgis.osgeo.org/en/site/
[4] https://earthexplorer.usgs.gov/
5 http://newposa.sanbi.org/
6 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)

The Red List of South African Plants website (SANBI, 2021)[7] 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).

2.4 FIELD SURVEYS

Site visits were undertaken in March 2021 (dry conditions), October 2021 (sporadic wet conditions) and June 2022 (wet conditions) by a botanist and zoologist 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 2-5).

Figure 2-5: Wet conditions on the study area during the June 2022 survey.

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

7 http://redlist.sanbi.org/

(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.

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 fauna and flora. However, regional conservation status assessments performed for species of conservation concern (SCC) following the IUCN criteria were the most relevant and sourced for each group as follows:

- Plants: Red List of South African plants version 2021 and Raimondo *et al.* (2009);
- Reptiles: Bates *et al.* (2014);
- Amphibians: Du Preez & Carruthers (2017);
- Mammals: Child *et al.* (2016).

The conservation status categories defined by the IUCN (Figure 2-6), 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.

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).

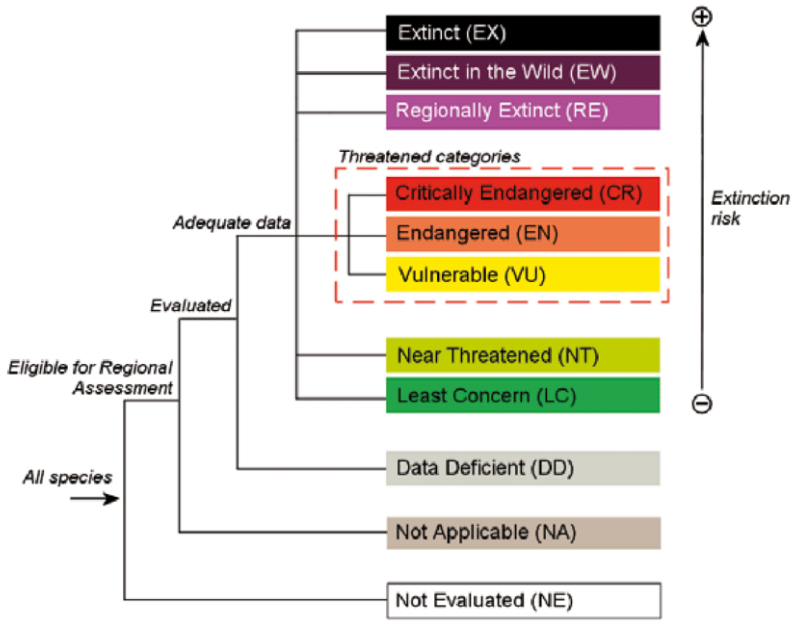

Figure 2-6: Schematic representation of the structure of the IUCN Red List Categories (IUCN 2012).

2.6 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)	
Low (26-50)	Pre-construction
Low – Medium (51-75)	Construction
Medium – High (76-100)	Operation
High (101-125)	Decommissioning
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.

	Consequence (Severity + Spatial Scope + Duration)														
Likelihood (Frequency of Activity + Probability of Impact)	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.

2.7 HABITAT MAPPING

Habitats were manually mapped within the PAOI and surrounding areas as structural units that would be utilised differently by herpetofauna / mammals or represent distinct habitats to flora (geology, water-courses, vegetation 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[8]); and
- the most recent satellite imagery (courtesy of Google Corporation).

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.

[8] https://earthexplorer.usgs.gov/

- 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 site sensitivity verification 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). In order to simply this, each required aspect is indicated in Table 3-1 below, and where triggered or relevant, it is discussed in more detail in the sections to follow.

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 – located in the Bushmanland Basin Shrubland vegetation type	Section 3.1
Threatened Ecosystems	No – not located within any listed threatened ecosystem	-
Important Bird Areas (IBA)	No – not located in any IBA. Red Sands Southeast WEF is the closest to the Bitterputs Conservation Area (SA036), located approximately 18 km northwest of the WEF. The Haramoep and Black Mountain Mine (SA035) is located approximately 19km northeast from Red Sands Northeast WEF.	-
Protected Areas	No – not located in any protected area. The closest protected area, the Marietjie van Niekerk Nature Reserve, is located approximately 10km west of Red Sands Northwest WEF and Red Sands Southwest WEF.	
Provincial Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)	Yes. A CBA and ESA is located in Red Sands Southwest WEF. An ESA is located in Red Sands Northwest WEF, Red Sands Northeast WEF and Red Sands Southeast WEF.	Section 3.2

	No CBA or ESA is located in Red Sands Solar WEST and EAST.	
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 3.3

3.1 REGIONAL VEGETATION

The study area is located in the Bushmanland Arid Grassland (NKb3; Table 3-2) and Bushmanland Basin Shrubland (NKb6; Table 3-3) vegetation typeFigure 3-1. The study area is not located in a national threatened ecosystem.

Bushmanland Arid Grassland

The Bushmanland Arid Grassland vegetation type (Table 3-2) is present in the Northern Cape Province, extending from around Aggeneys in the west to Prieska in the east. Three of the four WEFs, namely Red Sands Northwest (Figure 3-1), Northeast (Figure 3-2) and Southwest (Figure 3-4), including the two solar facilities (Figure 3-5; Figure 3-6) are located in NKb3.

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. Most of the western border is formed by the edge of the Namaqualand hills.

It is the second most extensive vegetation type in South Africa and occupies an area of 45 478 km^2. The vegetation type is located on plains on slightly sloping plateau sparsely vegetated by grassland dominated by white grass (*Stipagrostis* species) and with semi-desert characteristics. In places low shrubs of *Salsola* change the vegetation structure. During years of abundant rainfall annual species flower abundantly.

Table 3-2: 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 (only differs from Bioregion in Fynbos)	Bushmanland Bioregion
Name of Bioregion (only differs from Group in Fynbos)	Bushmanland Bioregion

The soils are mostly a red-yellow apedal soil of less than 300 mm deep, but exceeding this depth in approximately a fifth of the area. The area has low rainfall, with a mean annual precipitation (MAP) of between 70mm and 200mm. Rainfall ranges mainly from the end of summer towards the beginning of autumn. Frost incidence towards the east can be up to 35 days.

The vegetation type is classified as Least Threatened. Although a very small area is statutorily conserved in Augrabies Falls National Park and Goegab Nature Reserve, very few areas have been transformed. However, this outdated assessment might have to be revisited since the construction of renewable energy projects since 2012 within this vegetation type. One biogeographically important species and six endemic species are listed by Mucina and Rutherford (2006, as amended).

Bushmanland Basin Shrubland

Red Sands Southeast WEF (Figure 3-3) is completely embedded in the Bushmanland Basin Shrubland, with sections of Red Sands Northwest (Figure 3-1), Northeast (Figure 3-2) and Southwest (Figure 3-4) located in NKb6. 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 3-3). 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 3-3: 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 Bioregion	Bushmanland Bioregion

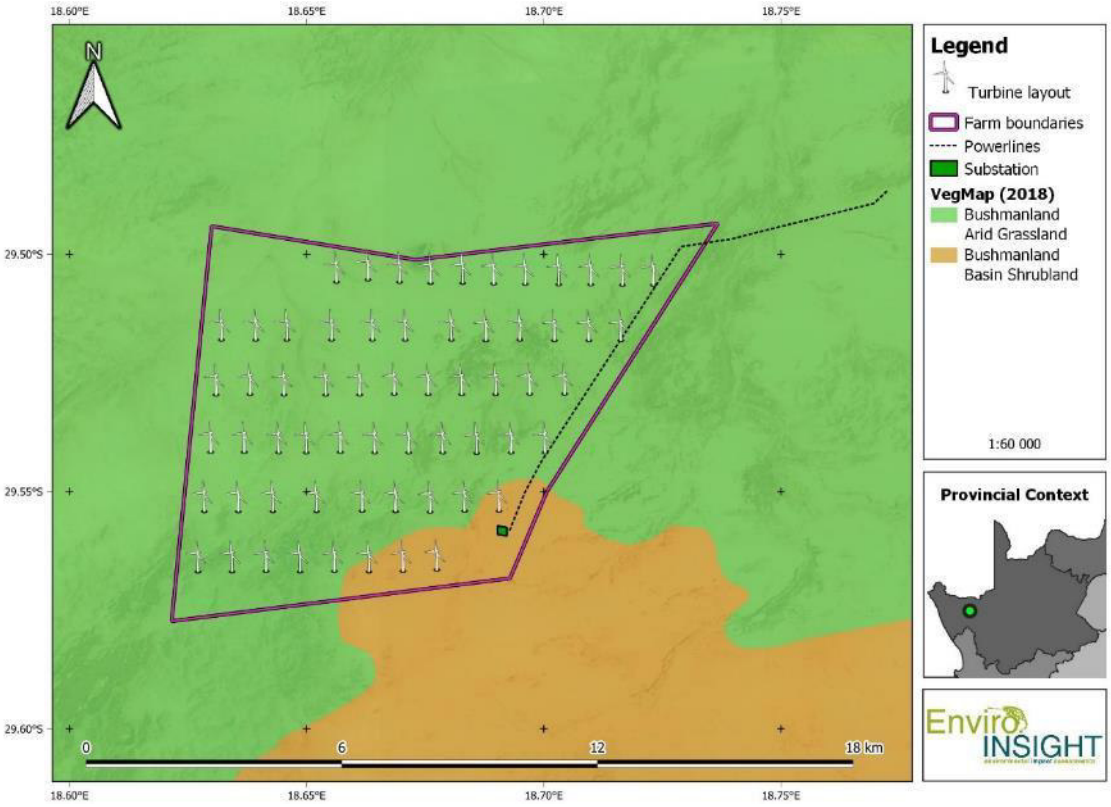

Figure 3-1: Regional vegetation types in relation to Red Sands Northwest WEF (SANBI, 2018).

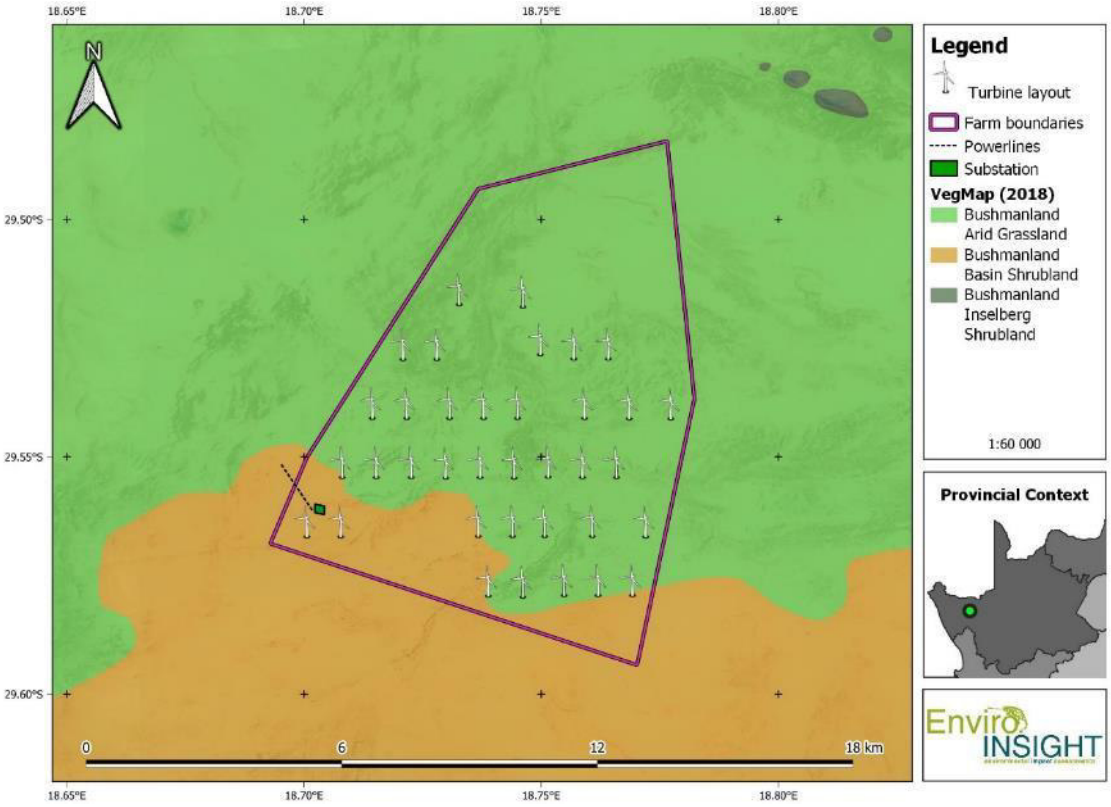

Figure 3-2: Regional vegetation types in relation to Red Sands Northeast WEF (SANBI, 2018).

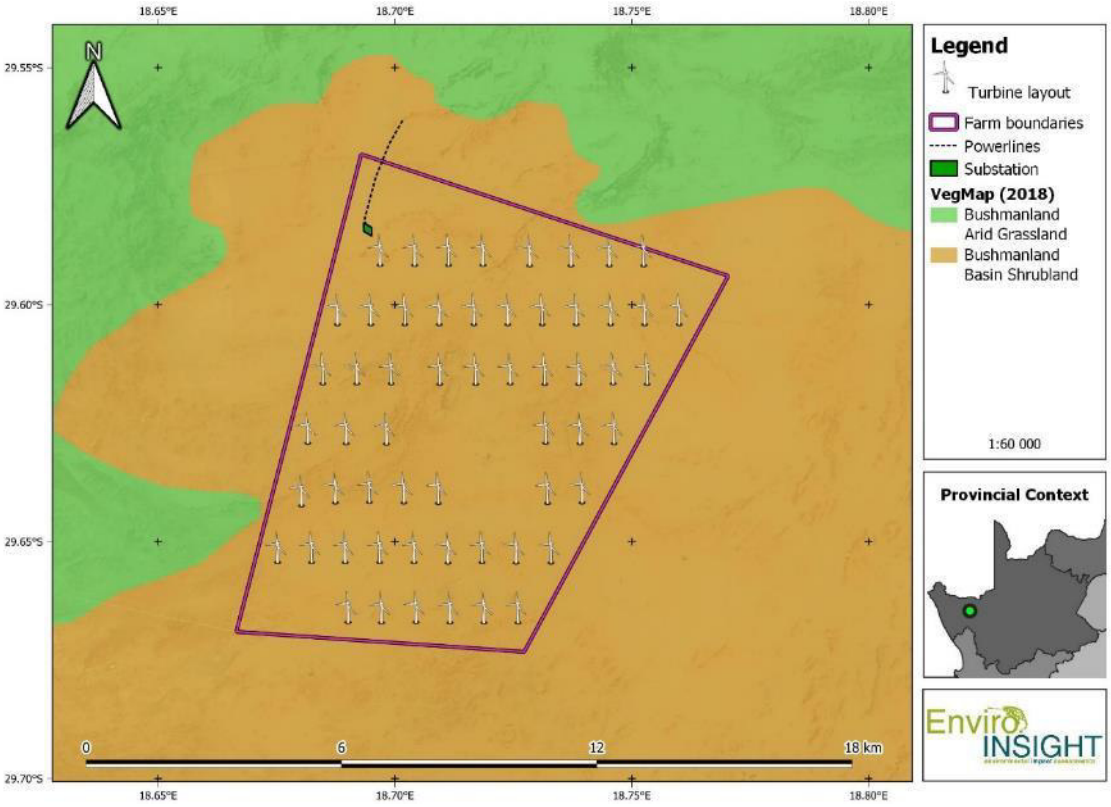

Figure 3-3: Regional vegetation types in relation to Red Sands Southeast WEF (SANBI, 2018).

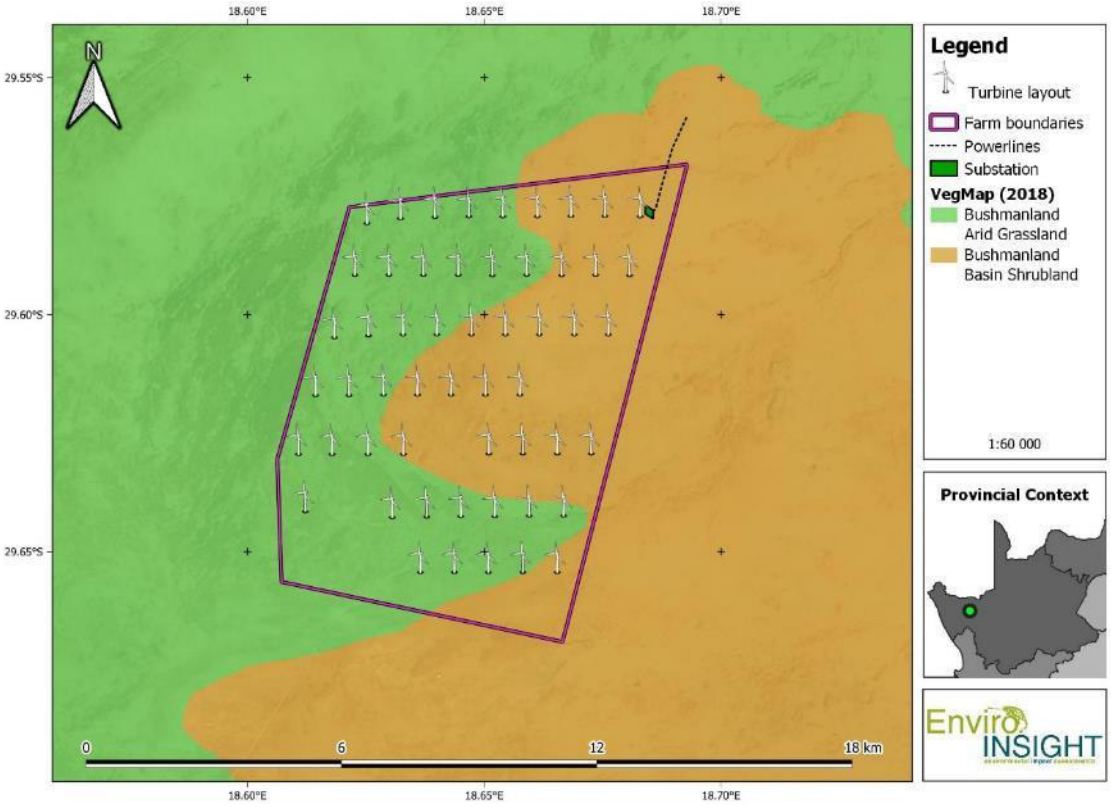

Figure 3-4: Regional vegetation types in relation to Red Sands Southwest WEF (SANBI, 2018).

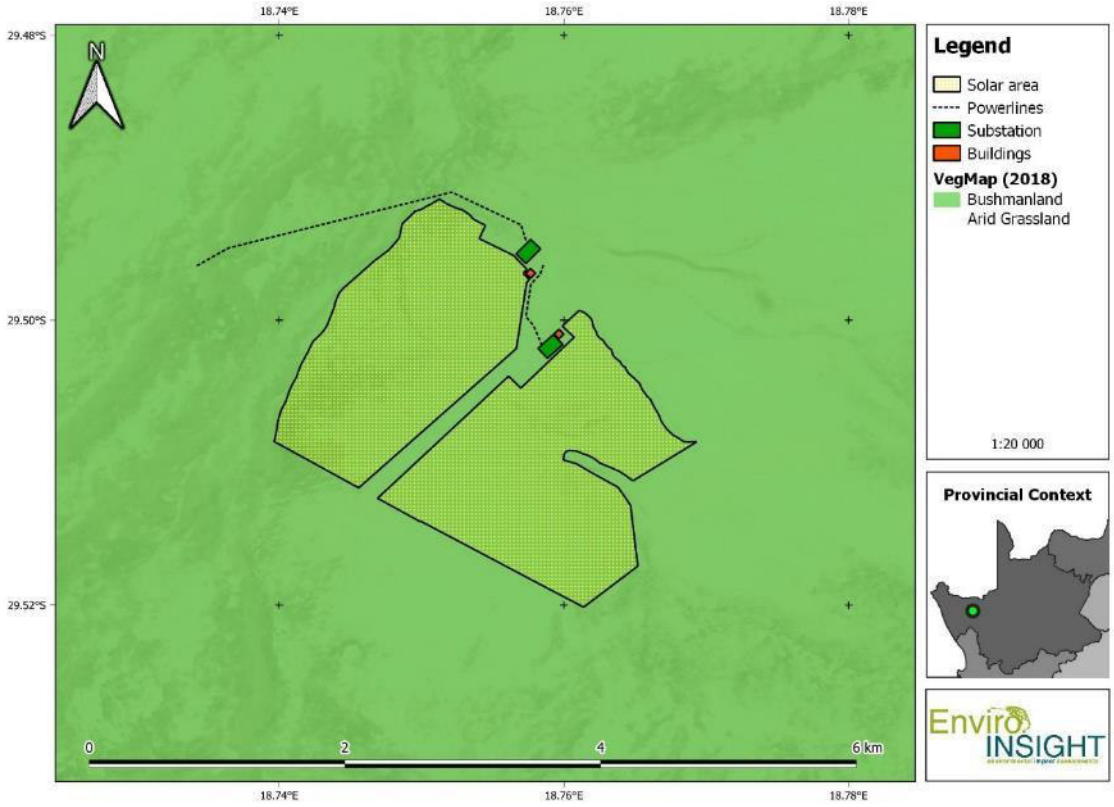

Figure 3-5: Regional vegetation types in relation to Red Sands Solar WEST (SANBI, 2018).

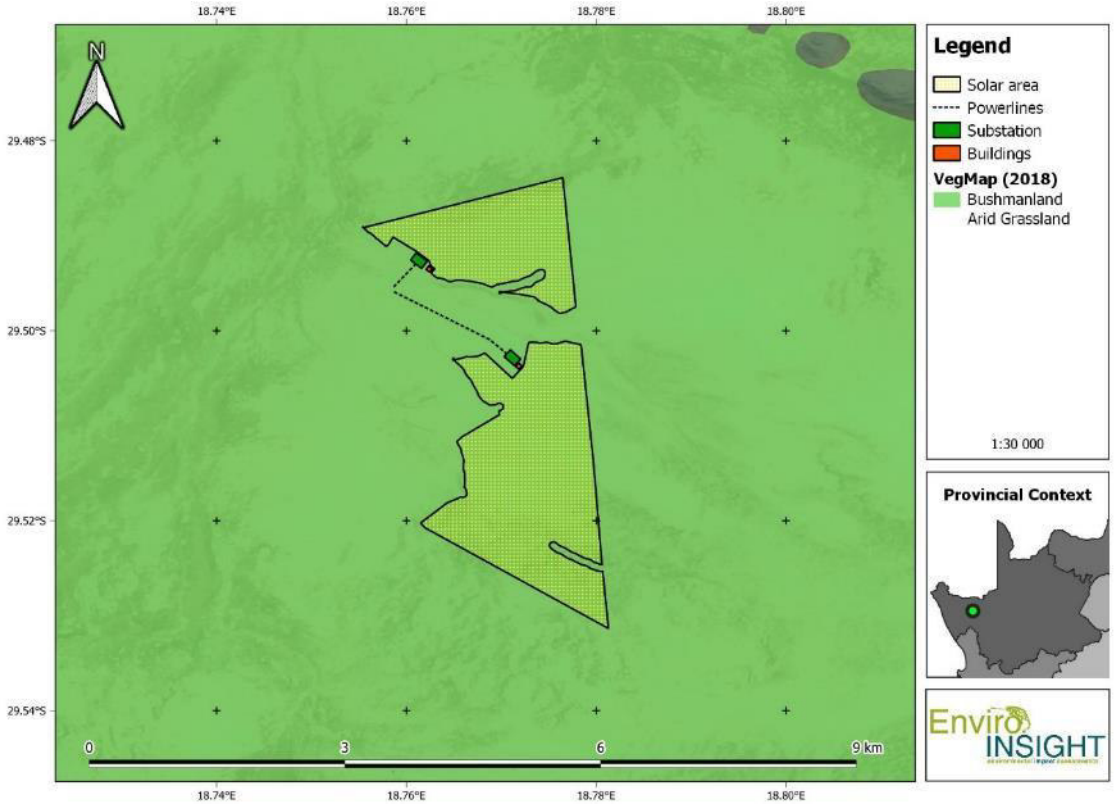

Figure 3-6: Regional vegetation types in relation to Red Sands Solar EAST (SANBI, 2018).

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 "Other Natural Areas". CBA1 is located on Red Sands Southwest WEF (Figure 3-10), while ESAs are located on Red Sands Northwest (Figure 3-7), Northeast (Figure 3-8) and Southeast (Figure 3-9). The CBA1 is listed due to recorded presence of a listed unknown threatened species, but this was not picked up in the screening report or desktop studies. Accordingly, it is assumed that the threatened species is avifauna, as no plant or animal species was flagged by the screening report or recorded during the site surveys. The area is also not considered having a high biodiversity value, compared to the surrounding areas. Accordingly, the classification of this area as a CBA1 remains unknown, and at best can be considered an ESA. Fourteen turbines are located within the CBA1 area. This equates to approximately 8,9% of the 1616.8 ha transformation of the proposed development, of which approximately 3,9% will be rehabilitated post-construction. The ESA are due to the large rivers running through the site and other natural non-FEPA Wetlands.

It must be noted that for the purpose of this report, avifauna and aquatic biodiversity is excluded. Where relevant, ecosystem services related to aquatic systems, or avifauna habitats may be included in the discussion, but the relevant assessments must be referred to for more details on impacts and mitigation measures.

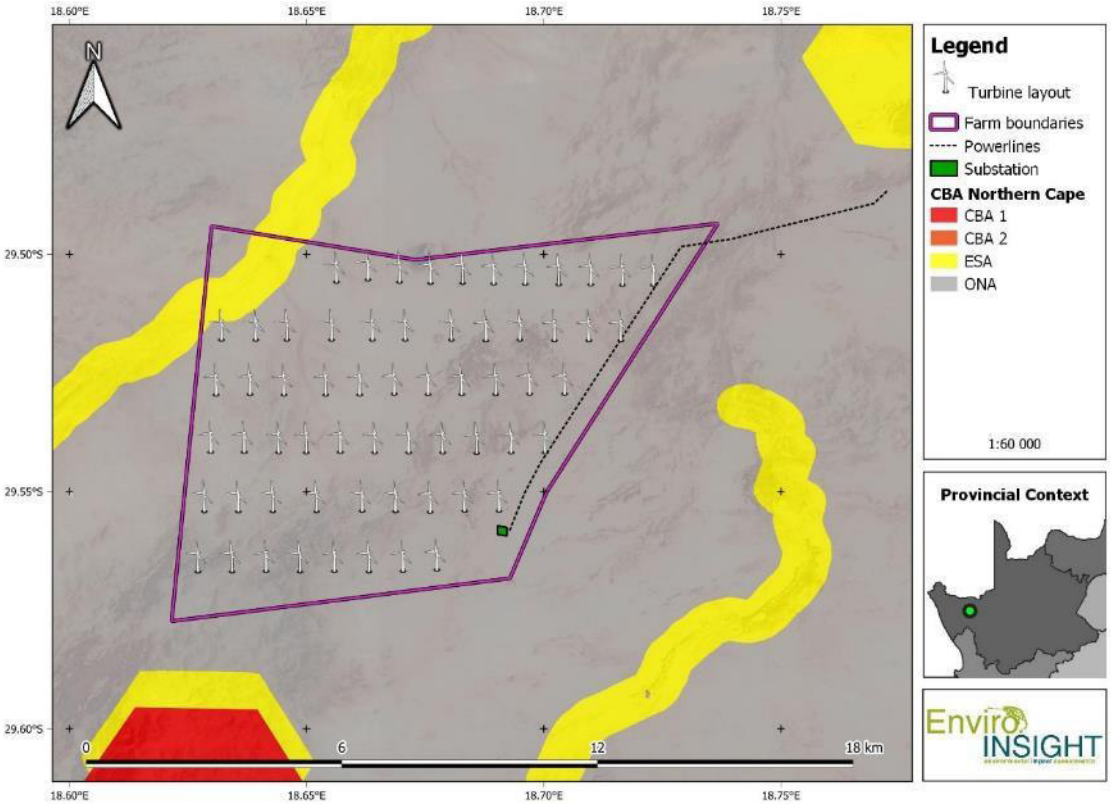

Figure 3-7: Red Sands Northwest WEF in relation to the Northern Cape Critical Biodiversity Areas (2016).

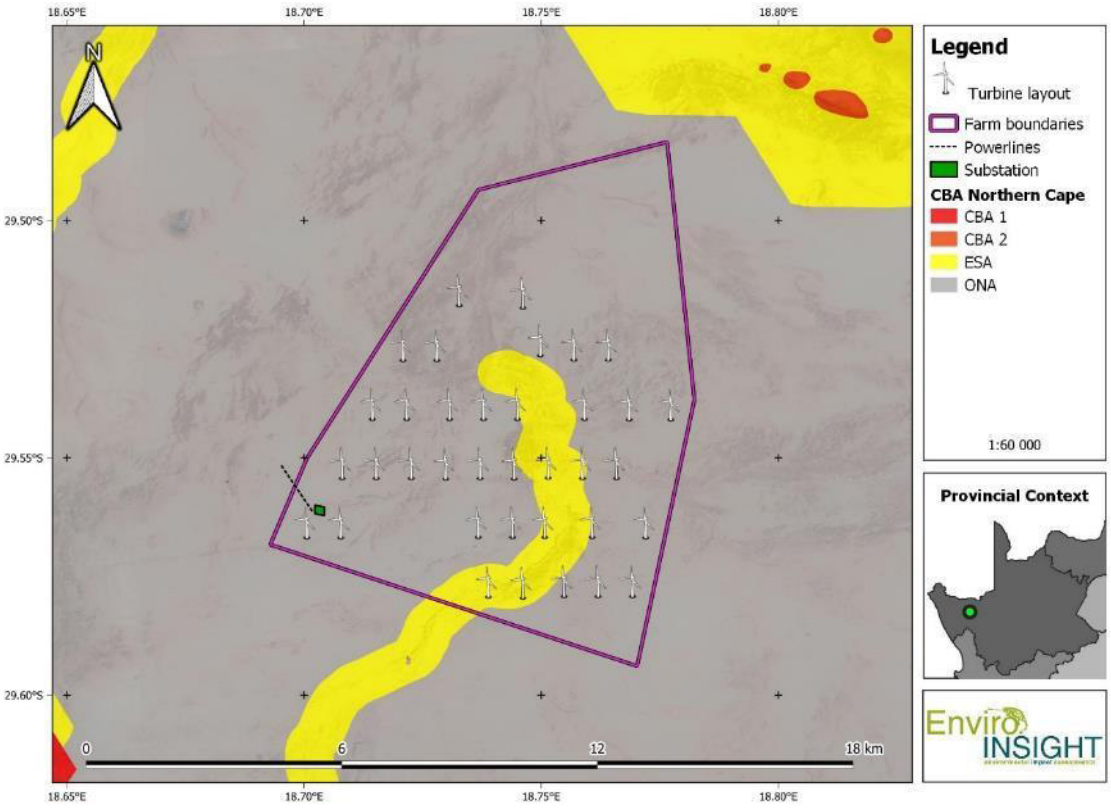

Figure 3-8: Red Sands Northeast WEF in relation to the Northern Cape Critical Biodiversity Areas (2016).

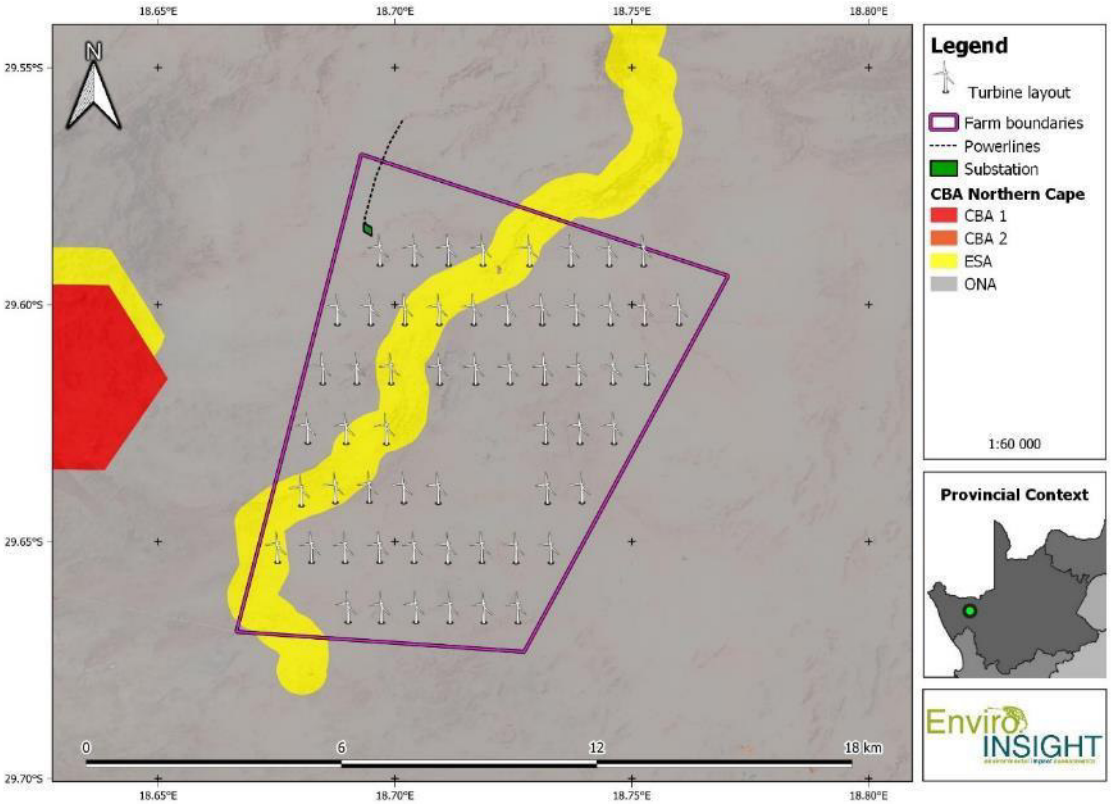

Figure 3-9: Red Sands Southeast WEF in relation to the Northern Cape Critical Biodiversity Areas (2016).

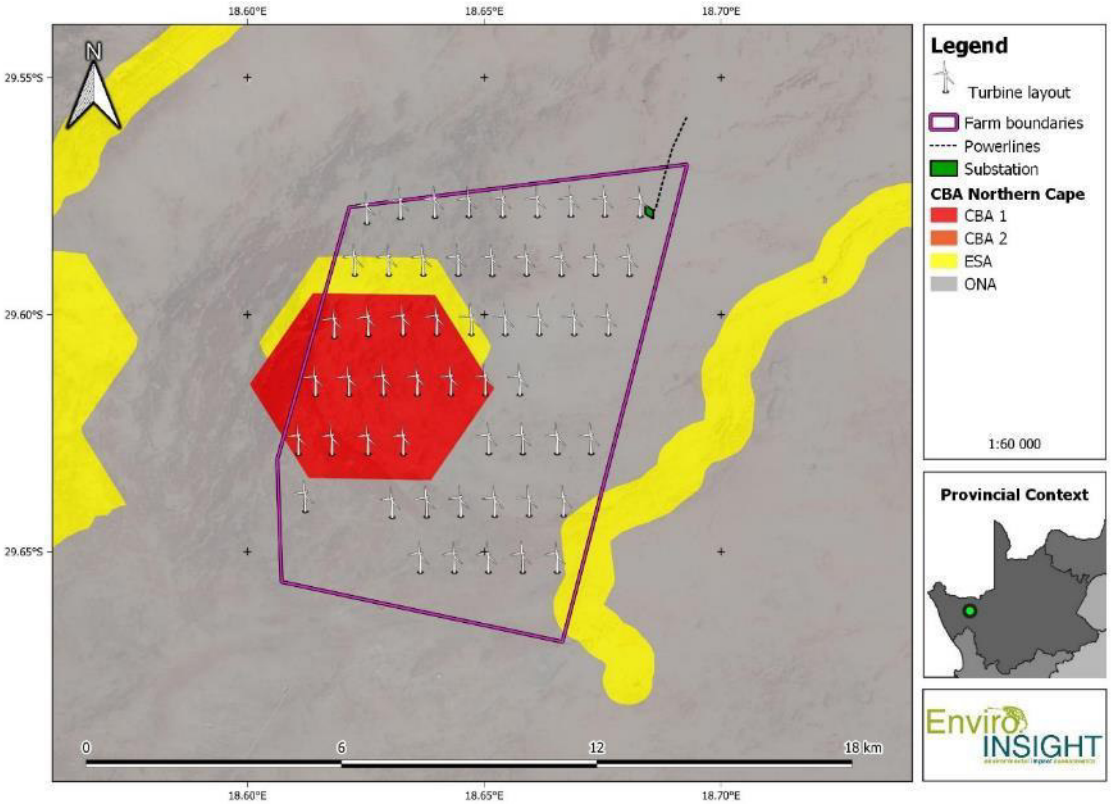

Figure 3-10: Red Sands Southwest WEF in relation to the Northern Cape Critical Biodiversity Areas (2016).

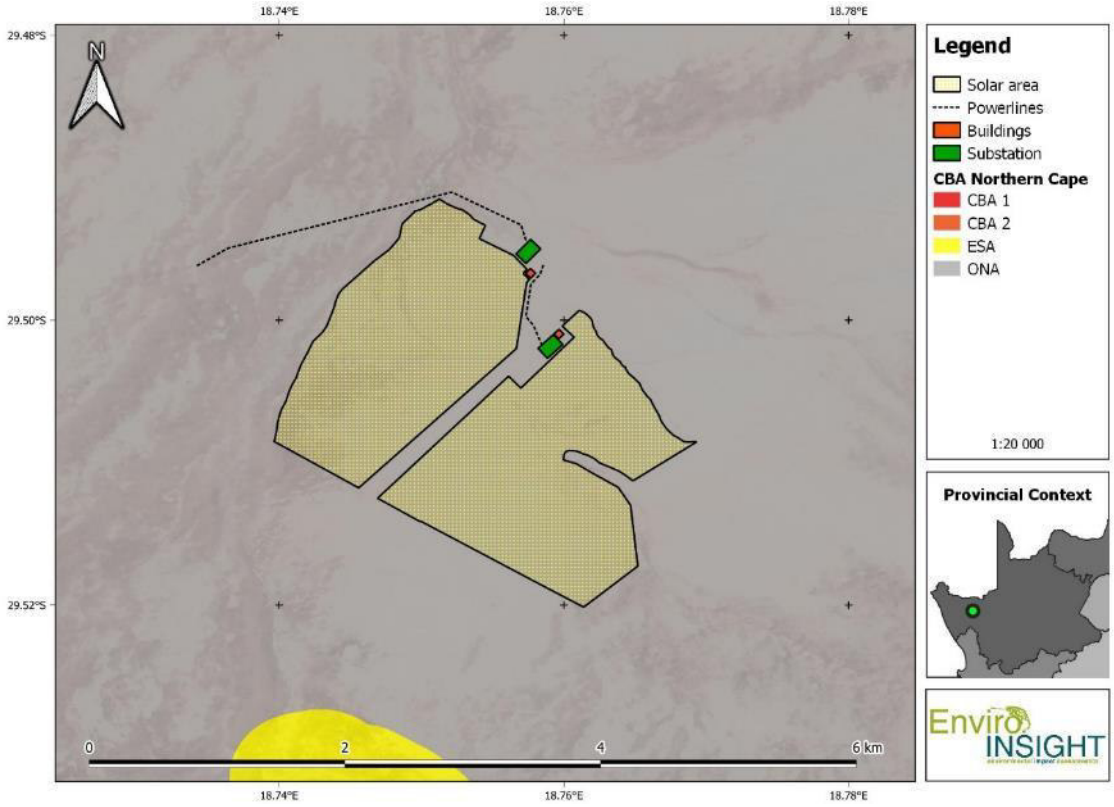

Figure 3-11: Red Sands Solar WEST in relation to the Northern Cape Critical Biodiversity Areas (2016).

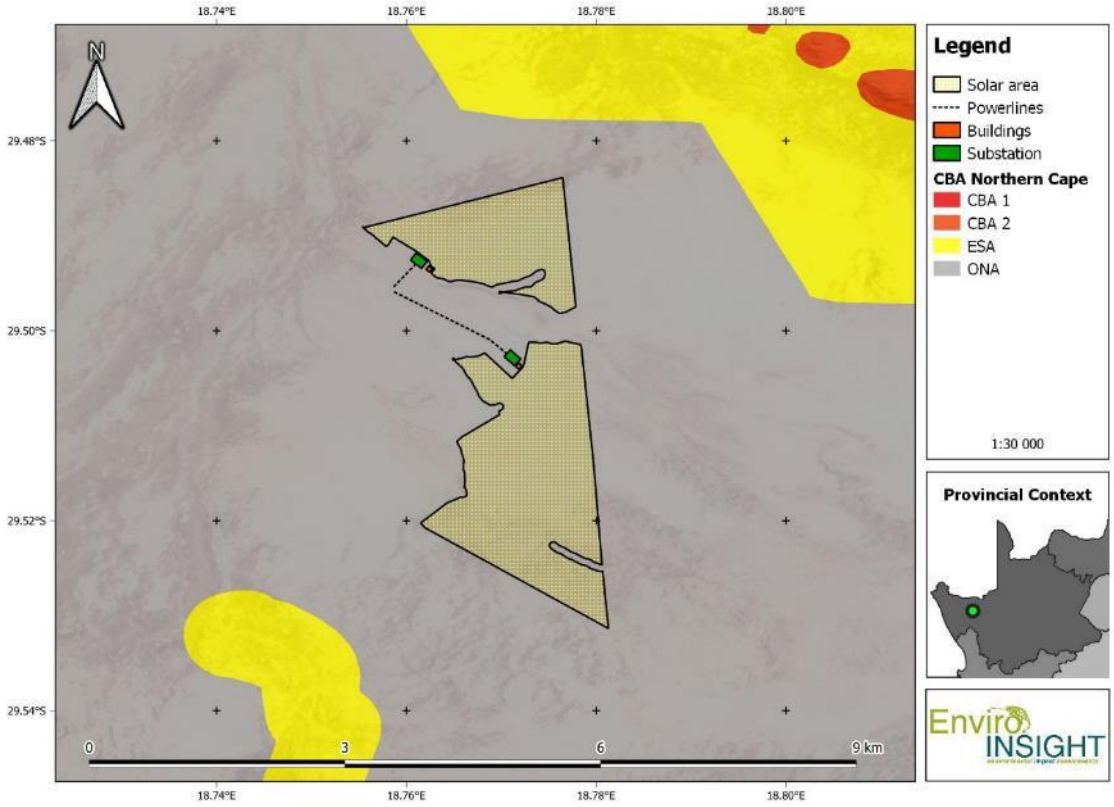

Figure 3-12: Red Sands Solar EAST in relation to the Northern Cape Critical Biodiversity Areas (2016).

3.3 ECOLOGY OF THE SYSTEM

3.3.1 Ecological drivers and significant terrestrial landscape features

The study area is located in the D82C quaternary catchment of the Orange River water management area. Several important endorheic pans, wetlands clusters 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 Bushmanland Arid Grassalnd and Bushmanland Basin Shrubland is minimal and has increased mainly due to the construction of renewable energy facilities, both wind and solar since 2012. Information with regards to this is unfortunately limited.

3.3.1.1 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 2011
    - Existing protected areas and focus areas for protected area expansion identified in the National Protected Area Expansion Strategy.

The National spatial datasets revealed the presence of multiple depression systems as well as the two identified river systems, D82C-04394 and D82C-04152, as defined by the Sub Quaternary Reaches database (Refer to Figures 3-13 to 3-18). It must be noted that even though no NFEPA rivers or Sub Quaternary Reaches have been identified for the SEFs, it should not be interpreted that there are no drainage lines or depression systems on these sites. Please refer to the Aquatic Assessment for more information.

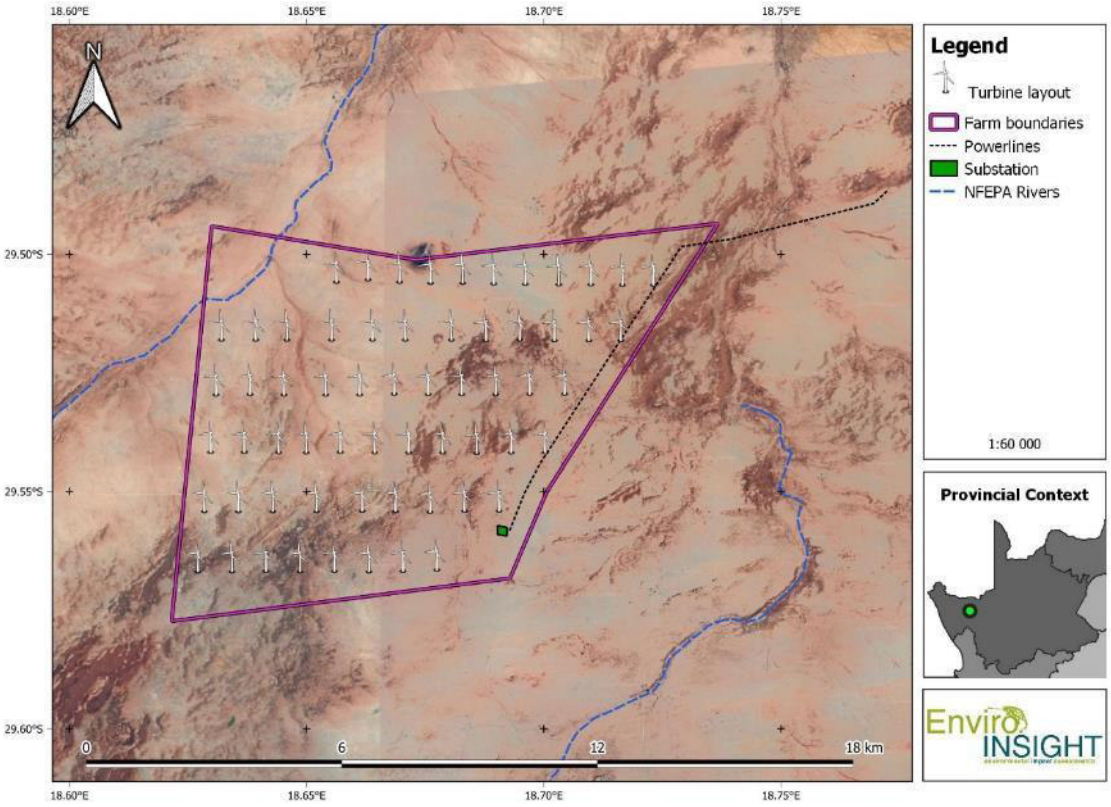

Figure 3-13: Red Sands Northwest WEF in relation to FEPA Rivers and wetlands.

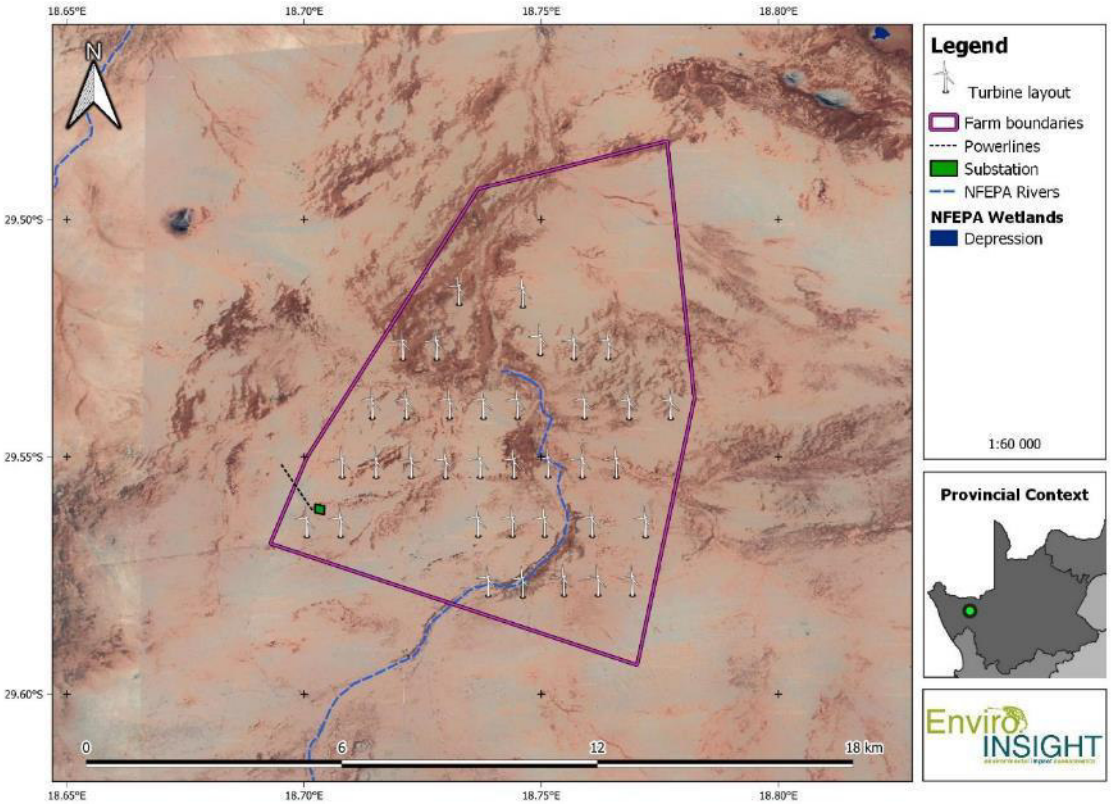

Figure 3-14: Red Sands Northeast WEF in relation to FEPA Rivers and wetlands.

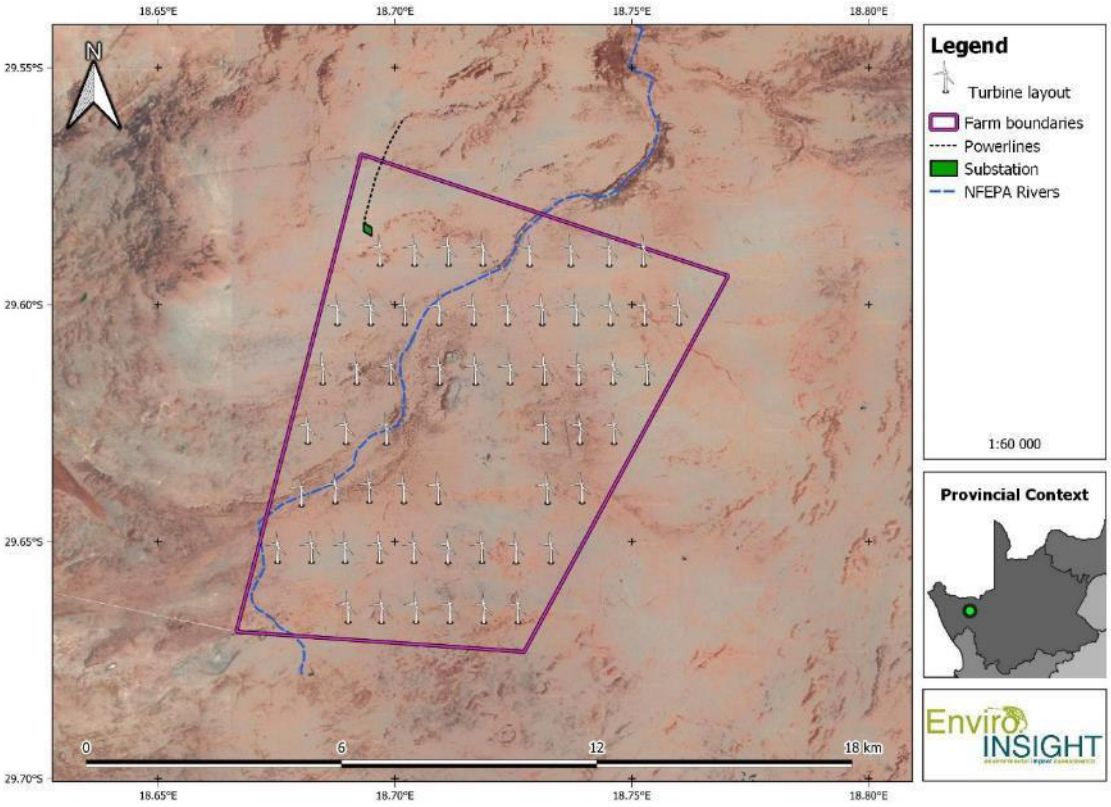

Figure 3-15: Red Sands Southeast WEF in relation to FEPA Rivers and wetlands.

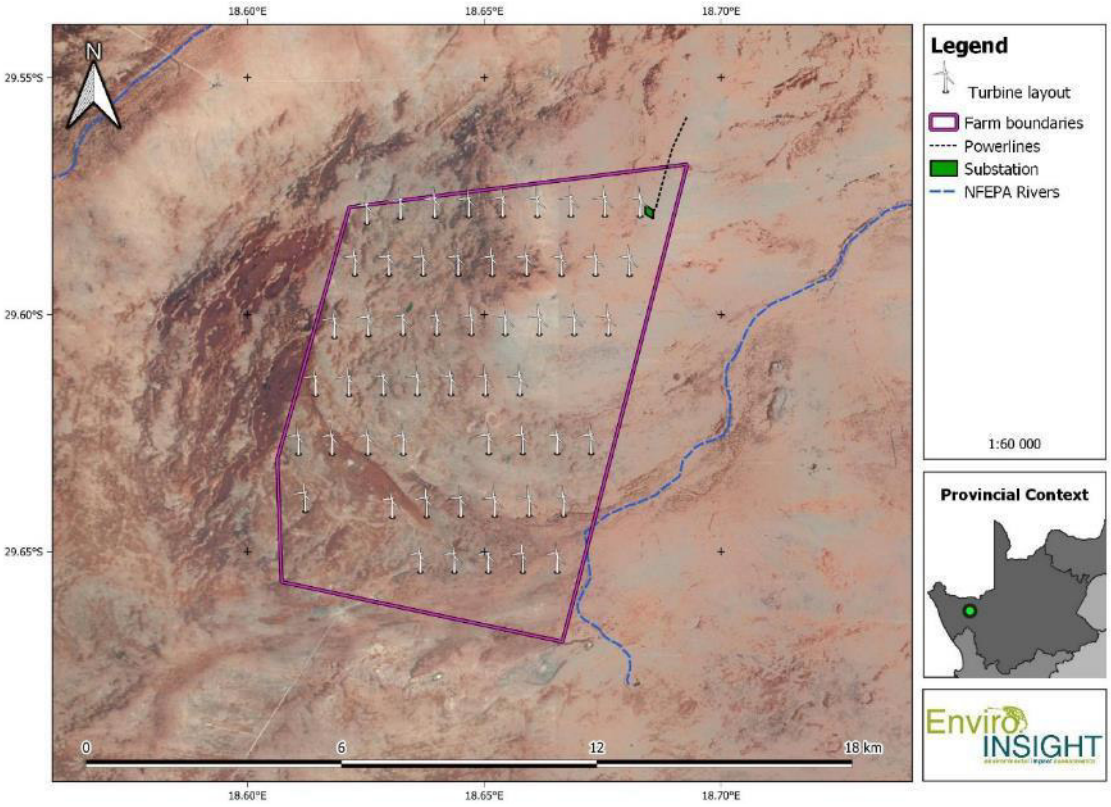

Figure 3-16: Red Sands Southwest WEF in relation to FEPA Rivers and wetlands.

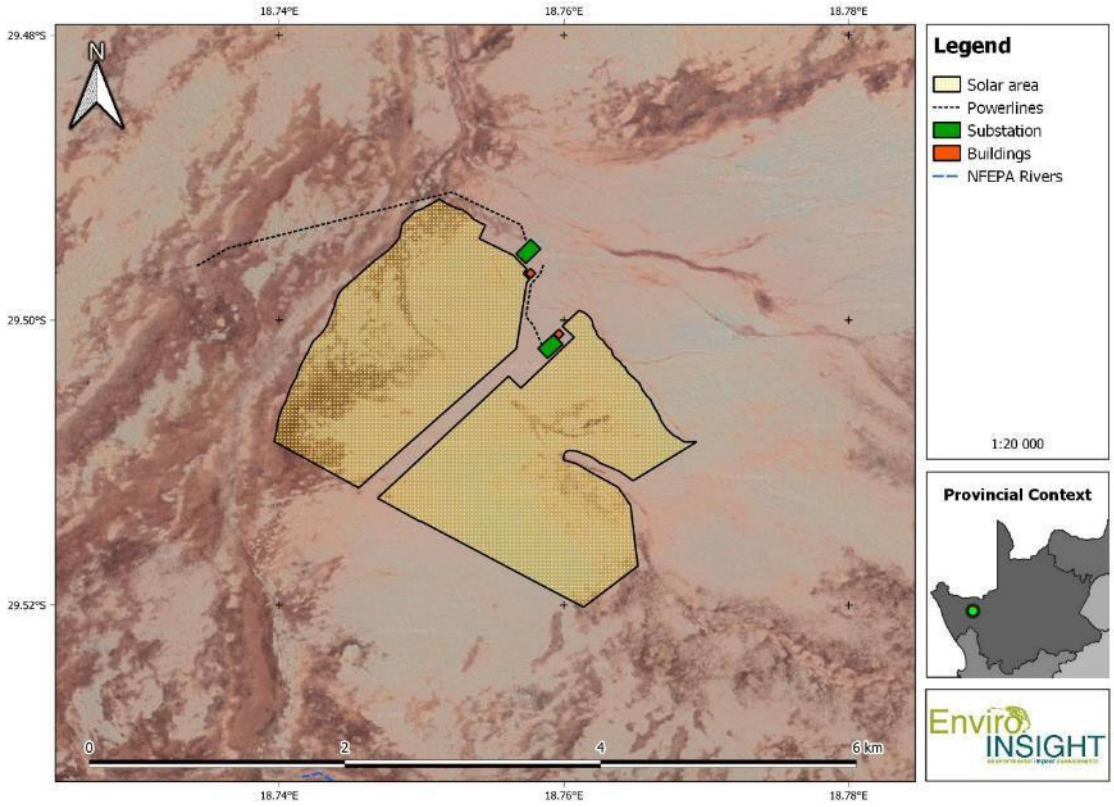

Figure 3-17: Red Sands Solar WEST in relation to FEPA Rivers and wetlands.

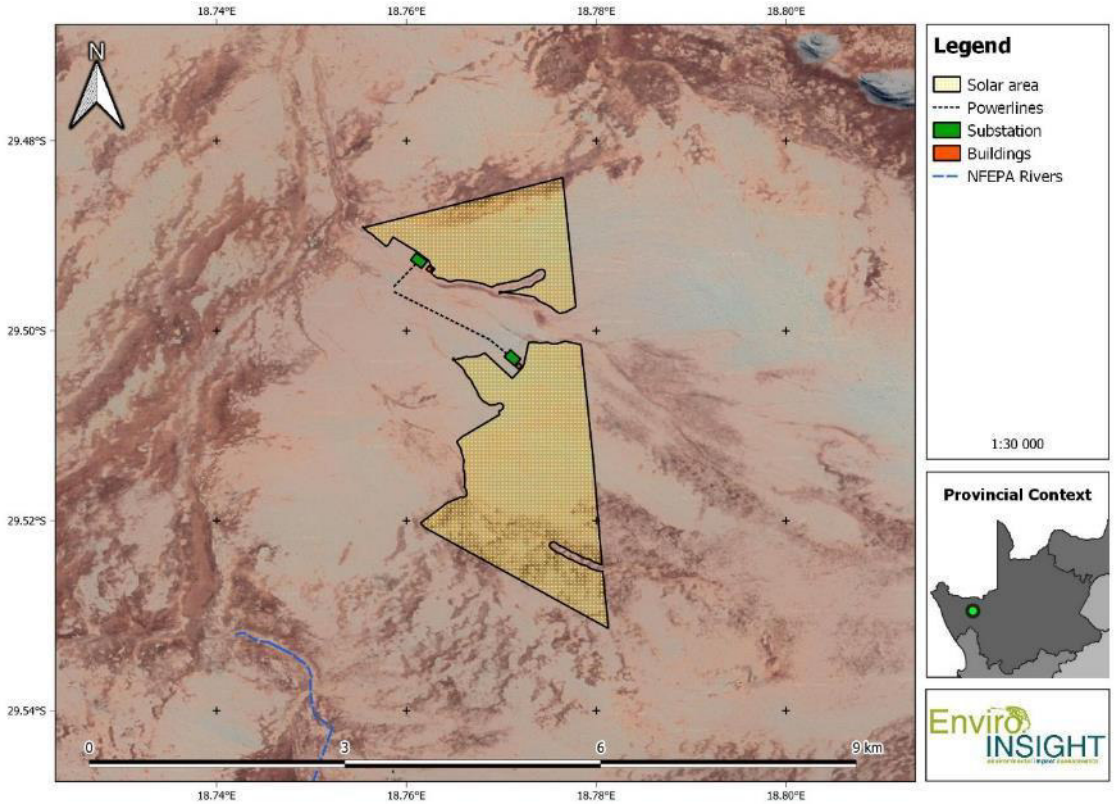

Figure 3-18: Red Sands Solar EAST in relation to FEPA Rivers and wetlands.

3.3.2 Ecological functioning and processes

The watercourses and red sands in the region represent the most important ecological features, and if not protected it could lead to reduced ecosystem services and could impact negatively on terrestrial biodiversity features. Neither vegetation units are considered threatened and there are limited sensitive features or important landscape features that, if disturbed or transformed, will result in a catastrophic collapse of the system. (Note: Please refer to the Aquatic Biodiversity, Avifauna and Bat Assessments for detailed information).

The four proposed Red Sands WEFs and two proposed SEFs do not represent a significant impact on the ecosystem processes and services. The main river courses and wetland pans 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.

3.3.3 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 / rivers 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.

3.3.4 Species, distribution, and important habitats

This area generally receives very limited rain, sporadic rainfall. Accordingly, plant diversity is generally low. Three main habitats were identified based on species composition and structure. The main driver of vegetation pattern in the area is substrate.

Georeferenced photographs (Appendix A) 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.

3.3.4.1 Sandy Grassland

The major habitat of Red Sands Northwest, Northeast and Southwest WEFs and the Red Sands Solar West and East is the Sandy Grassland, where perennial grasses with scattered shrubs occur on shallow, relatively coarse red sands (Figure 3-19). Dominant species include:

- grasses: *Stipagrostis ciliate, S. brevifolia, S. uniplumis* and *Aristida adscenionis*, *A. congesta* and *Eragrostis nindensis,*
- shrubs: *Lycium pumilum, Rhigozum trichotomum, Aptosimum spinescens, Plinthus karooicus, Salsola tuberculate, Asparagus cf. retrofractrus*
- forbs: *Leysera tenella, Osteospermum pinnatum*, *Tribulis cristatus*, *Felicia hirsuta*, *Lachenalia* sp., *Sesamum capense, Requienia sphaerosperma, Gisekia pharnaceoides* and *Limeum africanum.*

The abundance of listed or protected species within this habitat is low and apart from a low density of *Hoodia gordonii* which is scattered throughout the study area. Other provincially protected species include *Euphorbia* sp, *Anacampseros papyracea subsp. namaensis, Oxalis sp., Mesembryanthemum sp., Mesembryanthemum crystallinum, Crassula corallina, Colchicum sp.*

Figure 3-19: Vegetation and landscape features of grasslands.

As the habitat is not listed as threatened and is widely available in the area, it is not considered sensitive. The impacts are considered to be medium to low, and 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.

3.3.4.2 Shrubland

The major habitat of Red Sands Southeast WEF is Shrubland, with parts of Red Sands Northwest, Northeast and Southwest WEFs covered by this (Figure 3-20). 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. Overall diversity within this vegetation type at the site is considered 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: *Hoodia gordonii, Euphorbia dregeana, Oxalis sp.,* and *Mesembryanthemum crystallinum.*

Figure 3-20: Vegetation and landscape features of the shrubland.

3.3.4.3 Pans (Temporary)

The pans do not hold water regularly for extended periods and is only periodically filled with water after heavy rain (Figure 3-21). When filled with water it provides important ecosystem services which the fauna in the area relies on. Due to the nature of these pans and the important role they play in maintaining ecosystem services and functioning in the landscape, they are considered sensitive features which should be excluded from development.

Figure 3-21: Vegetation and landscape features of pans.

3.3.4.4 Drainage lines

The drainage lines are not well defined due to limited active channels which limits the presentation of defined zonation typically present in riparian zones. 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 3-22: Dry drainage lines on site.

4 PLANT SPECIES THEME RESULTS

4.1 NATIONAL SENSITIVE SPECIES

As per the screening reports, two sensitive species (SCC) are likely to occur on the study area, sensitive species 12 and sensitive species 144[9]. Based on existing literature and surveys conducting, no additional SCC were included in this assessment (Table 4-1). The species provided in the POSA list do not occur within the area and were accordingly omitted from the assessment. Overall, the abundance of plant SCC within the site is low and no significant impacts on such species is expected.

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

Species	National Status	Provincially Protected	Endemic to (1) RSA or (2) Northern Cape	Observed or likely to occur within the study area
Sensitive species 144	Vulnerable A3ce	Yes	No	No natural individuals were recorded, but several individuals have been planted at two of the homesteads on the study area. The species has a low likelihood to occur on the study area.
Sensitive species 12	Rare		Yes (1 and 2)	Likely to occur along drainage lines, which will be excluded from development.

[9] The names have been withheld as the species may be prone to illegal harvesting and must be protected. As per the best practise guideline, the name of the sensitive species may not appear in the final EIA report nor any of the specialist reports.

Hoodia gordonii **(Masson) Sweet ex Decne.**	**Data Deficient – Insufficient Information**	**Yes**	**No**	**Observed within the study area and on neighbouring properties. Refer to section below and Figure 4-4 for more details.**

***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 at homesteads (Figure 4-1) and will not be impacted on by the proposed layout. 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.

Figure 4-1: Sensitive species 144 recorded within the PAOI at a homestead (not occurring naturally – planted).

Sensitive species 12 – Rare

This species is a range-restricted habitat specialist endemic to Namaqualand, with an extent of occurrence (EOO) of 1955 km². It occurs on semi-arid flats east of O'kiep and Springbok in the Northern Cape. It is localised to deep red sands along drainage lines. There are no known threats to this species, and it's believed that less than 5% of its habitat is irreversibly modified.

Figure 4-2: Example of sensitive species 12 (photo taken by Arthur Benjamin Cloete).

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

Within the study area, the species is not abundant, and less than five individuals have been recorded on site, with about another five individuals recorded in the surrounding area (Figure 4-3; Figure 4-4). 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 not recorded on Red Sands Southeast and the two solar facilities, but this does not mean they are not present here. During the pre-construction monitoring, 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.

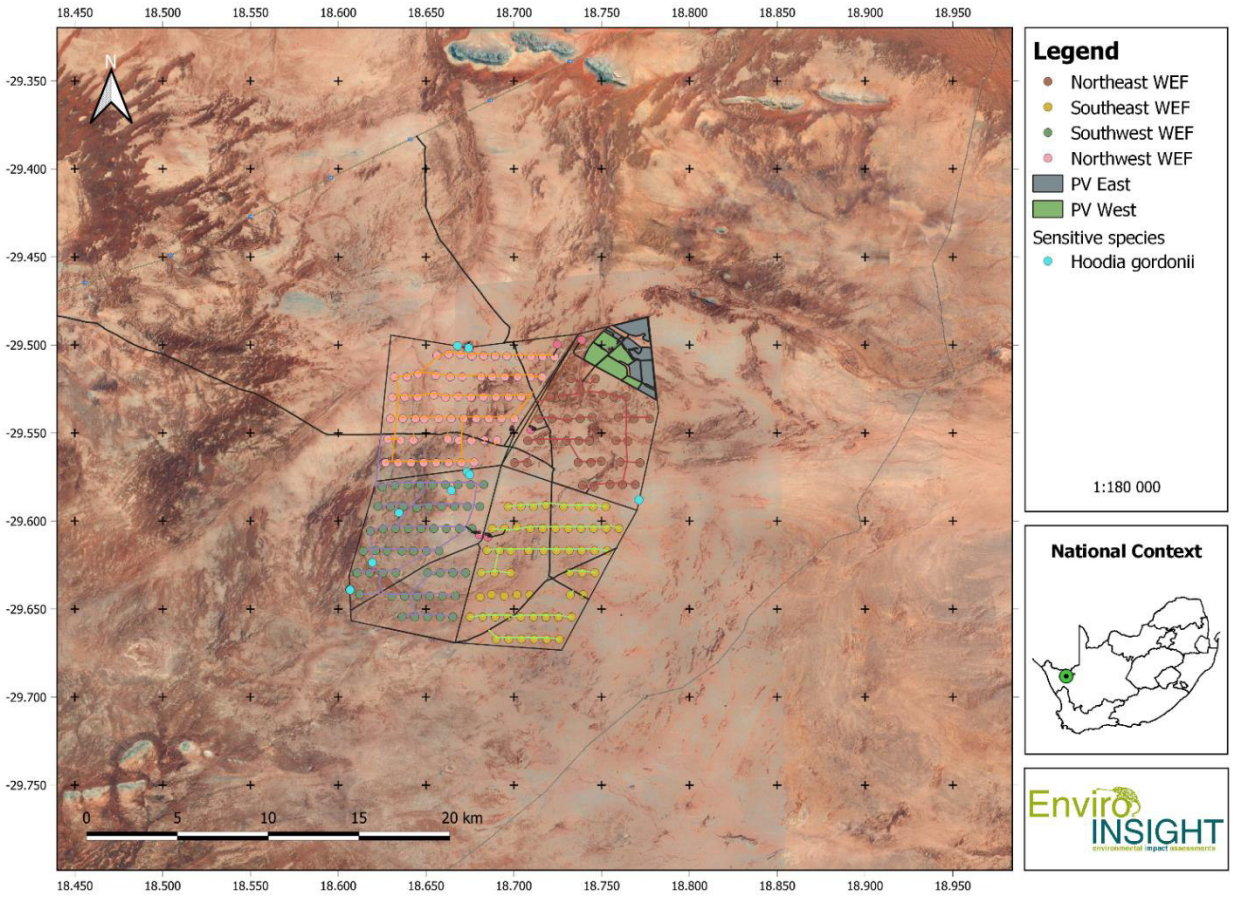

Figure 4-4: Location of Hoodia gordonii on the respective projects.

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.

Provincially protected species include:

Schedule 1 species:

- *Hoodia gordonii*
- *Sutherlandia spp.*

Schedule 2 species:

- All species within the Aizoaceae family, which includes *Ruschia, Mesembryanthemum crystallinum, Drosanthemum spp., Stomatium mustelinum,*
- All *Euphorbia spp., including E. dregeana*
- All *Mesembryanthemum sp.*
- All Crassulaceae spp., including *Crassula corallina*
- 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

5 SENSITIVITY MAP

The sensitivity map generated for the study area is indicated in Figure 5-1, 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 low diversity of fauna and flora, with no records of species of conservation concern. The watercourses are considered suitable habitat for sensitive species 12, and a accordingly a 50m buffer has been applied to protect this habitat from development. 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 no highly significant biodiversity features within the development footprint, and no likely impacts associated with the development activities that cannot be appropriately mitigated toa acceptable levels.

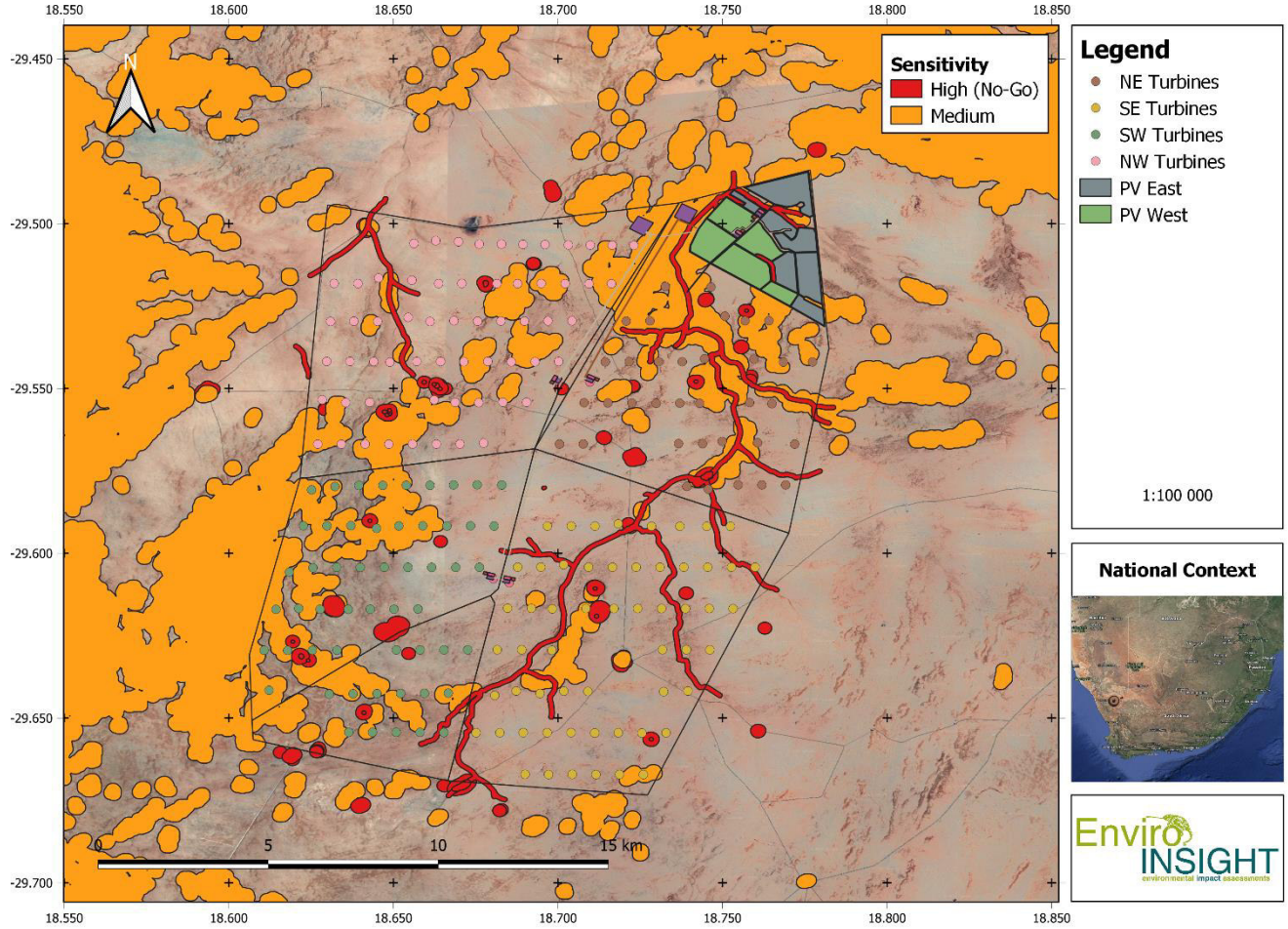

Figure 5-1: Habitat sensitivity of the study area.

6 IMPACT ASSESSMENT

The development of the Red Sands WEFs are 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 490,2 ha for Red Sands Solar West and 461 ha for Red Sands Solar East. 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 Red Sands 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,
- 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, 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 Red Sands 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 Red Sands 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 Red Sands WEFs and SEFs are not located in a threatened ecosystem. It is located in the Bushmanland Arid Grassland and Bushmanland Basin Shrubland vegetation types which has a status of least concern. There is a CBA1 located on Red Sands Southwest WEF, and ESA located on the other three WEFs (but not the solar facilities) which should be excluded from development, where possible. It must be noted, as stated previously, the CBA1 was not confirmed for threatened species. 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 these areas.

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 all six Red Sands WEFs and SEFs will potentially cover total combined area of approximately 5039,444 ha during the construction phase. Of this, approximately 1779,482 ha will be rehabilitated post-construction for all six projects.

For the specific vegetation types, approximately 1855,696 ha of the Bushmanland Basin Shrubland (Table 6-1) and 3183,748 ha of the Bushmanland Arid Grassland (Table 6-2) will be transformed for the respective projects. This is about 0,041% and 0,092% transformation of the remaining extent of the Bushmanland Basin Shrubland and the Bushmanland Arid Grassland, respectively. This is not a significant loss of the vegetation types, considering that the ecosystem services will remain intact, and certain areas will be rehabilitated post-construction.

Table 6-1: Extent of development within the Bushmanland Basin Shrubland for the three Red Sands WEFs.

	Northwest WEF	Northeast WEF	Southwest WEF	Southeast WEF
Total Development Footprint (m^2)	56160	78911	894758	825867
Total Development Footprint (ha)	56,16	78,911	894,758	825,867
Rehabilitation post-construction (m^2)	25972	27766	354576	386550
Rehabilitation post-construction (ha)	25,972	27,766	354,576	386,55

Table 6-2: Extent of development within the Bushmanland Arid Grassland for the three Red Sands WEFs

	Northwest WEF	Northeast WEF	Southwest WEF	Solar West	Solar East
Total Development Footprint (m^2)	1026071	482125	159805	744849,22	770897,94
Total Development Footprint (ha)	1026,071	482,125	159,805	744,849	770,898
Rehabilitation post-construction (m^2)	413142	236130	121830	97549,74	115965,98
Rehabilitation post-construction (ha)	413,142	236,13	121,83	97,549	115,965

Table 6-3: Impacts associated with Habitat Loss and Fragmentation of the four Red Sands WEFs.

Nature: Habitat Loss and Fragmentation during construction phase of the wind energy facilities.								
	Red Sands Northwest WEF		**Red Sands Northeast WEF**		**Red Sands Southwest WEF**		**Red Sands Southeast WEF**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**
Spatial Scale	2	1	2	1	2	1	2	1
Duration	5	5	5	5	5	5	5	5
Severity	5	3	5	3	5	3	5	3
Probability	5	4	5	4	5	4	5	4
Frequency of Activity	5	4	5	4	5	4	5	4
Significance	**120**	**72**	**120**	**72**	**120**	**72**	**120**	**72**
Status (positive or negative)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Non-reversible	Low	Non-reversible	Low	Non-reversible	Low	Non-reversible	Low
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low	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.							

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.

Since more than one WEF and one SEF are built simultaneously in the area, cumulative impacts are expected to extend and the significance level will be higher. Habitat destruction is therefore a cumulative impact between all these locations, since more area will be affected. As mentioned, the cumulative impact is the loss of approximately 5039,444 ha during the construction phase of which approximately 1779,482 ha will be rehabilitated post construction. The cumulative impact is localised and not considered significant in terms of the regional vegetation types extent.

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 6-4: Impacts associated with Habitat Loss and Fragmentation of the Red Sands SEFs.

Nature: Habitat Loss and Fragmentation during construction phase of the solar energy facilities.				
	Red Sands Solar West		**Red Sands Solar East**	
	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 drainage lines should be avoided.
- Ensure that lay-down and other temporary infrastructure is within low 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 of low significance.
- 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.
- Approximately 1505,849 ha for the WEFs and 213,516 for the SEFs, needs to 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. No plant SCC were recorded on site, only provincially protected species. 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.

Proposed mitigation measures:

- A comprehensive Plant Search and Rescue must be undertaken by a suitably qualified botanical specialist prior to vegetation clearance.
- 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 SEFs.

Nature: Loss of species of conservation concern for the two SEFs.				
	Red Sands Solar West		**Red Sands Solar East**	
	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	2	1	2	1
Frequency of Activity	5	4	5	4
Significance	**70**	**35**	**70**	**35**
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. No SCC are expected to occur on the two SEFs.			
Residual Impacts:	If sensitive species are avoided and the necessary permits are obtained for provincially protected species removal, there should be no residual impacts.			

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

Nature: Loss of species of conservation concern.								
	Red Sands Northwest WEF		Red Sands Northeast WEF		Red Sands Southwest WEF		Red Sands Southeast WEF	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	1	1	1	1	1	1	1	1
Duration	5	3	5	3	5	3	5	3
Severity	4	2	4	2	5	3	4	2
Probability	3	2	3	2	4	2	3	2
Frequency of Activity	5	4	5	4	5	4	5	4
Significance	**80**	**36**	**80**	**36**	**99**	**42**	**80**	**36**
Status (positive or negative)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Non-reversible	Moderate	Non-reversible	Moderate	Non-reversible	Moderate	Non-reversible	Moderate
Irreplaceable loss of resources?	High	Low	High	Low	High	Low	High	Low
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 6-7: Alien and invasive plant species in the SEFs.

Nature: Alien and invasive plant species.				
	Red Sands Solar West		Red Sands Solar East	
	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 Managament Plan needs to be developed			
Residual Impacts:	Some residual impact is likely as the containment of alien invasive species are never 100% possible.			

Table 6-8: Alien and invasive plant species for the wind energy facilities.

Nature: Alien and invasive plant species.								
	Red Sands Northwest WEF		Red Sands Northeast WEF		Red Sands Southwest WEF		Red Sands Southeast WEF	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	3	2	3	2	3	2	3	2
Duration	5	5	5	5	5	5	5	5
Severity	4	2	4	2	4	2	4	2
Probability	3	2	3	2	3	2	3	2
Frequency of Activity	4	2	4	2	4	2	4	2
Significance	**84**	**36**	**84**	**36**	**84**	**36**	**84**	**36**
Status (positive or negative)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Low	Moderate	Low	Moderate	Low	Moderate
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low	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 6-9: Increased risk of erosion and flash floods for the two SEFs.

Nature: Increased risk of erosion and flash floods.				
	Red Sands Solar West		**Red Sands Solar East**	
	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 6-10: Increased risk of erosion and flash floods for the four WEFs.

Nature: Increased risk of erosion and flash floods.								
	Red Sands Northwest WEF		Red Sands Northeast WEF		Red Sands Southwest WEF		Red Sands Southeast WEF	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
Spatial Scale	2	2	2	2	2	2	2	2
Duration	5	5	5	5	5	5	5	5
Severity	4	2	4	2	4	2	4	2
Probability	3	2	3	2	3	2	3	2
Frequency of Activity	4	2	4	2	4	2	4	2
Significance	**77**	**36**	**77**	**36**	**77**	**36**	**77**	**36**
Status (positive or negative)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Low	Moderate	Low	Moderate	Low	Moderate
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low	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.							

Impact 5: Disturbances or displacement impacts on fauna including traffic, noise and dust

The construction of the proposed Red Sands WEFs and SEFs and associated infrastructure will result in an increase in noise and dust within the proposed site and surrounds. Roads are known to alter the physical characteristics of the environment and it is possible that numerous species within the proposed site will be affected by the increase in noise and dust to some extent. Species which is most likely to be impacted by the increase in noise and dust levels water associated. Increased dust levels alter wetlands and watercourses which could affect the feeding and breeding of species within these areas.

Fauna varies in the degree to which they can tolerate such disturbances and the increase in noise and dust could potentially have adverse impacts on various faunal groups. Increased noise and motor vibrations in wetland areas could also impact amphibian breeding choruses, but these impacts will be localised and many amphibian species are surprisingly tolerant of vehicle noise. Noise pollution will occur during all phases of development (construction, operational, and de-commissioning/closure).

Table 6-11: Disturbances or displacement impacts on fauna including traffic, noise and dust for the Solar facilities.

Nature: Disturbances or displacement impacts on fauna including traffic, noise and dust.				
	Red Sands Solar West		**Red Sands Solar East**	
	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	3	2	3	2
Frequency of Activity	4	2	4	2
Significance	**70**	**32**	**70**	**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			
Residual Impacts:	Animal collisions are likely, but the number of collisions can be reduced significantly			

Table 6-12: Disturbances or displacement impacts on fauna including traffic, noise and dust due to the four WEFs.

Nature: Disturbances or displacement impacts on fauna including traffic, noise and dust.								
	Red Sands Northwest WEF		**Red Sands Northeast WEF**		**Red Sands Southwest WEF**		**Red Sands Southeast WEF**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**
Spatial Scale	2	1	2	1	2	1	2	1
Duration	4	3	4	3	4	3	4	3
Severity	3	2	3	2	3	2	3	2
Probability	3	2	3	2	3	2	3	2
Frequency of Activity	3	2	3	2	3	2	3	2
Significance	**54**	**24**	**54**	**24**	**54**	**24**	**54**	**24**
Status (positive or negative)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Low	Moderate	Low	Moderate	Low	Moderate
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low	Moderate	Low	Moderate	Low
Can impacts be mitigated?	Yes							
Residual Impacts:	Animal collisions are likely, but the number of collisions can be reduced significantly							

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.
- Speed restrictions (40 km per hour is recommended) should be in place to reduce the amount of dust caused by vehicle movement along the roads, and to reduce possible fauna fatalities with vehicle collisions.
- Driving around in the area as well as noise levels at night should be limited, as should the use of harsh lights which could cause light pollution for nocturnal species.
- Where appropriate, sound dampeners must be used.
- Avoid the presence of people and vehicles in highly sensitive areas, including riverine areas and natural vegetation, as far as possible.
- Fences should be constructed in such a way so that burrowing animals can still gain access. Additionally, gaps can be made below certain areas in the fences to allow fauna movement underneath the fence. Where possible the electrification of fences should be limited.
- Strict measures should be put into place to prevent workers from poaching and hunting naturally occurring fauna.
- Working at night should be limited, as should the use of harsh lights which could cause light pollution for nocturnal species.

6.4 OPERATIONAL PHASE

Impact 1: Direct faunal impacts due to operation

Operational phase has a longer duration (approximately 15 years) in comparison to the construction phase (approximately 12-18 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 6-13: Direct faunal impacts due to operation of the WEFs.

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

Table 6-14: Direct faunal impacts due to operation of the SEFs.

Nature: Direct faunal impacts due to operation.				
	Red Sands Solar West		Red Sands Solar East	
	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	The impact will persist for the lifespan of the facility	The impact will persist for the lifespan of the facility	The impact will persist for the lifespan of the facility
Can impacts be mitigated?	Yes			
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 snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location,
- lower the levels of noise whenever possible and avoid the destruction or disturbance of identified important features,
- illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone except by individuals 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,
- 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.

Impact 2: Alien and invasive plant species

The clearance of vegetation associated with the development of the Red Sands 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.

Table 6-15: Alien and invasive plant species during the operation phase of SEFs.

Nature: Alien and invasive plant species during the operation phase of SEFs.				
	Red Sands Solar West		**Red Sands 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 Managament 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.
- 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 6-16: Alien and invasive plant species during the operation phase of** the WEFs.*

Nature: Alien and invasive plant species during the operation phase of the WEFs.								
	Red Sands Northwest WEF		**Red Sands Northeast WEF**		**Red Sands Southwest WEF**		**Red Sands Southeast WEF**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**
Spatial Scale	3	2	3	2	3	2	3	2
Duration	5	5	5	5	5	5	5	5
Severity	4	2	4	2	4	2	4	2
Probability	3	2	3	2	3	2	3	2
Frequency of Activity	4	3	4	3	4	3	4	3
Significance	**84**	**45**	**84**	**45**	**84**	**45**	**84**	**45**
Status (positive or negative)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Low	Moderate	Low	Moderate	Low	Moderate
Irreplaceable loss of resources?	Moderate	Low	Moderate	Low	Moderate	Low	Moderate	Low
Can impacts be mitigated?	Yes - an Alien Invasive Species Managament 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 DECOMISSIONING PHASE

When the four 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 issue is not the physical removal but rather the disposal of the used parts. Where possible, all recyclable materials must be repurposed in an environmentally friendly way.

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.

The dismantling of the project will eventually contribute to the removal of all the implemented structures; accordingly, this may be considered a positive impact.

6.6 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. There are not large amounts of existing renewable energy facilities within the area, except for the planned SEFs towards the north of these projects, and the operational Kangnas wind farm situated east of Springbok. The cumulative impacts from the four WEFs and the two SEFs 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. However, it must be noted that these projects are all located within the Springbok REDZ for large scale wind and solar photovoltaic developments.

The PV panels and associated infrastructure are expected to have a moderate cumulative impact. Cumulatively these developments will be responsible for the destruction of a large portion of vegetation in various states.

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.

7 CONCLUSION AND PROFESSIONAL OPINION

The study areas for the four wind facilities and two solar facilities are located within the Bushmanland Arid Grassland Bushmanland Basin Shrubland vegetation types, listed as Least Threatened. Red Sands Southwest intersects a CBA1 and ESA, while Red Sands Northwest, Northeast and Southeast intersects an ESA. This is mainly due to rivers and wetlands. These ESAs should be avoided as far as possible and the appropriate mitigation measures should be in place to reduce impacts to acceptable levels. The CBA1 is triggered for threatened species, but neither the screening report or desktop studies triggered known records for any species, and the site surveys did not record any plant or animal species. Sensitive species 144 would have easily been recorded if it occurred on site, while sensitive species 12 occurs, if present on site, occurs in drainage lines which is excluded from development. It is possible that it can be avifauna, but this is not addressed in this report. Approximately 5% of the 1616.8 ha CBA1 will be transformed after rehabilitation has taken place. This is not considered significant, and as it is unclear what specific species needs to be protected, it does not represent a fatal flaw to the project, as long as the development of Red Sands Southwest ensures that the overall functioning of the CBA is not compromised. It is not anticipated that the development will lead to a significant loss of a population or habitat

Most of the Red Sands WEFs and SEFs consist of grasslands on flat plains and gently sloping hills that are not considered sensitive. The watercourses and pans 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 affected area are not considered sensitive and there are no specific features of the affected area which would 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. 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.

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APPENDIX A: SACNASP PROFESSIONAL CERTIFICATE

SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Samuel David Laurence

Registration number: 400450/13

is registered as a

Professional Natural Scientist

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

Zoological Science	20 November 2013
Ecological Science	20 November 2013

20 November 2013
Pretoria

President

Executive Director

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, 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 desktop analysis including database search and literature review was done by Mr Sam Laurence and Corné Niemandt.

The following information is applicable to the site verification:

- Date: March 2021 and May 2022
- Duration: Five days
- Season/s: Dry and Wet season
- Season Relevance: Conditions were suboptimal due to poor and very sporadic 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) was queried for the presence of mammal (MammalMAP, 2022), reptile (ReptileMAP, 2022) and amphibian (FrogMAP, 2022) SCC within the QDGC in which the proposed development resides;
- Mammal SCC information was obtained from Child *et al.,* (2016);
- Reptile SCC information was obtained from Bates *et al.,* (2014); and
- Amphibian SCC information was obtained from Du Preez and Carruthers (2017).

Species nomenclature follows the aforementioned references throughout this document except for herpetofauna where nomenclature for reptiles follows ReptileMAP (2022) as new distribution data and taxonomic changes have already occurred since publication of Bates *et al.,* (2014). Similarly, the Frog Atlas of Southern Africa (FrogMAP, 2022) provides information on the geographic distributions of amphibians and keeps up to date with the latest taxonomic changes. The use of these online facilities is justified as it not only includes the latest verified publicly contributed data but also a complete record of the museum material in South Africa. The applicability of the information obtained from the literature sources was evaluated for the study area and the subsequent recommendations are to be used by the Applicant to drive the development process in accordance with the relevant legislation.

Field survey

- The specialist investigated the study area on foot and by vehicle for five days.
- All four WEFs and the two SEFs were investigated for animal signs and sightings.

- Since no SCC (excluding avifauna) were flagged by the screening report or desktop assessment, the survey was brief.
- For each project site the habitat was characterised, photographs were taken and the likelihood of any SCC being present were assessed.
- 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 survey had to be repeated in the wet season due to the initial dry season conditions.
- The Avifauna assessment is 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

Sampling

Random walk transects were done, covering all major habitats on site within each of the project development footprints. At each sample site the habitat was characterised, photographs were taken and the likelihood of any SCC being present was assessed. The below table indicates species recorded on site.

Potential SCC, Provincially Protected (NCNCA, 2009) and CITES species (based on records of the regional area):

- Black-footed Cat *Felis nigripes* – Vulnerable, CITES Appendix I
- Brown Hyaena *Parahyaena brunnea* – Near Threatened
- African Wild Cat *Felis silvestris* – NCNCA (2009) Schedule 1
- Striped Polecat *Ictonyx striatus* – NCNCA (2009) Schedule 1
- Aardwolf *Proteles cristatus* – CITES Appendix III
- Caracal *Caracal caracal* – Appendix II
- African Wildcat *Felis silvestris* – Appendix II

Table 1: Recorded species and site description.

Description	Photo
Species: *Proteles cristata* Common name: Aardwolf Conservation status: Least Concern Provincially Protected CITES - Appendix III	
Species: *Psammophis leightoni* Common name: Cape Sand Snake Conservation status: Least Concern	

Species: *Suricata suricatta* Common name: Meerkat or Suricate Conservation status: Least Concern	
Species: *Malacothrix typica* Common name: Large-eared Mouse Conservation status: Least Concern	
Species: *Dipsina multimaculata* Common name: Dwarf Beaked Snake Conservation status: Least Concern	

Species: *Psammobates tentorius* Common name: Tent Tortoise Conservation status: Least Concern	
Species: *Bitis caudalis* Common name: Horned Adder Conservation status: Least Concern	
Species: *Psammophis notostictus* Common name: Karoo Sand Snake Conservation status: Least Concern	

Species: *Meroles suborbitalis* Common name: Spotted Desert Lizard Conservation status: Least Concern	
Species: *Chondrodactylus bibronii* Common name: Bibron's Thick-toed Gecko Conservation status: Least Concern	

Proposed impact management actions

- Vegetation clearing close to the watercourse should be minimised and where necessary, appropriate storm water management should be put in place to limit erosion potential of exposed soil, such as placing sedimentation trapping to prevent exposed soils from spilling into the watercourse (if necessary).
- No layover or temporary construction areas to be installed on natural vegetated areas or within high sensitivity areas.
- The watercourse and its buffer areas should be demarcated and fenced off prior to construction to exclude the watercourse from development activities.
- Buffer zones are allocated to sensitive or important habitat features to alleviate the effect of habitat loss, habitat fragmentation, disturbances, increased isolation and edge effects.
- 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 (especially reptiles and amphibians) and, wherever possible, prevent accidental road kills of fauna. Drivers not complying with speed limits should be subject to penalties.
- Roadkills 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.
- All vehicle speeds associated with the project should be monitored and should be limited to 40 km/h (maximum) during the construction phase.
- Excavated trenches must be left open for as short a time as possible to avoid acting as dispersal barriers or traps.
- All open excavated trenches must have escape points with an angle of less than 45° to allow for trapped animals to escape, or similar mitigation measure applied.
- All power lines linking solar panels to each other and to the internal substation should be buried.
- All power lines linking turbines to each other and to the internal substation should be buried.
- No chemical spills or any other material dumps should be conducted within the development footprint, with special focus in areas nearby riparian vegetation or drainage lines. All the maintenance of vehicles must be carried out in specially designated areas to prevent any type of pollution in the area.

- Ensure the implementation of a construction monitoring plan to survey fauna communities on the WEFs and the SEFs and the impacts resulting from the infrastructure installation. This plan should have a minimum duration equal to the duration for the construction phase. This plan should focus on assessing the displacement and disturbance effects of the development on the fauna communities, as well as continue to gather information on the fauna communities present in the area.
- Hunting or intentional killing of all fauna must be prohibited on site.
- 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 during the breeding season and juveniles.
- 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.
- All staff should be subjected to an induction training program where appropriate conservation principles, safety procedures, snake bite avoidance and first aid treatment are taught. Several staff members should complete a snake handling course to safely remove snakes from construction areas.

Conclusion

This compliance statement is applicable to all four Red Sands WEFs and the two Red Sands SEFs. The study area is in a natural or semi-natural state (due to grazing and presence of alien invasive species), and accordingly it is of a medium to low sensitivity for terrestrial animal species.

The watercourse is considered high sensitivity and must be protected. It serves as a corridor for animal movements, as well as providing important ecosystem services, such as water supply. No animal SCC were recorded on the projects area. The proposed development is not expected to have a significant impact on fauna SCC, if one should occur on site. If the proposed mitigation measures are implemented, the project is not considered to cause irreplaceable loss of fauna biodiversity nor have a significant negative impact on the sensitive species

A number of fauna species recorded on the property are provincially protected, including species under Schedule 1 and 2, as well as CITES. Should it be necessary to capture and relocate any of these animals prior or during construction, or during the operational phase of the project, a permit application with the provincial authority is required. No species may be killed or injured during any phase of the project.

The above management actions should be included in the Environmental Management Programme to reduce fatalities and minimise impacts on animals that do occur on the study area.

During operational phase monitoring, it will be very important to improve the understanding of the real impacts caused by the Red Sands WEFs and SEFs on local fauna populations.

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