Red Sands Photovoltaic 3 (PV3) Facility - Biodiversity Impact Assessment

Mgcawu District Municipality, Northern Cape

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CLIENT

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Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

List of Acronyms

ADU	Animal Demography Unit
BI	Biodiversity Importance
CBA	Critical Biodiversity Area
CI	Conservation Importance
CR	Critically Endangered
EOO	Extent of occurrence
EN	Endangered
ESA	Ecological Support Area
FI	Functional Integrity
GBIF	Global Biodiversity Information Facility
IAP	Invasive Alien Plant
IUCN	International Union for Conservation of Nature
LC	Least Concern
MP	Moderately Protected
NBA	National Biodiversity Assessment
NEMBA	National Environmental Management Biodiversity Act
NP	Not Protected
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
ONA	Other Natural Area
POSA	Plants of Southern Africa
PP	Poorly Protected
SACAD	South Africa Conservation Areas Database
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
SAPAD	South Africa Protected Areas Database
SCC	Species of Conservation
SEI	Site Ecological Importance
SWSA	Strategic Water Source Area
VU	Vulnerable
WP	Well Protected

Executive Summary

AGV Projects (Pty) Ltd is proposing the development of a solar PV facility (known as the Red Sands PV3 Facility) and associated infrastructure on a site located approximately 26 km northeast of Groblershoop, within the Tsantsabane Local Municipality and the ZF Mgcawu District Municipality in the Northern Cape Province. The project is to be known as Red Sands PV3 and will have a contracted capacity of up to 75 MW(ac).

This assessment describes the composition of the floral and faunal (herpetofauna and non-volant mammals) community within the area affected by the proposed development, and the possible impacts on the local biota. In order to achieve this, a review of available desktop information and a field survey for the Project Area of Influence (PAOI) was undertaken.

The PAOI exhibits homogenous habitat characteristics, and the entire area was classified as Plains Thornveld. The ecological condition of the PAOI has been negatively altered due to livestock grazing and browsing and is evidenced by dense stands of *Rhigozum trichotomum* and *Senegalia mellifera* subsp. *detinens*. However, the area still supports important mammalian ecosystem engineers as well as several species of mesocarnivore. These species are vital in maintaining ecosystem structure and functioning. The Site Ecological Importance (SEI) was determined to be 'High' as summarised in the table below.

Habitat (Area [ha])	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Plains Thornveld (218.949)	High Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A.	Very High Very large (> 100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches.	Very High	High	High

The expected impacts of the proposed infrastructure will include the following:

- habitat loss and fragmentation;
- degradation of surrounding habitat;
- disturbance and displacement of fauna caused during the construction and maintenance phases; and
- direct mortality during the construction phase.

In order to reduce the significance of the impacts several mitigation measures can be implemented during the construction and operational phase of the proposed developed. As indicated in the IUCN guidelines, indigenous vegetation must be maintained under the solar panels to ensure biodiversity maintenance. Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil

functioning, such as its filtering and buffering characteristics, while maintaining habitats for both fossorial and epigeic biodiversity.

During the construction phase, displacement and disturbance of fauna can be reduced by restricting habitat loss and disturbance to within the footprint of the development area. All personnel should undergo environmental induction with regards to the local fauna and in particular awareness about not harming, collecting or hunting terrestrial species.

Rehabilitation of disturbed areas must occur to mitigate against erosion and the encroachment of invasive plants as this will lead to a negative shift in the wellbeing of the biotic community within the landscape. It is important to ensure that regular monitoring for invasive plant encroachment occurs during the operation phase. This should be undertaken quarterly during the first two years of the operation phase and annually for the life of the project. This is to ensure that the area is not degraded further. Monitoring for signs of erosion must be undertaken in parallel and rectified as soon as possible.

Cumulative impacts in the area are a concern due to the proliferation of energy developments and in terms of the cumulative impact, it was rated as 'High'. Based on the outcomes of the SEI determination, the project possesses a 'High' SEI. This denotes that avoidance mitigation wherever possible must be implemented. The project area has been designated as a REDZ (Renewable Energy Development Zone) and taking into consideration the extent of 'avoidance' achieved for the project, it is the opinion of the specialist that the authorisation of the proposed project may be favourably considered. It is recommended that should any future developments be proposed for the remaining extent of the 'High' and 'Very High' areas within the Kheis farm area, that compensation strategies be required for these authorisations.

The 'High' SEI denotes that avoidance mitigation wherever possible must be implemented. This includes changes to project infrastructure design to limit the amount of habitat impacted. In order to appreciate the extent of 'avoidance' achieved for the project, the three proposed PV facilities have been jointly considered, the following is noteworthy:

- The footprint areas for the three facilities amounts to 403 ha, with a total area of 164 ha being avoided within the respective project areas combined;
- The total extent of the entire Kheis farm area comprising five portions measures 21,464 ha, thus approximately 2% of the farm area will be developed; and
- The extent of the two farm portions (PV 1 and PV 2 are located on 2/386, and PV 3 is located on 19/387) with 'High' SEI habitat directly affected by the project area measures 8,668 ha; thus approximately 5% of the two farm portions will be developed.

The project area has been designated as a REDZ (Renewable Energy Development Zone) and taking into consideration the extent of 'avoidance' achieved for the project, it is the opinion of the specialist that the authorisation of the proposed project may be favourably considered.

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1 Introduction

1.1 Background

AGV Projects (Pty) Ltd is proposing the development of a solar PV facility (known as the Red Sands PV3 facility) and associated infrastructure on a site located approximately 22km northeast of Groblershoop, within the !Kheis Local Municipality and the ZF Mgcawu District Municipality in the Northern Cape Province. The project is to be known as Red Sands PV3 and will have a contracted capacity of up to 75 (ac)MW.

A preferred project site with an extent of ~3380ha and a development area of ~184ha within the project site has been identified by AGV Projects (Pty) Ltd as a technically suitable area for the development of the Red Sands PV3 facility. The development area for the PV facility is located on Portion 19 of the Farm Rooisand 387. The project site is accessible via an existing gravel farm road from an existing main gravel road off the N8 which is located southeast of the project site.

The Biodiversity Company (TBC) was appointed to undertake a Biodiversity Impact Assessment for the proposed Red Sands PV3 Facility. The approach was informed by the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices 320 (20 March 2020) in terms of NEMA, dated 20 March and 30 October 2020: "*Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation*" (Reporting Criteria). This is contingent of the PV facility providing electricity output of 20 megawatts (MW) or more. See Appendix A for the Protocol Checklist and where the checklist items are located in the report.

1.2 Project Description

The Red Sands PV3 project site is proposed to accommodate the following infrastructure, which will enable the PV facility to supply a contracted capacity of up to 75 MW(ac):

- Solar PV array comprising PV modules and mounting structures;
- Inverters and transformers;
- Low voltage cabling between the PV modules to the inverters;
- Fence around the project development area;
- Camera surveillance;
- Internet connection;
- 33 kV cabling between the project components and the facility substation;

- 33/132 kV onsite facility substation[1];
- Battery Energy Storage System (BESS);
- Site offices and maintenance buildings, including workshop areas for maintenance and storage;
- Laydown areas; and
- Access roads (up to 6 m) and internal distribution roads (up to 4 m).

The solar PV facility is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Red Sands PV3 Facility under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme (or a similar programme), with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) with the Red Sands PV3 Facility set to inject up to 75 MW(ac) into the national grid.

1 A 132kV powerline will be assessed through a separate Basic Assessment Process

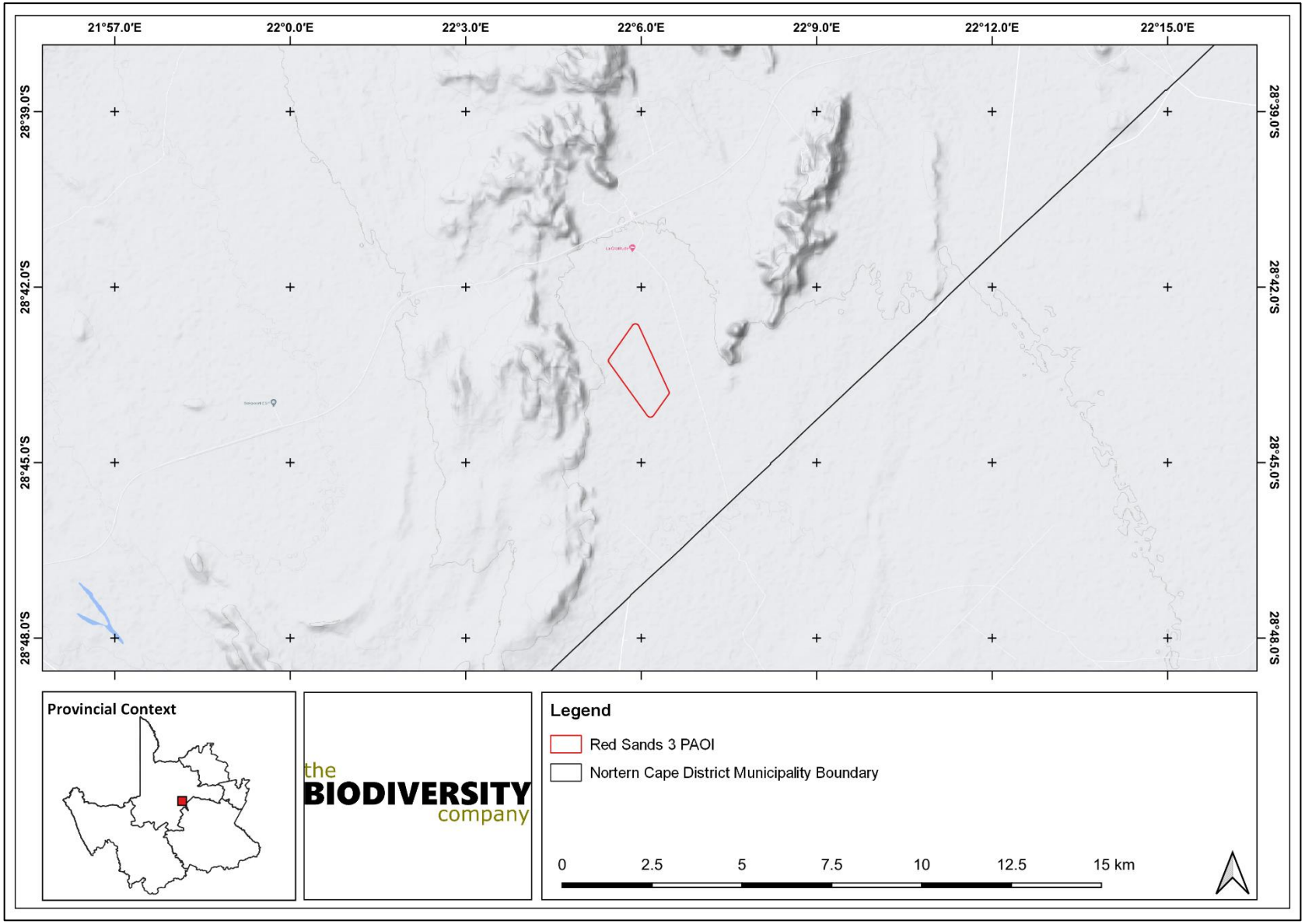


Figure 1-1 Map illustrating the location of the proposed Red Sands PV3 Facility, Northern Cape

1.3 Scope of Work

The principal aim of the assessment was to provide information to guide the risk of the proposed development to the flora and fauna communities of the ecosystems associated with the project area. The scope of work for the assessment comprises of the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the proposed mining area and surrounding landscape;
- Desktop assessment to compile an expected species list and possible threatened flora and fauna species that occur within the proposed development area;
- Field survey to ascertain the species composition of the present flora and fauna community within the proposed development area;
- Delineate and map the habitats and their respective sensitivities that occur within the proposed development area;
- Identify the manner that the proposed development impacts the flora and fauna community and evaluate the level of risk of these potential impacts; and
- The prescription of mitigation measures and recommendations for identified risks.

1.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the Project Area of Influence (PAOI) provided by the client and any alterations to the area and/or missing GIS information pertaining to the development layout would have affected the area surveyed.;
- Whilst every effort was made to cover as much of the site as possible, it is possible that some flora and fauna species that are present on site were not recorded during the field survey, especially secretive or rare species;
- With regards to the fauna species assessment, only amphibians, reptiles and non-volant mammal species were considered; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by 5 m.

1.5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-1 A list of key legislative requirements relevant to biodiversity and conservation in the Northern Cape

Region	Legislation
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 43110 (March 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Protected Areas Expansion Strategy (NPAES)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA, 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	Northern Cape Nature Conservation Act No. 9 of 2009

2 Methods

This section details the methods used in the assessment and is divided into the desktop and field components.

2.1 Climate

No climate data was available for Kheis or Groblershoop and therefore the climate data available for Upington was used as a proxy. The climate here is classified as BWh (hot desert climate) by the Köppen-Geiger system. BWh areas are typically located under the subtropical ridge in the lower middle latitudes, often between 20° and 33° north and south latitude. In these locations, stable descending air and high pressure aloft create hot, arid conditions with intense sunshine. During the year, there is minimal rainfall with a mean annual precipitation of 219 mm (Figure 2-1). The average annual temperature in Upington is 21.6 °C (Figure 2-1).

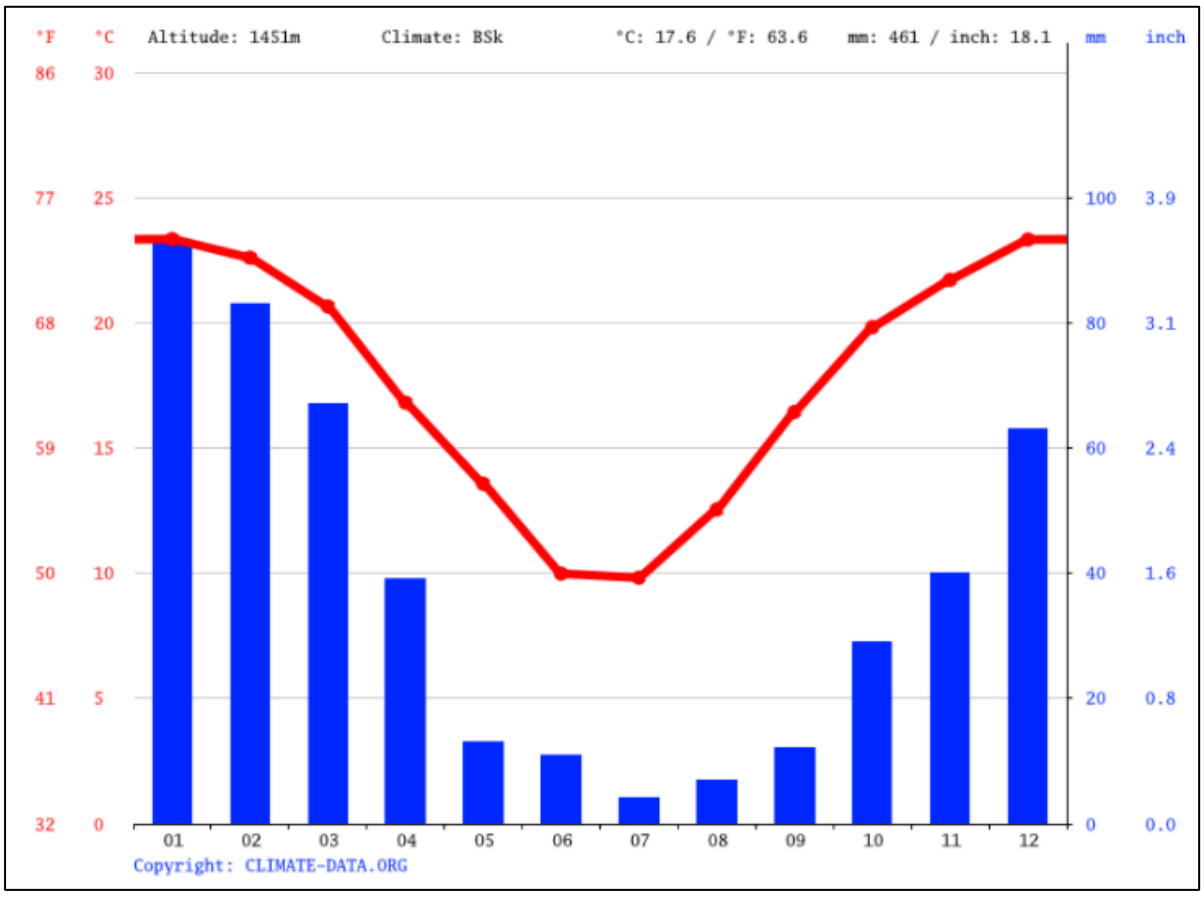


Figure 2-1 Column and line plots illustrating the climatic conditions of the Upington area. Source: CLIMATE-DATA.org

2.2 Desktop Assessment

The desktop assessment was principally undertaken using a Geographic Information System (GIS) to access the latest available spatial datasets in order to develop digital cartographs and species lists. These datasets and their date of publishing are provided below.

2.2.1 Ecologically Important Landscape Features

Existing ecologically relevant data layers were incorporated into a GIS to establish how the proposed development might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- National Biodiversity Assessment 2018 (Skowno *et al*, 2019) - The purpose of the National Biodiversity Assessment (NBA) is to assess the state of South Africa's biodiversity based on best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The NBA deals with all three components of biodiversity: genes, species and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments. The two headline indicators assessed in the NBA are:
    - Ecosystem Threat Status – indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition.
    - Ecosystem Protection Level – indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, Poorly Protected or Moderately Protected ecosystem types are collectively referred to as under-protected ecosystems.
- Protected areas:
    - South Africa Conservation Areas Database (SACAD) and South Africa Protected Areas Database (SAPAD) (DFFEa, 2021) – The South African Protected Areas Database (SAPAD) contains spatial data for the conservation of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. SAPAD is updated on a continuous basis and forms the basis for the Register of Protected Areas which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003.
    - National Protected Areas Expansion Strategy (NPAES) (SANBI, 2021) – The National Protected Area Expansion Strategy (NPAES) provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and are therefore, of high importance for biodiversity, climate resilience and freshwater protection.
- Northern Cape Critical Biodiversity Areas (CBAs) (SANBI, 2016) - The identification of Critical Biodiversity Areas for the Northern Cape was undertaken using a Systematic Conservation Planning approach. Available data on biodiversity features (incorporating

both pattern and process, and covering terrestrial and inland aquatic realms), their condition, current Protected Areas and Conservation Areas, and opportunities and constraints for effective conservation were collated. 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 were incorporated. Targets for terrestrial ecosystems were based on established national targets, while targets used for other features were aligned with those used in other provincial planning processes. CBA categories are based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

  - Critical Biodiversity Area (CBA) – An area that must be maintained in a good ecological condition (natural or near-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 near-natural habitat, that have not already been met in the protected area network (SANBI, 2016).

  - Ecological Support Area (ESA) – An area that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a CBA or protected area, or to generate or deliver ecosystem services, or to meet remaining biodiversity targets for ecosystem types or species when it is not possible or no necessary to meet them in natural or near-natural areas (SANBI, 2016).

  - Other Natural Area (ONA) – An area in good or fair ecological condition (natural, near-natural or semi-natural) that is not required to meet biodiversity targets for ecosystem types, species or ecological processes (SANBI, 2016).

- South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al.,* 2018) – A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the National Biodiversity Assessment of 2018. It is a collection of data layers that represent the extent of river and inland wetland ecosystem types as well as pressures on these systems.

2.2.2 Desktop Flora Assessment

The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) was used in order to identify the vegetation type that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Plants of Southern Africa (POSA) database was accessed to compile a list of expected flora species within the proposed development area and surrounding landscape (Figure 2-2). The Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2021) was utilized to provide the most current national conservation status of flora species.

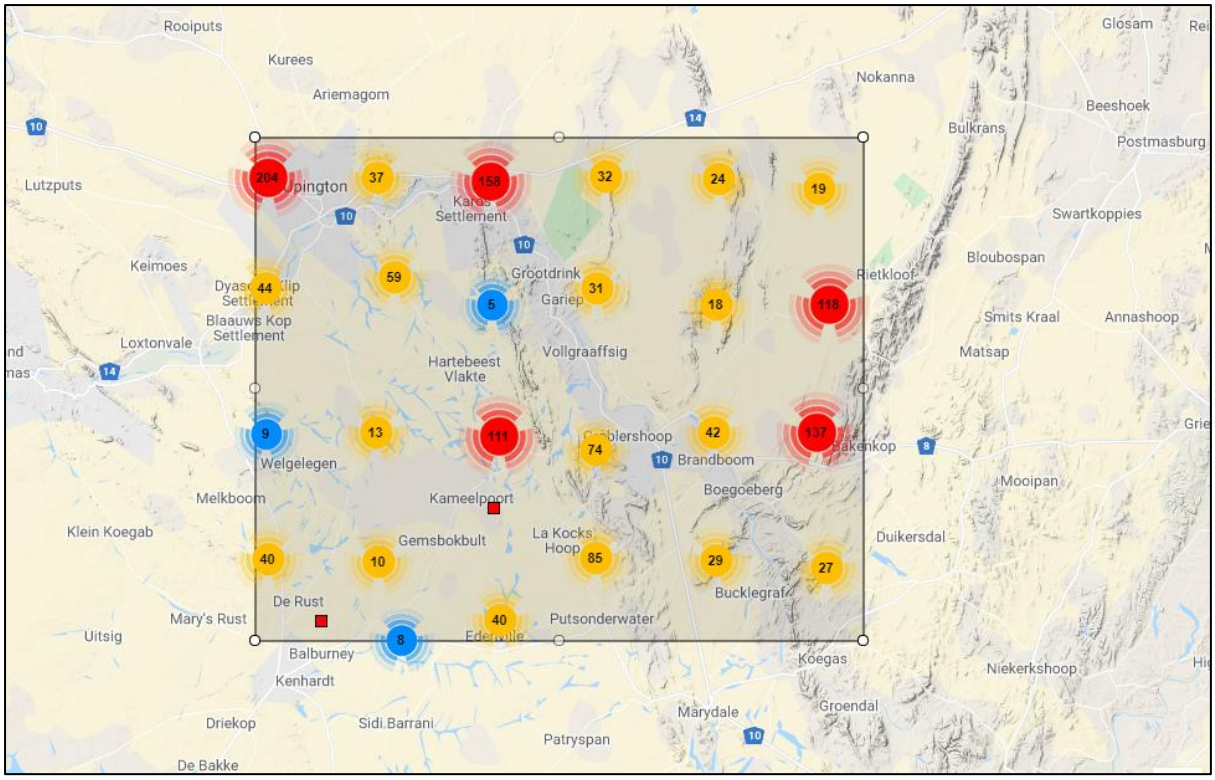


Figure 2-2 Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa database

2.2.3 Desktop Fauna Assessment

The faunal desktop assessment comprised of the following:

- Compiling an expected amphibian list generated from the IUCN spatial dataset (2017 and the FrogMap (ADU, 2021) database using the 2822CA and 2822CC quarter degree squares;
- Compiling an expected reptile list generated from the IUCN spatial dataset (2017) and the ReptileMap database (ADU, 2021) 2822CA and 2822CC quarter degree squares; and
- Compiling an expected mammal list from the IUCN spatial dataset (2017).

2.2.4 Literature Review

The Environmental Impact Assessment (EIA) for Bokpoort CSP Solar Park (Bohlweki-SSI, 2011) and the Basic Assessment for the proposed 200 MW PV plants on the remaining extent of Farm Bokpoort (RoyalHaskoningDHV, 2020) was reviewed to consider species that were recorded during the surveys as well as any key findings.

2.3 Field Assessment

A single field survey was undertaken in from the 15th – 19th November 2021 (Spring), which is a wet-season survey, to determine the presence of Species of Conservation Concern (SCC). Effort was made to cover the different habitat types within the limits of time and access. The fieldwork was placed within targeted areas perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which

included the latest applicable biodiversity datasets) available prior to the fieldwork. Fauna specimens observed during the scoping survey in winter (24th-25th June 2021) were also included in the species list.

2.3.1 Flora Survey

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling flora species lists and therefore gives a rapid indication of flora diversity. Suitable habitat for SCC were identified according to and targeted as part of the timed meanders.

Homogenous vegetation units were subjectively identified using satellite imagery and existing land cover maps. The floristic diversity and search for flora SCC was conducted through meanders within representative habitat units.

During the survey, notes were made regarding current impacts, subjective recording of dominant vegetation species and any sensitive features (e.g. wetlands, outcrops etc.).

Relevant field guides and texts consulted for identification purposes in the field during the survey included the following:

- Identification Guide to Southern African Grasses: An Identification Manual with Keys, Descriptions, and Distributions (Fish *et al,* 2015);
- Flowering Plants of the Southern Kalahari (Van Rooyen and Van Rooyen, 2019);
- Problem Plants and Alien Weeds of South Africa (Bromilow, 2010);
- Field Guide to Succulents in Southern Africa (Smith *et al,* 2017);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Medicinal Plants of South Africa (Van Wyk *et al.,* 2013).

2.3.2 Fauna Survey

The faunal assessment within this report pertains to herpetofauna, avifauna and mammals. The faunal field survey comprised of the following active and passive techniques:

- Visual and auditory searches - This typically comprised of traversing the PAOI and using a camera to view species from a distance without them being disturbed as well as listening to species calls. Due to the climatic and habitat characteristics of the project area, the use of signs and tracks was vital in recording species (Figure 2-3A);
- Active hand-searches - are used for species that shelter in or under particular micro-habitats (typically rocks and coarse woody debris.);
- Camera Traps (Figure 2-3B-C) – Two (2) camera traps were deployed for 108 hours, and three (3) camera traps were deployed for 84 hours accounting for a total of 468 hours. Camera traps were baited with tinned tuna in vegetable oil to improve sampling efficacy;
- Sherman Traps (Figure 2-3D) – Five (5) Sherman traps were deployed for 108 hours, and five (5) Sherman traps were deployed for 84 hours in order to capture small non-volant mammals. This accounts for a total of 960 trapping hours. Sherman traps were baited with a mixture of peanut butter, oats and honey; and
- Funnel Traps (Figure 2-3E) – Four (4) funnel traps were deployed for 108 hours accounting for a total of 432 trapping hours.

Diagnostic features of the individuals that were captured were photographed at site and released (Figure 2-3F).

Relevant field guides and texts consulted for identification purposes included the following:

- Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- A Complete Guide to the Snakes of Southern Africa (Marais, 2004);
- Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland (Bates *et al,* 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez and Carruthers, 2009);
- Stuarts' Field Guide to Mammals of Southern Africa including Angola, Zambia & Malawi (Stuart and Stuart, 2015); and
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart and Stuart, 2000).

Figure 2-3 ***Photographs illustrating sampling methods utilised in the biodiversity impact assessment for the proposed Red Sands PV3 Facility. A) Tracks recorded within the PAOI using a knife for scale, B)-C) Camera traps placed at burrows which are critical for supporting fauna in arid or semi-arid regions, D) Sherman trap placed in dense cover, E) Funnel trap placed in dense cover and F) Photographing diagnostic features of specimens***

2.4 Site Ecological Importance

The different habitat types within the assessment area were delineated and identified based on observations during the field assessment as well as available satellite imagery. These habitat types were assigned Site Ecological Importance (SEI) categories based on their ecological integrity, conservation value, the presence of species of conservation concern and their ecosystem processes. The determination of the SEI was in accordance with the method described in the Species Environmental Assessment Guideline (SANBI, 2020).

Site Ecological Importance (SEI) is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community or habitat type present on the site) and Receptor Resilience (RR) (its resilience to impacts).

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows. The criteria for the CI and FI ratings are provided in Table 2-1 and Table 2-2, respectively.

Table 2-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global extent of occurrence (EOO) of < 10 km^2. Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Table 2-2 Summary of Functional Integrity (FI) criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbance.
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts with no signs of major past disturbance and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy

Functional Integrity	Fulfilling Criteria
	used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very Low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

BI can be derived from a simple matrix of CI and FI as provided in Table 2-3

Table 2-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

Biodiversity Importance (BI)		Conservation Importance (CI)				
		Very high	**High**	**Medium**	**Low**	**Very low**
Functional Integrity (FI)	**Very high**	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very low	Medium	Low	Very Low	Very Low	Very Low

The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor as summarised in Table 2-4.

Table 2-4 Summary of Resource Resilience (RR) criteria

Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 2-5.

Table 2-5 Matrix used to derive Site Ecological Importance from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance		Biodiversity Importance (BI)				
		Very High	High	Medium	Low	Very Low
Receptor Resilience (RR)	Very Low	Very High	Very High	High	Medium	Low
	Low	Very High	Very High	High	Medium	Very Low
	Medium	Very High	High	Medium	Low	Very Low
	High	High	Medium	Low	Very Low	Very Low
	Very High	Medium	Low	Very Low	Very Low	Very Low

Interpretation of the SEI in the context of the proposed development activities is provided in Table 2-6.

Table 2-6 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities (SANBI, 2020)

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

The SEI evaluated for each taxon can be combined into a single multi-taxon evaluation of SEI for the assessment area. Either a combination of the maximum SEI for each receptor should be applied, or the SEI may be evaluated only once per receptor but for all necessary taxa simultaneously. For the latter, justification of the SEI for each receptor is based on the criteria that conforms to the highest CI and FI, and the lowest RR across all taxa.

3 Results & Discussion

This section provides the results of the assessment and is divided into the desktop and field assessment components.

3.1 Desktop Assessment

3.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed development to ecologically important landscape features are summarised in Table 3-1.

Table 3-1 Summary of relevance of the proposed project to ecologically important landscape features.

Ecological Feature	Relevance	Section
Ecosystem Threat Status	Irrelevant – Overlaps with Least Concern ecosystems	3.1.1.1
Ecosystem Protection Level	Relevant – Overlaps with a Poorly Protected ecosystem	3.1.1.2
Protected Areas	Irrelevant – Located approximately 14 km North-West from the Glen Lyon Nature Reserve	3.1.1.3
National Protected Areas Expansion Strategy (NPAES)	Irrelevant – Does not overlap a NPAES focus area	3.1.1.3
Northern Cape Critical Biodiversity Areas	Relevant – Overlaps Other Natural Areas	3.1.1.4
Hydrological Context	Irrelevant – Does not intersect any aquatic systems draining into the Orange River reach located approximately 16 km to the South	3.1.1.5

3.1.1.1 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset the PAOI overlaps with LC ecosystems (Figure 3-1).

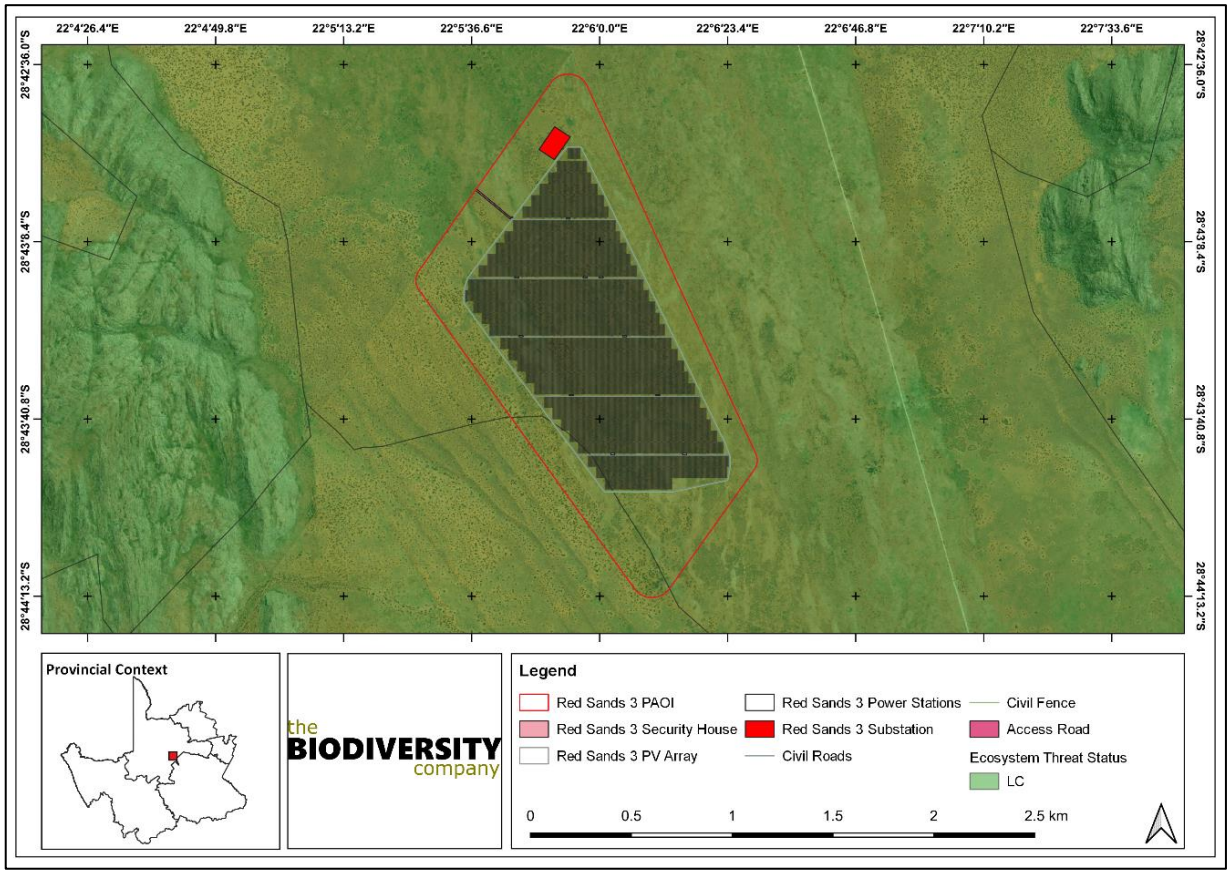


Figure 3-1 Map illustrating the ecosystem threat status associated with the proposed Red Sands PV3 Facility PAOI

3.1.1.2 Ecosystem Protection Level

Indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, Poorly Protected or Moderately Protected ecosystem types are collectively referred to as under-protected ecosystems. The PAOI overlaps with MP and PP ecosystems (Figure 3-2).

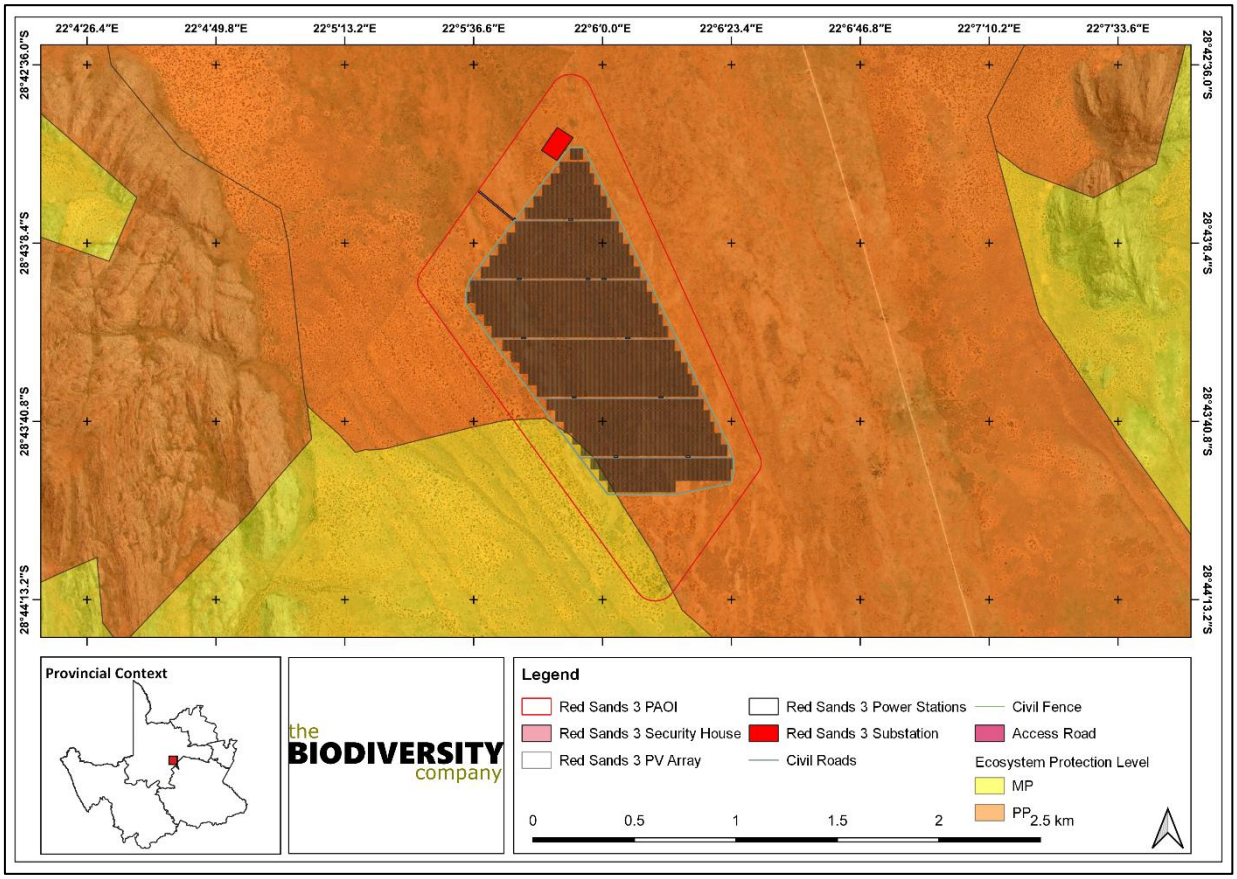


Figure 3-2 Map illustrating the ecosystem protection level associated with the proposed Red Sands PV3 Facility PAOI

3.1.1.3 Protected Areas

According to the SAPAD dataset (2021), the proposed development area does not occur within any protected area (Figure 3-3). The Glen Lyon Nature Reserve is located approximately 14 km to the South-East and the Witsand Nature Reserve is located approximately 34 km to the North-East. The proposed activity is unlikely to influence these protected areas as they are situated outside of the buffer zone required to maintain the functioning of protected areas. In addition, there are no NPAES focus areas within the surrounding landscape.

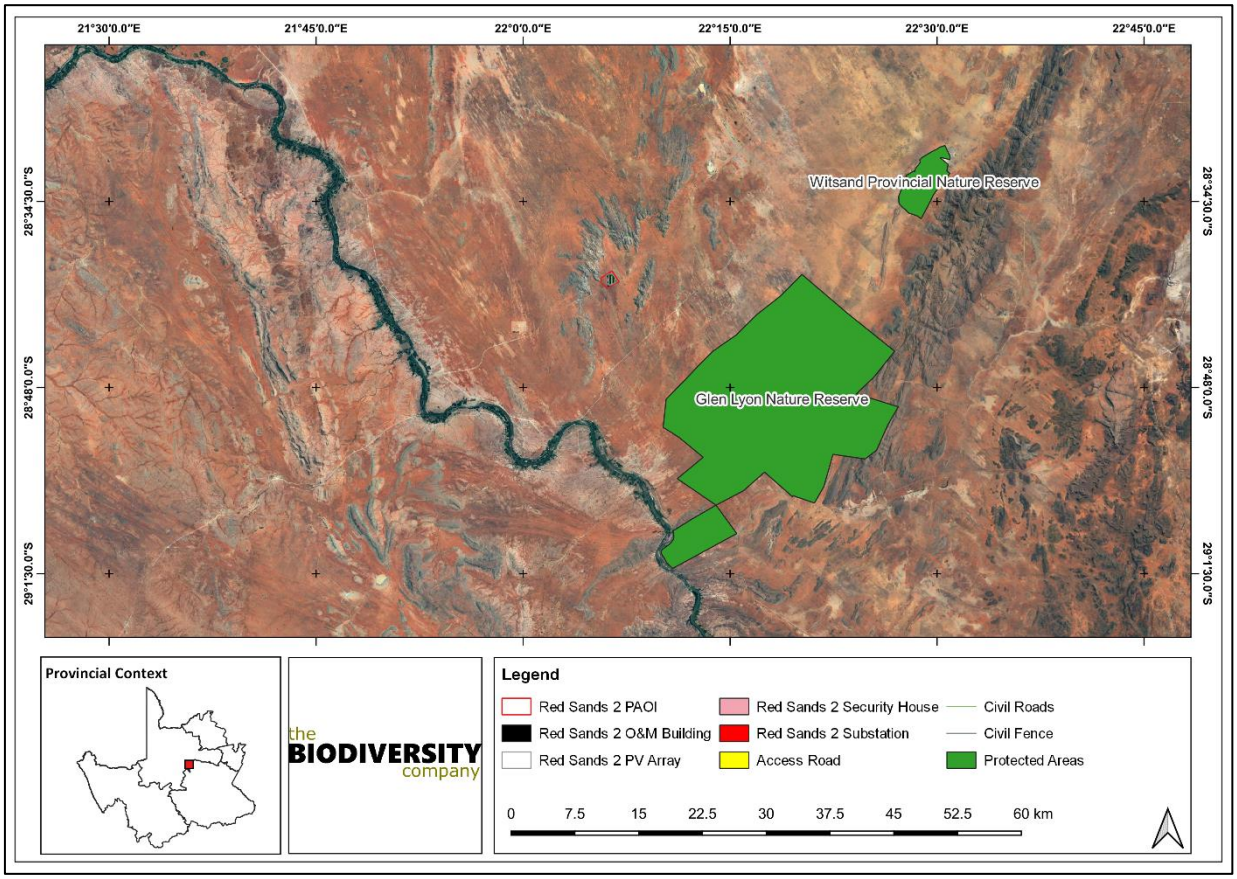


Figure 3-3 Map illustrating the location of protected areas proximal to the proposed Red Sands PV3 Facility PAOI

3.1.1.4 Northern Cape Critical Biodiversity Areas

Figure 3-4 illustrates that the proposed development overlaps with an Other Natural Area feature. The nature of the development, i.e., a solar energy facility and associated infrastructure, will lead to destruction of the ONA and consequently, the footprint area will be no longer congruent with an ONA.

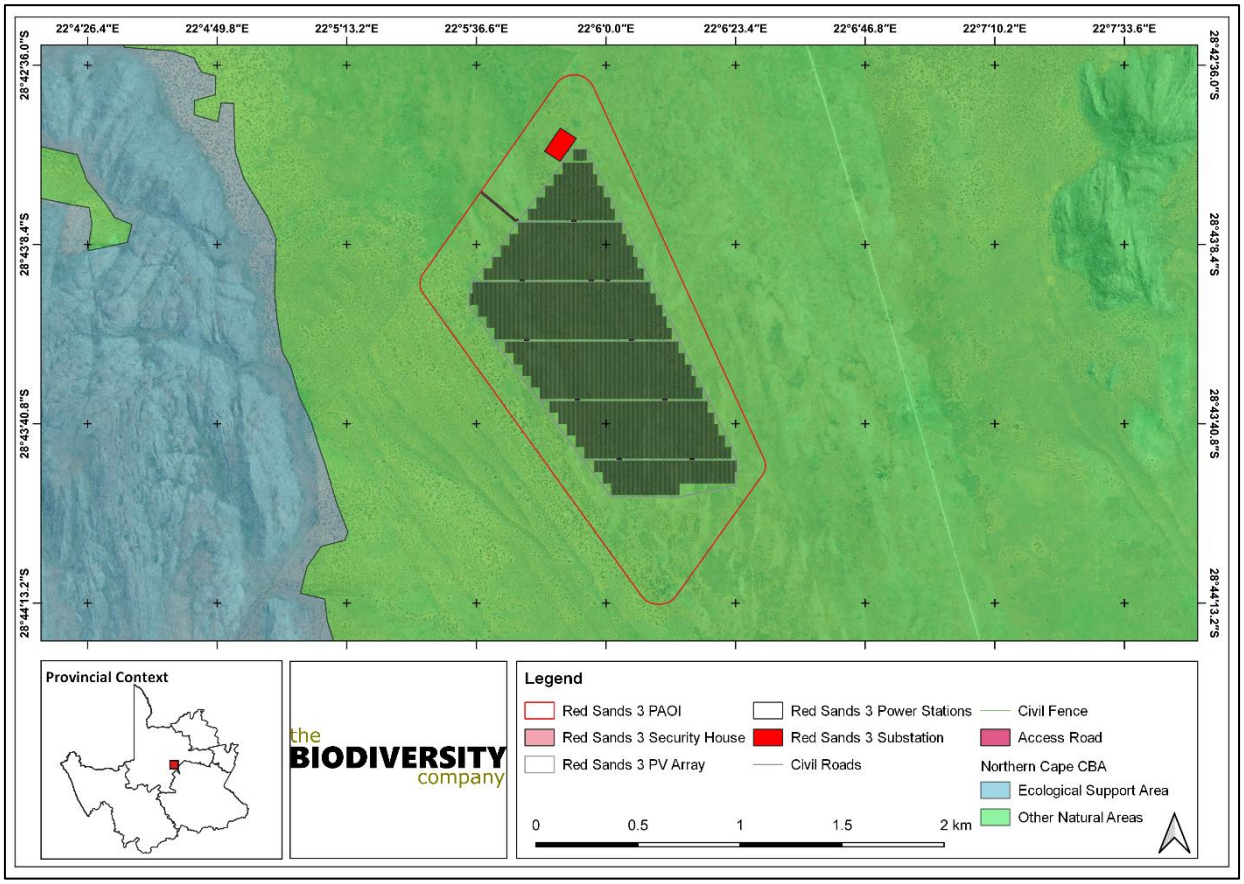


Figure 3-4 Map illustrating the proposed Red Sands PV3 Facility PAOI overlaid onto the Northern Cape Critical Biodiversity Areas

3.1.1.5 Hydrological Context

The PAOI is located in the Orange Water Management Area (WMA) (NWA, 2016), and the Southern Kalahari lower aquatic ecoregion. The watercourses in the surrounding landscape of the project area are characterised as ephemeral drainage lines, which do not drain into the Orange River, located approximately 16 km to the South. (Figure 3-5).

The ecological status and composition of the Sub-quaternary Reach (SQR) is provided in Table 3-2. The D73D-3267 SQR is considered largely modified with a 'High' Ecological Importance and a 'High' Ecological Sensitivity at a desktop level (DWS, 2014). The modified state of the reach was due to moderate impacts to instream habitat continuity, wetland and riparian zone, large impacts on physico-chemical conditions (water quality) and serious potential impacts to flow modifications. This results from the extensive irrigation canals, weirs and road crossings within the SQR.

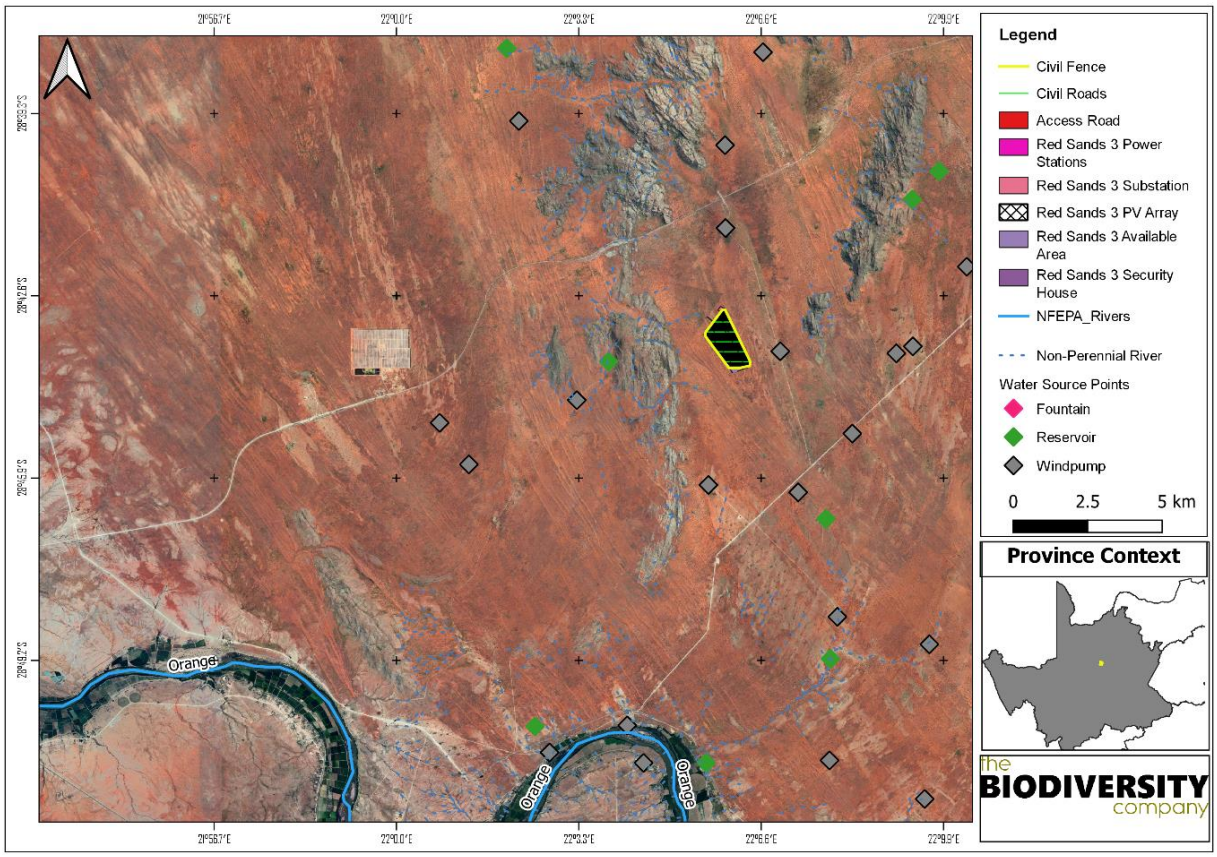


Figure 3-5 ***Map illustrating the location of the proposed Red Sands PV3 Facility PAOI within the Orange River catchment***

Table 3-2 ***Summary of the Present Ecological State – Ecological Importance and Ecological Sensitivity (PES-EIES) for Sub-Quaternary Reach D73D-3267***

Present Ecological State		Ecological Importance		Ecological Sensitivity	
D (Largely Modified)		High		High	
Variable	Status	Variable	Status	Variable	Status
Modifications to Instream Habitat Continuity	Moderate	Fish species per sub quaternary catchment	10	Fish Physico-Chemical sensitivity description	High
Modifications to Riparian/ Wetland Zone Continuity	Serious	Invertebrate taxa per sub quaternary catchment	51	Fish No-flow sensitivity description	High
Potential Instream Habitat Modifications	Large	Habitat Diversity Class	Low	Invertebrate Physico-Chemical sensitivity	Very High
Modifications to Riparian/ Wetland Zones	Moderate	Instream Migration Link Class	High	Invertebrate velocity sensitivity	Very High
Potential Flow Modifications	Serious	Riparian-Wetland Zone Migration Link	Low	Stream size sensitivity to modified flow/water level changes description	Low
Potential Physico-Chemical Modifications	Large	Instream Habitat Integrity Class	High	Riparian-Wetland Vegetation intolerance to water level changes description	Very Low
Anthropogenic Impacts					
Extensive irrigation - river and canal, weirs, road crossings					

The ETS is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. The threat status of the Orange River reach proximal to the PAOI is categorised as CR (Figure 3-6). Note that the reach does not traverse the PAOI and there are no drainage systems traversing the PAOI that drain into this reach of the Orange.

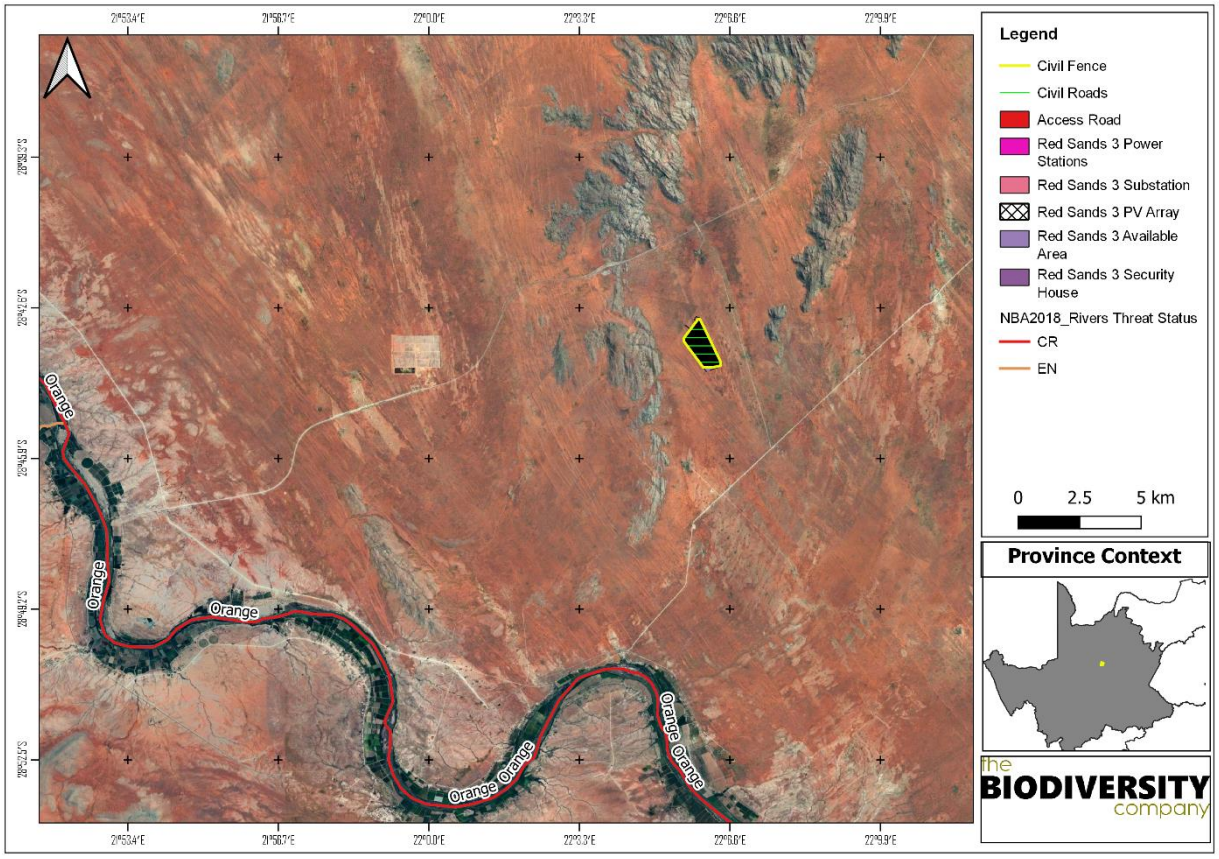


Figure 3-6 Map illustrating the Ecosystem Threat Status of the Orange River reach proximal to the proposed Red Sands PV3 Facility PAOI

Ecosystem types are categorised as Not Protected (NP), Poorly Protected (PP), Moderately Protected (MP) or Well Protected (WP), based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno *et al.*, 2019). The protection level of the Orange River reach proximal to the PAOI is categorised as PP (Figure 3-7).

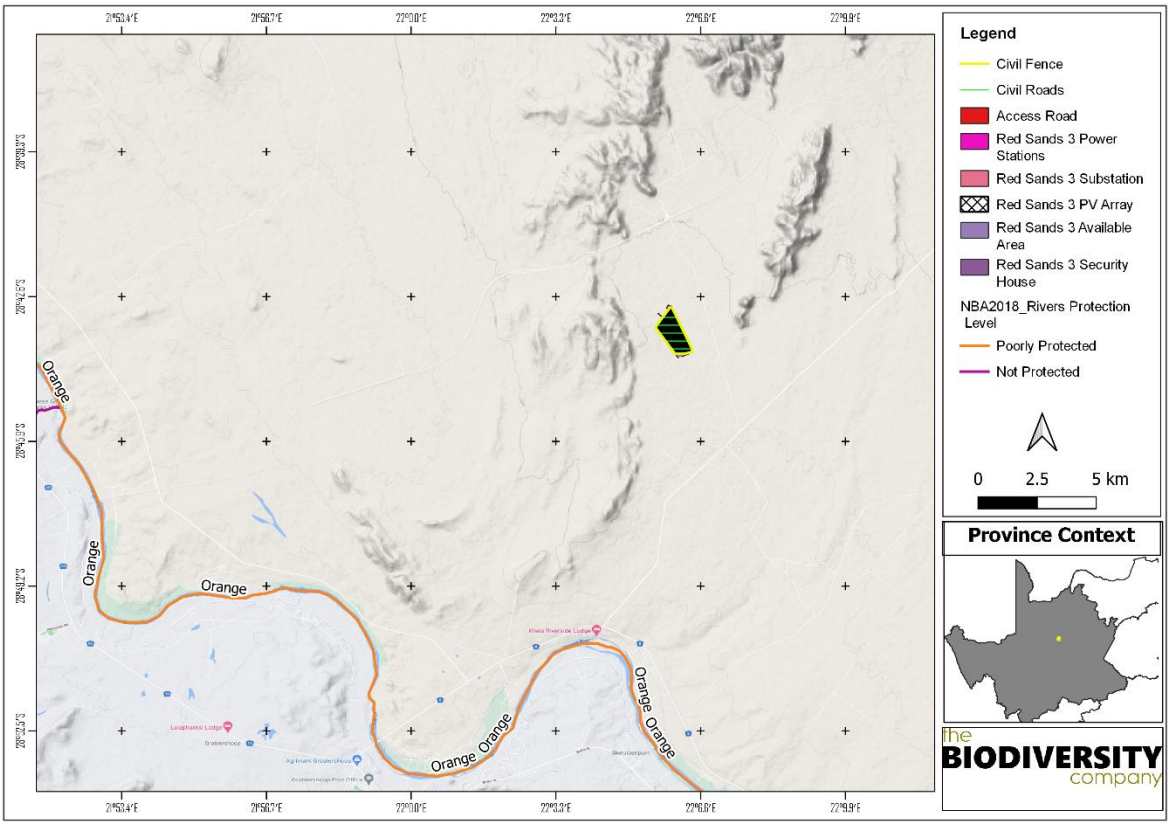


Figure 3-7 ***Map illustrating the Ecosystem Protection Level of the Orange River reach proximal to the proposed Red Sands PV3 Facility PAOI***

The National Freshwater Ecosystem Priority Area (NFEPA) database forms part of a comprehensive approach of the sustainable and equitable development of South Africa's scarce water resources. The NFEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's biodiversity goals (NEM:BA) (Act 10 of 2004), informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act (Nel *et al.,* 2011). Certain FEPAs are regarded as fish sanctuaries or fish support areas, which are rivers that are essential for protecting threatened and near threatened freshwater fish that are indigenous to South Africa. Fish sanctuaries in a good condition were identified as FEPAs. The remaining fish sanctuaries in lower ecological conditions were identified as Fish Support Areas. Fish Support Areas also include sub-quaternary catchments that are important for migration of threatened or near threatened fish species

The Orange River reach within the context of this assessment has a single NFEPA designated to it, namely the Fish Support Area: *Enteromius anoplus* (Figure 3-8). FEPAs, with their associated sub-quaternary catchments are symbolised in dark green, and Fish Support Areas, with their associated sub-quaternary catchments symbolised in olive green. The watercourse therefore needs to be managed in a manner that enables the systems to remain in a good condition to contribute to national biodiversity goals and support sustainable use of water resources. Nevertheless, there are no drainage systems within the project area that will influence the condition of this reach. The D73D-3267 SQR is labelled as a Fish Support Area and is therefore considered sensitive to further modification and needs to be managed to sustain the River FEPA's and associated aquatic and terrestrial biota located downstream of the project area. This will further ensure downstream water users have water security for the required use.

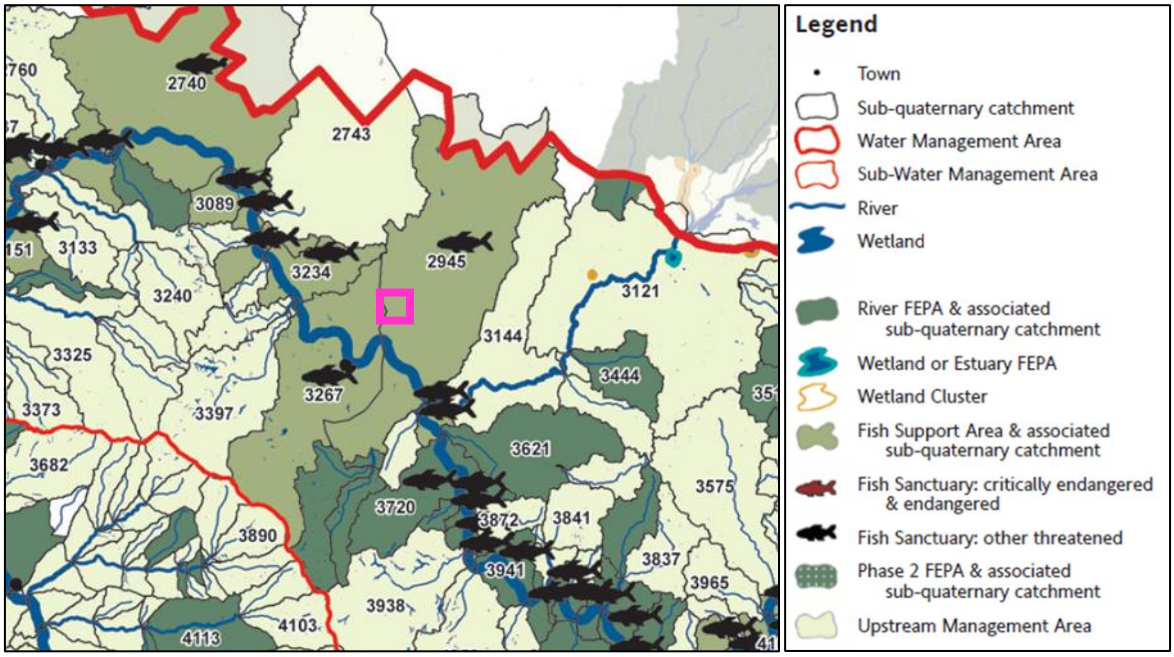


Figure 3-8 ***Map illustrating the National Freshwater Ecosystem Priority Areas associated with the proposed Red Sands PV3 Facility PAOI (indicated by the pink square). The black fish symbol (🐟) indicates the presence of vulnerable and near threatened fish populations***

A list of expected fish species within the aforementioned reach is presented in Table 3-3 (IUCN, 2021; Skelton, 2001; DWS, 2014). A total of ten (10) fish species were expected to occur in the project area. It should be noted that these expected species lists are compiled on an SQR basis and not on a site-specific basis. It is therefore unlikely that all of the expected species will be present at every site in the SQR with habitat type and availability being the main driver of species present. There are no river systems within the PAOI and therefore, these species will not occur within the PAOI.

Table 3-3 ***Summary of fish species expected to occur within the Orange River reach proximal to the proposed Red Sands PV3 Facility PAOI. Species of conservation concern are highlighted in red***

Species	Common Names	Conservation Status	Sensitivity	
			No-flow	Phys-chem
Austroglanis sclateri	Rock Catfish	LC	3.2	2.6
Clarias gariepinus	Sharptooth Catfish	LC	1.7	1.0
Enteromius anoplus	Chubbyhead Barb	LC	2.3	2.6
Enteromius paludinosus	Straightfin Barb	LC	2.3	1.8
Enteromius trimaculatus	Three Spotted Barb	LC	2.7	1.8
Labeo capensis	Orange River Mudfish	LC	2.5	2.8
Labeobarbus aeneus	Smallmouth Yellowfish	LC	3.3	2.5
Labeobarbus kimberleyensis	Largemouth Yellowfish	NT	3.8	3.6
Pseudocrenilabrus philander	Southern Mouthbrooder	LC	1.0	1.4
Tilapia sparrmanii	Banded Tilapia	LC	0.9	1.4
Total Expected Native Species		10		

Species	Common Names	Conservation Status	Sensitivity	
			No-flow	Phys-chem
LC: Least Concern NT: Near Threatened				

3.1.2 Flora Assessment

This section is divided into a description of the vegetation type expected under natural conditions and the expected flora species.

3.1.2.1 Vegetation Type

The project area is situated within the savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

a) Seasonal precipitation; and

b) (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layer, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family and a generally dense herbaceous layer (Scholes & Walker, 1993).

On a fine-scale vegetation type, the PAOI overlaps with two vegetation types, namely the Olifantshoek Plains Thornveld and to a minor extent, the Koranna-Langeberg Mountain Bushveld (Figure 3-9). However, based on field observations, the PAOI only overlaps the Olifantshoek Plains Thornveld vegetation type, and the overlap illustrated on the map is due to the resolution of the vegetation map.

The Gordonia Duneveld vegetation type is described as follows:

I. Topography – Parallel dunes about 3–8 m above the plains.

II. Geology & Soils – Aeolian sand underlain by superficial silcretes and calcretes of the Cenozoic Kalahari Group.

III. Important Taxa - Small Tree: *Senegalia mellifera subsp. detinens*. Tall Shrubs: *Grewia flava, Rhigozum trichotomum*. Low Shrubs: *Aptosimum albomarginatum, Monechma incanum, Requienia sphaerosperma*. Succulent Shrubs: *Lycium bosciifolium, L. pumilum, Talinum caffrum*. Graminoids: *Schmidtia kalahariensis, Brachiaria glomerata, Bulbostylis hispidula, Centropodia glauca, Eragrostis lehmanniana, Stipagrostis ciliata, S. obtusa, S. uniplumis*. Herbs: *Hermbstaedtia fleckii, Acanthosicyos naudinianus,*

Hermannia tomentosa, Limeum arenicolum, L. argute-carinatum, Oxygonum dregeanum subsp. canescens var. canescens, Sericorema remotiflora, Sesamum triphyllum, Tribulus zeyheri.

IV. Biogeographically Important Taxa (Kalahari endemics) – Tall Shrub: *Vachellia haematoxylon*. Graminoids: *Stipagrostis amabilis, Anthephora argentea, Megaloprotachne albescens*. Herbs: *Helichrysum arenicola, Kohautia ramosissima, Neuradopsis austro-africana*.

V. Conservation – About 14% statutorily conserved in the Kgalagadi Transfrontier Park. Little transformed. Generally low erosion, but some areas with spectacular destabilisation of normally vegetated dunes through local overstocking.

The Olifantshoek Plains Thornveld is described as follows:

I. Topography – A very wide and diverse unit on plains with usually open tree and shrub layers with a usually sparse grass layer.

II. Geology & Soils – Red aeolian sand of Tertiary to Recent age (Kalahari Group) with silcrete and calcrete and some andesitic and basaltic lava of the Griqualand West Supergroup. Hutton soil forms, deeper than 1.2 m.

III. Important Taxa - Tree: *Vachellia erioloba*. Small Trees: *Boscia albitrunca, Senegalia mellifera subsp. detinens, Terminalia sericea*. Tall Shrubs: *Lessertia frutescens, Lycium hirsutum, Rhigozum obovatum*, *Searsia tridactyla*, *Tarchonanthus camphoratus*. Low Shrubs: *Aptosimum procumbens*, *Grewia retinervis, Hoffmannseggia burchellii, Lycium pilifolium, Solanum tomentosum*. Succulent Shrubs: *Lycium cinereum, Talinum caffrum. Graminoids: Schmidtia pappophoroides, Stipagrostis uniplumis, Aristida congesta, Brachiaria serrata, Digitaria eriantha subsp. eriantha, Melinis repens*. Herbs: *Acanthosicyos naudinianus, Gisekia pharnacioides, Hermannia tomentosa, Ipomoea magnusiana, Oxygonum delagoense, Pollichia campestris, Tephrosia purpurea subsp. leptostachya*. Succulent Herb: *Piaranthus decipiens*. Geoxylic Suffrutex: *Elephantorrhiza elephantina*.

IV. Biogeographically Important Taxa (^{GW} Griqualand West endemic, ^{K} Kalahari endemic) – Small Tree: *Senegalia luederitzii var. luederitzii*^{K} . Tall Shrub: *Lebeckia macrantha*^{GW}. Low Shrubs: *Hermannia burchellii*^{K}, *Justicia puberula*^{GW}, *Putterlickia saxatilis*^{GW}, *Tarchonanthus obovatus*^{GW}. Graminoid: *Anthephora argenteaK*. Herb: *Sutera griquensis*^{GW}.

V. Conservation – Only 0.3% statutorily conserved in the Witsand Nature Reserve. Only about 1% of the area has been transformed and erosion is very low.

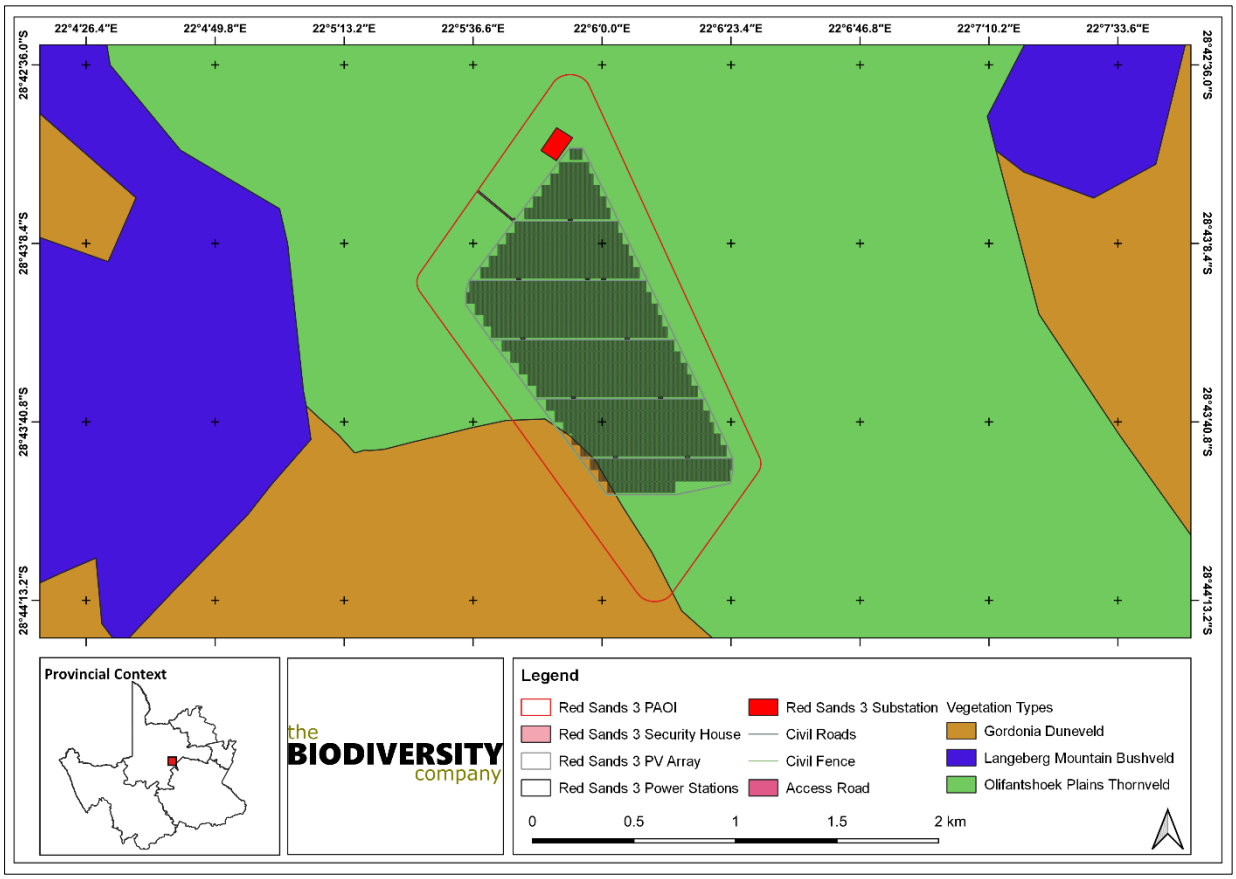


Figure 3-9 ***Map illustrating the vegetation types within the proposed Red Sands PV3 Facility PAOI***

3.1.2.2 Expected Flora Species of Conservation Concern

The POSA database indicates that 567 species of indigenous plants are expected to occur within the PAOI and surrounding landscape. Appendix B provides the list of species and their respective conservation status and endemism. Seven (7) SCC based on their conservation status could be expected to occur within the PAOI and are provided in Table 3-4 below. Three of these expected species are endemic to South Africa. The likelihood of occurrence was determined by considering the species habitat requirements and examining records on the Global Biodiversity Information Facility (GBIF) database,

Table 3-4 ***Threatened flora species that may occur within the proposed Red Sands PV3 Facility PAOI. CR=Critically Endangered, DD = Data Deficient, VU = Vulnerable and NT = Near Threatened***

Family	Species Name	Conservation Status	Endemism	Habitat	Likelihood of Occurrence
Acanthaceae	*Acanthopsis hoffmannseggiana*	DD		Sandy plains, stony hillsides and ridges, usually associated with weathered quartzite and granite, but also occurs on mudstone (in Prince Albert area) and limestone (Asbestos Mountains), usually at an elevation between 650 and 1000 m.	High
Aizoaceae	*Dinteranthus wilmotianus*	NT	Endemic	Quartz slopes and alluvial gravel soils. EOO < 10 000 km², suspected to occur at 10-20 locations.	Low
Asphodelaceae	*Aloidendron dichotomum*	VU	Near-Endemic	On north-facing rocky slopes (particularly dolomite) in the south of its range. Any slopes and sandy flats in the central and northern parts of range.	Low

Asteraceae	*Eriocephalus macroglossus*	NT	Endemic	Rocky lower slopes in Richtersveld and northern Namaqualand, from Kubus to Springbok.	Low
Asteraceae	*Senecio monticola*	DD		Literature is lacking. Data Deficient - Taxonomically Problematic.	Low
Asteraceae	*Senecio trachylaenus*	DD	Endemic	Literature is lacking. Data Deficient - Taxonomically Problematic.	Low
Poaceae	*Brachiaria dura var. pilosa*	DD		Savanna woodland and grassland on sandy soils.	Low

3.1.3 Fauna Assessment

3.1.3.1 Expected Amphibian Species of Conservation Concern

Based on the IUCN Red List Spatial Data and the FrogMAP database, 11 amphibian species are expected to occur within the area with none of these expected species regarded as threatened.

3.1.3.2 Expected Reptiles Species of Conservation Concern

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 20 reptile species are expected to occur within the area with none of these species regarded as threatened.

3.1.3.3 Expected Mammal Species of Conservation Concern

The IUCN Red List Spatial Data indicates that 49 mammal species are expected to occur within the PAOI. This list excludes larger mammal species that are generally restricted to protected areas and volant mammal species which were not considered in this assessment. Five (5) threatened mammal species could be expected to occur within the project area (Table 3-5).

Table 3-5 Threatened mammal species that are expected to occur within the proposed Red Sands PV3 Facility PAOI. NT= Near Threatened and VU = Vulnerable.

Family	Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence
			Regional	Global	
Felidae	*Felis nigripes*	Black-footed Cat	VU	VU	High
Felidae	*Panthera pardus*	Leopard	VU	VU	Low
Hyaenidae	*Parahyaena brunnea*	Brown Hyaena	NT	NT	Low
Manidae	*Smutsia temminckii*	Temminck's Pangolin	VU	VU	Low
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	NT	NT	Low

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa. This species is predominantly aquatic, and it is seldom found far from water. The main threat to the species is the declining state of freshwater ecosystems in Africa (Jacques *et al*, 2015). In parts of their range, they are killed for skins and other body parts, because they are regarded as competitors for food, particularly in rural areas where fishing is an important source of income, or where they are believed to be responsible for poultry losses, and damage to young maize plants.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. The estimated number of mature individuals is 9 707, with the population exhibiting a continuing decline (Sliwa *et al*, 2016). The principle long-term threat for the species is the loss of key resources, such as den sites and prey, from

anthropogenic disturbance or habitat degradation (Sliwa *et al*, 2016). An additional threat is indirect persecution, such as accidental poisonings (for example locust spraying, predator control lures/baits) and general predator persecution throughout most of their range. The long-term effects of climate change should not be overlooked and may lead to changes in range, changes in timing of breeding events, increases in severe weather such as flooding and droughts, as well as increased disease patterns or risks of the spread of pathogens from parasites. The likelihood of occurrence for the species within the PAOI was rated as 'High', due to the presence of suitable habitat, burrows and available prey.

Panthera pardus (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (Stein *et al*, 2020). There are few reliable data on changes in the status (distribution or abundance) throughout Africa over the last three generations, although there is compelling evidence that subpopulations have likely declined considerably. Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (Stein *et al*, 2020).

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. The total population size has been estimated between 5 000-8 000 individuals with a continuing decline in mature individuals (Wiesel, 2015). Outside protected areas, the Brown Hyaena may come into conflict with humans, and they are often shot, poisoned, trapped, and hunted with dogs in predator eradication or control programmes, or inadvertently killed in non-selective control programs (Wiesel, 2015). The species is regarded as a threat to livestock in some areas, despite the finding that they very seldom prey on livestock. Their body parts are also used in traditional medicine.

Smutsia temminckii (Temminck's Pangolin) inhabits mainly savannas and woodlands in low-lying regions with moderate to dense scrub where average annual rainfall is between 250 mm and 1 400 mm. It also occurs in floodplain grassland, rocky slopes and sandveld up to 1 700 m above sea level. The population in South Africa is estimated to be between 16 329–24 102 mature individuals (Pietersen *et al*, 2019). In the Northern Cape Province, densities have been calculated at 0.16 reproductively active individuals/km² and overall densities at 0.23 individuals/km². The species' is over-exploited for medicinal use and is increasingly focused on core conservation areas. There has been a sharp increase in the number of individuals that have been seized from illegal trade since 2010. Changes in farming practices are directly impacting the species through habitat loss and alteration, while the increased human presence in these previously undisturbed areas is resulting in increased levels of poaching. Nomadic grazing is also having a negative impact across their range due to increased levels of poaching. Additional threats include fences (electrified and not), mining and roadkills.

3.2 Field Assessment

The following sections provides the results from the field survey for the proposed development that was undertaken during June and November 2021.

3.2.1 Flora Assessment

3.2.1.1 Indigenous Flora

A total of 31 woody and herbaceous plant species, representing 17 families, were recorded within the PAOI during the field survey (Table 3-6). Only one of these species is endemic to South Africa. Five of the recorded flora species are protected under national and provincial legislation (Table 3-6, Figure 3-10) and therefore, the necessary permits are required from the relevant authority for their removal and relocation where possible. The locations of the protected species are provided in Figure 3-11. It is important to note that these were not all of the specimens recorded but were those that were recorded during the meandering and covered an area of 181.93 ha. Using the number of individuals recorded and the area traversed the density of the protected flora can be summarised as follows:

- *Aloe claviflora* – 12 individuals in 181.93 ha = 0.066 ind.ha^{-1};
- *Boscia albitrunca* – 4 individuals in 181.93 ha = 0.02 ind.ha^{-1};
- *Ledebouria apertiflora* – 2 individuals in 181.93 ha = 0.01 ind.ha^{-1};32
- *Vachellia erioloba* – 32 individuals in 181.93 ha = 0.18 ind.ha^{-1}; and
- *Vachellia haematoxylon* – 58 individuals in 181.93 ha = 0.32 ind.ha^{-1}.

The only species that is suitable for relocation are *A. claviflora* and *L. apertiflora*. These species are succulent and geophytic herbs respectively, and can be relocated into adjacent areas out of the project footprint or can also be used for revegetation purposes. *B. albitrunca, V. erioloba* and *V. haematoxylon* are woody species that are difficult to relocate, although *B. albitrunca* can be grown from cuttings. The seeds of the *Vachellia spp.* can be collected and used for revegetation purposes where required.

Table 3-6 Summary of indigenous flora recorded within the proposed Red Sands PV3 Facility PAOI during the survey period. LC = Least Concern. Species protected by legislation are highlighted in green

Family	Species Name	Growth Form	Conservation Status	Endemism
Acanthaceae	*Justicia incana*	Herb	LC	
Asparagaceae	*Asparagus capensis* var. *capensis*	Herb	LC	
Asphodelaceae	***Aloe claviflora***	**Succulent Herb**	**LC**	
Asteraceae	*Dimorphotheca polyptera*	Herb	LC	
Bignoniaceae	*Rhigozum trichotomum*	Small tree	LC	
Boraginaceae	*Ehretia alba*	Small tree	LC	
Boraginaceae	*Heliotropium ciliatum*	Herb	LC	
Brassicaceae	***Boscia albitrunca***	**Large tree**	**LC**	
Cucurbitaceae	*Coccinia rehmannii*	Geophytic herbaceous creeper	LC	
Cucurbitaceae	*Cucumis africanus*	Geophytic creeper	LC	
Fabaceae	*Lotononis leptoloba*	Herb	LC	Endemic
Fabaceae	*Parkinsonia africana*	Tree	LC	
Fabaceae	*Senegalia mellifera* subsp. *detinens*	Small tree	LC	
Fabaceae	*Senna italica*	Herb	LC	
Fabaceae	***Vachellia erioloba***	**Tree**	**LC**	
Fabaceae	***Vachellia haematoxylon***	**Tree**	**LC**	
Hyacinthaceae	***Ledebouria apertiflora***	**Geophytic herb**	**LC**	
Loranthaceae	*Tapinanthus oleifolius*	Semi-parasitic epiphyte	LC	
Malvaceae	*Grewia flava*	Woody scrambler	LC	
Molluginaceae	*Mollugo cerviana* var. *cervinia*	Herb	LC	
Nyctaginaceae	*Phaeoptilum spinosum*	Small tree	LC	
Poaceae	*Aristida adscensionis*	Graminoid	LC	
Poaceae	*Aristida congesta* subsp. *congesta*	Graminoid	LC	
Poaceae	*Aristida junciformis*	Graminoid	LC	
Poaceae	*Stipagrostis ciliata*	Graminoid	LC	
Poaceae	*Stipagrostis obtusa*	Graminoid	LC	
Poaceae	*Stipagrostis uniplumis*	Graminoid	LC	
Scrophulariaceae	*Aptosimum albomarginatum*	Herb	LC	
Scrophulariaceae	*Peliostomum leucorrhizum*	Herb	LC	
Zygophyllaceae	*Tribulus pterophorus*	Herb	LC	
Zygophyllaceae	*Tribulus terrestris*	Herb	LC	

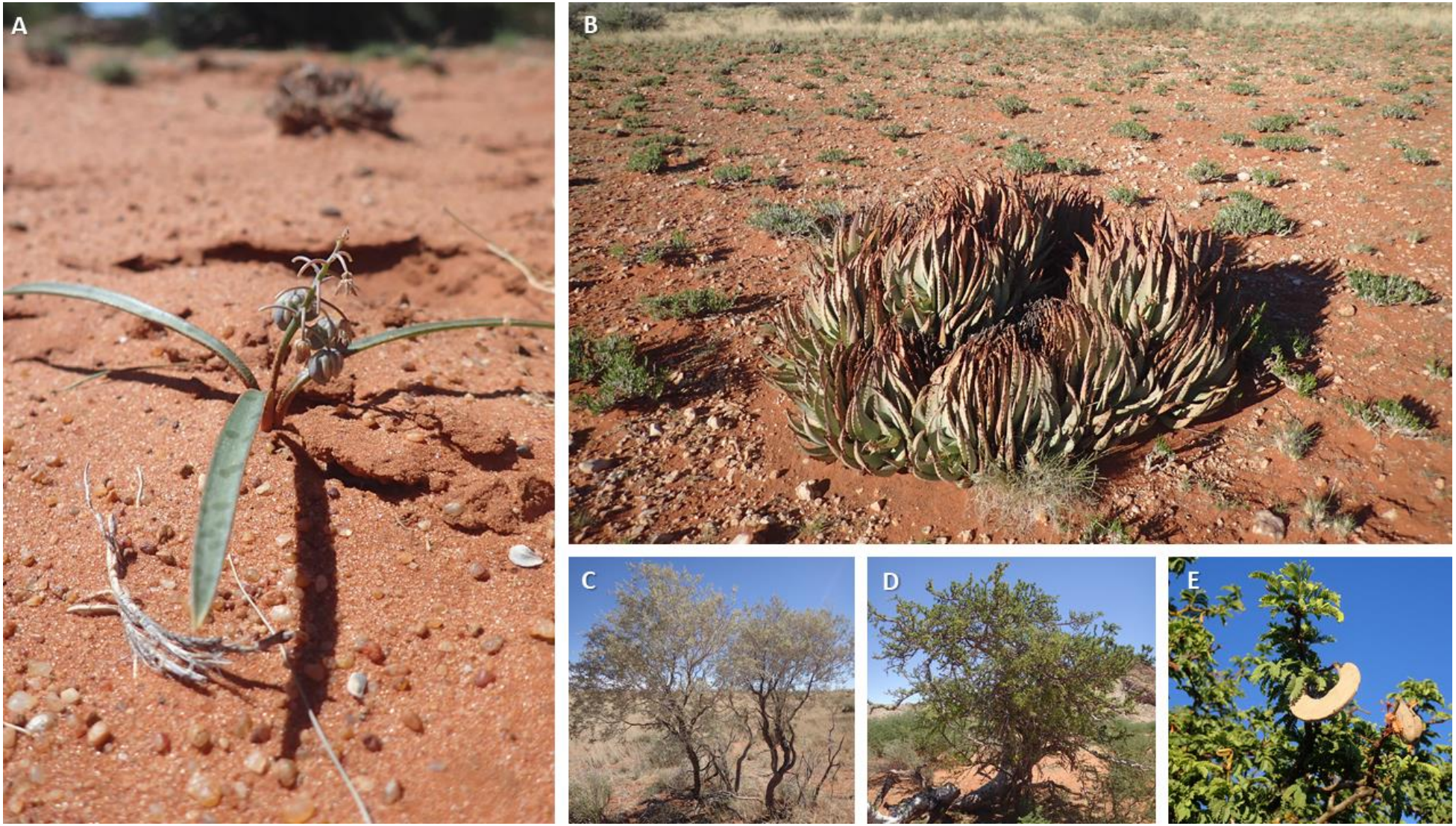


Figure 3-10 ***Photographs illustrating the protected flora recorded within the proposed Red Sands PV3 Facility PAOI during the survey period. A) Ledebouria apertiflora, B) Aloe claviflora, C) Vachellia haematoxylon, D) Boscia albitrunca and E) Vachellia erioloba***

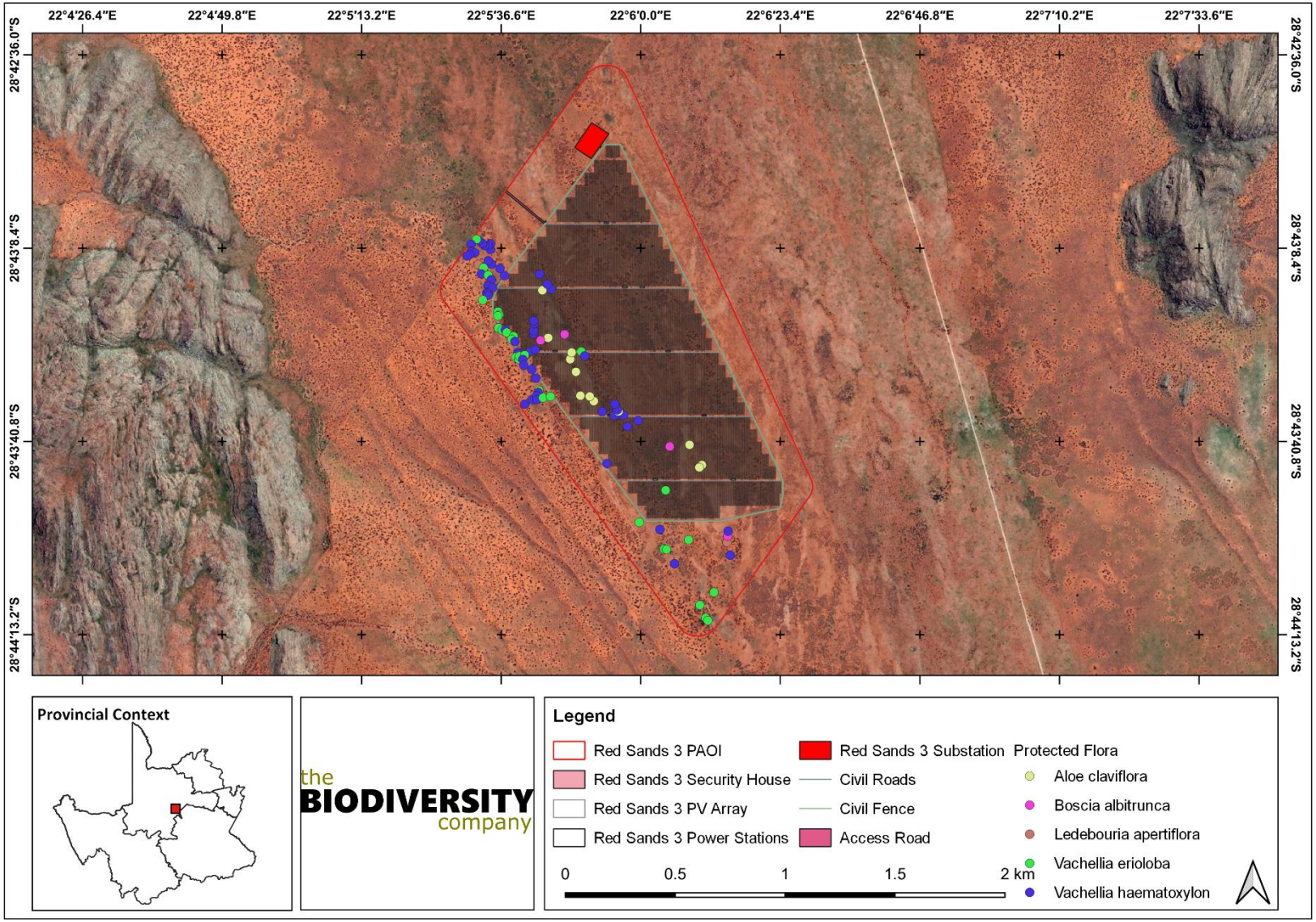


Figure 3-11 Map illustrating the locations of protected flora within the proposed Red Sands PV3 Facility PAOI recorded during the survey period

3.2.1.2 Invasive Alien Plants

Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, it is important that these plants are controlled by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the NEMBA. The Alien and Invasive Species Regulations were published in the Government Gazette No. 44182, 24th of February 2021. The legislation calls for the removal and / or control of AIP species (Category 1 species). In addition, unless authorised thereto in terms of the NWA, no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the NEMBA:

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the Act;
    - The relevant invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the Act.

Notably, no IAP species were recorded within the PAOI. However, invasive species tend to encroach into disturbed areas and should be considered a possible risk.

3.2.2 Fauna Assessment

3.2.2.1 Amphibians

No amphibian species were recorded within the PAOI during the survey period, and it is unlikely to support any amphibian species due to the lack of suitable habitat.

3.2.2.2 Reptiles

Four (4) species of reptile were recorded within the assessment area during the survey period, accounting for 20% of the expected species (Table 3-7, Figure 3-12). None of the species recorded are regarded as threatened, albeit all are protected under provincial legislation. The lack of species diversity within the PAOI is due to the secretive behaviour of many species and therefore, extensive survey periods are required to obtain an accurate representative sample. However, considering the homogenous structure of the PAOI in terms of habitat diversity, it is unlikely to support a highly diverse species assemblage. The Bokpoort CSP EIA indicates that eight reptile species were recorded during the field survey. However, the PAOI considered was larger and possessed a higher habitat diversity. Nevertheless, no threatened species were recorded.

Table 3-7 Summary of reptile species recorded within the proposed Red Sands PV3 Facility PAOI during the survey period. LC = Least Concern

Family	Scientific Name	Common Name	Conservation Status		Protection Status
			Regional	Global	
Agamidae	*Agama aculeata aculeata*	Western Ground Agama	LC	LC	-
Elapidae	*Naja nivea*	Cape Cobra	LC	LC	Schedule 2
Lacertidae	*Heliobolus lugubris*	Bushveld Lizard	LC	LC	Schedule 2
Lacertidae	*Pedioplanis inornata*	Western Sand Lizard	LC	LC	Schedule 2

Figure 3-12 Photograph illustrating individuals of the reptile species recorded within the proposed Red Sands PV3 Facility PAOI during the survey period. A) Naja nivea (Cape Cobra) and B) Pedioplanis inornata (Western Sand Lizard)

3.2.2.3 Mammals

Thirteen (13) mammal species were recorded during the survey based on either direct observation, capture of specimens by passive sampling techniques or the presence of visual tracks and signs (Table 3-8, Figure 3-13 and **Error! Reference source not found.**). This accounts for approximately 26% of the expected species. None of the species recorded are regarded as threatened, either on a regional or global scale. Notably, the Bokpoort CSP EIA had indicated that a single SCC was recorded, namely *Gerbilliscus leucogaster* (Bushveld Gerbil), which was regarded as DD but is presently listed as LC.

Although none of the species are regarded as threatened, many are considered important in maintaining biodiversity and ecosystem functioning. Species such as *Geosciurus inauris* (South African Ground Squirrel) and *Pedetes capensis* (Southern Springhare) are regarded as ecosystem engineers and the burrows they create are also utilised as shelter by an array of faunal species, which is pertinent in the thermally variable and arid environment of the project area. Moreover, these burrowing species can be regarded as keystone species within the landscape, as herbivorous mammal burrows are usually associated with higher levels of soil nutrients and greater degree of water infiltration and can result in elevated foliar nutrient concentrations and greater plant biomass surrounding their burrows (Davidson *et al*, 2012). Therefore, the areas around the burrows are utilised by many species and can result in a highly diverse arthropod community. In addition, the burrows made by *Gerbillurus paeba* (Hairy-footed Gerbil) within the PAOI were observed to be used by reptile species to escape predation.

The PAOI also supports a species rich assemblage of mesocarnivores. Mesocarnivores have strong effects on their prey species, and this especially so in simple ecological communities or in regions where apex predators are lacking (Roemer *et al*, 2009). Consequently, shifts in the population or diversity of the mesocarnivore community may lead to trophic cascade effects.

Table 3-8 Summary of mammal species recorded within the proposed Red Sands PV3 Facility PAOI during the survey period. LC = Least Concern.

Family	Scientific Name	Common Name	Conservation Status		Protection Status
			Regional	Global	
Bovidae	*Raphicerus campestris campestris*	Southern Steenbok	LC	LC	Schedule 2
Canidae	*Otocyon megalotis megalotis*	Southern Bat-eared Fox	LC	LC	Schedule 1
Canidae	*Vulpes chama*	Cape Fox	LC	LC	Schedule 1
Felidae	*Felis lybica cafra*	Southern African Wildcat	LC	LC	Schedule 1
Herpestidae	*Cynictis penicillata bradfieldi*	Desert Yellow Mongoose	LC	LC	Schedule 2
Herpestidae	*Herpestes sanguineus*	Common Slender Mongoose	LC	LC	Schedule 2
Hyaenidae	*Proteles cristata cristata*	Southern Aardwolf	LC	LC	Schedule 1
Leporidae	*Lepus saxatilis*	Scrub Hare	LC	LC	Schedule 2
Muridae	*Gerbillurus paeba*	Hairy-footed Gerbil	LC	LC	Schedule 2
Mustelidae	*Ictonyx striatus striatus*	Southern Striped Polecat	LC	LC	Schedule 1
Pedetidae	*Pedetes capensis*	Southern Springhare	LC	LC	Schedule 2
Sciuridae	*Geosciurus inauris*	South African Ground Squirrel	LC	LC	Schedule 2
Suidae	*Phacochoerus africanus sundevallii*	Southern Warthog	LC	LC	Schedule 2
Viverridae	*Genetta genetta felina*	Southern Small-spotted Genet	LC	LC	Schedule 2

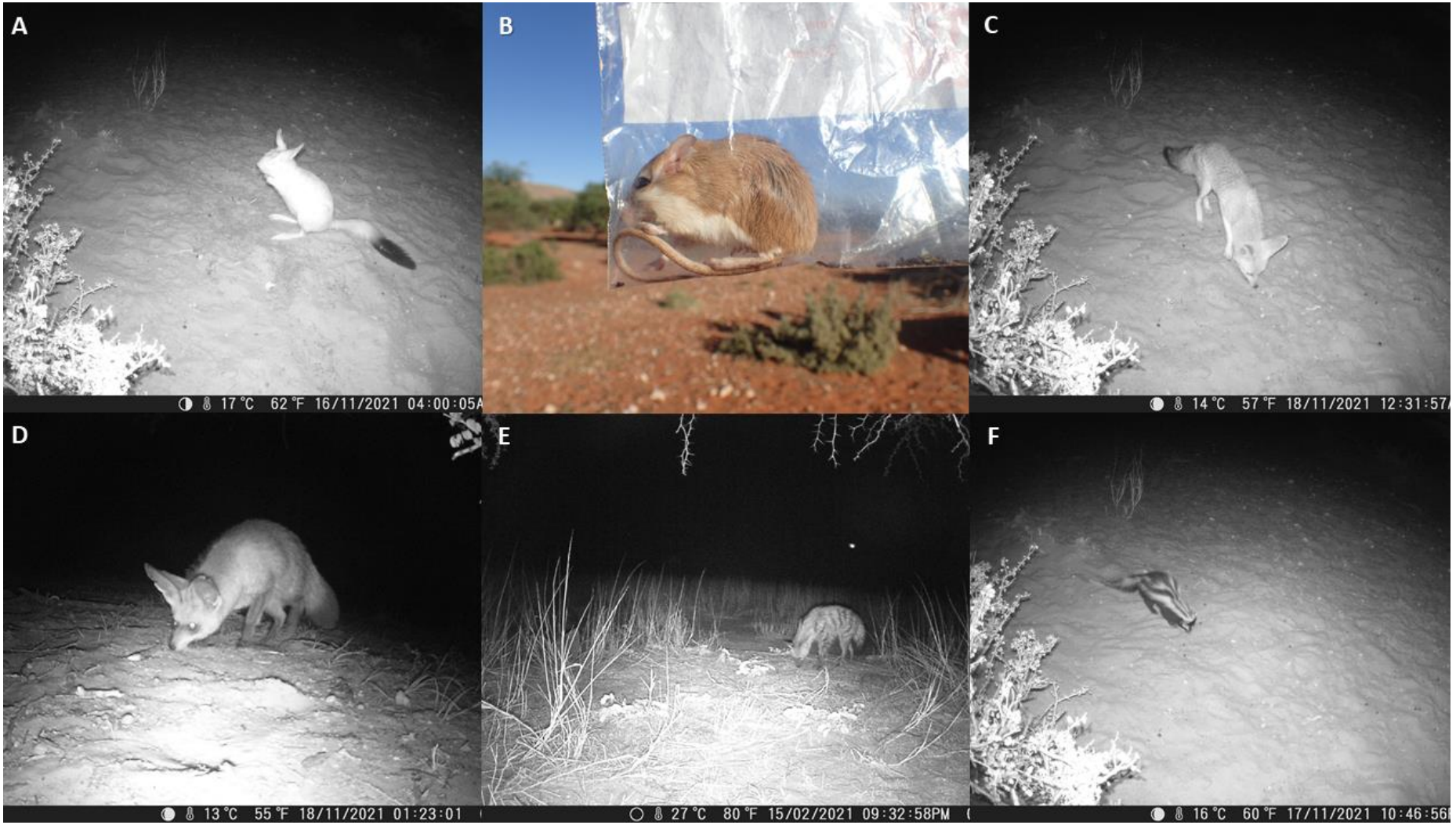


Figure 3-13 ***Photographs illustrating a portion of the mammal species recorded within the proposed Red Sands PV3 Facility PAOI during the survey period. A) Pedetes capensis (Southern Springhare), B) Gerbillurus paeba (Hairy-footed Gerbil), C) Vulpes chama (Cape Fox), D) Otocyon megalotis megalotis (Southern Bat-eared Fox), E) Proteles cristata cristata (Southern Aardwolf) and F) Ictonyx striatus striatus (Southern Striped Polecat)***

4 Habitat Assessment and Site Ecological Importance (SEI)

4.1 Habitat Assessment

The habitat structure within the Red Sands PV3 PAOI was homogeneous, with no distinctive variability, and therefore, a single habitat type was delineated. This was termed Plains Thornveld (Figure 4-1). Photographs illustrating the general structure of the habitat is provided in Figure 4-2. The overall habitat condition can be regarded as degraded due to the dense stands of *Rhigozum trichotomum* (Figure 4-2A-B) and *Senegalia mellifera* subsp. *detinens* in certain areas.

During meandering the PAOI, the species richness of the Formicidae was recorded. Formicidae are reliable indicators of habitat condition because each species or group differ in their tolerance to anthropogenic drivers (Andersen et al, 2002; Gollan et al, 2011). In addition to being reliable bio-indicators, they are important in maintaining ecosystem functioning as they predate on other invertebrate species, turnover soil, control plant pathogens and distribute of myrmecochorous seeds. A standardized method was not utilised as that was beyond the scope of this assessment, but species were recorded while meandering through the PAOI. Due to the arid environment of the project area, a diverse assemblage is not expected under natural conditions. However, the community was not dominated by a single species or generalist species, with arid specialists comprising the community. These included species such as *Ocymyrmex flaviventris* (Figure 4-2C) and *Crematogaster kneri*. This suggests that although degraded, degradation is not severe and there is still a level of good ecological condition.

Two key processes that maintain the wellbeing of savannah ecosystems are fire and herbivory. These drivers influence the dynamics between herbaceous and woody species, thereby maintaining species diversity. The proposed development activity will negatively influence the local ecosystems as fire will be impeded to prevent infrastructure damage and herbivores will be excluded from the area, either due to emigration or direct mortality. In addition, ecosystem engineers would be excluded from the area changing soil properties and vegetation characteristics.

Additional ecosystem processes observed within the PAOI include invertebrate predation and nutrient recycling by the Formicidae species, and as aforementioned, maintenance of soil turnover and nutrient dynamics by burrowing mammals. Notably, although species such as *Grewia flava, Aptosimum albomarginatum*, *Peliostomum leucorrhizum* and *Vachellia haematoxylon* were flowering, pollinators were lacking in diversity, with only some individuals of Halictini (Sweat Bee) observed actively involved in pollination (Figure 4-2D). Communication with a landowner revealed that there was also a noticeable decline in the abundance of *Apis mellifera scutellata* during the past several years. The lack of pollinators is concerning and perhaps is due to the prevailing drought conditions. Therefore, at present, pollination is not a major ecosystem service within the PAOI.

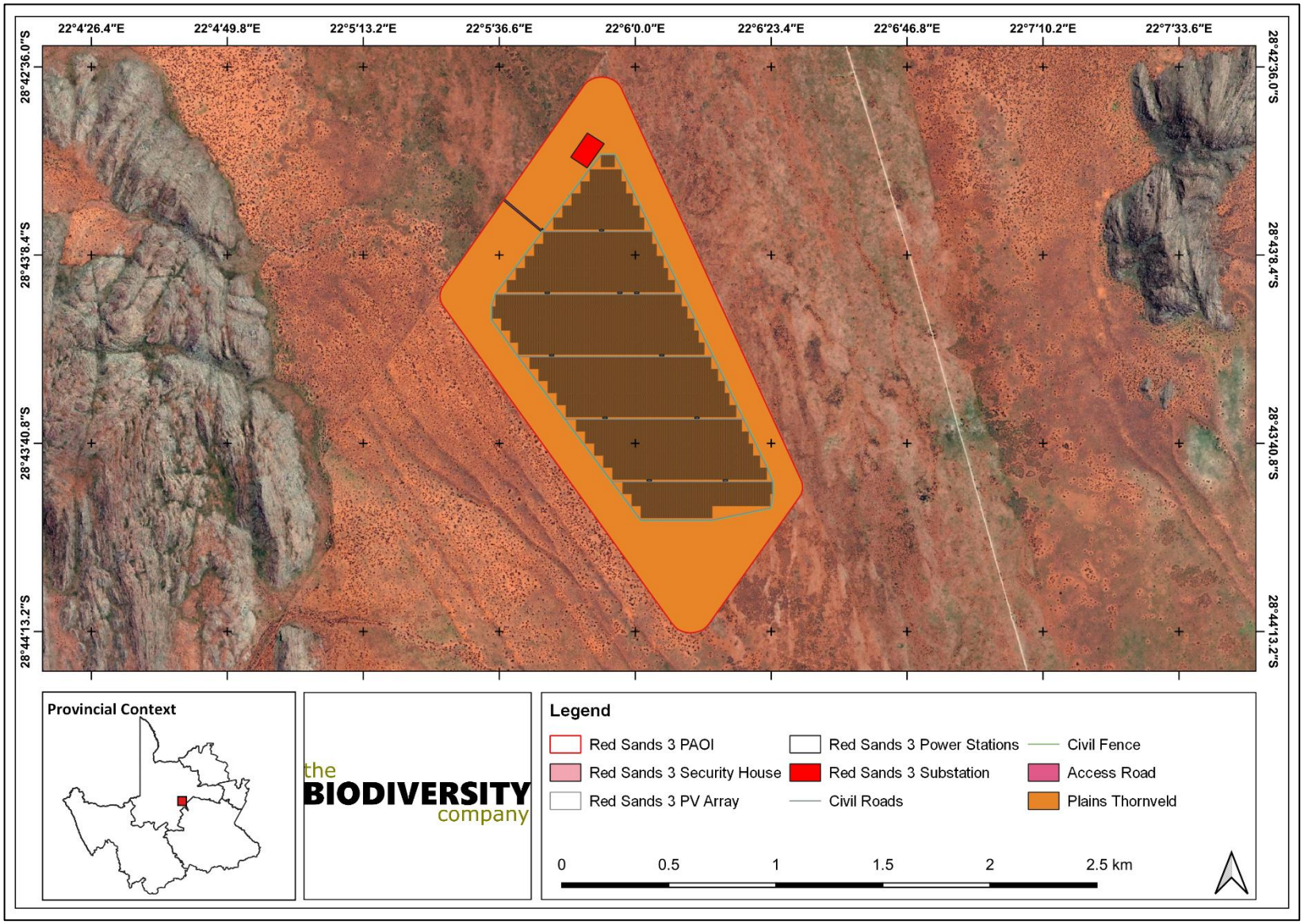


Figure 4-1 Map illustrating the extent of habitat types delineated within the proposed Red Sands PV3 Facility PAOI

Figure 4-2 ***Photograph illustrating an overview of the habitat condition present within the proposed Red Sands PV3 PAOI. A-B) Plains Thornveld with dense stands of Rhigozum trichotomum, C) Ocymyrmex flaviventris and D) Halictini pollinating Aptosimum albomarginatum***

4.2 Site Ecological Importance

The Relative Plant Species Theme Sensitivity as indicated in the screening report was derived to be 'Low' and the Relative Animal Species Theme Sensitivity was derived to be 'Medium' (Figure 4-3).

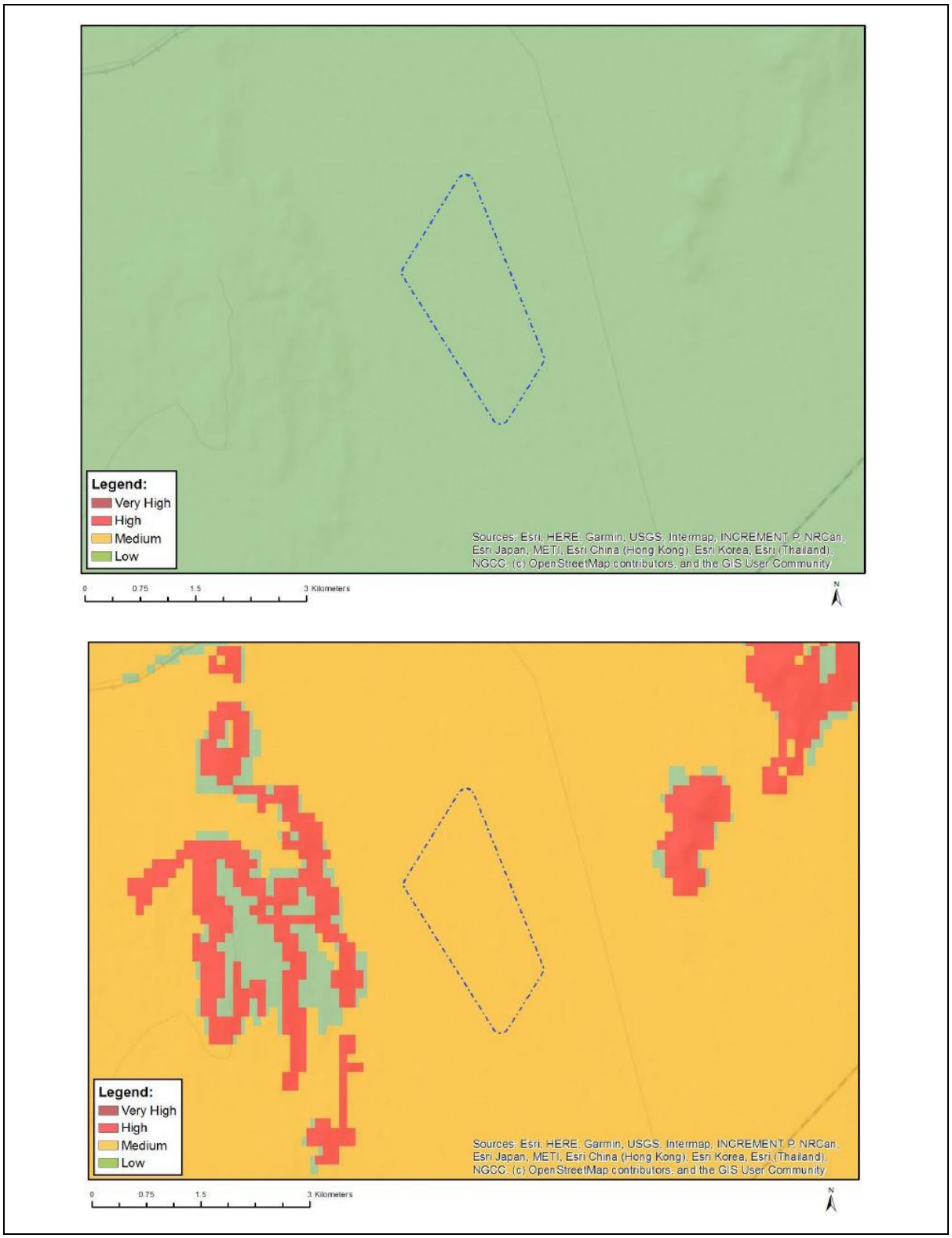


Figure 4-3 Relative Plant Species Theme Sensitivity (top) and Relative Animal Species Theme Sensitivity (bottom) for the proposed Red Sands PV3 Facility PAOI

Based on the criteria provided in Section 0 of this report, all habitats within the assessment area of the proposed development were allocated a sensitivity category, i.e., a SEI category. The Plains Thornveld habitat delineated within the PAOI was categorised as possessing a 'High Sensitivity' (Table 4-1). The SEI of the habitat type delineated within the assessment area are illustrated in Figure 4-4. As aforementioned, the guidelines for interpreting the SEI category are provided in Table 4-2.

Table 4-1 Summary of the proposed Red Sands PV3 PAOI Site Ecological Importance

Habitat (Area [ha])	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Plains Thornveld (218.949)	High Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A.	Very High Very large (> 100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches.	Very High	High	High

Table 4-2 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities (SANBI, 2020)

Site Ecological Importance (SEI)	Interpretation in relation to proposed development activities
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.

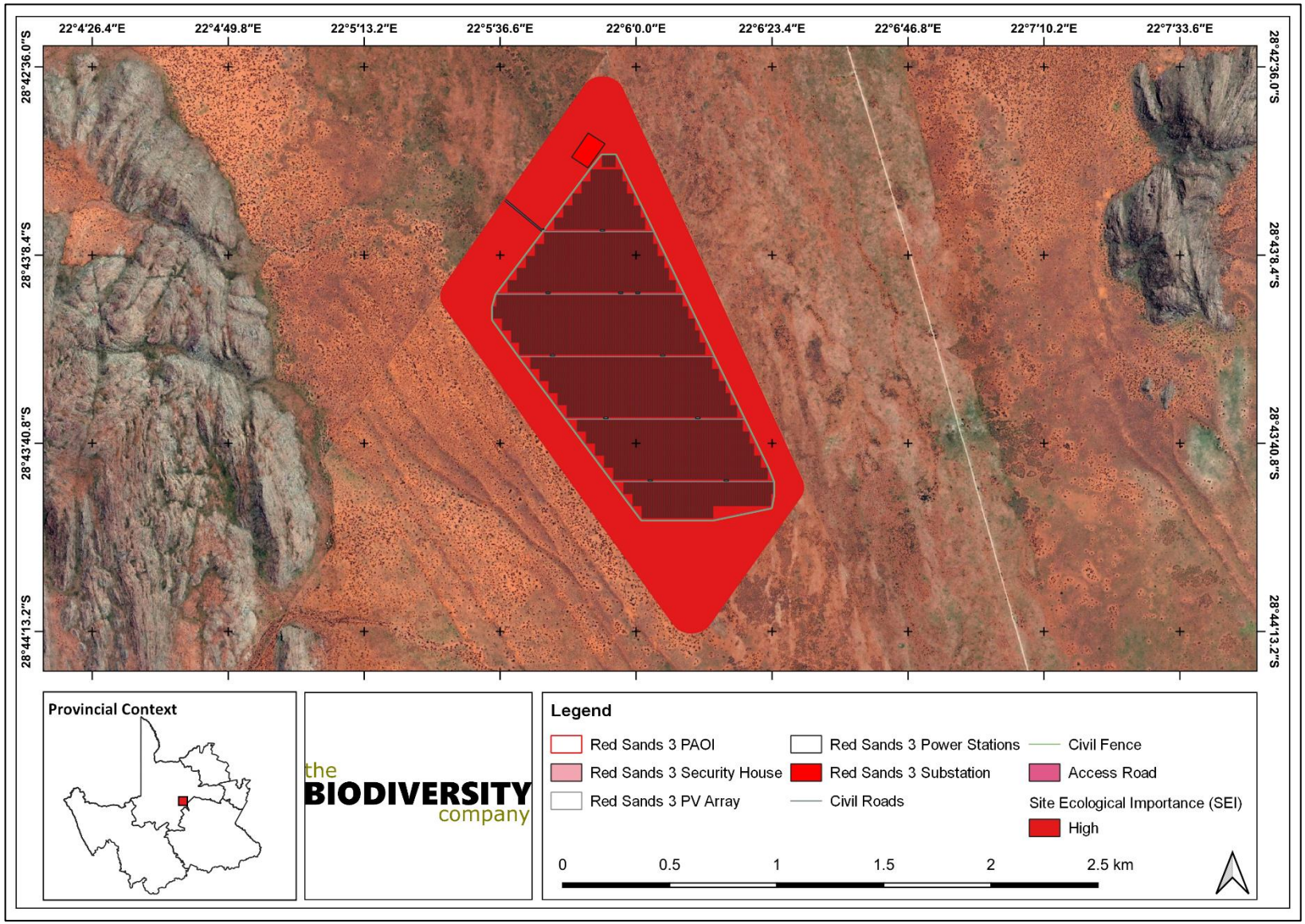


Figure 4-4 Map illustrating the Site Ecological Importance (SEI) of the habitats delineated within the proposed Red Sands PV3 Facility PAOI

4.3 Limits of Acceptable Change

Limits of acceptable change refers to non-negotiable ecological thresholds required to maintain natural capital over time. These are the upper and lower thresholds within which those ecosystems would be resilient to disturbance or change, and beyond which impacts could be irreversible or lead to irreplaceable loss of natural capital. Use of natural resources (biodiversity and ecosystem services) should be at or less than rates of replenishment or renewal or agreed upon thresholds or limits of acceptable change.

The Oliantshoek Plains Thornveld vegetation type occupies a total of 851 768 ha with only a 1% loss (8 517.68 ha). The protected area target for this vegetation type is 16% (136 282 ha). Based on the size of the development (219 ha), approximately 0.025% will be lost. In consideration the LC ecosystem threat status of this vegetation types and the development not overlapping a CBA, the final development footprint is considered to not exceed limits of acceptable change.

5 Impact Assessment

5.1 Present Impacts to Biodiversity

Considering the anthropogenic activities and influences within the landscape, several negative impacts to biodiversity were observed within the PAOI and the surrounding landscape. These include:

- Livestock grazing land-use;
- Persecution and trapping;
- Roads and associated vehicle traffic and road kills;
- Railway line;
- Existing Solar Energy Facilities in the surrounding landscape; and
- Jackal-proof fences.

Figure 5-1 Photographs illustrating impacts to biodiversity A) Roadkill, B-D) Livestock agriculture and E) Jackal-proof fencing

5.2 Alternatives considered

No alternatives were considered.

5.3 Irreplaceable Loss

The current proposed layout of the development will not result in the irreplaceable loss of resources.

5.4 Identification of Additional Potential Impacts

Bennun *et al* (2021) describes three broad types of impacts associated with solar energy development:

- Direct impacts – Impacts that result from project activities or operational decisions that can be predicted based on planned activities and knowledge of local biodiversity, such as habitat loss under the project footprint, habitat frag- mentation as a result of project infrastructure and species disturbance or mortality as a result of project operations;
- Indirect impacts – Impacts induced by, or 'by-products' of, project activities within a project's area of influence; and
- Cumulative impacts – Impacts that result from the successive, incremental and/or combined effects of existing, planned and/or reasonably anticipated future human activities in combination with project development impacts.

The potential impacts during the construction and operation phases of the proposed development are presented in Table 5-1.

Table 5-1 Potential impacts to biodiversity associated with the proposed Red Sands PV3 Facility

Main Impact	**Project activities that can cause loss of habitat**	**Secondary impacts anticipated**
Habitat Destruction	Physical removal of vegetation and surface grading for construction of the Solar Park.	• Displacement/loss of flora & fauna (including SCC) • Increased potential for soil erosion • Habitat fragmentation • Increased potential for establishment of alien & invasive vegetation
Main Impact	**Project activities that can cause the spread and/or establishment of alien and/or invasive species**	**Secondary impacts anticipated**
Spread and/or establishment of alien and/or invasive species into disturbed areas	Vegetation removal	• Habitat loss for indigenous flora & fauna (including potential SCC) • Spreading of potentially dangerous diseases due to invasive and pest species • Increased potential for soil erosion • Alteration of fauna assemblages due to habitat modification
	Vehicles potentially spreading seed	
	Unsanitary conditions surrounding infrastructure promoting the establishment of pest rodents	
Main Impact	**Project activities that can cause the direct mortality of fauna**	**Secondary impacts anticipated**
	Roadkill due to vehicle collision	• Loss of ecosystem services
	Intentional killing of fauna for food (hunting and persecution)	
Main Impact	**Project activities that can cause reduced dispersal/migration of fauna**	**Secondary impacts anticipated**

Reduced dispersal/migration of fauna	Loss of landscape used as corridor	• Loss of ecosystem services • Reduced plant seed dispersal • Reduced gene flow
	Removal of vegetation	
Main Impact	**Project activities that can cause emigration of fauna**	**Secondary impacts anticipated**
Emigration of fauna	Operation of machinery (Large earth moving machinery, generators)	• Loss of ecosystem services
	Reflection of solar panel arrays	
	Heavy vehicle use	
	Outside lighting	

5.5 Assessment of Impact Significance

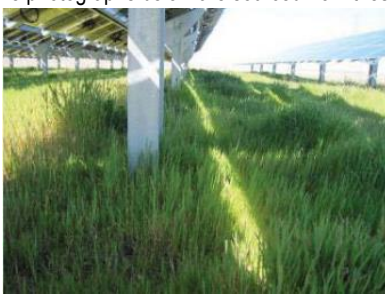
The assessment of impact significance was undertaken in consideration of the following:

- Extent of impact;
- Duration of impact;
- Magnitude of impact;
- Probability of impact; and
- Reversibility.

The assessment of impact significance considers pre-mitigation as well as implemented post-mitigation scenarios. Three phases were considered for the impact assessment:

- Construction Phase;
- Operational Phase; and
- Closure/Rehabilitation Phase.

5.5.1 Construction Phase

Impact Nature: Loss of habitat within development footprint		
There will be a loss of natural vegetation and habitat due to construction of the solar energy facility. This impact was considered for both the construction and operational phases.		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	High	Medium
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, albeit to a limited extent.	
Mitigation:		
• Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both fossorial and epigeic biodiversity (Bennun et al, 2021). If concrete foundations are used that would increase the impact of the project as there would be direct impacts to soil permeability and characteristics, thereby influencing inhabitant fauna. In addition, stormwater runoff and runoff from cleaning the panels would be increased, increasing erosion in the surrounding areas. • Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018). The photographs below are sourced from these documents.   • Vegetation clearing to commence only after the necessary permits have been obtained. • Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities.		
Residual Impacts:		
The loss of indigenous vegetation is an unavoidable consequence of the development and cannot be entirely mitigated. The residual impact would be moderate.		

Impact Nature: Degradation and loss of surrounding natural habitat		
Degradation and loss of surrounding natural vegetation arising from construction activities if these are allowed to penetrate into the surrounding area.		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Very short term (1)
Magnitude	Moderate (6)	None (0)
Probability	Highly probable (4)	Improbable (2)
Significance	Medium	Low

Impact Nature: Degradation and loss of surrounding natural habitat		
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, remaining within demarcated construction areas etc. • All construction activity and roads to be within the clearly defined and demarcated areas. • Temporary laydown areas should be clearly demarcated and rehabilitated subsequent to end of use. • Appropriate dust control measures to be implemented. • Suitable sanitary facilities to be provided for construction staff as per the guidelines in Health and Safety Act. • All hazardous materials, if any, 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.		
Residual Impacts:		
It is unlikely that residual impacts are expected if the appropriate mitigation measures are implemented. However, there may still be minimal degradation due to dust precipitation.		

Impact Nature: Direct mortality of fauna		
Construction activity will likely lead to direct mortality of fauna due to earthworks, vehicle collisions, accidental hazardous chemical spills and persecution.		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	MIinor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	Medium	Low
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, vehicle collisions, poaching, and persecution can be mitigated.	
Mitigation:		
• All personnel should undergo environmental induction with regards to fauna and awareness about not harming or collecting species. • Prior to commencing work each day, two individuals should traverse the working area in order to disturb any fauna and so they have a chance to vacate. • Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist. • All construction vehicles should adhere to a speed limit of maximum 40 km/h to avoid collisions. Appropriate speed control measures and signs must be erected. • All hazardous materials, if any, 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. • Any excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Excavations should only be dug when they are required and should be used and filled shortly thereafter.		
Residual Impacts:		
It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.		

Impact Nature: Emigration of fauna due to noise pollution		
Construction activity will likely lead to the emigration of fauna due to noise pollution.		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Moderate (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium	Medium
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, but only to a limited extent. The mitigation of noise pollution during construction is difficult to mitigate against	
Mitigation:		
• Considering that many of the mammal fauna recorded within the project area are nocturnal, no construction activity is to occur at night.		
Residual Impacts:		
It is probable that some individuals of susceptible species will emigrate due to the noise generated from the construction activity. However, this is not likely to impact the viability of the local population of any fauna species.		

5.5.2 Operational Phase

Impact Nature: Loss of habitat within development footprint		
There will be a loss of natural vegetation and habitat due to construction of the solar energy facility. This impact was considered for both the construction and operational phases.		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	High	Medium
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, albeit to a limited extent.	
Mitigation:		
• Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both below and above-ground biodiversity (Bennun et al, 2021). • Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018). The photographs below are sourced from these documents.		

Impact Nature: Loss of habitat within development footprint
 
• Vegetation clearing to commence only after the necessary permits have been obtained. • Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities.
Residual Impacts:
The loss of indigenous vegetation is an unavoidable consequence of the development and cannot be entirely mitigated. The residual impact would be moderate.

Impact Nature: Encroachment of Invasive Alien Plants into disturbed areas		
Invasive Alien Plants (IAPs) tend to encroach into disturbed areas and can outcompete/displace indigenous vegetation.		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Moderate (3)
Duration	Permanent (5)	Very short term (1)
Magnitude	High (8)	MIinor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	High	Low
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• An IAP Management Plan must be written for the development. • Regular monitoring for IAP encroachment during the operation phase to ensure that no alien invasion problems have developed as result of the disturbance. This should be every 3 months during the first two years of the operation phase and every six months for the life of the project. • All IAP species must be removed/controlled using the appropriate techniques as indicated in the IAP management plan.		
Residual Impacts:		
Based on the lack of IAPs within the development area and the implementation of an IAP Management Plan there are unlikely to be residual impacts		

Impact Nature: Soil erosion and continued habitat degradation		
Disturbance created during the construction phase will leave the development area vulnerable to erosion		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Moderate (3)
Duration	Permanent (5)	Very short term (1)
Magnitude	High (8)	MIinor (2)
Probability	Highly probable (4)	Improbable (2)

Impact Nature: Soil erosion and continued habitat degradation		
Significance	High	Low
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• A Rehabilitation Plan must be written for the development area and ensured that it be adhered to. • Access roads should have run-off control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. • All erosion observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • There should be follow-up rehabilitation and re-vegetation of any remaining denuded areas with local indigenous perennial shrubs and succulents from the area.		
Residual Impacts:		
There is still the potential for erosion but would have a low impact.		

Impact Nature: Impacts to fauna movement patterns due to reflection effects		
The reflection caused by solar panels may affect the movement patterns of fauna within the landscape		
	Without Mitigation	**With Mitigation**
Extent	High (4)	High (4)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	MIinor (2)
Probability	Probable (3)	Probable (3)
Significance	Medium	Low
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Non-polarising white tape can be used around and/or across panels to minimise reflection (Bennun *et al*, 2021).		
Residual Impacts	There is still the potential for reflection impacts but would have a low impact.	

Impact Nature: Disturbance or persecution of fauna		
The operation and maintenance of the Solar Energy Facility may lead to disturbance or persecution of fauna in the vicinity of the development.		
	Without Mitigation	**With Mitigation**
Extent	Low (2)	Low (2)
Duration	Long term (4)	Very short term (1)
Magnitude	High (8)	Minor (2)
Probability	Probable (3)	Very improbable (1)
Significance	**Medium**	**Low**

Impact Nature: Disturbance or persecution of fauna		
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• All staff are to be educated on the importance of local fauna and must be made aware that no poaching or persecution is allowed. • Any fauna threatened by the maintenance and operational activities should be removed to a safe location by an appropriate individual. • All vehicles accessing the site should adhere to a max 40 km/h max to avoid collisions. Appropriate signs must be erected. • If any excavations are to be dug these must not be left open for more than a few hours without ramps for trapped fauna to leave and must be filled at night.		
Residual Impacts:		
Disturbance from maintenance activities will occur albeit at a low and infrequent level.		

5.5.3 Decommissioning/Rehabilitation Phase

Impact Nature: Direct mortality of fauna		
Decommissioning activity will likely lead to direct mortality of fauna due to earthworks, vehicle collisions and persecution.		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	MIinor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	Medium	Low
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, vehicle collisions, poaching, and persecution can be mitigated.	
Mitigation:		
• All personnel should undergo environmental induction with regards to fauna and awareness about not harming or collecting species. • Prior to commencing work each day, two individuals should traverse the working area in order to disturb any fauna and so they have a chance to vacate. • Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist. • All construction vehicles should adhere to a speed limit of maximum 40 km/h to avoid collisions. Appropriate speed control measures and signs must be erected. • All hazardous materials, if any, 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. • Any excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Excavations should only be dug when they are required and should be used and filled shortly thereafter.		
Residual Impacts:		
It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.		

Impact Nature: Continued habitat degradation		
Disturbance created during decommissioning will leave the development area vulnerable to erosion and alien plant invasion for several years.		
	Without Mitigation	**With Mitigation**
Extent	Moderate (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Medium (3)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	Medium	Low
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	Yes	No
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation:		
• Rehabilitation in accordance with the Rehabilitation Plan for the development must be undertaken in areas disturbed during the decommissioning phase. • Monitoring of the rehabilitated area must be undertaken at quarterly intervals for 3 years after the decommissioning phase. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous flora.		
Residual Impacts:		
No significant residual risks are expected, although IAP encroachment and erosion might still occur but would have a negligible impact if effectively managed.		

5.6 Cumulative Impacts

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system.

This section describes the cumulative potential impacts of the project on biodiversity. Cumulative impacts are assessed in context of the extent of the proposed development area, other developments in the area, as well as general habitat loss and transformation resulting from other activities in the area.

Presently, the surrounding immediate and broader landscape consists of natural vegetation used for supporting livestock and to a lesser extent game, with energy generation and distribution facilities and infrastructure, as well as a road and rail network. The South African Renewable Energy EIA Application Database (DFFEb, 2021) was used to determine the presence of additional energy facilities within the surrounding landscape. This database contains spatial data for renewable energy applications for environmental authorisation. It includes spatial and attribute information for both active (in process and with valid authorisations) and non-active (lapsed or replaced by amendments) applications. Data is

captured and managed on a parcels level as well as aggregated to the project level at the boundary level. Considering the approved and in process developments within the surrounding landscape (Figure 5-2), the expected cumulative impact is expected to be of a 'High' significance.

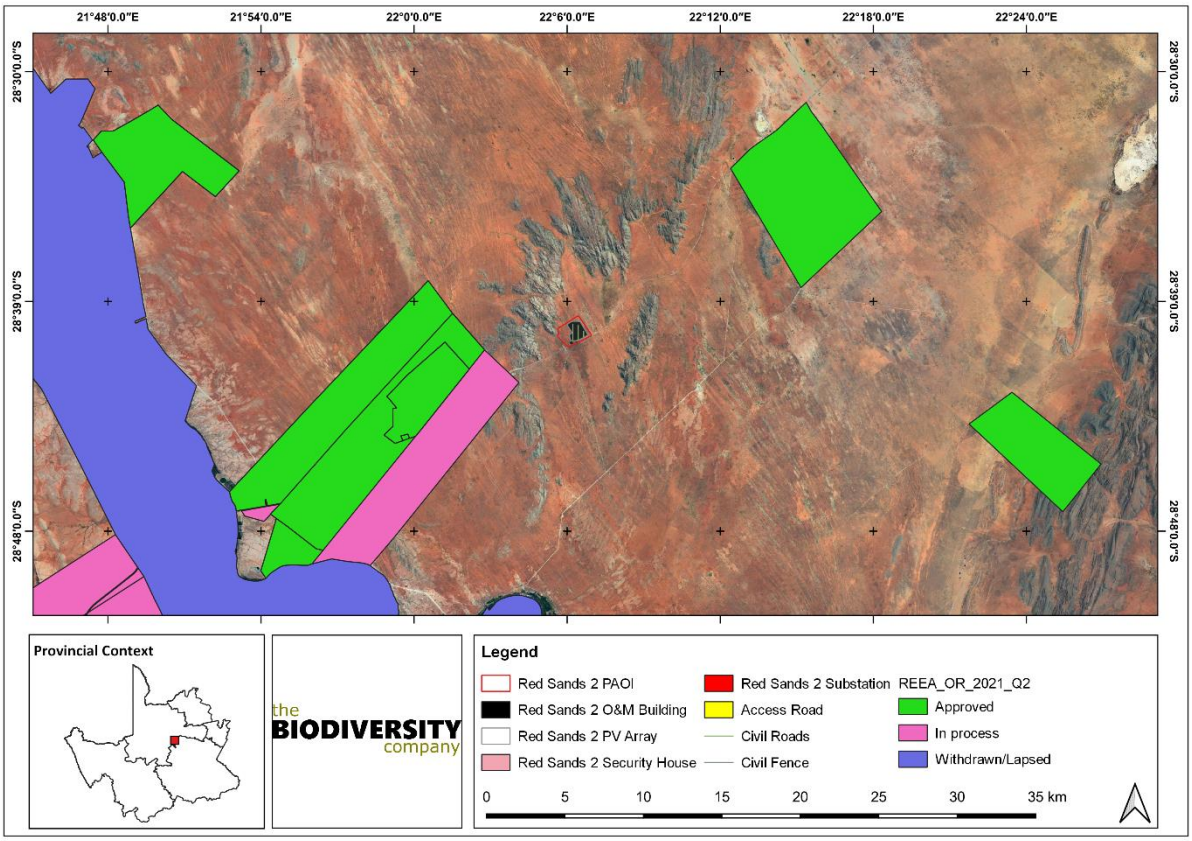


Figure 5-2 Map illustrating additional renewable energy developments within the landscape in relation to the proposed Red Sands PV3 Facility

Impact Nature: Cumulative habitat loss within the region		
The development of the proposed Red Sands PV3 Facility Cluster will contribute to cumulative habitat loss within Other Natural Areas and Ecological Support Areas within the landscape.		
	Overall impact of the proposed development considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (2)	Moderate (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	High (8)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium	High
Status	Negative	Negative
Reversibility	High	Moderate
Irreplaceable loss of resources	No	Yes, in certain cases
Can impacts be mitigated	To some degree, but the majority of the impact results from the presence of the various energy facilities cannot be well mitigated.	
Mitigation: Ensure that a rehabilitation plan and IAP management plan be compiled for each development and are effectively implemented. . Set-aside areas (Avoidance areas) should be established in order to conserve natural habitats where possible. This has already been considered for this project.		

5.7 Unplanned Events

The planned activities will have known impacts as discussed above; however, unplanned events may occur on any project and may have potential impacts which will need mitigation and management.

Table 5-2 is a summary of the findings of an unplanned event assessment from a terrestrial ecology perspective. Note, not all potential unplanned events may be captured herein, and this must therefore be managed throughout all phases according to recorded events.

Table 5-2 Summary of unplanned events for terrestrial biodiversity

Unplanned Event	Potential Impact	Mitigation
Hydrocarbon spills into the surrounding environment from heavy machinery during the construction phase	Contamination of soil leading to mortality of flora and fauna.	A spill response kit must always be available. The incident must be reported on and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Fire	Uncontrolled/unmanaged fire that spreads to surrounding natural habitats that result in habitat destruction and fauna mortality. Although fires are a feature of savannah habitats, incorrect timing of the fire can have considerably negative effects.	Appropriate/Adequate fire management plan needs to be implemented.

5.8 Biodiversity Impact Management Actions

The purpose of the Biodiversity Impact Management Actions to inform on the mitigations required to lower the risk of the impacts associated with the proposed activity, provide measures for improving the conservation value of the property and to be able to be inserted into the Environmental Management Programme (EMPr). The mitigation actions required to reduce the significance of the impacts associated with the development are provided in Table 5-3.

Table 5-3 The Biodiversity Impact Management Actions for the proposed Red Sands PV3 Facility

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Vegetation and Habitats				
The areas to be developed/mined must be specifically demarcated to prevent movement into surrounding environments.	Life of operation	Project Manager Environmental Officer	Development footprint	Ongoing
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further.	Life of operation	Project Manager Environmental Officer	Areas of indigenous vegetation	Ongoing
Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both below and above-ground biodiversity	Life of operation	Project Manager Environmental Officer	Development footprint	Ongoing
Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018).	Life of operation	Project Manager Environmental Officer	Areas of indigenous vegetation	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are indigenous to this vegetation type.	Decommissioning Phase/Rehabilitation phase	Project Manager Environmental Officer	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to three years after the closure
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing
Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.	Life of operation	Environmental Officer & Contractor	Leaks and spills	Ongoing
A fire management plan needs to be complied to restrict the impact of fire. This is especially concerning stochastic fire events such as discarding of lit cigarette butts and/or glowing embers from cooking fires.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
Management outcome: Fauna				

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals	Construction Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed Signs must be put up to enforce this and must be made a punishable offence	Life of operation	Environmental Officer	Evidence of trapping, dead animals, etc.	Ongoing
The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on fauna	Construction/Operational Phase	Project Manager Environmental Officer	Construction/Closure Phase	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (yellow) lights should be used wherever possible.	Construction/Operational Phase	Project Manager Environmental Officer	Light pollution and period of light.	Ongoing
Wildlife friendly fences must be incorporated into the design. A tunnel underpass of a height of 500 mm will be acceptable for small mammals. Pre-fabricated concrete elements are appropriate for rectangular tunnels. Metal pipes must be avoided. This will also ensure fences are not damaged by burrowing activity.	Operational	Project Manager Environmental Officer Design Engineer	Fauna movement	Ongoing
Management outcome: Invasive Alien Species				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Compilation of and implementation of an Invasive Alien Plant Management Plan	Life of operation	Project Manager Environmental Officer	Assess presence and encroachment of alien vegetation	Quarterly monitoring
A pest control plan must be put in place and implemented; it is imperative that poisons not be used due to the presence of indigenous fauna.	Life of operation	Environmental Officer Health and Safety Officer	Evidence or presence of pests	Ongoing
Management outcome: Dust				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Reducing the dust generated by construction activities, especially the earth moving machinery, through wetting the soil surface (with “dirty water”) and putting up signs to enforce speed limit as well as speed. It is recommended that a wind fence be implemented for the construction phase of the project, especially due the sandy nature of the soil.	Construction	Project Manager Environmental Officer	Dust pollution levels	Ongoing
Management outcome: Waste Management				
Impact Management Actions	Implementation		Monitoring	

	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored adequately. Refuse bins must be secured. Temporary storage of domestic waste shall be in covered waste skips.	Life of operation	Environmental Officer Health and Safety Officer	Presence of waste	Life of operation
The ratio of toilets to staff must be provided as per the requirements in the Health and Safety Act. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
Refuse bins must be secured .Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer Contractor Health and Safety Officer	Management of bins and collection of waste	Ongoing, every 10 days
All solid waste collected shall be disposed of at a licensed disposal facility. Under no circumstances may domestic waste be burned on site	Life of operation	Environmental Officer Health and Safety Officer	Availability of bins and the collection of the waste.	Ongoing
Management outcome: Environmental awareness training				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff on the importance, biology, habitat requirements and management requirements of the Environmental Authorisation.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Management outcome: Erosion				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Appropriate drainage must be constructed along the access roads in order to slow the flow of water run-off from the road surface.	Operational	Project Manager Design Engineer	Water runoff from road surfaces	Ongoing
Areas that are denuded during construction that do not have infrastructure during the operational phase must be re-vegetated with indigenous vegetation to prevent erosion.	Operational	Project Manager Environmental Officer	Re-establishment of indigenous vegetation	Quarterly for the first 2 years. Thereafter, annually for the life of the project
A row of indigenous trees can be planted along the boundary to act as wind break to impede erosion.	Operational	Project Manager Environmental Officer	Re-establishment of indigenous vegetation	Quarterly for the first 2 years. Thereafter, annually for the life of the project
All areas affected by the development must be re-vegetated with indigenous vegetation to prevent erosion on an extensive temporal scale.	Rehabilitation	Project Manager Environmental Officer	Re-establishment of indigenous vegetation	Quarterly for 3 years after decommissioning

6 Conclusion and Impact Statement

6.1 Conclusion

The aim of this Biodiversity Impact Assessment was to provide information to guide the risk of the proposed Red Sands PV3 Facility to the ecosystems affected by its development and their inherent fauna and flora.

Based on the latest available ecologically relevant spatial data the following information is pertinent to the project area:

- It is recognised as an Other Natural Area as per the Northern Cape CBA database;
- The Combined Animal Species Theme Sensitivity was rated as 'Moderate' according the Environmental Screening Tool; and
- The Ecosystem Protection Level for the vegetation types associated with the development footprint are regarded as Poorly Protected.

The habitats present within the PAOI are not diverse and considered to be homogenous. However, based on the ecological condition and the diversity of mesocarnivores, the area possesses biodiversity value. The SEI was determined to 'High' based on the high likelihood of occurrence for a globally VU species, the extent of the area considered and its connectivity to natural areas within the landscape. This VU species has not been located within the PAOI but there is a high likelihood of occurrence as it was observed within the surrounding landscape.

6.2 Impact Statement

The main expected impact of the proposed Red Sands 3 Solar PV Cluster will be the loss of habitat and emigration of fauna. Based on the outcomes of the SEI determination, the project possesses a 'High' SEI. This denotes that avoidance mitigation wherever possible must be implemented. This includes changes to project infrastructure design to limit the amount of habitat impacted. In order to appreciate the extent of 'avoidance' achieved for the project, the three proposed PV facilities have been jointly considered, the following is noteworthy:

- The footprint areas for the three facilities amounts to 403 ha, with a total area of 164 ha being avoided within the respective project areas combined;
- The total extent of the entire Kheis farm area comprising five portions measures 21,464 ha, thus approximately 2% of the farm area will be developed; and
- The extent of the two farm portions (PV 1 and PV 2 are located on 2/386, and PV 3 is located on 19/387) with 'High' SEI habitat directly affected by the project area measures 8,668 ha; thus approximately 5% of the two farm portions will be developed.

The project area has been designated as a REDZ (Renewable Energy Development Zone) and taking into consideration the extent of 'avoidance' achieved for the project, it is the opinion of the specialist that the authorisation of the proposed project may be favourably considered.

It is recommended that should any future developments be proposed for the remaining extent of the ‘High’ and ‘Very High’ areas within the Kheis farm area, that compensation strategies be required for these authorisations.

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8 Appendix Items

8.1 Appendix A – Protocol Checklist

"Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity" gazetted 20 March 2020, published in Government Notice No. 320

Paragraph	Item	Pages	Comment
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	i	
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	4	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these.	37, 39	
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site	37, 39	
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna.	19	
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments.	19, 21-24	
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: (a) main vegetation types; (b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified.	16, 25-27, 39	
2.3.6	The assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification.	-	No "low" sensitivity areas were identified due to the ecological condition of the site.
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: (a) the reasons why an area has been identified as a CBA; (b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation; (c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s); (d) the impact on ecosystem threat status; (e) the impact on explicit subtypes in the vegetation; (f) the impact on overall species and ecosystem diversity of the site; and (g) the impact on any changes to threat status of populations of species of conservation concern in the CBA.	-	No CBAs recorded within the assessment area
2.3.7.2	Terrestrial ecological support areas (ESAs), including: (a) the impact on the ecological processes that operate within or across the site; (b) the extent the proposed development will impact on the functionality of the ESA; and (c) loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna.	-	No ESAs recorded within the assessment area
2.3.7.3	Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- (a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan.	18-19	

2.3.7.4	Priority areas for protected area expansion, including- (a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network.	-	Does not overlap NPAES areas
2.3.7.5	SWSAs including: (a) the impact(s) on the terrestrial habitat of a SWSA; and (b) the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses)	-	Does not overlap a SWSA
2.3.7.6	FEPA sub catchments, including- (a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment	23-24	
2.3.7.7	indigenous forests, including: (a) impact on the ecological integrity of the forest; and (b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.	-	No forest habitats within the area
3.1.1.	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae.	Cover page i	
3.1.2	A signed statement of independence by the specialist.	84-85	
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment.	9-10	
3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant.	6-15	
3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations.	4	
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant).	-	No areas unsuitable for development identified
3.1.7	Additional environmental impacts expected from the proposed development.	47-48	
3.1.8	Any direct, indirect and cumulative impacts of the proposed development.	48-49, 55-56	
3.1.9	The degree to which impacts and risks can be mitigated.	50-56	
3.1.10	The degree to which the impacts and risks can be reversed.	50-56	
3.1.11	The degree to which the impacts and risks can cause loss of irreplaceable resources.	48, 50-56	
3.1.12	Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr).	58-60	
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a “low” terrestrial biodiversity sensitivity and that were not considered appropriate.	-	N/A
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not;	61	
3.1.15	any conditions to which this statement is subjected	61	

8.2 Appendix B – Flora species expected to occur in the project area

Family	Species Name	Conservation Status	Endemism
Acanthaceae	*Acanthopsis hoffmannseggiana*	DD	
Acanthaceae	*Barleria lichtensteiniana*	LC	
Acanthaceae	*Barleria rigida*	LC	
Acanthaceae	*Blepharis integrifolia var. integrifolia*	LC	
Acanthaceae	*Blepharis mitrata*	LC	
Acanthaceae	*Dicliptera cernua*	LC	
Acanthaceae	*Justicia australis*	LC	
Acanthaceae	*Justicia distichotricha*	LC	
Acanthaceae	*Justicia divaricata*	LC	
Acanthaceae	*Justicia incana*	LC	
Acanthaceae	*Justicia puberula*	LC	Endemic
Acanthaceae	*Justicia spartioides*	LC	
Acanthaceae	*Justicia thymifolia*	LC	Endemic
Acanthaceae	*Petalidium aromaticum var. canescens*	LC	
Aizoaceae	*Aizoon burchellii*	LC	
Aizoaceae	*Aizoon schellenbergii*	LC	
Aizoaceae	*Dinteranthus wilmotianus*	NT	Endemic
Aizoaceae	*Galenia africana*	LC	
Aizoaceae	*Galenia namaensis*	LC	
Aizoaceae	*Galenia sarcophylla*	LC	
Aizoaceae	*Mesembryanthemum articulatum*	LC	
Aizoaceae	*Mesembryanthemum coriarium*	LC	
Aizoaceae	*Mesembryanthemum crystallinum*	LC	
Aizoaceae	*Mesembryanthemum guerichianum*	LC	
Aizoaceae	*Mesembryanthemum noctiflorum subsp. stramineum*	LC	
Aizoaceae	*Mesembryanthemum subnodosum*	LC	
Aizoaceae	*Mesembryanthemum tetragonum*	LC	
Aizoaceae	*Mesembryanthemum vaginatum*	LC	Endemic
Aizoaceae	*Mestoklema arboriforme*	LC	Endemic
Aizoaceae	*Mestoklema copiosum*	LC	Endemic
Aizoaceae	*Nananthus margaritiferus*	LC	
Aizoaceae	*Plinthus sericeus*	LC	
Aizoaceae	*Ruschia canonotata*	LC	
Aizoaceae	*Ruschia hamata*	LC	
Aizoaceae	*Ruschia ruralis*	LC	Endemic
Aizoaceae	*Tetragonia arbuscula*	LC	
Aizoaceae	*Tetragonia calycina*	LC	
Aizoaceae	*Tetragonia fruticosa*	LC	
Aizoaceae	*Titanopsis calcarea*	LC	Endemic
Alliaceae	*Tulbaghia tenuior*	LC	
Amaranthaceae	*Amaranthus dinteri subsp. dinteri*	NE	
Amaranthaceae	*Amaranthus dinteri subsp. dinteri*	NE	
Amaranthaceae	*Cyphocarpa angustifolia*	LC	
Amaranthaceae	*Hermbstaedtia fleckii*	LC	

Family	Species Name	Conservation Status	Endemism
Amaranthaceae	*Hermbstaedtia odorata*	LC	
Amaranthaceae	*Leucosphaera bainesii*	LC	
Amaranthaceae	*Salsola glabrescens*	LC	
Amaranthaceae	*Salsola tuberculata*	LC	
Amaranthaceae	*Salsola tuberculatiformis*	LC	
Amaranthaceae	*Salsola zeyheri*	LC	
Amaranthaceae	*Sericocoma avolans*	LC	
Amaranthaceae	*Sericocoma heterochiton*	LC	
Amaranthaceae	*Sericorema remotiflora*	LC	
Amaranthaceae	*Suaeda caespitosa*	LC	Endemic
Amaryllidaceae	*Crinum bulbispermum*	LC	
Amaryllidaceae	*Nerine laticoma*	LC	
Anacampserotaceae	*Anacampseros albissima*	LC	
Anacampserotaceae	*Anacampseros filamentosa subsp. tomentosa*	LC	
Anacardiaceae	*Searsia ciliata*	LC	
Anacardiaceae	*Searsia lancea*	LC	
Anacardiaceae	*Searsia leptodictya forma leptodictya*	NE	
Anacardiaceae	*Searsia pendulina*	LC	
Anacardiaceae	*Searsia pyroides var. pyroides*	LC	
Anacardiaceae	*Searsia tridactyla*	LC	Endemic
Apocynaceae	*Adenium oleifolium*	LC	
Apocynaceae	*Asclepias stellifera*	LC	
Apocynaceae	*Cynanchum viminale subsp. viminale*	LC	
Apocynaceae	*Fockea angustifolia*	LC	
Apocynaceae	*Gomphocarpus tomentosus subsp. tomentosus*	LC	
Apocynaceae	*Huernia hystrix subsp. hystrix*	LC	
Apocynaceae	*Larryleachia marlothii*	LC	
Apocynaceae	*Microloma longitubum*	LC	
Apocynaceae	*Orbea lutea subsp. lutea*	LC	
Apocynaceae	*Orbea variegata*	LC	Endemic
Apocynaceae	*Orthanthera jasminiflora*	LC	
Apocynaceae	*Pachycarpus dealbatus*	LC	
Asparagaceae	*Asparagus cooperi*	LC	
Asphodelaceae	*Aloe claviflora*	LC	
Asphodelaceae	*Aloidendron dichotomum*	VU	Near-endemic
Asphodelaceae	*Haworthiopsis tessellata*	LC	
Asphodelaceae	*Trachyandra laxa var. rigida*	LC	
Asteraceae	*Amellus tridactylus subsp. arenarius*	LC	
Asteraceae	*Amphiglossa tecta*	LC	Endemic
Asteraceae	*Arctotis leiocarpa*	LC	
Asteraceae	*Arctotis venusta*	LC	
Asteraceae	*Berkheya annectens*	LC	
Asteraceae	*Berkheya ferox var. tomentosa*	LC	
Asteraceae	*Berkheya spinosissima subsp. spinosissima*	LC	
Asteraceae	*Brachylaena ilicifolia*	LC	

Family	Species Name	Conservation Status	Endemism
Asteraceae	*Cineraria geraniifolia*	LC	Endemic
Asteraceae	*Cineraria saxifraga*	LC	Endemic
Asteraceae	*Cotula sericea*	LC	Endemic
Asteraceae	*Dicoma capensis*	LC	
Asteraceae	*Dimorphotheca cuneata*	LC	
Asteraceae	*Dimorphotheca pluvialis*	LC	
Asteraceae	*Dimorphotheca polyptera*	LC	
Asteraceae	*Dimorphotheca sinuata*	LC	
Asteraceae	*Dimorphotheca zeyheri*	LC	
Asteraceae	*Doellia cafra*	LC	
Asteraceae	*Eriocephalus ambiguus*	LC	
Asteraceae	*Eriocephalus macroglossus*	NT	Endemic
Asteraceae	*Eriocephalus merxmuelleri*	LC	
Asteraceae	*Euryops brachypodus*	LC	Endemic
Asteraceae	*Euryops brevipapposus*	LC	
Asteraceae	*Euryops chrysanthemoides*	LC	Endemic
Asteraceae	*Euryops subcarnosus subsp. vulgaris*	LC	
Asteraceae	*Felicia aethiopica subsp. ecklonis*	LC	Endemic
Asteraceae	*Felicia clavipilosa subsp. clavipilosa*	LC	
Asteraceae	*Felicia echinata*	LC	Endemic
Asteraceae	*Felicia filifolia subsp. filifolia*	LC	
Asteraceae	*Felicia hirsuta*	LC	
Asteraceae	*Felicia muricata subsp. muricata*	LC	
Asteraceae	*Felicia ovata*	LC	Endemic
Asteraceae	*Gazania krebsiana subsp. arctotoides*	LC	
Asteraceae	*Gazania leiopoda*	LC	Endemic
Asteraceae	*Gazania lichtensteinii*	LC	
Asteraceae	*Geigeria filifolia*	LC	
Asteraceae	*Geigeria ornativa subsp. ornativa*	LC	
Asteraceae	*Geigeria pectidea*	LC	
Asteraceae	*Gnaphalium capense*	LC	Endemic
Asteraceae	*Gnaphalium vestitum*	LC	Endemic
Asteraceae	*Helichrysum arenicola*	LC	
Asteraceae	*Helichrysum herniarioides*	LC	
Asteraceae	*Helichrysum micropoides*	LC	
Asteraceae	*Helichrysum rutilans*	LC	Endemic
Asteraceae	*Hirpicium echinus*	LC	
Asteraceae	*Ifloga molluginoides*	LC	
Asteraceae	*Laggera decurrens*	LC	
Asteraceae	*Leysera tenella*	LC	
Asteraceae	*Lopholaena cneorifolia*	LC	
Asteraceae	*Metalasia pulcherrima forma pulcherrima*	NE	Endemic
Asteraceae	*Nidorella auriculata*	LC	
Asteraceae	*Nidorella resedifolia subsp. resedifolia*	LC	
Asteraceae	*Nolletia annetjieae*	LC	

Family	Species Name	Conservation Status	Endemism
Asteraceae	*Nolletia chrysocomoides*	LC	
Asteraceae	*Oedera humilis*	LC	
Asteraceae	*Oedera pungens subsp. pungens*	LC	Endemic
Asteraceae	*Osteospermum junceum*	LC	Endemic
Asteraceae	*Osteospermum microcarpum subsp. microcarpum*	LC	
Asteraceae	*Othonna eriocarpa*	LC	Endemic
Asteraceae	*Pegolettia retrofracta*	LC	
Asteraceae	*Pentzia calcarea*	LC	
Asteraceae	*Pentzia calva*	LC	
Asteraceae	*Pentzia dentata*	LC	Endemic
Asteraceae	*Pentzia incana*	LC	
Asteraceae	*Pentzia lanata*	LC	
Asteraceae	*Pentzia pinnatisecta*	LC	
Asteraceae	*Pseudognaphalium oligandrum*	LC	
Asteraceae	*Psiadia punctulata*	LC	
Asteraceae	*Pteronia acuminata*	LC	
Asteraceae	*Pteronia mucronata*	LC	
Asteraceae	*Pteronia sordida*	LC	
Asteraceae	*Pteronia teretifolia*	LC	Endemic
Asteraceae	*Senecio angulatus*	LC	Endemic
Asteraceae	*Senecio asperulus*	LC	
Asteraceae	*Senecio consanguineus*	LC	
Asteraceae	*Senecio erubescens var. erubescens*	NE	Endemic
Asteraceae	*Senecio hastatus*	LC	
Asteraceae	*Senecio intricatus*	LC	Endemic
Asteraceae	*Senecio juniperinus var. juniperinus*	LC	Endemic
Asteraceae	*Senecio macroglossus*	LC	
Asteraceae	*Senecio monticola*	DD	
Asteraceae	*Senecio niveus*	LC	
Asteraceae	*Senecio othonniflorus*	LC	
Asteraceae	*Senecio puberulus*	LC	Endemic
Asteraceae	*Senecio retrorsus*	LC	
Asteraceae	*Senecio sisymbriifolius*	LC	
Asteraceae	*Senecio trachylaenus*	DD	Endemic
Asteraceae	*Tarchonanthus camphoratus*	LC	
Asteraceae	*Tarchonanthus littoralis*	LC	Endemic
Asteraceae	*Ursinia nana subsp. nana*	LC	
Asteraceae	*Zyrphelis ciliaris*	LC	Endemic
Aytoniaceae	*Plagiochasma rupestre var. rupestre*	LC	
Bignoniaceae	*Rhigozum brevispinosum*	LC	
Bignoniaceae	*Rhigozum obovatum*	LC	
Bignoniaceae	*Rhigozum trichotomum*	LC	
Boraginaceae	*Anchusa riparia*	LC	
Boraginaceae	*Heliotropium ciliatum*	LC	
Boraginaceae	*Trichodesma africanum*	LC	

Family	Species Name	Conservation Status	Endemism
Brassicaceae	*Heliophila deserticola*	LC	
Brassicaceae	*Heliophila deserticola var. deserticola*	LC	
Brassicaceae	*Heliophila minima*	LC	
Brassicaceae	*Heliophila seselifolia var. nigellifolia*	NE	Endemic
Brassicaceae	*Heliophila trifurca*	LC	
Brassicaceae	*Lepidium englerianum*	LC	
Brassicaceae	*Sisymbrium burchellii var. burchellii*	LC	
Bryaceae	*Bryum argenteum*	LC	
Bryaceae	*Bryum pycnophyllum*	LC	
Bryaceae	*Rosulabryum capillare*	LC	
Burseraceae	*Commiphora gracilifrondosa*	LC	
Campanulaceae	*Wahlenbergia capillacea subsp. capillacea*	LC	
Campanulaceae	*Wahlenbergia denticulata var. denticulata*	LC	
Campanulaceae	*Wahlenbergia denticulata var. transvaalensis*	LC	Endemic
Campanulaceae	*Wahlenbergia tenella var. tenella*	LC	Endemic
Capparaceae	*Boscia foetida subsp. foetida*	LC	
Capparaceae	*Cadaba aphylla*	LC	
Caryophyllaceae	*Cerastium capense*	LC	
Caryophyllaceae	*Dianthus micropetalus*	LC	
Caryophyllaceae	*Dianthus namaensis*	LC	
Caryophyllaceae	*Silene burchellii subsp. pilosellifolia*	LC	
Celastraceae	*Gymnosporia linearis subsp. lanceolata*	LC	
Celastraceae	*Lauridia reticulata*	LC	Endemic
Celastraceae	*Maytenus ilicina*	LC	Endemic
Celastraceae	*Maytenus undata*	LC	
Celastraceae	*Putterlickia saxatilis*	LC	Endemic
Cleomaceae	*Cleome angustifolia subsp. diandra*	LC	
Cleomaceae	*Cleome gynandra*	LC	
Cleomaceae	*Cleome kalachariensis*	LC	
Cleomaceae	*Cleome monophylla*	LC	
Cleomaceae	*Cleome rubella*	LC	
Colchicaceae	*Colchicum melanthioides subsp. melanthioides*	LC	
Colchicaceae	*Ornithoglossum vulgare*	LC	
Combretaceae	*Combretum erythrophyllum*	LC	
Commelinaceae	*Commelina livingstonii*	LC	
Convolvulaceae	*Convolvulus ocellatus var. ocellatus*	LC	
Convolvulaceae	*Ipomoea magnusiana*	LC	
Corbichoniaceae	*Corbichonia decumbens*	LC	
Crassulaceae	*Cotyledon orbiculata var. dactylopsis*	LC	Endemic
Crassulaceae	*Cotyledon orbiculata var. orbiculata*	LC	
Crassulaceae	*Crassula capitella subsp. nodulosa*	LC	
Crassulaceae	*Crassula muscosa var. muscosa*	NE	
Crassulaceae	*Tylecodon rubrovenosus*	LC	
Cucurbitaceae	*Acanthosicyos naudinianus*	LC	
Cucurbitaceae	*Corallocarpus schinzii*	LC	

Family	Species Name	Conservation Status	Endemism
Cucurbitaceae	*Cucumis africanus*	LC	
Cucurbitaceae	*Cucumis heptadactylus*	LC	Endemic
Cucurbitaceae	*Cucumis maderaspatanus*	LC	
Cucurbitaceae	*Cucumis myriocarpus subsp. leptodermis*	LC	
Cucurbitaceae	*Kedrostis capensis*	LC	
Cucurbitaceae	*Momordica balsamina*	LC	
Cyperaceae	*Afroscirpoides dioeca*	LC	
Cyperaceae	*Bulbostylis hispidula*	LC	
Cyperaceae	*Bulbostylis hispidula subsp. pyriformis*	LC	
Cyperaceae	*Cyperus congestus*	LC	
Cyperaceae	*Cyperus indecorus var. namaquensis*	NE	
Cyperaceae	*Cyperus longus var. tenuiflorus*	NE	
Cyperaceae	*Cyperus usitatus*	LC	
Cyperaceae	*Fuirena pubescens var. pubescens*	LC	
Cyperaceae	*Isolepis costata*	LC	
Cyperaceae	*Schoenoplectus corymbosus*	LC	
Cyperaceae	*Schoenoplectus erectus*	LC	
Cyperaceae	*Scirpoides burkei*	LC	
Ebenaceae	*Diospyros lycioides subsp. lycioides*	LC	
Ebenaceae	*Euclea undulata*	LC	
Elatinaceae	*Bergia polyantha*	LC	
Euphorbiaceae	*Euphorbia avasmontana*	LC	
Euphorbiaceae	*Euphorbia braunsii*	LC	
Euphorbiaceae	*Euphorbia davyi*	LC	
Euphorbiaceae	*Euphorbia gariepina subsp. gariepina*	LC	
Euphorbiaceae	*Euphorbia inaequilatera*	LC	
Euphorbiaceae	*Euphorbia mauritanica*	LC	
Euphorbiaceae	*Euphorbia patula subsp. wilmaniae*	LC	Endemic
Euphorbiaceae	*Euphorbia spartaria*	LC	
Euphorbiaceae	*Euphorbia spinea*	LC	
Fabaceae	*Adenolobus garipensis*	LC	
Fabaceae	*Amphithalea williamsonii*	LC	Endemic
Fabaceae	*Argyrolobium harveyanum*	LC	
Fabaceae	*Aspalathus subtingens*	LC	Endemic
Fabaceae	*Aspalathus tridentata subsp. staurantha*	LC	Endemic
Fabaceae	*Calobota linearifolia*	LC	
Fabaceae	*Calobota spinescens*	LC	
Fabaceae	*Crotalaria virgultalis*	LC	
Fabaceae	*Cullen tomentosum*	LC	
Fabaceae	*Dipogon lignosus*	LC	
Fabaceae	*Indigastrum niveum*	LC	
Fabaceae	*Indigofera alternans var. alternans*	LC	
Fabaceae	*Indigofera auricoma*	LC	
Fabaceae	*Indigofera charlieriana var. charlieriana*	LC	
Fabaceae	*Indigofera daleoides var. daleoides*	NE	

Family	Species Name	Conservation Status	Endemism
Fabaceae	*Indigofera heterotricha*	LC	
Fabaceae	*Indigofera heterotricha subsp. pechuelii*	LC	
Fabaceae	*Indigofera porrecta var. porrecta*	NE	
Fabaceae	*Indigofera zeyheri*	LC	
Fabaceae	*Leobordea platycarpa*	LC	
Fabaceae	*Lessertia excisa*	LC	Endemic
Fabaceae	*Lessertia frutescens subsp. frutescens*	LC	
Fabaceae	*Lessertia macrostachya var. macrostachya*	LC	
Fabaceae	*Lessertia pauciflora var. pauciflora*	LC	
Fabaceae	*Listia heterophylla*	LC	
Fabaceae	*Lotononis falcata*	LC	
Fabaceae	*Lotononis laxa*	LC	
Fabaceae	*Lotononis rabenaviana*	LC	
Fabaceae	*Melolobium candicans*	LC	
Fabaceae	*Melolobium exudans*	LC	Endemic
Fabaceae	*Melolobium macrocalyx*	LC	
Fabaceae	*Melolobium macrocalyx var. macrocalyx*	LC	
Fabaceae	*Parkinsonia africana*	LC	
Fabaceae	*Pomaria lactea*	LC	
Fabaceae	*Ptycholobium biflorum*	LC	
Fabaceae	*Ptycholobium biflorum subsp. biflorum*	LC	
Fabaceae	*Requienia sphaerosperma*	LC	
Fabaceae	*Senna italica subsp. arachoides*	LC	
Fabaceae	*Tephrosia capensis var. capensis*	LC	
Fabaceae	*Tephrosia dregeana var. dregeana*	LC	
Fabaceae	*Tephrosia grandiflora*	LC	Endemic
Fabaceae	*Vachellia erioloba*	LC	
Fabaceae	*Vachellia haematoxylon*	LC	
Fabaceae	*Vachellia karroo*	LC	
Funariaceae	*Goniomitrium africanum*	LC	
Gentianaceae	*Sebaea pentandra var. pentandra*	LC	
Geraniaceae	*Monsonia crassicaulis*	LC	
Geraniaceae	*Monsonia glauca*	LC	
Geraniaceae	*Monsonia luederitziana*	LC	
Geraniaceae	*Monsonia spinosa*	LC	Endemic
Geraniaceae	*Pelargonium anethifolium*	LC	Endemic
Geraniaceae	*Pelargonium grossularioides*	LC	Endemic
Geraniaceae	*Pelargonium inquinans*	LC	Endemic
Gisekiaceae	*Gisekia africana*	LC	
Gisekiaceae	*Gisekia africana var. africana*	LC	
Gisekiaceae	*Gisekia pharnaceoides var. pharnaceoides*	LC	
Grimmiaceae	*Grimmia laevigata*	LC	
Haloragaceae	*Laurembergia repens subsp. brachypoda*	LC	
Hyacinthaceae	*Albuca virens subsp. arida*	LC	
Hyacinthaceae	*Dipcadi bakerianum*	LC	

Family	Species Name	Conservation Status	Endemism
Hyacinthaceae	*Dipcadi gracillimum*	LC	
Hyacinthaceae	*Dipcadi papillatum*	LC	
Hyacinthaceae	*Lachenalia buchubergensis*	LC	
Hyacinthaceae	*Ornithogalum nanodes*	LC	
Hypericaceae	*Hypericum lalandii*	LC	
Iridaceae	*Babiana flabellifolia*	LC	Endemic
Iridaceae	*Dierama pulcherrimum*	LC	Endemic
Iridaceae	*Ferraria ferrariola*	LC	Endemic
Iridaceae	*Ferraria variabilis*	LC	Endemic
Iridaceae	*Freesia andersoniae*	LC	Endemic
Iridaceae	*Lapeirousia littoralis*	LC	
Iridaceae	*Lapeirousia littoralis subsp. littoralis*	LC	
Iridaceae	*Lapeirousia plicata subsp. foliosa*	LC	
Iridaceae	*Moraea polystachya*	LC	
Iridaceae	*Moraea venenata*	LC	
Iridaceae	*Tritonia strictifolia*	LC	Endemic
Juncaceae	*Juncus dregeanus subsp. dregeanus*	LC	
Juncaceae	*Juncus exsertus*	LC	
Juncaceae	*Juncus oxycarpus*	LC	
Juncaceae	*Juncus rigidus*	LC	
Lamiaceae	*Acrotome inflata*	LC	
Lamiaceae	*Mentha longifolia subsp. capensis*	LC	
Lamiaceae	*Ocimum americanum var. americanum*	LC	
Lamiaceae	*Stachys burchelliana*	LC	
Lamiaceae	*Stachys humifusa*	LC	Endemic
Limeaceae	*Limeum aethiopicum var. aethiopicum*	NE	Endemic
Limeaceae	*Limeum aethiopicum var. lanceolatum*	NE	
Limeaceae	*Limeum argute-carinatum var. argute-carinatum*	LC	
Limeaceae	*Limeum fenestratum var. fenestratum*	LC	
Limeaceae	*Limeum myosotis var. myosotis*	LC	
Limeaceae	*Limeum pterocarpum var. pterocarpum*	LC	
Limeaceae	*Limeum sulcatum var. sulcatum*	LC	
Limeaceae	*Limeum viscosum subsp. transvaalense*	LC	Endemic
Limeaceae	*Limeum viscosum subsp. viscosum*	NE	
Loasaceae	*Kissenia capensis*	LC	
Lophiocarpaceae	*Lophiocarpus polystachyus*	LC	
Lophiocarpaceae	*Lophiocarpus tenuissimus*	LC	
Loranthaceae	*Septulina glauca*	LC	
Loranthaceae	*Tapinanthus oleifolius*	LC	
Malpighiaceae	*Triaspis hypericoides subsp. hypericoides*	LC	
Malpighiaceae	*Triaspis hypericoides subsp. nelsonii*	LC	
Malvaceae	*Corchorus asplenifolius*	LC	
Malvaceae	*Grewia flava*	LC	
Malvaceae	*Hermannia abrotanoides*	LC	
Malvaceae	*Hermannia bicolor*	LC	

Family	Species Name	Conservation Status	Endemism
Malvaceae	*Hermannia burkei*	LC	
Malvaceae	*Hermannia comosa*	LC	
Malvaceae	*Hermannia eenii*	LC	
Malvaceae	*Hermannia flammea*	LC	Endemic
Malvaceae	*Hermannia gracilis*	LC	Endemic
Malvaceae	*Hermannia linnaeoides*	LC	
Malvaceae	*Hermannia minutiflora*	LC	
Malvaceae	*Hermannia modesta*	LC	
Malvaceae	*Hermannia mucronulata*	LC	Endemic
Malvaceae	*Hermannia salviifolia var. grandistipula*	LC	Endemic
Malvaceae	*Hermannia spinosa*	LC	
Malvaceae	*Hermannia tomentosa*	LC	
Malvaceae	*Hermannia vestita*	LC	
Malvaceae	*Hibiscus elliottiae*	LC	
Malvaceae	*Pavonia praemorsa*	LC	Endemic
Malvaceae	*Sida rhombifolia subsp. rhombifolia*	LC	
Meliaceae	*Nymania capensis*	LC	
Menispermaceae	*Cissampelos capensis*	LC	
Molluginaceae	*Pharnaceum brevicaule*	LC	
Molluginaceae	*Pharnaceum viride*	LC	Endemic
Moraceae	*Ficus cordata subsp. cordata*	LC	
Neuradaceae	*Grielum humifusum var. humifusum*	LC	
Neuradaceae	*Grielum humifusum var. parviflorum*	LC	
Neuradaceae	*Grielum sinuatum*	LC	
Nyctaginaceae	*Boerhavia repens subsp. repens*	LC	
Nyctaginaceae	*Phaeoptilum spinosum*	LC	
Ochnaceae	*Ochna arborea var. arborea*	NE	
Oleaceae	*Olea capensis subsp. capensis*	LC	Endemic
Oleaceae	*Olea europaea subsp. cuspidata*	LC	
Orchidaceae	*Holothrix burchellii*	LC	Endemic
Orobanchaceae	*Hyobanche sanguinea*	LC	
Orobanchaceae	*Striga gesnerioides*	LC	
Oxalidaceae	*Oxalis ambigua*	LC	Endemic
Oxalidaceae	*Oxalis bowiei*	LC	Endemic
Oxalidaceae	*Oxalis imbricata var. violacea*	LC	Endemic
Oxalidaceae	*Oxalis lawsonii*	LC	
Passifloraceae	*Adenia repanda*	LC	
Pedaliaceae	*Harpagophytum procumbens subsp. procumbens*	NE	
Pedaliaceae	*Rogeria longiflora*	LC	
Pedaliaceae	*Sesamum capense*	LC	
Phyllanthaceae	*Phyllanthus maderaspatensis*	LC	
Plantaginaceae	*Veronica anagallis-aquatica*	LC	
Plumbaginaceae	*Dyerophytum africanum*	LC	
Poaceae	*Agrostis lachnantha var. lachnantha*	LC	
Poaceae	*Alloteropsis semialata subsp. eckloniana*	LC	

Family	Species Name	Conservation Status	Endemism
Poaceae	*Andropogon chinensis*	LC	
Poaceae	*Andropogon eucomus*	LC	
Poaceae	*Anthephora argentea*	LC	
Poaceae	*Anthephora pubescens*	LC	
Poaceae	*Aristida adscensionis*	LC	
Poaceae	*Aristida congesta subsp. barbicollis*	LC	
Poaceae	*Aristida congesta subsp. congesta*	LC	
Poaceae	*Aristida diffusa subsp. burkei*	LC	
Poaceae	*Aristida engleri var. engleri*	LC	
Poaceae	*Aristida meridionalis*	LC	
Poaceae	*Aristida stipitata subsp. spicata*	LC	
Poaceae	*Aristida stipitata subsp. stipitata*	LC	
Poaceae	*Aristida vestita*	LC	
Poaceae	*Brachiaria dura var. pilosa*	DD	
Poaceae	*Brachiaria glomerata*	LC	
Poaceae	*Brachiaria marlothii*	LC	
Poaceae	*Cenchrus ciliaris*	LC	
Poaceae	*Centropodia glauca*	LC	
Poaceae	*Chloris virgata*	LC	
Poaceae	*Digitaria eriantha*	LC	
Poaceae	*Digitaria polyphylla*	LC	
Poaceae	*Diheteropogon amplectens var. amplectens*	LC	
Poaceae	*Dinebra retroflexa*	LC	
Poaceae	*Echinochloa holubii*	LC	
Poaceae	*Echinochloa stagnina*	LC	
Poaceae	*Enneapogon cenchroides*	LC	
Poaceae	*Enneapogon desvauxii*	LC	
Poaceae	*Enneapogon scaber*	LC	
Poaceae	*Eragrostis annulata*	LC	
Poaceae	*Eragrostis aspera*	LC	
Poaceae	*Eragrostis biflora*	LC	
Poaceae	*Eragrostis brizantha*	LC	
Poaceae	*Eragrostis curvula*	LC	
Poaceae	*Eragrostis echinochloidea*	LC	
Poaceae	*Eragrostis gummiflua*	LC	
Poaceae	*Eragrostis homomalla*	LC	
Poaceae	*Eragrostis lehmanniana*	LC	
Poaceae	*Eragrostis lehmanniana var. chaunantha*	LC	
Poaceae	*Eragrostis lehmanniana var. lehmanniana*	LC	
Poaceae	*Eragrostis nindensis*	LC	
Poaceae	*Eragrostis pallens*	LC	
Poaceae	*Eragrostis porosa*	LC	
Poaceae	*Eragrostis procumbens*	LC	
Poaceae	*Eragrostis pseudobtusa*	NE	Endemic
Poaceae	*Eragrostis rotifer*	LC	

Family	Species Name	Conservation Status	Endemism
Poaceae	*Eragrostis trichophora*	LC	
Poaceae	*Eragrostis truncata*	LC	
Poaceae	*Fingerhuthia africana*	LC	
Poaceae	*Heteropogon contortus*	LC	
Poaceae	*Imperata cylindrica*	LC	
Poaceae	*Leptochloa fusca*	LC	
Poaceae	*Melinis nerviglumis*	LC	
Poaceae	*Melinis repens subsp. grandiflora*	LC	
Poaceae	*Melinis repens subsp. repens*	LC	
Poaceae	*Microchloa caffra*	LC	
Poaceae	*Oropetium capense*	LC	
Poaceae	*Panicum lanipes*	LC	
Poaceae	*Panicum maximum*	LC	
Poaceae	*Pogonarthria squarrosa*	LC	
Poaceae	*Schmidtia kalahariensis*	LC	
Poaceae	*Schmidtia pappophoroides*	LC	
Poaceae	*Setaria sphacelata var. sphacelata*	LC	
Poaceae	*Setaria verticillata*	LC	
Poaceae	*Sorghum bicolor subsp. arundinaceum*	LC	
Poaceae	*Sporobolus ioclados*	LC	
Poaceae	*Sporobolus nervosus*	LC	
Poaceae	*Stipagrostis amabilis*	LC	
Poaceae	*Stipagrostis anomala*	LC	
Poaceae	*Stipagrostis ciliata var. capensis*	LC	
Poaceae	*Stipagrostis namaquensis*	LC	
Poaceae	*Stipagrostis obtusa*	LC	
Poaceae	*Stipagrostis uniplumis var. uniplumis*	LC	
Poaceae	*Tragus berteronianus*	LC	
Poaceae	*Tragus racemosus*	LC	
Poaceae	*Tricholaena capensis subsp. capensis*	LC	
Poaceae	*Tricholaena monachne*	LC	
Poaceae	*Triraphis ramosissima*	LC	
Polygalaceae	*Polygala leptophylla var. leptophylla*	LC	
Polygalaceae	*Polygala seminuda*	LC	
Polygonaceae	*Oxygonum alatum var. alatum*	LC	
Polygonaceae	*Oxygonum delagoense*	LC	
Polygonaceae	*Persicaria madagascariensis*	LC	
Portulacaceae	*Portulaca kermesina*	LC	
Portulacaceae	*Portulaca quadrifida*	LC	
Pottiaceae	*Syntrichia laevipila*	LC	
Pottiaceae	*Tortula atrovirens*	LC	
Pottiaceae	*Trichostomum brachydontium*	LC	
Pteridaceae	*Cheilanthes deltoidea subsp. deltoidea*	LC	
Rhamnaceae	*Ziziphus mucronata subsp. mucronata*	LC	
Ricciaceae	*Riccia albornata*	LC	Endemic

Family	Species Name	Conservation Status	Endemism
Ricciaceae	*Riccia cavernosa*	LC	
Ricciaceae	*Riccia okahandjana*	LC	
Rosaceae	*Cliffortia linearifolia*	LC	
Rosaceae	*Cliffortia serpyllifolia*	LC	
Rubiaceae	*Kohautia caespitosa subsp. brachyloba*	LC	
Rubiaceae	*Kohautia cynanchica*	LC	
Rubiaceae	*Nenax microphylla*	LC	
Rubiaceae	*Pavetta capensis subsp. capensis*	LC	Endemic
Ruscaceae	*Eriospermum bakerianum subsp. bakerianum*	LC	
Ruscaceae	*Eriospermum corymbosum*	LC	
Ruscaceae	*Eriospermum roseum*	LC	
Ruscaceae	*Sansevieria aethiopica*	LC	
Salicaceae	*Salix mucronata subsp. mucronata*	LC	
Santalaceae	*Lacomucinaea lineata*	LC	
Santalaceae	*Thesium acutissimum*	LC	
Santalaceae	*Thesium gnidiaceum var. gnidiaceum*	LC	Endemic
Santalaceae	*Thesium hystricoides*	LC	
Santalaceae	*Thesium resedoides*	LC	
Santalaceae	*Thesium zeyheri*	LC	
Scrophulariaceae	*Aptosimum albomarginatum*	LC	
Scrophulariaceae	*Aptosimum elongatum*	LC	
Scrophulariaceae	*Aptosimum indivisum*	LC	
Scrophulariaceae	*Aptosimum marlothii*	LC	
Scrophulariaceae	*Aptosimum procumbens*	LC	
Scrophulariaceae	*Aptosimum spinescens*	LC	
Scrophulariaceae	*Buddleja saligna*	LC	
Scrophulariaceae	*Diascia engleri*	LC	
Scrophulariaceae	*Gomphostigma virgatum*	LC	
Scrophulariaceae	*Jamesbrittenia adpressa*	LC	
Scrophulariaceae	*Jamesbrittenia atropurpurea subsp. atropurpurea*	LC	
Scrophulariaceae	*Jamesbrittenia atropurpurea subsp. pubescens*	LC	
Scrophulariaceae	*Jamesbrittenia canescens var. canescens*	LC	
Scrophulariaceae	*Jamesbrittenia integerrima*	LC	
Scrophulariaceae	*Jamesbrittenia tysonii*	LC	Endemic
Scrophulariaceae	*Manulea burchellii*	LC	
Scrophulariaceae	*Manulea gariepina*	LC	
Scrophulariaceae	*Manulea schaeferi*	LC	
Scrophulariaceae	*Nemesia hanoverica*	LC	Endemic
Scrophulariaceae	*Peliostomum junceum*	LC	
Scrophulariaceae	*Peliostomum leucorrhizum*	LC	
Scrophulariaceae	*Selago divaricata*	LC	
Scrophulariaceae	*Selago paniculata*	LC	Endemic
Scrophulariaceae	*Selago welwitschii var. australis*	LC	
Scrophulariaceae	*Zaluzianskya diandra*	LC	
Solanaceae	*Lycium bosciifolium*	LC	

Family	Species Name	Conservation Status	Endemism
Solanaceae	*Lycium cinereum*	LC	
Solanaceae	*Lycium hirsutum*	LC	
Solanaceae	*Lycium pilifolium*	LC	
Solanaceae	*Solanum burchellii*	LC	
Solanaceae	*Solanum capense*	LC	
Solanaceae	*Withania somnifera*	LC	
Talinaceae	*Talinum arnotii*	LC	
Thymelaeaceae	*Gnidia sericea*	LC	Endemic
Thymelaeaceae	*Lasiosiphon meisnerianus*	LC	Endemic
Thymelaeaceae	*Lasiosiphon polycephalus*	LC	
Thymelaeaceae	*Struthiola argentea*	LC	Endemic
Urticaceae	*Forsskaolea candida*	LC	
Vahliaceae	*Vahlia capensis subsp. capensis*	LC	
Vahliaceae	*Vahlia capensis subsp. ellipticifolia*	LC	
Vahliaceae	*Vahlia capensis subsp. vulgaris*	NE	
Verbenaceae	*Chascanum cuneifolium*	LC	Endemic
Verbenaceae	*Chascanum pinnatifidum var. pinnatifidum*	LC	
Violaceae	*Afrohybanthus densifolius*	LC	
Zygophyllaceae	*Augea capensis*	LC	
Zygophyllaceae	*Fagonia isotricha var. isotricha*	LC	
Zygophyllaceae	*Roepera lichtensteiniana*	LC	
Zygophyllaceae	*Tetraena retrofracta*	LC	
Zygophyllaceae	*Tetraena simplex*	LC	
Zygophyllaceae	*Tribulus cristatus*	LC	
Zygophyllaceae	*Tribulus pterophorus*	LC	
Zygophyllaceae	*Tribulus terrestris*	LC	
Zygophyllaceae	*Tribulus zeyheri subsp. zeyheri*	LC	
Zygophyllaceae	*Zygophyllum dregeanum*	LC	

8.3 Appendix C – Amphibian species expected to occur in the project area

Family	Scientific Name	Conservation Status
Bufonidae	*Sclerophrys capensis*	LC
Bufonidae	*Sclerophrys gutturalis*	LC
Bufonidae	*Sclerophrys poweri*	LC
Bufonidae	*Vandijkophrynus gariepensis*	LC
Hyperoliidae	*Kassina senegalensis*	LC
Pipidae	*Xenopus laevis*	LC
Pyxicephalidae	*Amietia delalandii*	LC
Pyxicephalidae	*Cacosternum boettgeri*	LC
Pyxicephalidae	*Pyxicephalus adspersus*	LC
Pyxicephalidae	*Tomopterna cryptotis*	LC
Pyxicephalidae	*Tomopterna tandyi*	LC

8.4 Appendix D – Reptile species expected to occur in the project area

Family	Scientific Name	Conservation Status
Agamidae	*Agama aculeata aculeata*	LC
Agamidae	*Agama atra*	LC
Amphisbaenidae	*Dalophia pistillum*	LC
Amphisbaenidae	*Monopeltis mauricei*	LC
Elapidae	*Naja nivea*	LC
Gekkonidae	*Chondrodactylus angulifer angulifer*	LC
Gekkonidae	*Chondrodactylus bibronii*	LC
Gekkonidae	*Pachydactylus capensis*	LC
Gekkonidae	*Pachydactylus latirostris*	LC
Gekkonidae	*Pachydactylus rugosus*	LC
Lacertidae	*Heliobolus lugubris*	LC
Lamprophiidae	*Pseudaspis cana*	LC
Scincidae	*Trachylepis sparsa*	LC
Scincidae	*Trachylepis sulcata sulcata*	LC
Scincidae	*Trachylepis variegata*	LC
Testudinidae	*Psammobates oculifer*	LC
Testudinidae	*Stigmochelys pardalis*	LC
Varanidae	*Varanus albigularis albigularis*	LC
Varanidae	*Varanus niloticus*	LC
Viperidae	*Bitis arietans arietans*	LC

8.5 Appendix E – Mammal species expected to occur within the project area

Family	Scientific Name	Conservation Status
Bovidae	*Antidorcas marsupialis*	LC
Bovidae	*Oreotragus oreotragus*	LC
Bovidae	*Oryx gazella*	LC
Bovidae	*Raphicerus campestris*	LC
Bovidae	*Sylvicapra grimmia*	LC
Bovidae	*Tragelaphus oryx*	LC
Canidae	*Canis mesomelas*	LC
Canidae	*Otocyon megalotis*	LC
Canidae	*Vulpes chama*	LC
Cercopithecidae	*Chlorocebus pygerythrus*	LC
Cercopithecidae	*Papio ursinus*	LC
Felidae	*Caracal caracal*	LC
Felidae	*Felis nigripes*	VU
Felidae	*Felis silvestris*	LC
Felidae	*Panthera pardus*	VU
Herpestidae	*Atilax paludinosus*	LC
Herpestidae	*Cynictis penicillata*	LC
Herpestidae	*Herpestes pulverulentus*	LC
Herpestidae	*Herpestes sanguineus*	LC
Herpestidae	*Suricata suricatta*	LC
Hyaenidae	*Proteles cristata*	LC
Hystricidae	*Hystrix africaeaustralis*	LC
Leporidae	*Lepus capensis*	LC
Leporidae	*Lepus saxatilis*	LC
Macroscelididae	*Macroscelides proboscideus*	LC
Manidae	*Smutsia temminckii*	VU
Molossidae	*Tadarida aegyptiaca*	LC
Muridae	*Aethomys namaquensis*	LC
Muridae	*Desmodillus auricularis*	LC
Muridae	*Gerbilliscus brantsii*	LC
Muridae	*Gerbilliscus leucogaster*	LC
Muridae	*Gerbillurus paeba*	LC
Muridae	*Mastomys coucha*	LC
Muridae	*Parotomys brantsii*	LC
Muridae	*Parotomys littledalei*	LC
Muridae	*Rhabdomys pumilio*	LC
Mustelidae	*Aonyx capensis*	NT
Mustelidae	*Ictonyx striatus*	LC
Mustelidae	*Mellivora capensis*	LC
Mustelidae	*Poecilogale albinucha*	LC
Nesomyidae	*Malacothrix typica*	LC
Nesomyidae	*Petromyscus monticularis*	LC
Nesomyidae	*Saccostomus campestris*	LC
Orycteropodidae	*Orycteropus afer*	LC

Pedetidae	*Pedetes capensis*	LC
Procaviidae	*Procavia capensis*	LC
Sciuridae	*Xerus inauris*	LC
Soricidae	*Suncus varilla*	LC
Viverridae	*Genetta genetta*	LC

8.6 Appendix G – Specialists Declarations

I, Mahomed Desai, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Mahomed Desai

Biodiversity Specialist

The Biodiversity Company

December 2021

I, Khethokuhle Hlatshwayo, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Khethokuhle Hlatshwayo

Aquatic Ecologist

The Biodiversity Company

December 2021