Terrestrial Ecology Scoping Report for the Agricultural and Pivot Expansion Project

Letsemeng Local Municipality, Free State

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CLIENT

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1 Introduction

The Biodiversity Company was appointed by Savannah Environmental (Pty) Ltd (Savannah) to undertake a scoping level assessment for the Agricultural and Pivot Expansion project.

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). The National Web based Environmental Screening Tool has characterised the terrestrial theme sensitivity of the project area as "Very High".

The purpose of the specialist studies is to provide relevant input into the environmental authorisation process and provide a report for the proposed activities associated with the project. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

1.1 Project Description

JN Venter Beleggings Trust is proposing the development of an expansion of a centre pivot irrigation farm on a site located southwest of Luckhoff and Koffiesfontein in the Free State Province. The proposed area of development is accessible via the R48. This expansion will be developed on farms Weltevreden 755, Lemoen-spruit 667 and Diepdraai 754. The total area on all three portions is 4800 ha, however only 2690 ha is proposed for development. The project area falls within the Letsemeng Local Municipality within the Xhariep District Municipality. The agricultural development will entail the following at a minimum:

- Development of centre pivot areas (cultivation and irrigation); and
- Construction of an abstraction pipeline from the existing irrigation canal to two water storage dams.

The current proposed water pipeline crossing will be approximately 68m downstream and north west of an existing road bridge crossing.

It is proposed that ~2690ha will be transformed across the property for the establishment of the agricultural development

The proposed development will require the following infrastructure:

Infrastructure	Purpose
315 mm PVC pipeline	Water for the pivots will be sourced from the Oranje Riet Water User Association's canal pumped 6km underground through 2 x 1.4m fibreglass pipes, which will be extended by further 500 m to reach the pivots
Centre Pivot Irrigation System	The underground PVC pipeline will provide water to a centre pivot irrigation system. A centre pivot irrigation system is a moveable pipe structure which usually spans the length of a field and rotates around a pivot in the centre of the field. As the irrigation system rotates around its central pivot, it supplies water to crops through sprinklers along its length.

The project area is located approximately 11 km southwest of Luckhof (Figure 1-1). The proposed development will overlap with three current farms (Weltevreden 755, Lemoen-spruit 667 and Diepdraai 754) and will also expand the current northernmost farm boundaries (Figure 1-2).

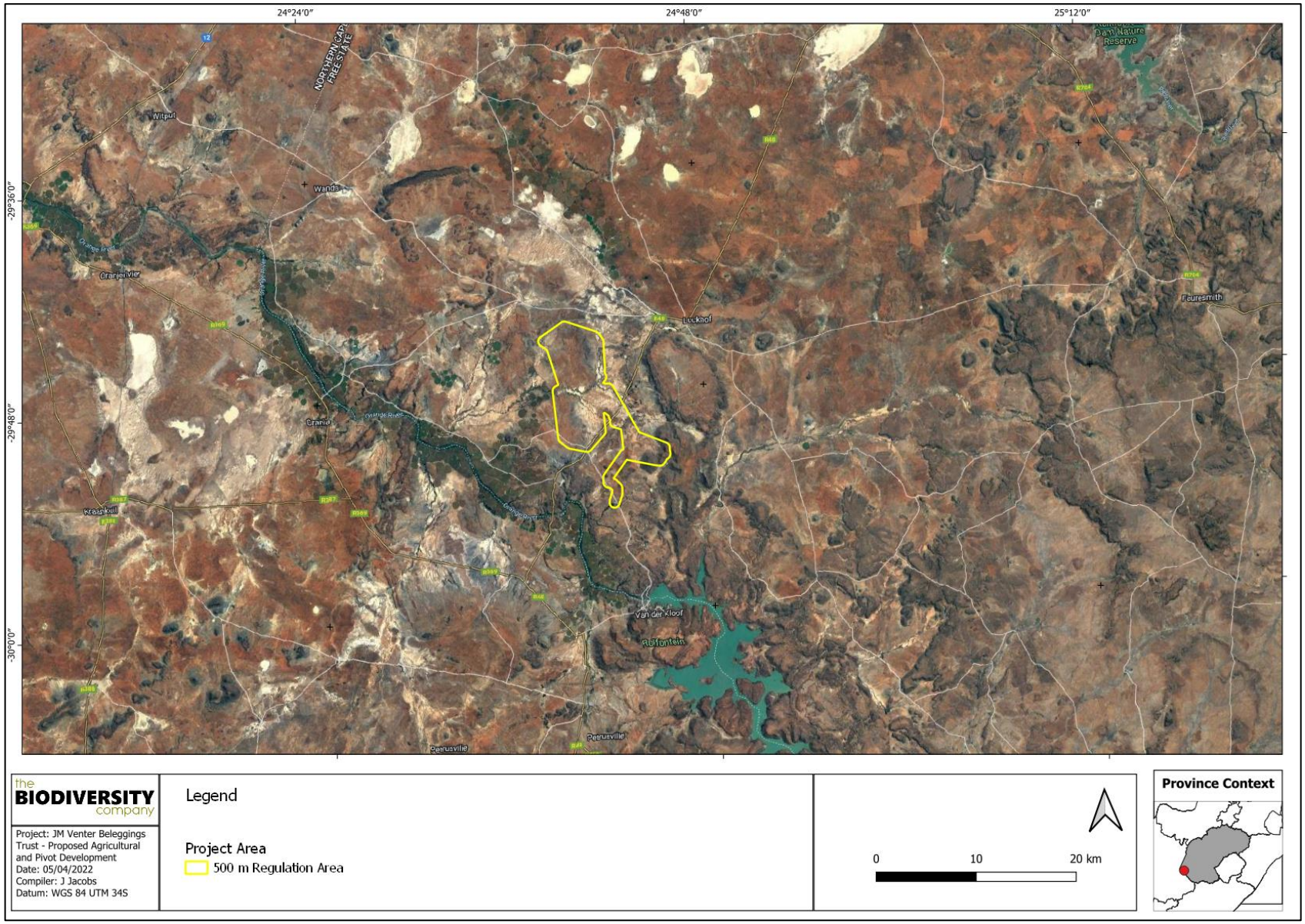


Figure 1-1 Proposed location of the project area in relation to the nearby towns

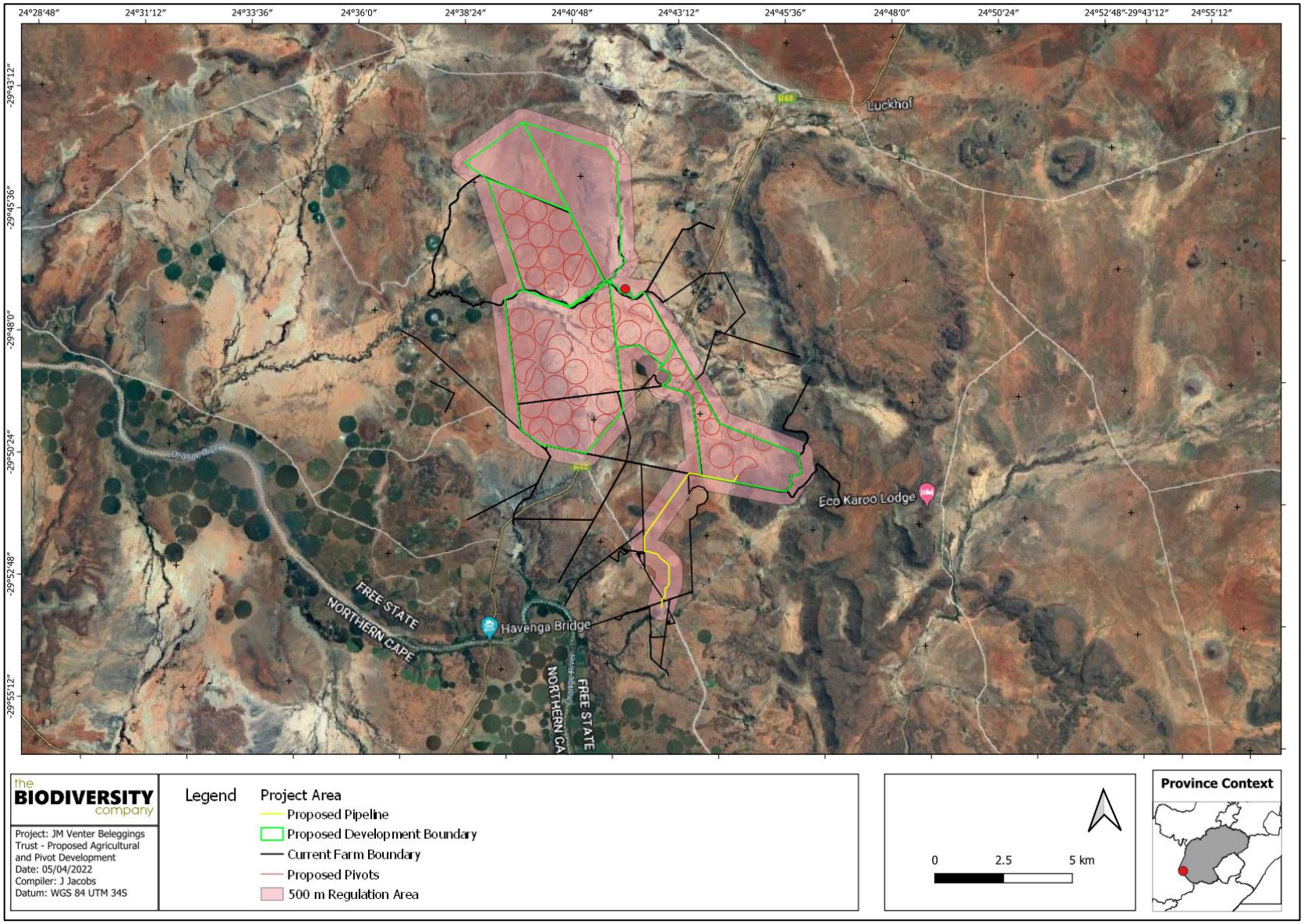
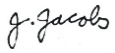


Figure 1-2 The various components of the project area

1.2 Specialist Details

Report Name	**Scoping Report for the Terrestrial Ecology for the Agricultural and Pivot Expansion Project**
Reference	**Agricultural and Pivot Expansion**
Submitted to	savannah environmental
Report Writer	**Jan Jacobs**  Jan Jacobs completed his BSc Honours degree in Biodiversity and Conservation Biology at the University of the Western Cape in 2016 and completed his Master of Applied Science degree in Nature Conservation at the Tshwane University of Technology in 2022. His Masters thesis is currently under examination and he is expected to officially graduate in October 2022.
Reviewer	**Andrew Husted**  Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
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.

2 Scope of Work

The principle aim of the assessment was to provide information to guide the risk of the proposed activity to the ecological communities of the associated ecosystems and the agricultural potential within the project area. This was achieved through the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the project area;
- Desktop assessment to compile an expected species list and identify possible threatened flora and fauna species that occur within the project area;
- Identify the manner that the proposed project impacts based on the desktop information, and evaluate the level of risk of these potential impacts; and
- The prescription of mitigation measures and recommendations for identified risks.

3 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 3-1 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 3-1 A list of key legislative requirements relevant to biodiversity and conservation in the Free State province

Region	Legislation / Guideline
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 1996)
	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), Threatened or Protected Species Regulations
	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, GNR 320 of Government Gazette 43310 (March 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, GNR 1150 of Government Gazette 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989)
	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) (Act No. 36 of 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 and, Alien and Invasive Species List 20142020, published under NEMBA
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	Boputhatswana Nature Conservation Act 3 of 1973
	Free State Nature Conservation Ordinance 8 of 1969

4 Methods

4.1 Desktop Assessment

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

4.1.1 Ecologically Important Landscape Features

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

- National Biodiversity Assessment 2018 (Skowno et al, 2019) (NBA) - The purpose of the 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. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.
- Protected areas - South Africa Protected Areas Database (SAPAD) (DEA, 2021) – The SAPAD Database contains spatial data pertinent to the conservation of South African biodiversity. 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, 2016) – The NPAES provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and therefore, of high importance for biodiversity, climate resilience and freshwater protection.
- Conservation/Biodiversity Sector Plans:

The **Free State Biodiversity Sector Plan (FSBSP)** was completed in 2016 for the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) (Collins, 2016). The purpose of the FSBSP was to develop the spatial component of a bioregional plan (i.e., map of Critical Biodiversity Areas and associated land-use guidelines). A Free State Biodiversity Sector Plan map was produced as part of this plan and sites were assigned to the following CBA categories based on their biodiversity characteristics, spatial configuration, and requirement for meeting targets for both biodiversity pattern and ecological processes:

- Critical Biodiversity Area 1 (CBA1);
- Critical Biodiversity Area 2 (CBA2);
- Ecological Support Area 1 (ESA1);
- Ecological Support Area 2 (ESA2);
- Other Natural Area (ONA);
- Protected Area (PA); and
- No Natural Remaining (NNR).

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (Collins, 2016).

Ecological Support Areas (ESA's) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services (SANBI, 2017). Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

Other Natural Areas (ONAs) consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (Driver *et al.,* 2017).

Areas with No Natural Habitat Remaining (NNR) are areas in poor ecological condition that have not been identified as CBAs or ESAs. They include all irreversibly modified areas (such as urban or industrial areas and mines), and most severely modified areas (such as cultivated fields and forestry plantations). A biodiversity sector plan or bioregional plan must not specify the desired state/management objective or provide land-use guidelines for NNR areas (Driver *et al.,* 2017).

The **Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA)**, as custodian of the environment in the Free State, is the primary implementing agent of the Biodiversity Sector Plan. The spatial component of the Biodiversity Sector Plan is based on systematic biodiversity planning undertaken by DESTEA. The purpose of a Biodiversity Sector Plan is to inform land use planning, environmental assessments, land and water use authorisations, as well as natural resource management, undertaken by a range of sectors whose policies and decisions impact on biodiversity. This is done by providing a map of biodiversity priority areas, referred to as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), with accompanying land use planning and decision-making guidelines (DESTEA, 2015).

- Important Bird and Biodiversity Areas (IBAs) (Birdlife South Africa, 2015) – IBAs constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria; and

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

4.1.2 Desktop Flora Assessment

The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) and SANBI (2019) was used 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 project area (Figure 4-1). The Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2020) was utilized to provide the most current national conservation status of flora species.

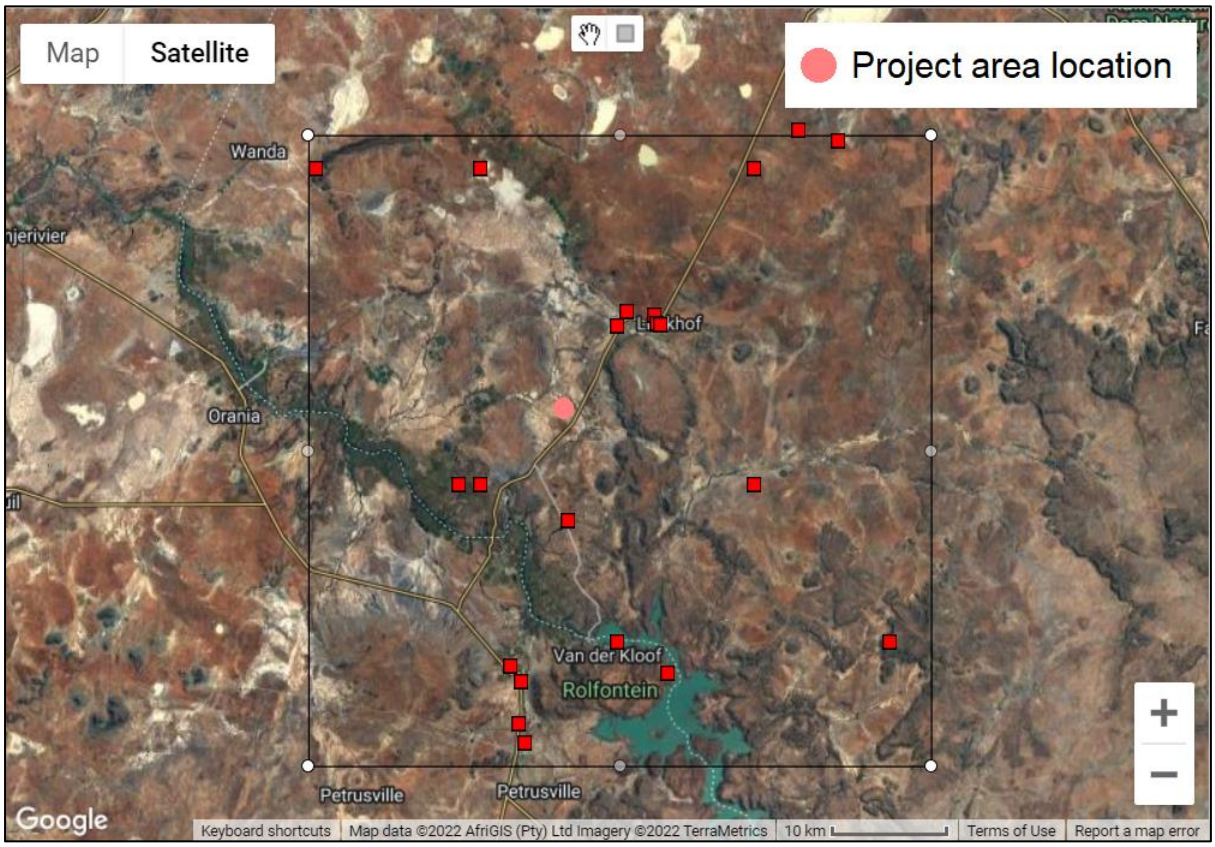


Figure 4-1 ***Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database. Light-red dot indicates approximate location of the project area. The red squares are cluster markers of botanical records as per POSA data.***

4.1.3 Desktop Faunal Assessment

The faunal desktop assessment comprised of the following, compiling an expected:

- Amphibian list, generated from the IUCN spatial dataset (2017) and FrogMap database (Fitzpatrick Institute of African Ornithology, 2021a), using the 2924 quarter degree square;
- Reptile list, generated from the IUCN spatial dataset (2017) and ReptileMap database (Fitzpatrick Institute of African Ornithology, 2021b), using the 2924 quarter degree square;
- Avifauna list, generated from the SABAP2 dataset by looking at pentads (2940_2430; 2940_2435; 2940_2440; 2945_2430; 2945_2435; 2945_2440; 2950_2430; 2950_2435; 2950_2440); and
- Mammal list from the IUCN spatial dataset (2017).

4.2 Terms of Methodology

4.2.1 Flora Survey

The fieldwork and sample sites will be placed within targeted areas (i.e., target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which will included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork will therefore be to maximise coverage and navigate to each target site in the field, to perform a rapid vegetation and ecological assessment at each sample site. Emphasis will be placed on sensitive habitats, especially those overlapping with the proposed project area.

Homogenous vegetation units will be subjectively identified using satellite imagery and existing land cover maps. The floristic diversity and search for flora SCC will be conducted through timed meanders within representative habitat units delineated during the fieldwork. Emphasis will be placed mostly on sensitive habitats overlapping with the proposed project areas.

The timed random meander method is highly efficient 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. The timed meander search will be performed based on the original technique described by Goff *et al.* (1982). Suitable habitat for SCC will be identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

At each sample site notes will be made regarding current impacts (e.g., livestock grazing, erosion etc.), subjective recording of dominant vegetation species, and any sensitive features (e.g., wetlands, outcrops etc.). In addition, opportunistic observations will be made while navigating through the project area.

4.2.2 Fauna Survey

The faunal assessment within this report pertains to herpetofauna (amphibians and reptiles), avifauna and mammals. The faunal field survey will be comprised of the following techniques:

- Visual and auditory searches - This typically comprises of meandering and using binoculars to view species from a distance without them being disturbed; and listening to species calls;
- Active hand-searches - Used for species that shelter in or under particular micro-habitats (typically rocks, exfoliating rock outcrops, fallen trees, leaf litter, bark etc.);
- Point counts for the avifauna; and
- Utilization of local knowledge.

Relevant field guides and texts that will be 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);
- Smithers' Mammals of Southern Africa (Apps, 2000);
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart and Stuart, 2000);
- Book of birds of South Africa, Lesotho and Swaziland (Taylor *et al.,* 2015); and
- Roberts – Birds of Southern Africa (Hockey *et al.,* 2005).

4.3 Terrestrial Site Ecological Importance

The different habitat types within the project area will be delineated and identified based on observations during the field assessment, and available satellite imagery. These habitat types will be assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of species of conservation concern and their ecosystem processes.

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) as follows.

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 4-1 and Table 4-2, respectively.

Table 4-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Extremely Rare or CR 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 Near Threatened (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 4-2 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 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 4-3.

Table 4-3 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 4-4.

Table 4-4 Summary of Receptor 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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) 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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) 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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) 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: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) 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: (i) remain at a site even when a disturbance or impact is occurring, or (ii) 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 4-5.

Table 4-5 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

Site Ecological Importance		Biodiversity Importance (BI)				
		Very high	High	Medium	Low	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 project is provided in Table 4-6.

Table 4-6 Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities

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.

4.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the area provided by the client and any alterations to the footprint and/or missing GIS information pertaining to the assessment area would have affected the area surveyed;
- The species likelihood of occurrence is based on desktop information and might be changed after the assessment;
- The impact assessment included is preliminary and is solely based on the desktop information; and
- No decommissioning phase impacts have been considered for this project. The life of operation is unknown and expected for perpetuity.

5 Results & Discussion

5.1 Desktop Assessment

5.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features is summarised in Table 5-1.

Table 5-1 Summary of relevance of the proposed project to ecologically important landscape features

Desktop Information Considered	Relevant/Irrelevant	Section
Ecosystem Threat Status	Relevant – Overlaps with a Least Concern ecosystem.	5.1.1.1
Ecosystem Protection Level	Relevant – Overlaps mainly with a Not Protected ecosystem and slightly with a Poorly Protected ecosystem.	5.1.1.2
Protected Areas	Relevant – The project area is located within the 5 km Protected Area Buffer Zones of five protected areas, namely Gemsbokpark Private Nature Reserve, Grasberg Reserve, Rolfontein Provincial Nature Reserve, Thanda Tula Reserve and Tuinhoek Reserve.	5.1.1.4
National Protected Areas Expansion Strategy	Relevant – The project area overlaps with a NPAES priority focus area.	5.1.1.5
Critical Biodiversity Area	Relevant – The project area overlaps with a CBA1, CBA2, ESA1 and ESA2 classified areas.	5.1.1.3
Important Bird and Biodiversity Areas	Relevant – The project area is located 3km from the Platberg-Karoo Conservancy IBA.	5.1.1.6
South African Inventory of Inland Aquatic Ecosystems	Relevant - The project area overlaps with CR wetlands, VU wetlands, EN rivers and is adjacent to LT rivers.	5.1.1.7
National Freshwater Priority Area	Relevant – The project area overlaps with a classified FEPA wetlands and unclassified FEPA wetlands.	5.1.1.8
Strategic Water Source Areas	Irrelevant – The project area is 254 km west from the closest SWSA.	-

5.1.1.1 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 proposed project overlaps with a LC ecosystem (Figure 5-1).

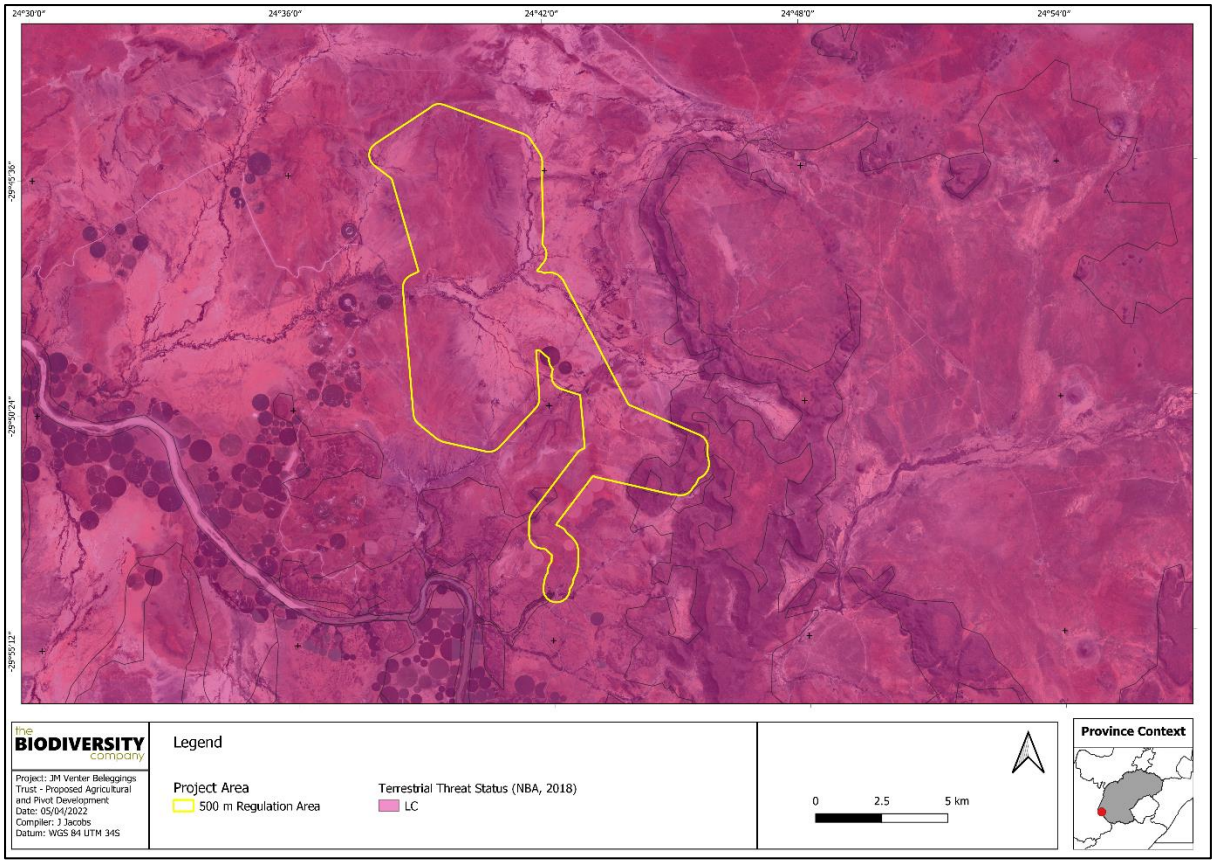


Figure 5-1 Map illustrating the ecosystem threat status associated with the project area

5.1.1.2 Ecosystem Protection Level

This is an 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. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed project overlaps mainly with a NP ecosystem, followed by a PP ecosystem (Figure 5-2).

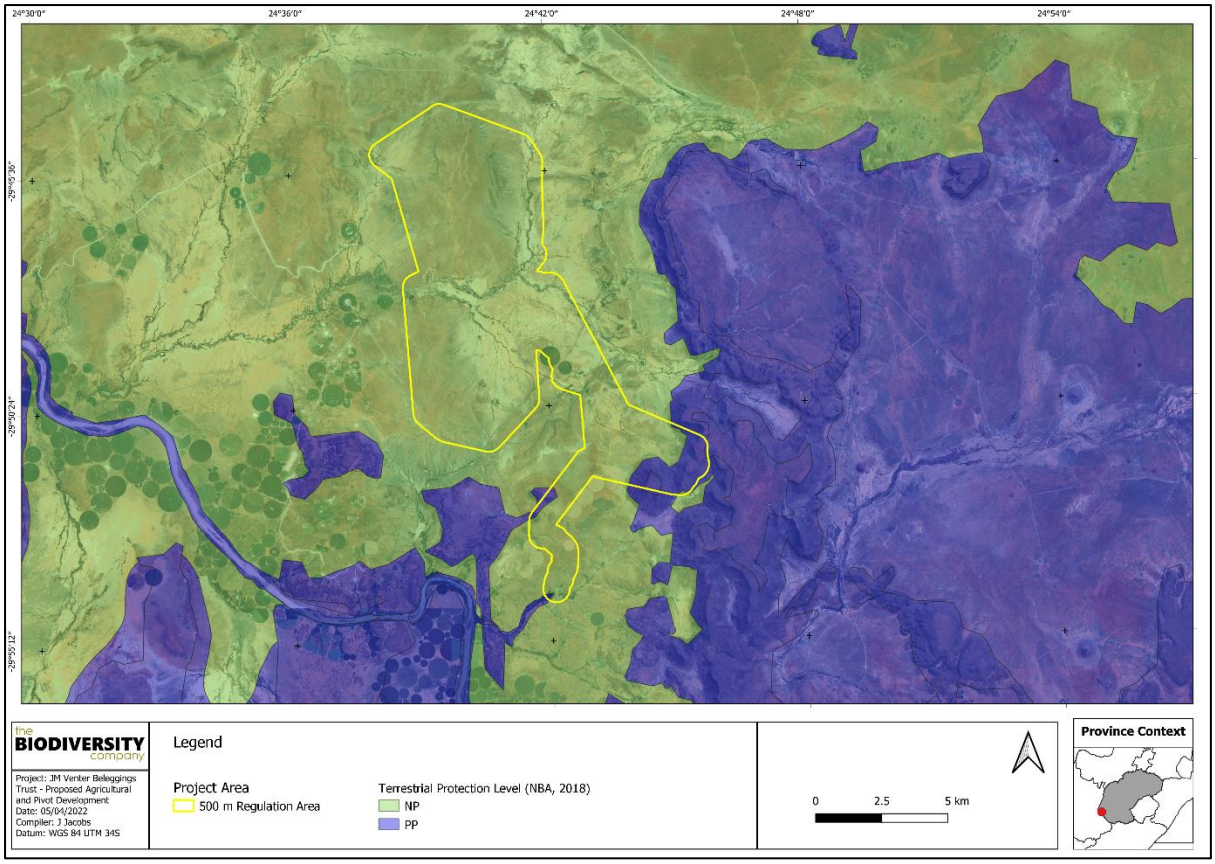


Figure 5-2 Map illustrating the ecosystem protection level associated with the project area

5.1.1.3 Critical Biodiversity Areas and Ecological Support Areas

The conservation of CBAs is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

The purpose of the Free State Biodiversity Sector Plan (2016) is to inform land-use planning and development on a provincial scale and to aid in natural resource management. One of the outputs is a map of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These are classified into different categories, namely Protected Areas, CBA1 areas, CBA2 areas, ESA1 areas, ESA2 areas, Other Natural Areas (ONAs) and areas with No Natural Habitat Remaining (NNR) based on biodiversity characteristics, spatial configuration, and requirements for meeting targets for both biodiversity patterns and ecological processes.

Figure 5-3 shows the project area superimposed on the Terrestrial CBA maps. The project area overlaps with CBA1, CBA2, ESA1, and ESA2 classified areas.

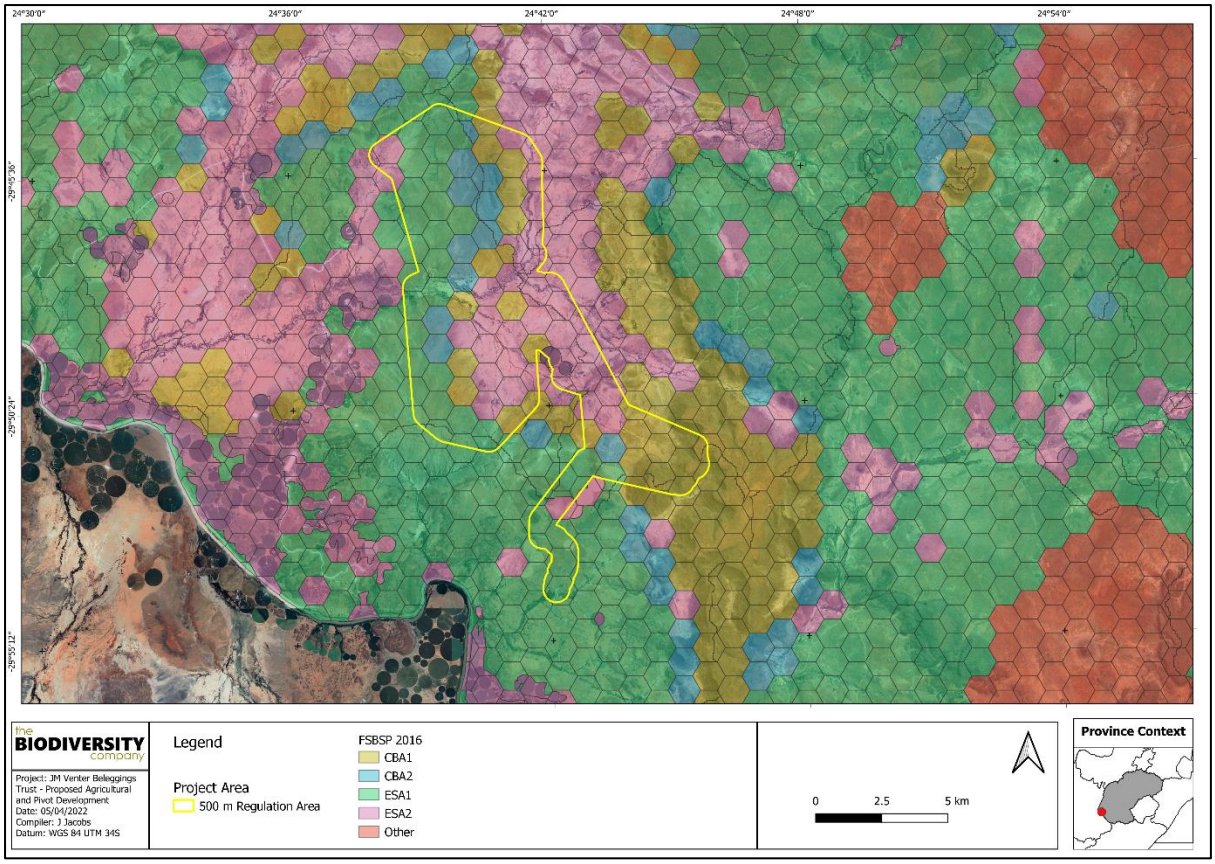


Figure 5-3 Map illustrating the locations of CBAs in the project area

5.1.1.4 Protected areas

According to the protected area spatial datasets from SAPAD (2021) and SACAD (2021), the project area does not overlap with any protected areas or conservation areas. However, the project area is located approximately 2 km northwest from Tuinhoek Reserve and Grasberg Reserve (the two reserves overlap almost identically) (Figure 5-4). Thus, the project area is located within the 5 km Protected Area Buffer Zones of two protected areas.

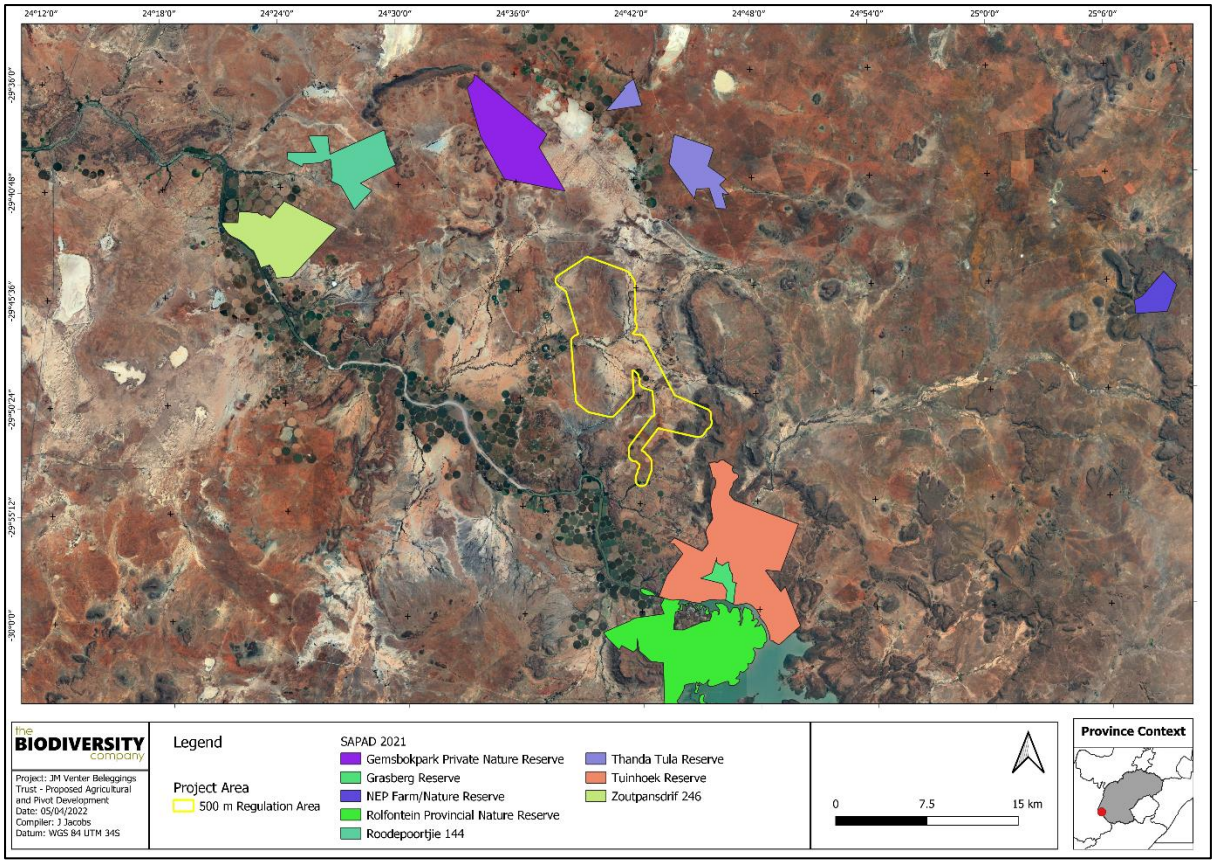


Figure 5-4 The project area in relation to the nearest protected areas

5.1.1.5 National Protected Area Expansion Strategy

National Protected Area Expansion Strategy 2016 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with a strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2016). The project area overlaps with a NPAES priority focus area as can be seen in Figure 5-5.

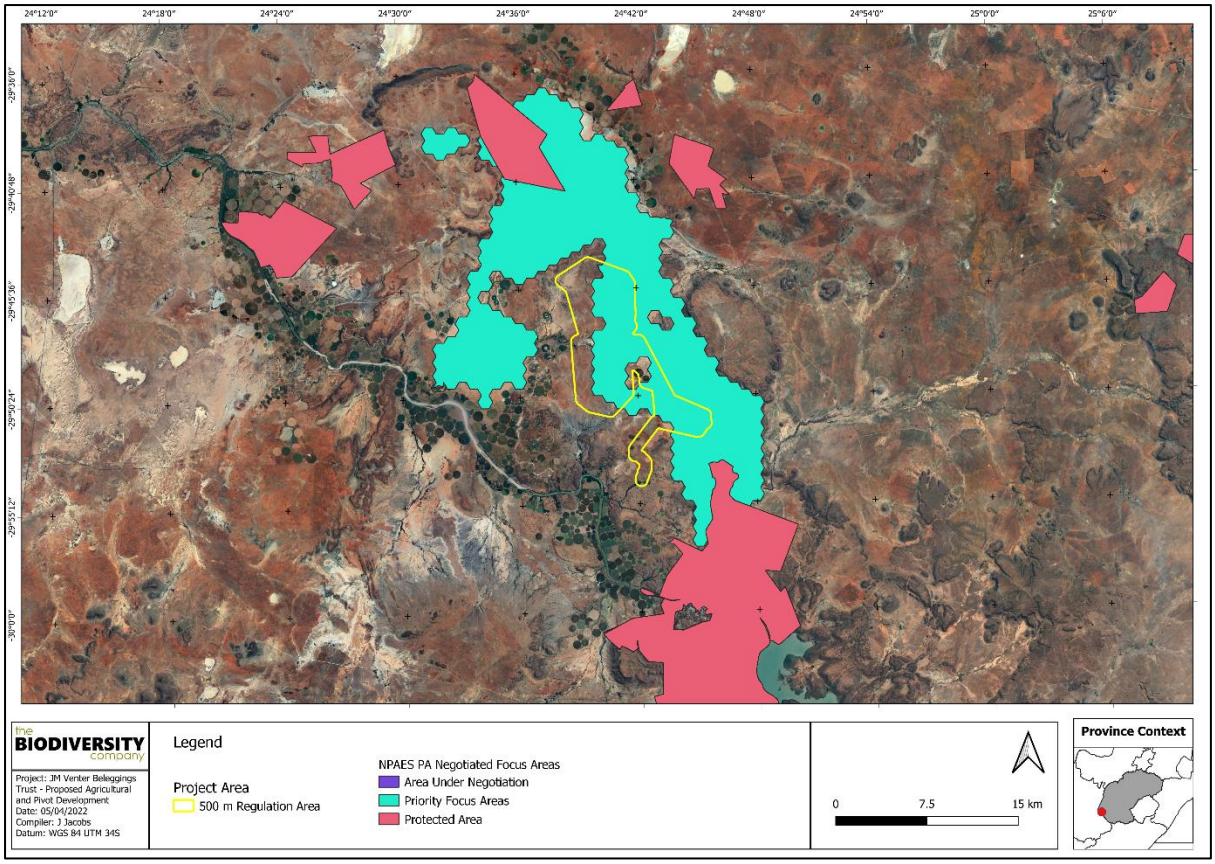


Figure 5-5 The project area in relation to the National Protected Area Expansion Strategy

5.1.1.6 Important Bird and Biodiversity Area

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by Birdlife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels. Figure 5-6 shows that the project area is located 3.25 km northeast from the Platberg-Karoo Conservancy.

The Platberg–Karoo Conservancy IBA covers the entire districts of De Aar, Philipstown and Hanover, including suburban towns, and consists of extensive flat to gently undulating plains that are broken by dolerite hills and flat-topped inselbergs. It is used mainly for grazing and agriculture (Birdlife South Africa, 2015).

This IBA is important because it contributes significantly to the conservation of large terrestrial birds as well as raptors. These birds include Blue Crane (*Anthropoides paradiseus*), Ludwig's Bustard (*Neotis ludwigii*), Kori Bustard (*Ardeotis kori*), Blue Korhaan (*Eupodotis caerulescens*), Black Stork (*Ciconia nigra*), Secretarybird (*Sagittarius serpentarius*), Martial Eagle (*Polemaetus bellicosus*), Verreaux's Eagle (*Aquila verreauxii*) and Tawny Eagle (*A. rapax*) (Birdlife South Africa, 2015).

Globally threatened species are the Blue Crane, Ludwig's Bustard, Kori Bustard, Secretarybird, Martial Eagle, Blue Korhaan, Black Harrier (*Circus maurus*) and Denham's Bustard (*Neotis denhami*) (Birdlife South Africa, 2015).

Regionally threatened species include the Black Stork, Lanner Falcon (*Falco biarmicus*), Tawny Eagle, Karoo Korhaan (*Eupodotis vigorsii*) and Verreaux's Eagle (Birdlife South Africa, 2015).

Biome-restricted species include Karoo Lark (*Calendulauda albescens*), Karoo Long-billed Lark (*Certhilauda subcoronata*), Karoo Chat (*Cercomela schlegelii*), Tractrac Chat (*C. tractrac*), Sickle-winged Chat (*C. sinuata*), Namaqua Warbler (*Phragmacia substriata*), Layard's Tit-Babbler (*Sylvia layardi*), Pale-winged Starling (*Onychognathus nabouroup*) and Black-headed Canary (*Serinus alario*) (Birdlife South Africa, 2015).

Congregatory species are the Lesser Kestrel and Amur Falcon (*Falco amurensis*) (Birdlife South Africa, 2015).

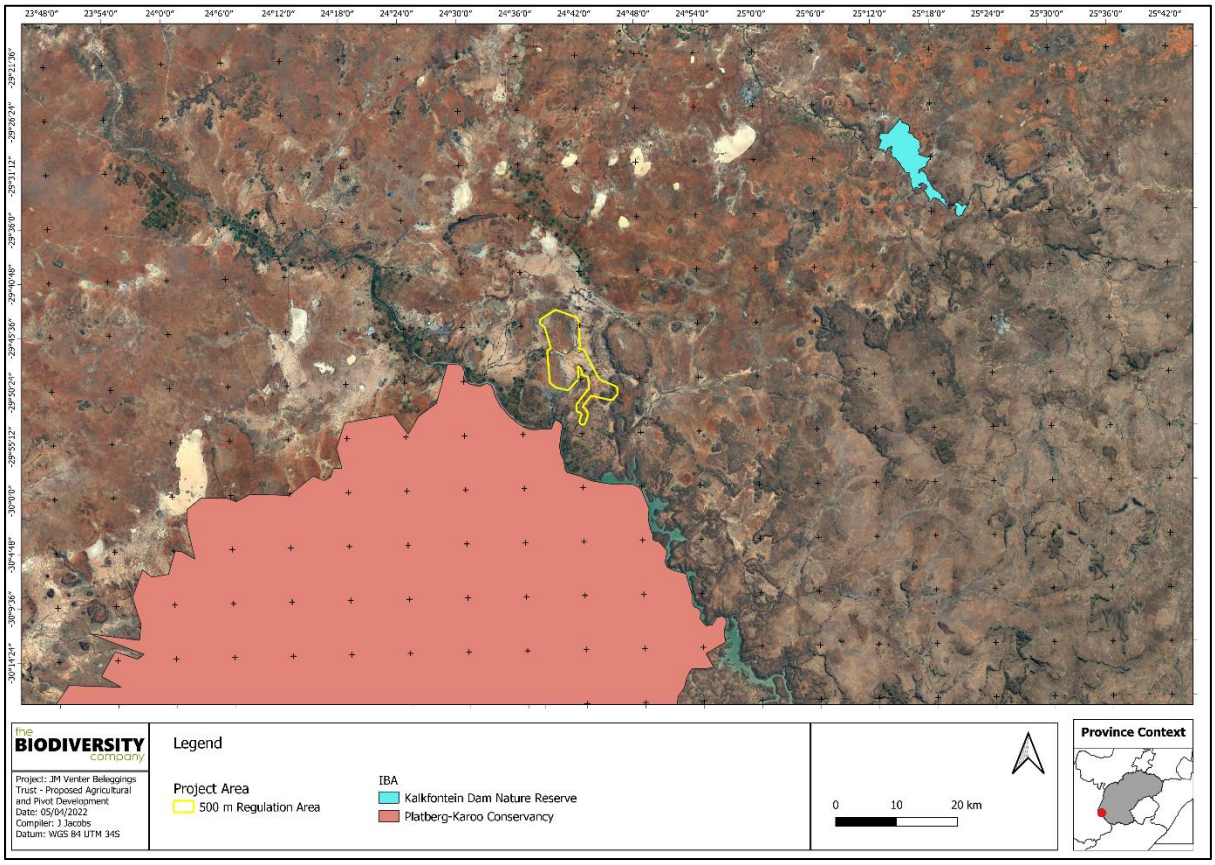


Figure 5-6 The project area in relation to the nearest IBAs

5.1.1.7 Hydrological Setting

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LT, with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). The project area overlaps with EN NBA rivers as well as CR NBA wetlands and a VU NBA wetland (Figure 5-7). Additionally, the project area is adjacent to LT NBA rivers and CR NBA wetlands.

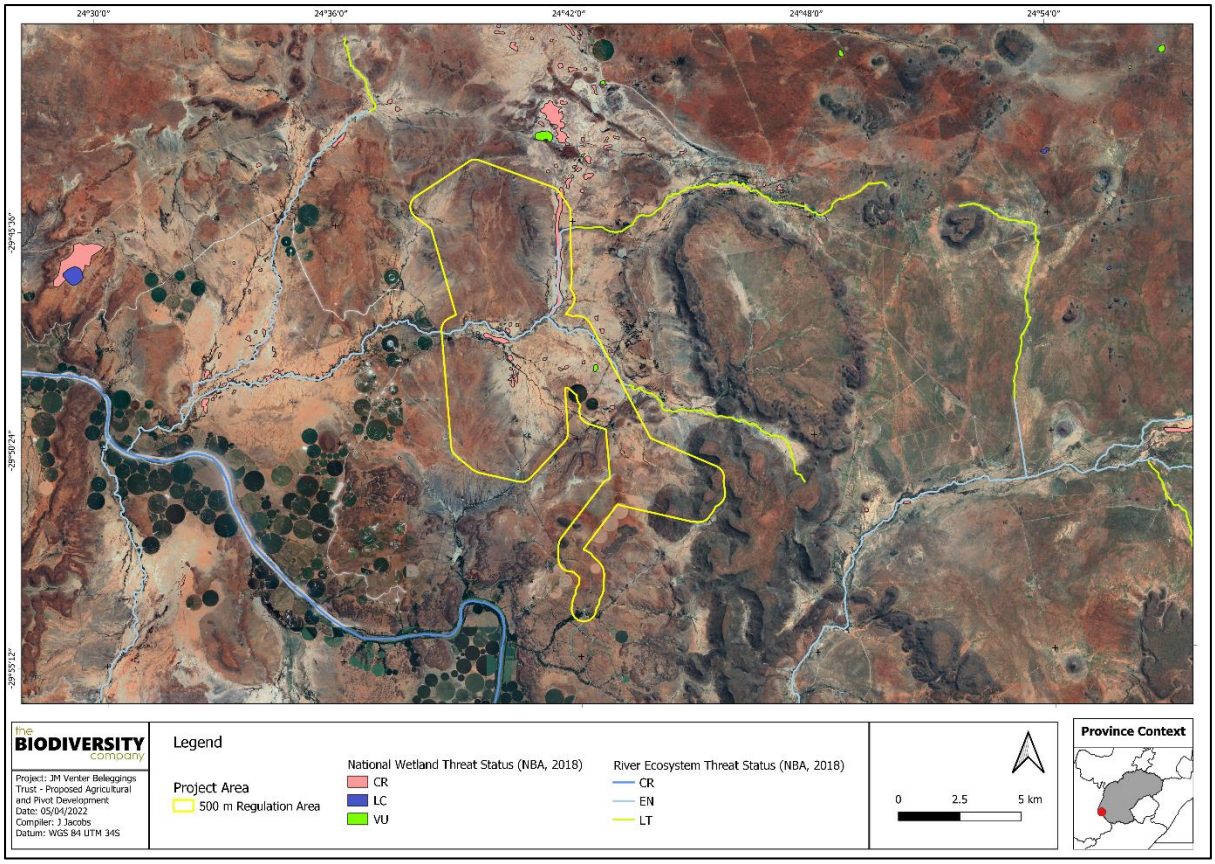


Figure 5-7 Map illustrating ecosystem threat status of rivers and wetland ecosystems in the project area

5.1.1.8 National Freshwater Ecosystem Priority Area Status

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al.,* 2011). The FEPAs 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 (NEM:BA) biodiversity goals (Nel *et al.,* 2011). Figure 5-8 shows the project area overlaps with both unclassified FEPA wetlands and true FEPA wetlands.

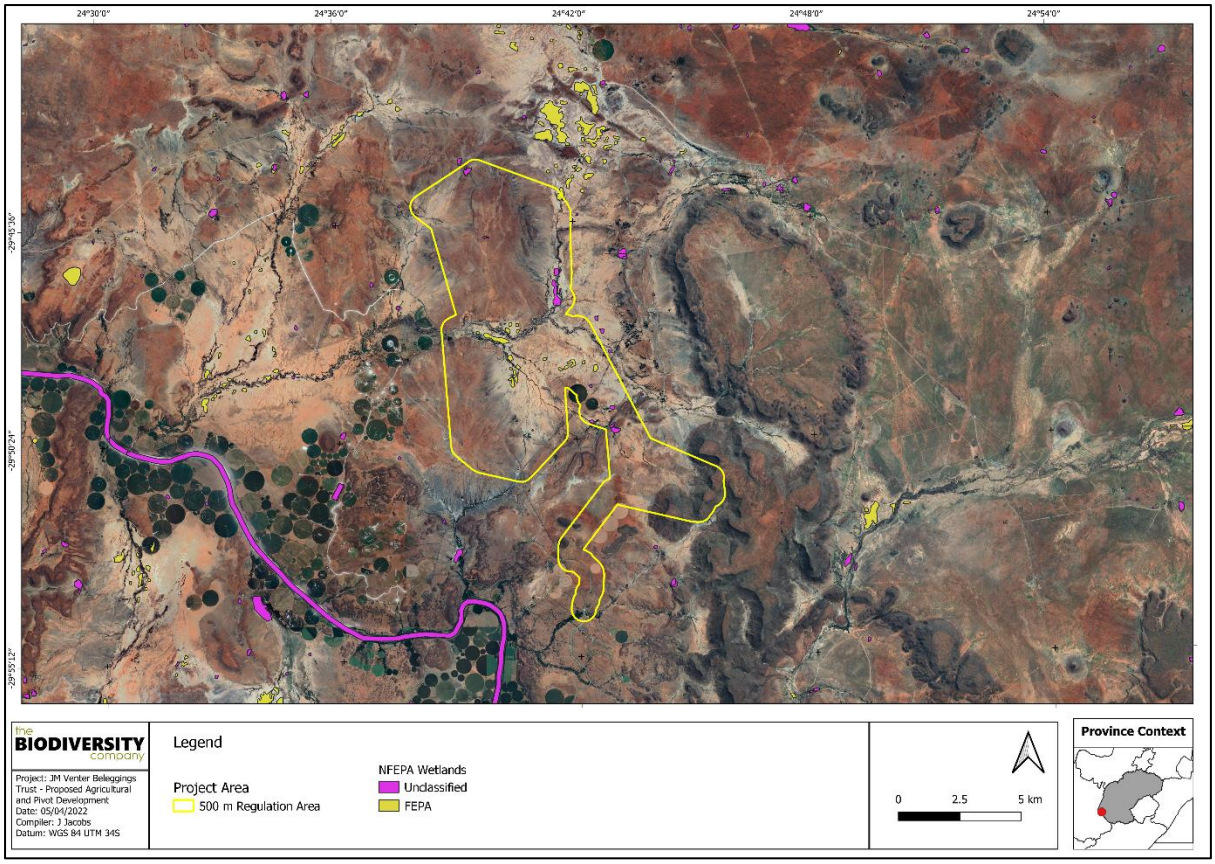


Figure 5-8 The project area in relation to the National Freshwater Ecosystem Priority Areas.

5.1.2 Flora Assessment

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

5.1.2.1 Vegetation Type

The project area is situated in the Nama-Karoo Biome. It is a large, landlocked region that lies on the central plateau of the western half of South Africa and extends into southeastern Namibia. In terms of climate, the Nama-Karoo Biome is arid and characterised by the presence of mostly nonperennial rivers, highly variable and unreliable low rainfall, and unpredictable and sometimes prolonged droughts (Booysen & Rowswell 1983; Mucina & Rutherford, 2006). On the plains to the northeast, there are gradual transitions between the Nama-Karoo and Grassland Biomes, making the border between the two biomes difficult to map (Mucina & Rutherford, 2006).

Generally, the vegetation of the Nama-Karoo Biome are a filtered subset of the vegetation of surrounding biomes, including Savanna, Grassland, Fynbos, Succulent Karoo and Albany Thicket Biomes (Hilton-Taylor, 1987). The three most dominant floral families are Asteraceae, Fabaceae and Poaceae, similar to the vegetation structure of other arid and semi-arid areas (Mucina & Rutherford).

On a fine-scale vegetation type, the project area overlaps with three vegetation types, mainly the Northern Upper Karoo, followed by the Besemkaree Koppies Shrubland and Upper Gariep Alluvial Vegetation (Figure 5-9).

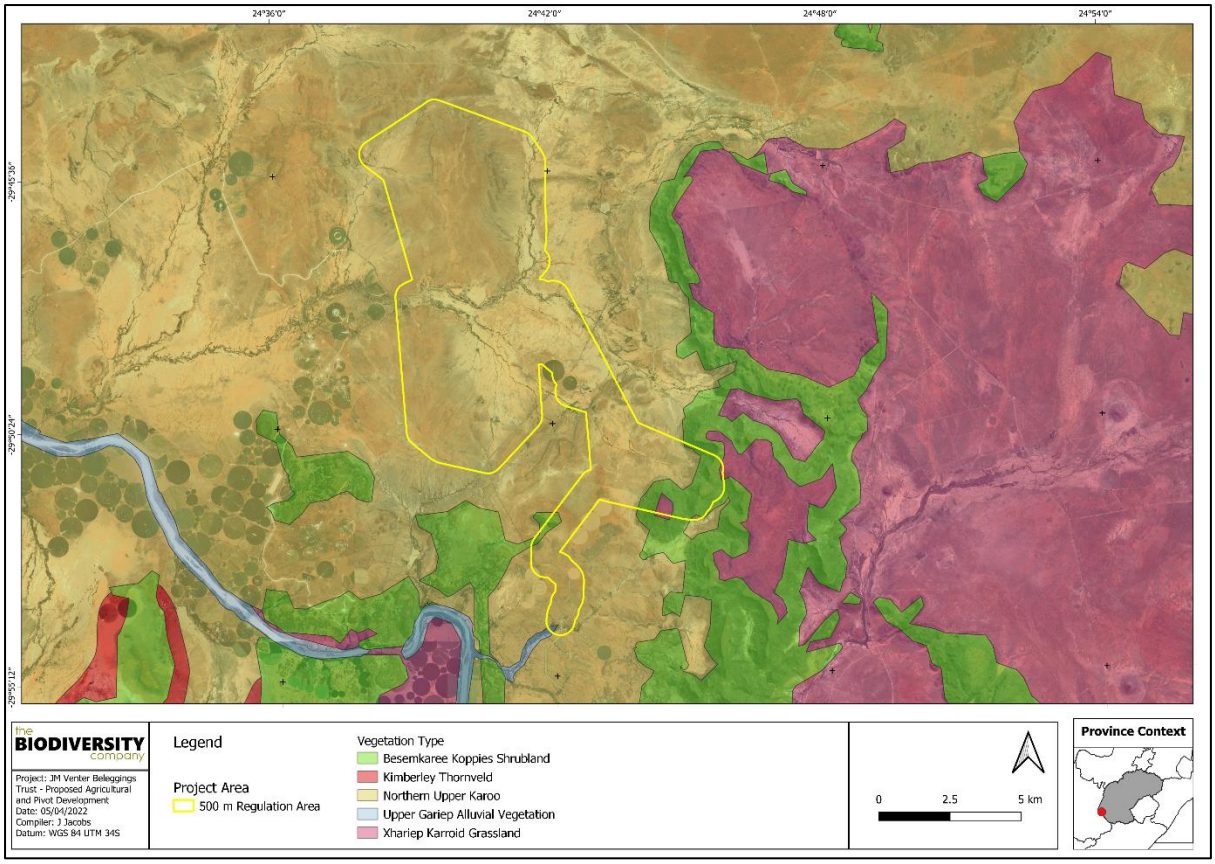


Figure 5-9 Map illustrating the vegetation type associated with the project area

5.1.2.1.1 Northern Upper Karoo

Northern Upper Karoo is restricted to the Northern Cape and Free State Provinces, specifically in the northern regions of the Upper Karoo plateau from Prieska, Vosburg and Carnarvon in the west to Philipstown, Petrusville and Petrusburg in the east. In the north, it is bordered by the towns of Niekerkshoop, Douglas and Petrusburg and in the south by Carnarvon, Pampoenpoort and De Aar. Additionally, there are a few patches in Griqualand West. Altitude varies mostly from 1000 to 1500 m (Mucina & Rutherford, 2006).

Its main vegetation feature is a shrubland dominated by dwarf karoo shrubs, grasses and *Senegalia mellifera* subsp. *detinens* and some other low trees (especially on sandy soils in the northern parts and vicinity of the Orange River). In terms of landscape features, it is flat to gently sloping, with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the northeast and with many interspersed pans (Mucina & Rutherford, 2006).

Important Plant Taxa in Northern Upper Karoo

Based on Mucina and Rutherford's (2006) vegetation classification, important plant taxa are those species that have a high abundance, a frequent occurrence (not being particularly abundant) or are prominent in the landscape within a particular vegetation type. They note that the following species are important taxa in the Northern Upper Karoo vegetation type:

Small Trees: *Senegalia mellifera* subsp. *detinens*, *Boscia albitrunca*.

Tall Shrubs: *Lycium cinereum*, *L. horridum*, *L. oxycarpum*, *L. schizocalyx*, *Rhigozum trichotomum*.

Low Shrubs: *Chrysocoma ciliata*, *Gnidia polycephala*, *Pentzia calcarea*, *P. globosa*, *P. incana*, *P. spinescens*, *Rosenia humilis*, *Amphiglossa triflora*, *Aptosimum marlothii*, *A. spinescens*, *Asparagus glaucus*, *Barleria rigida*, *Berkheya annectens*, *Eriocephalus ericoides* subsp. *ericoides*, *E. glandulosus*,

E. spinescens, *Euryops asparagoides*, *Felicia muricata*, *Helichrysum lucilioides*, *Hermannia spinosa*, *Leucas capensis*, *Limeum aethiopicum*, *Melolobium candicans*, *Microloma armatum*, *Osteospermum leptolobum*, *O. spinescens*, *Pegolettia retrofracta*, *Pentzia lanata*, *Phyllanthus maderaspatensis*, *Plinthus karooicus*, *Pteronia glauca*, *P. sordida*, *Selago geniculata*, *S. saxatilis*, *Tetragonia arbuscula*, *Zygophyllum lichtensteinianum*.

Succulent Shrubs: *Hertia pallens*, *Salsola calluna*, *S. glabrescens*, *S. rabieana*, *S. tuberculata*, *Zygophyllum flexuosum*.

Semiparasitic Shrub: *Thesium hystrix*.

Herbs: *Chamaesyce inaequilatera*, *Convolvulus sagittatus*, *Dicoma capensis*, *Gazania krebsiana*, *Hermannia comosa*, *Indigofera alternans*, *Lessertia pauciflora*, *Radyera urens*, *Sesamum capense*, *Sutera pinnatifida*, *Tribulus terrestris*, *Vahlia capensis*.

Succulent Herb: *Psilocaulon coriarium*.

Geophytic Herb: *Moraea pallida*.

Graminoids: *Aristida adscensionis*, *A. congesta*, *A. diffusa*, *Enneapogon desvauxii*, *Eragrostis lehmanniana*, *E. obtusa*, *E. truncata*, *Sporobolus fimbriatus*, *Stipagrostis obtusa, Eragrostis bicolor*, *E. porosa*, *Fingerhuthia africana*, *Heteropogon contortus*, *Stipagrostis ciliata*, *Themeda triandra*, *Tragus berteronianus*, *T. koelerioides*, *T. racemosus*.

Conservation Status

According to Mucina and Rutherford (2006), Northern Upper Karoo is classified as Least Threatened. Although the conservation target 21%, none is being conserved in statutory conservation areas and about 4% has already been cleared for cultivation (the highest proportion of any type in the Nama-Karoo) or irreversibly transformed by building of dams (Houwater, Kalkfontein and Smart Syndicate Dams). *Prosopis glandulosa*, one of the 12 agriculturally most important invasive alien plants in South Africa, is widely distributed in this vegetation type (Hoffman *et al.* 1999). Erosion ranges from very low to moderate.

5.1.2.1.2 Besemkaree Koppies Shrubland

Besemkaree Koppies Shrubland is restricted to the Northern Cape, Free State and Eastern Cape Provinces. Within these provinces, it can be found on plains of Eastern Upper Karoo (between Richmond and Middelburg in the south and the Orange River) and within dry grasslands of the southern and central Free State. Additionally, there area also extensive dolerite-dominated landscapes along the upper Orange River that belong to this unit as well. It extends northwards to around Fauresmith in the northwest and to the Wepener District in the northeast. Altitude varies from 1120 to 1680 m (Mucina & Rutherford, 2006).

In terms of vegetation and landscape features, this vegetation type is characterised by slopes of koppies, butts and tafelbergs covered with two-layered karroid shrublands. The lower closed-canopy layer is dominated by dwarf small-leaved shrubs and, especially in precipitation-rich years, also by abundant grasses, while the upper loose canopy layer is dominated by tall shrubs, including several *Rhus* species, *Euclea crispa* subsp. *ovata*, *Diospyros austro-africana* and *Olea europaea* subsp. *africana* (Mucina & Rutherford, 2006).

Important Plant Taxa in Besemkaree Koppies Shrubland

Mucina and Rutherford (2006) note that the following species are important taxa in the Besemkaree Koppies Shrubland:

Small Trees: *Cussonia paniculata*, *Ziziphus mucronata*.

Tall Shrubs: *Diospyros austro-africana*, *Euclea crispa* subsp. *ovata*, *Olea europaea* subsp. *africana*, *Rhus burchellii*, *R. ciliata*, *R. erosa*, *Buddleja saligna*, *Diospyros lycioides* subsp. *lycioides*, *Ehretia rigida*, *Grewia occidentalis*, *Gymnosporia polyacantha*, *Tarchonanthus minor*.

Low Shrubs: *Asparagus suaveolens*, *Chrysocoma ciliata*, *Amphiglossa triflora*, *Aptosimum elongatum*, *Asparagus striatus*, *Diospyros pallens*, *Eriocephalus ericoides*, *E. spinescens*, *Euryops empetrifolius*, *Felicia filifolia* subsp. *filifolia*, *F. muricata*, *Helichrysum dregeanum*, *H. lucilioides*, *Hermannia multiflora*, *H. vestita*, *Lantana rugosa*, *Limeum aethiopicum*, *Lycium cinereum*, *Melolobium candicans*, *M. microphyllum*, *Nenax microphylla*, *Pegolettia retrofracta*, *Pentzia globosa*, *Rhigozum obovatum*, *Selago saxatilis*, *Stachys linearis*, *S. rugosa*, *Sutera halimifolia*, *Wahlenbergia albens*.

Succulent Shrubs: *Aloe broomii*, *Chasmatophyllum musculinum*, *C. verdoorniae*, *Cotyledon orbiculata* var. *dactylopsis*, *Pachypodium succulentum*.

Graminoids: *Aristida adscensionis*, *A. congesta*, *A. diffusa*, *Cenchrus ciliaris*, *Cymbopogon caesius*, *Cynodon incompletus*, *Digitaria eriantha*, *Eragrostis curvula*, *E. lehmanniana*, *Heteropogon contortus*, *Setaria lindenbergiana*, *Themeda triandra*, *Tragus koelerioides*, *Cymbopogon pospischilii*, *Enneapogon scoparius*, *Eragrostis chloromelas*, *E. obtusa*, *Eustachys paspaloides*, *Fingerhuthia africana*, *Hyparrhenia hirta*, *Sporobolus fimbriatus*.

Herbs: *Convolvulus sagittatus*, *Dianthus caespitosus* subsp. *caespitosus*, *Gazania krebsiana* subsp. *krebsiana*, *Hibiscus pusillus*, *Indigofera alternans*, *I. rhytidocarpa*, *Lepidium africanum* subsp. *africanum*, *Pollichia campestris*.

Herbaceous Climber: *Argyrolobium lanceolatum*.

Geophytic Herbs: *Albuca setosa*, *Asplenium cordatum*, *Cheilanthes bergiana*, *C. eckloniana*, *Freesia andersoniae*, *Haemanthus humilis* subsp. *humilis*, *Oxalis depressa*, *Pellaea calomelanos*.

Succulent Herbs: *Aloe grandidentata*, *Crassula nudicaulis*, *Duvalia caespitosa*, *Euphorbia pulvinata*, *Huernia piersii*, *Stapelia grandiflora*, *S. olivacea*, *Tridentea gemmiflora*.

Conservation Status

This vegetation is classified as Least Threatened because it is largely excluded from intensive agricultural activities. The conservation target is 28% and about 5% statutorily conserved in the Rolfontein, Tussen Die Riviere, Oviston, Gariep Dam, Caledon and Kalkfontein Dam Nature Reserves. Additionally, there is a small patch that is protected in the private Vulture Conservation Area. About 3% of the area has been transformed due to dams building. Erosion varies from low to high (Mucina & Rutherford, 2006).

5.1.2.1.3 Upper Gariep Alluvial Vegetation

Upper Gariep Alluvial Vegetation is limited to the Free State and Northern Cape Provinces. It occurs as broad alluvia along the Orange River, lower Caledon and lower stretches of the Vaal, Riet and Modder Rivers as far as Groblershoop. Altitudes range from 1000 to 1500 (Mucina & Rutherford, 2006).

Important Plant Taxa in Upper Gariep Alluvial Vegetation

Mucina and Rutherford (2006) note that the following species are important taxa in the Upper Gariep Alluvial Vegetation:

Small trees: *Vachellia karroo*, *Celtis africana*, *Salix mucronata* subsp. *mucronata*.

Tall shrubs: *Diospyros lycioides*, *Melianthus comosus*, *Searsia pyroides*.

Low shrubs: *Asparagus setaceus*, *A. suaveolens*.

Woody Climber: *Clematis brachiata*.

Succulent Shrubs: *Lycium arenicola*, *L. hirsutum*.

Herbs: *Rubia cordifolia*, *Cineraria dregeana*, *C. lobata*.

Graminoid: *Melica decumbens*.

Conservation Status

This vegetation is classified as Vulnerable because only about 3% is statutorily conserved in Tussen Die Riviere, Gariep Dam and Oviston Nature Reserves. Over 20% has been transformed for cultivation and dam construction. The invasion of several woody alien plant species has also become a problem in heavily disturbed alluvial vegetation patches, where they have become common dominants. It has a conservation target of 31% (Mucina & Rutherford, 2006).

5.1.2.2 Expected Flora Species

The POSA database indicates that 330 species of indigenous plants are expected to occur within the project area (The full list of species will be provided in the final report). One SCC based on their conservation status could be expected to occur within the project area and are provided in Table 5-2 below. It is believed that additional SCC will be recorded in the assessment.

Table 5-2 Threatened flora species that may occur within the project area

Family	Taxon	Author	IUCN	Ecology
Aizoaceae	*Drosanthemum pulchrum*	L. Bolus	VU	Indigenous; Endemic

5.1.3 Faunal Assessment

5.1.3.1 Amphibians

Based on the IUCN Red List Spatial Data and FrogMap, 13 amphibian species are expected to occur within the area (The full list will be provided in the final assessment). One is regarded as threatened (Table 5-3).

Table 5-3 Threatened amphibian species that are expected to occur within the project area

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Pyxicephalus adspersus	Giant Bullfrog	NT	LC	Moderate

Giant Bull Frog (*Pyxicephalus adspersus*) is listed as NT on a regional scale. It is a species of drier savannas where it is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rains, and breed in shallow, temporary waters in pools, pans and ditches (IUCN, 2017). This species has a moderate likelihood of occurrence in the project area, due to the presence of wetlands within the project area.

5.1.3.2 Reptiles

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 40 reptile species are expected to occur within the area (The full list will be provided in the final assessment). One is regarded as threatened (Table 5-4).

Table 5-4 Threatened reptile species that are expected to occur within the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Psammobates tentorius	Tent Tortoise	NT	NT	Moderate

Tent Tortoise (*Psammobates tentorius*) is classified as NT both regionally and internationally. This species is endemic to South Africa and Namibia, where it is found in dwarf shrublands with succulents, annuals, grasses and geophytes of the Nama-Karoo, Succulent Karoo, Fynbos and Albany Thicket. The likelihood of occurrence is moderate because the project area is within the Northern Nama-Karoo vegetation type, which has succulents and grasses for food.

5.1.3.3 Mammals

The IUCN Red List Spatial Data lists 59 mammal species that could be expected to occur within the area (The full list will be provided in the final assessment). This list excludes large mammal species that are normally restricted to protected areas. Nine of these expected species are regarded as threatened (Table 5-5), of which one has a low likelihood of occurrence based on the lack of suitable habitat in the project area.

Table 5-5 Threatened mammal species that are expected to occur within the project area

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Atelerix frontalis	South Africa Hedgehog	NT	LC	High
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	Moderate
Felis nigripes	Black-footed Cat	VU	VU	Moderate
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	High
Leptailurus serval	Serval	NT	LC	High
Panthera pardus	Leopard	VU	VU	High
Parahyaena brunnea	Brown Hyaena	NT	NT	Moderate
Poecilogale albinucha	African Striped Weasel	NT	LC	Low
Redunca fulvorufula	Mountain Reedbuck	EN	LC	High

South African Hedgehog (*Atelerix frontalis*) has a tolerance to a degree for habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Suitable habitats occur in the project area that can function as habitat for this species, as such the likelihood of occurrence is rated as high.

African Straw-colored Fruit Bat (*Eidolon helvum*) has a wide distribution range across South Africa, occurring in a wide range of habitats, including moist and dry tropical rainforest, coastal and riverine forest, moist and dry savannas as well as areas modified by humans (IUCN, 2017). Main threats include habitat loss, persecution and unsustainable harvesting for bushmeat and traditional medicine (Apps, 2012; IUCN, 2017). The sparse presence of riverine woodlands in the project area as well as this species' ability to adapt to modified habitats contributed to the moderate likelihood of occurrence for this species.

Black-footed Cat (*Felis nigripes*) 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 highest densities of this species have been recorded in the more arid Karoo region of South Africa. The arid habitat in the project area can be considered to be somewhat suitable for the species and the likelihood of occurrence is therefore rated as moderate.

Spotted-necked Otter (*Hydrictis maculicollis*) only occurs in freshwater habitats with available shelter in the form of dense vegetation or holes (Apps, 2012). It is threatened by water pollution, clearing of vegetation near water as well as habitat destruction for agriculture, housing or industries (Apps, 2012).

The presence of rivers with some adjacent riparian vegetation patches in the project area contribute to the high likelihood of occurrence for this species.

Serval (*Leptailurus serval*) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In southern Africa they are always found near water in dense, well-watered grasslands and reedbeds. The main threat is habitat loss due to the development of agriculture and forestry (Apps, 2012). Suitable habitat is present for this species (rivers and grasslands) in the project area, as such the likelihood of occurrence is rated as high.

Leopard (*Panthera pardus*) has a wide habitat tolerance but is dependent on good cover for shelter and hunting. It can live in arid areas and is not dependent on water. Additionally, the Leopard is very adaptable to human encroachment, and in croplands it has the habit of hunting crop-raiding herbivores such as bushpigs (Apps, 2012). Due to its adaptability to human encroachment, its habits of hunting crop-raiding species in farms, as well as the presence of dense vegetation and hills around the proposed agricultural and pivot expansion area, the Leopard is deemed to have a high likelihood of occurrence in the project area.

Brown Hyaena (*Parahyaena brunnea*) 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. Given its known ability to persist outside of formally protected areas the likelihood of occurrence of this species in the project area is moderate.

African Striped Weasel (*Poecilogale albinucha*) prefers moist grassland or open woodland, but is found in various other habitats on occasion. It's moist grassland habitat is threatened by tree plantations, crops and overgrazing, and African Striped Weasels are also heavily hunted so that their body parts can be used in traditional charms and other magical uses (Apps, 2012). Due to the aridity of the Nama-Karoo Biome, with which the project area mostly overlaps, and consequently the lack of moist grasslands, the occurrence of this species is considered to be low for the project area.

Mountain Reedbuck (*Redunca fulvorufula*) is endemic to southern Africa and prefers dry, stony slopes (with a angle of 20 to 30 degrees) with grass cover and scattered bushes and trees. It is also dependent on water (Apps, 2012; IUCN, 2017). The presence of suitable habitats in the project area, including hills, grass cover, scattered riparian vegetation and rivers, contribute to the high likelihood of occurrence for this species.

5.1.3.4 Avifauna

The SABAP2 Data lists 197 avifauna species that could be expected to occur within the area (The full list will be provided in the final assessment). Fourteen of these expected species are regarded as threatened (Table 5-6). Three of the species have a low likelihood of occurrence due to lack of suitable habitat and food sources in the project area.

Table 5-6 Threatened avifauna species that are expected to occur within the project area

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Anthus crenatus	African Rock Pipit	NT	NT	High
Ardeotis kori	Kori Bustard	NT	NT	High
Cursorius rufus	Burchell's Courser	VU	LC	High
Eupodotis caerulescens	Blue Korhaan	LC	NT	High
Falco biarmicus	Lanner Falcon	VU	LC	High
Glareola nordmanni	Black-winged Pratincole	NT	NT	Low

Grus paradisea	Blue Crane	NT	VU	Moderate
Gyps coprotheres	Cape Vulture	EN	EN	High
Heterotetrax vigorsii	Karoo Korhaan	NT	LC	High
Monticola explorator	Sentinel Rock Thrush	LC	NT	High
Neotis ludwigii	Ludwig's Bustard	EN	EN	High
Phoeniconaias minor	Lesser Flamingo	NT	NT	Low
Phoenicopterus roseus	Greater Flamingo	NT	LC	Low
Sagittarius serpentarius	Secretarybird	VU	EN	High

African Rock Pipit (*Anthus crenatus*) is endemic to southern Africa and is closely associated with steep rocky habitats as well as scattered shrublands or grassy areas. It is threatened by habitat destruction due to the development of tree plantations. This species is given a high likelihood of occurrence due to the presence of suitable habitat in the project area, namely shrubland and grassland.

Kori Bustard (*Ardeotis kori*) is endemic to Sub-Saharan Africa, where it prefers flat, arid, mostly open habitats such as grassland, karoo, bushveld, thornveld, scrubland and savanna. In the Karoo of South Africa, the main threat to Kori Bustard is powerlines (IUCN, 2017). This species is given a high likelihood of occurrence due to the presence of suitable habitat in the project area.

Burchell's Courser (*Cursorius rufus*) is endemic to Sub-Saharan Africa, where it prefers a variety of habitats such as open short-sward grasslands, dry savannas, fallow fields, overgrazed or burnt grasslands and pastures, bare or sparsely vegetated sandy or gravelly deserts, stony areas with scattered small shrubs as well as saltpans. In the southern parts of its range, threats include habitat degradation due to agricultural activities such as poor grazing practices, disturbance from livestock, and intense use of irrigation or pesticides (IUCN, 2017). This species is given a high likelihood of occurrence due to the presence of suitable habitat in the project area.

Blue Korhaan (*Eupodotis caerulescens*) is endemic to South Africa and Lesotho, and occurs in grassveld usually over 1500 m above sea level, preferring open, fairly short grassland and a mixture of grassland and karoo dwarf-shrubland within 1 km of water, with termite mounds and few or no trees. The main threat is intensive agriculture leading to habitat loss (IUCN, 2017). This species is given a high likelihood of occurrence due to the presence of suitable habitat in the project area.

Lanner Falcon (*Falco biarmicus*) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. The likelihood of incidental records of this species in the project area is rated as high due to the project area's largely natural veld condition and the expected presence of several avifaunal prey species in the project area.

Black-winged Pratincole (*Glareola nordmanni*) is a migrant that occurs in seasonally wet grasslands, savannas and sandbanks along large rivers during the non-breeding season in Africa. Threats are poorly understood, but is possibly due to habitat loss for agriculture (IUCN, 2017). This species is given a low likelihood of occurrence due to the variable and unreliable low rainfall of the project area within the Nama-Karoo Biome.

Blue Crane (*Grus paradisea*) is endemic to southern Africa. During the breeding season, it breeds in natural grass- and sedge-dominated habitats and occasionally in or near wetland areas. During the non-breeding season, it occurs in short, dry, natural grasslands, as well as the Karoo and Fynbos biomes. Threats include poisoning, afforestation and collision with powerlines (IUCN, 2017). This species is given a moderate likelihood of occurrence due to the presence of suitable habitat in the project area during the non-breeding season.

Cape Vulture (*Gyps coprotheres*) is endemic to sub-Saharan Africa and occurs in a variety of habitats, including forest, savanna, shrubland, grassland, desert and rocky areas. It flies long distances over open country and uses steep cliffs to breed and roost. Main threats are considered to be the contamination and shortage of their food supply, collision with powerlines and poaching for traditional medicinal use purposes (IUCN, 2017). This species is given a high likelihood of occurrence due to the presence of suitable habitat in the project area.

Karoo Korhaan (*Heterotetrax vigorsii*) is endemic to southern Africa, where it occurs in shrublands and its main threats are habitat degradation due to climate change and severe weather. This species is given a high likelihood of occurrence due to the presence of suitable habitat in the project area. This species is given a high likelihood of occurrence due to the presence of suitable habitat in the project area.

Sentinel Rock Thrush (*Monticola explorator*) is endemic to southern Africa, occurring in South Africa, Lesotho, eSwatini and potentially Mozambique. It is found in shrublands, grasslands and rocky habitats. Potential threats include habitat loss due to agriculture as well as rising temperatures in South Africa due to climate change (IUCN, 2017). This species is given a high likelihood of occurrence due to the presence of suitable habitat in the project area.

Ludwig's Bustard (*Neotis ludwigii*) is found in open lowland and upland plains with grass and light thornbush, sandy open shrub veld and semi-desert in the arid and semi-arid Namib and Karoo biomes. The main threat to this species is collision with powerlines (IUCN, 2017). This species is given a high likelihood of occurrence due to the presence of suitable habitat in the project area.

Lesser Flamingo (*Phoeniconaias minor*) breeds in large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore. Breeding occurs after the seasonal rains flooded the area, leading to the separation of remote breeding sites from terrestrial predators and providing soft mud used for nest building. Threats include water pollution, land claims and powerlines (IUCN, 2017). This species is given a low likelihood of occurrence due to the lack of suitable habitat in the project area.

Greater Flamingo (*Phoenicopterus roseus*) inhabits shallow eutrophic waterbodies such as saline lagoons, saltpans and large saline or alkaline lakes. It seldom occurs in freshwater habitats but will commonly bathe and drink from freshwater inlets entering alkaline or saline lakes. Threats to their breeding success include disturbance from people and vehicles and nest predation due to the lowering of water levels surrounding nests. Water pollution due to mining, sewage and heavy metals are another threat (IUCN, 2017). This species is given a low likelihood of occurrence due to the lack of suitable habitat in the project area.

Secretarybird (*Sagittarius serpentarius*) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017). The likelihood of occurrence is rated as high due to the extensive grasslands and wetland areas present in the project area.

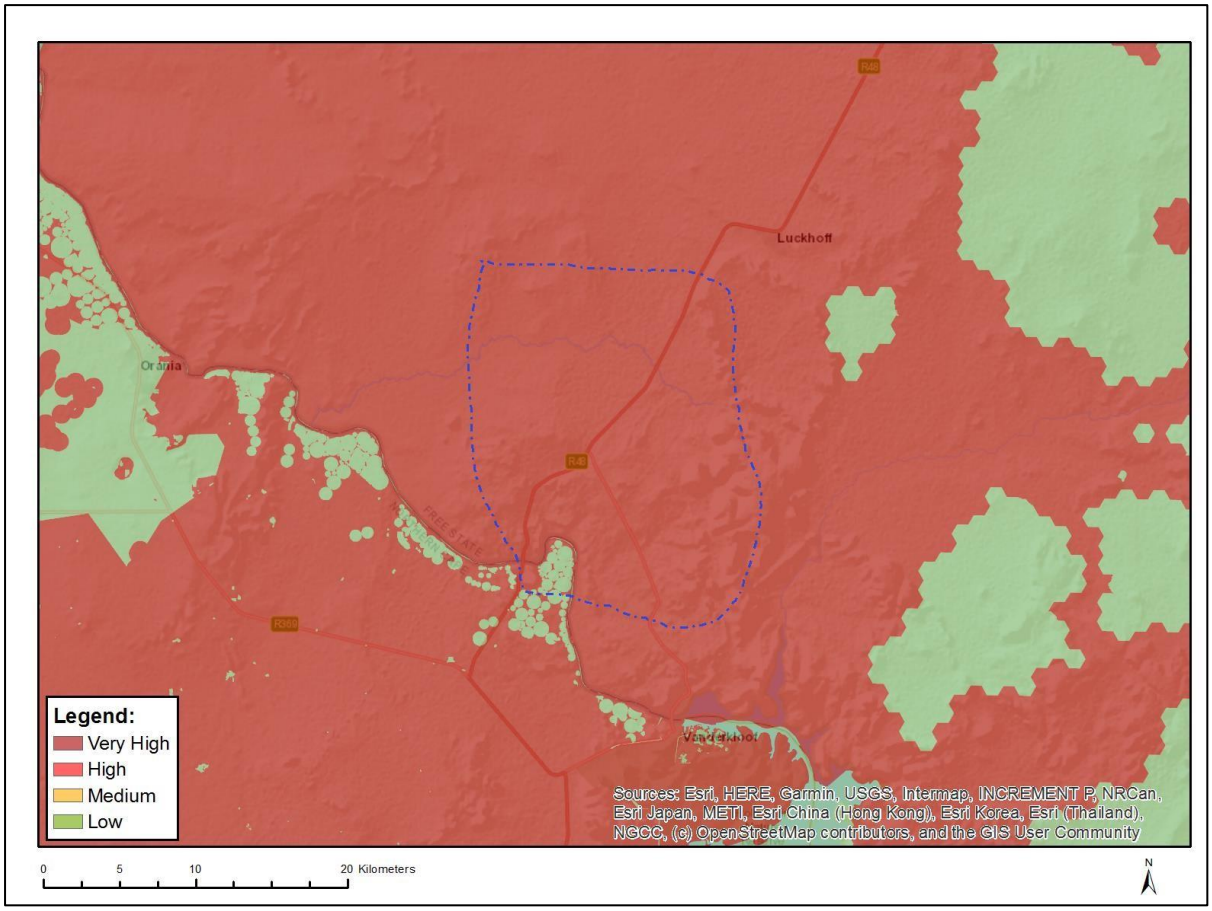
5.1.4 DEA Screening Tool

According to the Screening Tool Report generated (Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended), the following sensitivity classifications were from the National Web-based Environmental Screening Tool (Figure 5-10 to Figure 5-12)

- Terrestrial Biodiversity Theme is Very High for the project area, with the possibility of a CBA1, CBA2, ESA1, ESA2, Grasberg Reserve, Tuinhoek Reserve and a Protected Areas Expansion Strategy area being present;

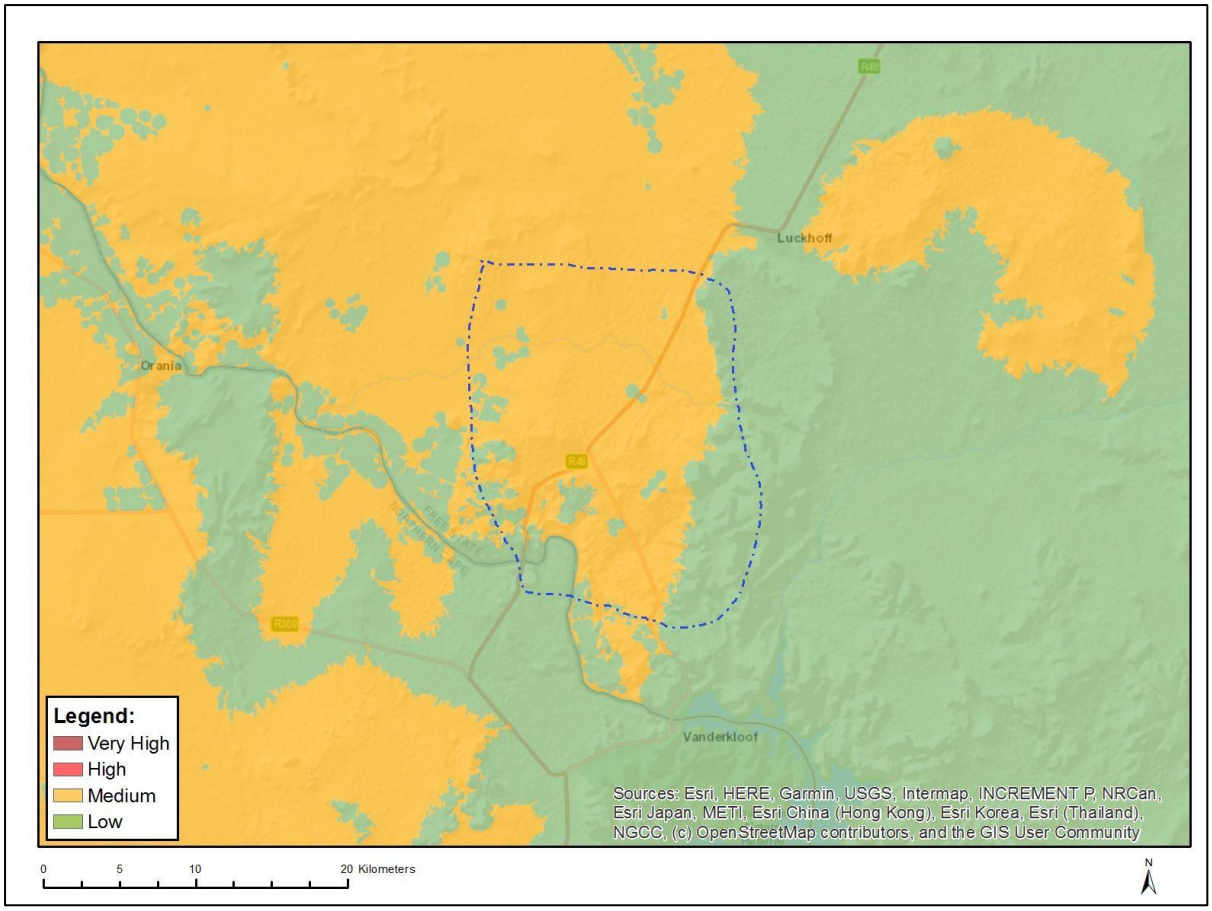
- Plant Species Theme is Medium for the project area, with the possibility of *Tridentea virescens* (Not listed in IUCN) being present; and

- Animal Species Theme is High for the project area, with the possibility of *Redunca fulvorufula* (EN), *Hydrictis maculicollis* (NT) *Neotis ludwigii* (EN) and *Aquila verreauxii* (LC) being present.



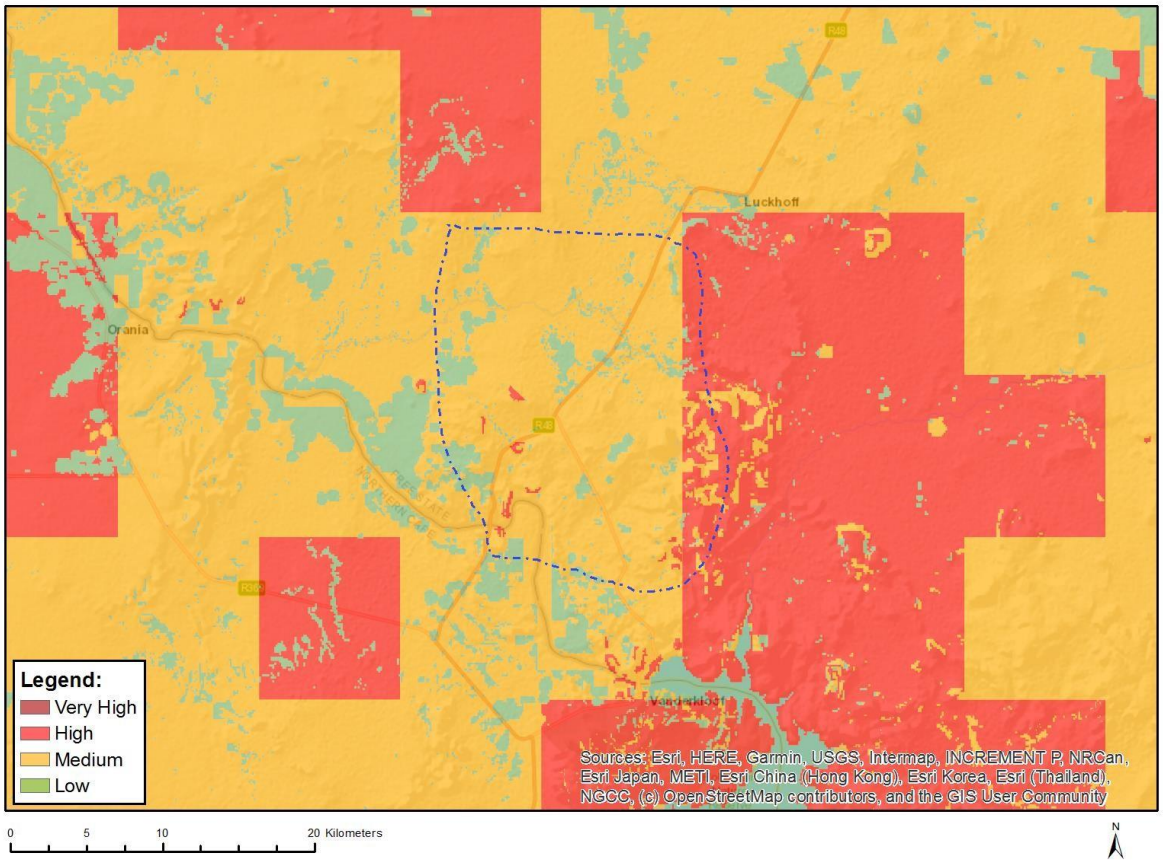
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Figure 5-10 Relative terrestrial biodiversity theme sensitivity for the project area



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Figure 5-11 Relative plant species theme sensitivity for the project area



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Figure 5-12 Relative animal species theme sensitivity for the project area

6 Impact Assessment

Anthropogenic activities drive habitat destruction causing displacement of fauna and flora and possibly direct mortality. Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation may reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area.

The terrestrial habitat expected in the project area consists mainly of Northern Upper Karoo, which based on the scoping assessment contains a number of threatened *Drosanthemum pulchrum* (VU). It is also believed that due to the mostly natural state of the area that additional flora SCCs will be recorded. Portions of the project area are classified as CBA1, CBA1, ESA1 and ESA2. The project area also overlaps with EN rivers, CR wetlands and a VU wetland. The importance of these areas are highlighted by the number of fauna SCCs expected (25). A total of 14 fauna SCCs were given a high likelihood of occurrence, while a further six were given a moderate likelihood of occurrence. Based on the desktop assessment information it can be said that majority of the project area will have a high sensitivity rating.

Table 6-1 Scoping evaluation table summarising the impacts identified to terrestrial biodiversity

Impact **Biodiversity loss/disturbance**			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**

Destruction, fragmentation and degradation of habitats and ecosystems	Direct impacts: » Disturbance / degradation / loss to vegetation and habitats » Ecological corridors are disrupted » Habitat fragmentation Indirect impacts: » Erosion risk increases » Fire risk increases » Increase in invasive alien species	Regional	Water resources and buffer area
Spread and/or establishment of alien and/or invasive species	Direct impacts: » Loss of vegetation and habitat due to increase in alien species Indirect impacts: » Creation of infrastructure suitable for breeding activities of alien and/or invasive species » Spreading of potentially dangerous diseases due to invasive and pest species	Regional	None identified at this stage
Direct mortality of fauna	Direct impacts: » Loss of SCC species » Loss of fauna diversity Indirect impacts: » Loss of diversity and species composition in the area. » Possible impact on the food chain	Regional/International	None identified at this stage
Reduced dispersal/migration of fauna	Direct impacts: » Loss of genetic diversity » Isolation of species and groups leading to inbreeding Indirect impacts: » Reduced seed dispersal » Loss of ecosystem services	Regional/National	None identified at this stage
Environmental pollution due to water runoff, spills from vehicles and erosion	Direct impacts: » Pollution in watercourses and the surrounding environment » Faunal mortality (direct and indirectly) Indirect impacts: » Ground water pollution » Loss of ecosystem services	Regional	None identified at this stage
Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust, heat radiation and light pollution.	Direct impacts: » Disruption/alteration of ecological life cycles due to noise » Reduced pollination and growth of vegetation due to dust » Faunal mortality due to light pollution (nocturnal species becoming more visible to predators) Indirect impacts: » Loss of ecosystem services	Regional	None identified at this stage
Staff and others interacting directly with fauna (potentially dangerous) or poaching of animals	Direct impacts: » Loss of SCCs or TOPS species Indirect impacts: » Loss of ecosystem service » Loss of genetic diversity	Regional	None identified at this stage
Description of expected significance of impact The development of the area could result in the loss or degradation of the habitat and vegetation, most of which is still in a natural condition and supports a number of fauna species. The construction of the pivot development could also lead to the displacement/mortalities of the fauna and more specifically SCC fauna species. The operation of the facility could result in the disruption of ecological life cycles. This could be as a result of a number of things, but mainly due to dust, noise and light pollution. The disturbance of the soil/vegetation layer will allow for the establishment of flora alien invasive species, the new infrastructure in turn will provide refuge for invasive/feral fauna species. Erosion is another possible impact that could result from the disturbance of the top soil and vegetation cover. A number of machines, vehicles and equipment will be required, aided by chemicals and concrete mixes for the project. Leaks, spillages or breakages from any of these could result in contamination of the receiving water resources. Contaminated water resources are likely to have an effect on the associated biota.			

Gaps in knowledge & recommendations for further study

- This is completed at a desktop level only.
- Identification and descriptions of habitats.
- Identification of the Site Ecological Importance.
- Location and identification of SCCs as well as in the case of fauna their location of the nests/dens.
- Determine a suitable buffer width for the identified features.

Recommendations with regards to general field surveys

- Field surveys to prioritise the development areas.
- Fieldwork to be undertaken during the wet season period.

6.1 Cummulative Impacts

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general habitat loss and transformation resulting from other activities in the area.

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 potential impacts of the project that are cumulative for fauna and flora.

Localised cumulative impacts include the cumulative effects from operations that are close enough to potentially cause additive effects on the environment or sensitive receivers (such as nearby pivots within the area). These include dust deposition, noise and vibration, disruption of corridors or habitat, groundwater drawdown, groundwater and surface water quality, and transport.

Long-term cumulative impacts due to an extensive agricultural and pivot development footprint can lead to the loss of endemic species and threatened species, loss of habitat and vegetation types and even degradation of well conserved areas (Table 6-2).

Table 6-2 Cumulative impact of the proposed agricultural and pivot expansion

The development of the proposed infrastructure will contribute to cumulative habitat loss within CBAs/ ESAs and thereby impact the ecological processes in the region.

	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	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	**Low**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Residual Impacts:		
» CBA 1 & ESA2 » Endemic species; » SCC fauna and flora species; » Portions of a NPAES; and		

- Niche habitats.

7 Conclusion

Based on the desktop assessment it can be said that the project area is sensitive with a moderate-high likelihood of species of conservation concern occurring. This assumption is based on the presence of CBA1, CBA2, ESA1, ESA2, NPAES (priority focus area), Platberg–Karoo Conservancy IBA, EN rivers, CR rivers and CR wetlands as well as a VU wetland found in and around the project area.

The expectant anthropogenic activities are likely to drive habitat destruction causing displacement of fauna and flora and possibly event direct mortality. Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation may reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area.

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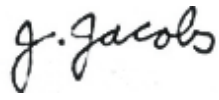
9 Appendix Items

9.1 Appendix A – Specialist Declaration of Independence

I, Jan Jacobs, 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.



Jan Jacobs

Biodiversity Specialist

The Biodiversity Company

April 2022