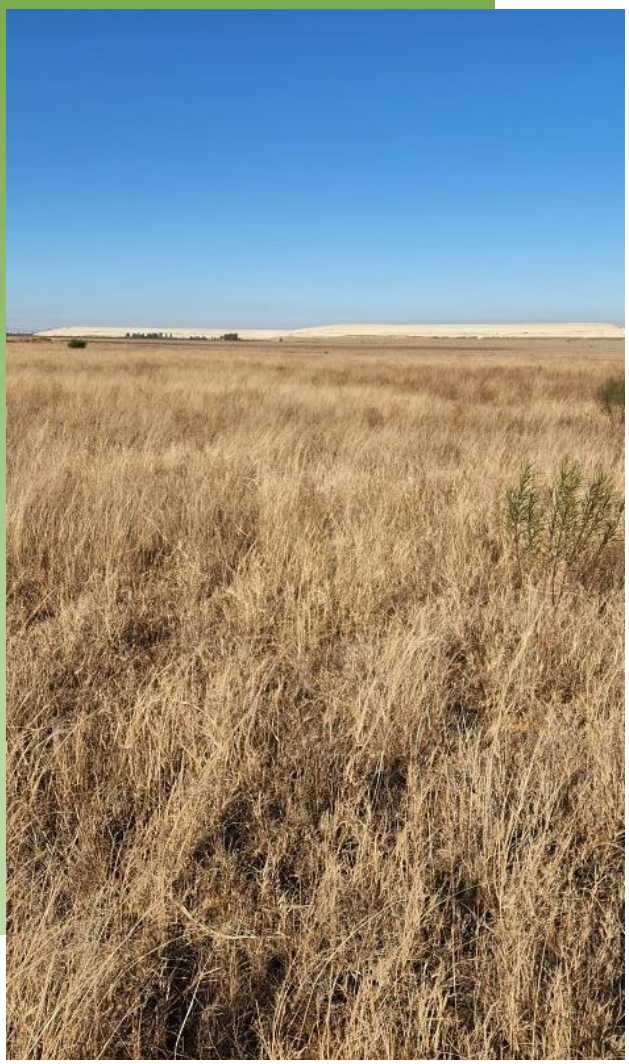

Terrestrial Biodiversity Assessment

Proposed Harmony Target PV facility

Date: 30/12/2022
Version: Draft
Author: J. Pote

Terrestrial Biodiversity Assessment

Proposed Harmony Target PV facility

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Compiled for: **Savannah Environmental**

Date of report: **30/12/2022**

Draft Report

Revisions

Report/Revision Version	Date:	Approved by:
First Draft	30/12/2022	Jamie Pote
IAP comments		
Final		

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1 Introduction & Background

1.1 Background

Savannah Environmental were appointed to undertake an environmental application, in terms of the National Environmental Management Act (Act 107 of 1998), for a proposed Photovoltaic (PV) energy facility for the Harmony Gold Mine outside Allanridge, Free State Province (Figure 1). As part of this application, a Terrestrial Biodiversity Assessment is required.

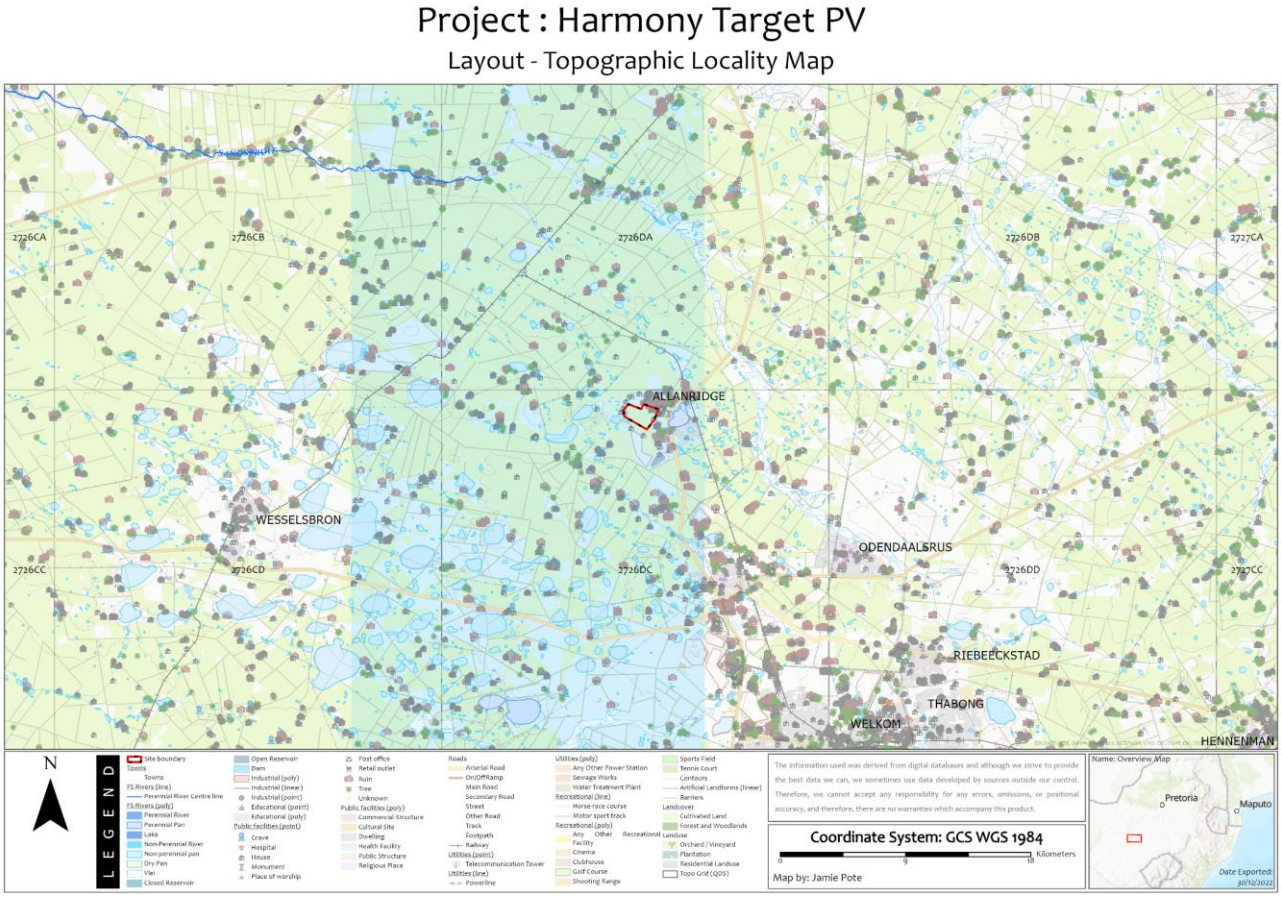

Figure 1: Locality Map.

1.2 Project Description

1.2.1 Activity Location and Description

Avgold (Pty) Ltd (a subsidiary of Harmony Gold Mining Company Ltd) is looking to supplement its energy supply by implementing Photovoltaic (PV) generation, aiding their transition to a more sustainable and environmentally friendly energy mix.

The development of a solar photovoltaic (PV) facility with a generating capacity of up to 30 MW is proposed 55 0m south of the Harmony Target operations, approximately ~14 km south of the town of Allanridge within the Matjhabeng Local Municipality and within the Lejweleputswa District Municipality, Free State Province. The PV facility is located on Portion 0 of the Farm Kromdraai 386 and Portion 0 of the Farm Aandenk 227 (Figure 1). The solar PV development will be known as Harmony Target Solar PV Facility.

The preferred site for the project is on properties which are privately owned by the Mine and are available for the proposed project and is therefore deemed technically feasible by the project developer for such development to take place.

A project site considered to be technically suitable for the development of the solar PV facility, with an extent of approximately 500 Ha, was identified. A development area of ~245 Ha was demarcated within this project site and allows an adequate footprint (~105 Ha) for the installation of a solar PV facility with a contracted capacity of up to 30 MW, while allowing for the avoidance of environmental site sensitivities.

The infrastructure associated with the 30 MW solar PV facility (Figure 2) will include:

- PV modules and mounting structures.
- Inverters and transformers a SCADA room, and maintenance room.
- Cabling between the project components, to be laid underground where practical.
- Access roads, internal roads and fencing around the development area.
- Temporary and permanent laydown areas and O&M buildings.
- Grid connection solution including an on-site facility substation, switching station, to be connected to the Avgold Substation via an overhead power line (located ~400 m north-east of the site).

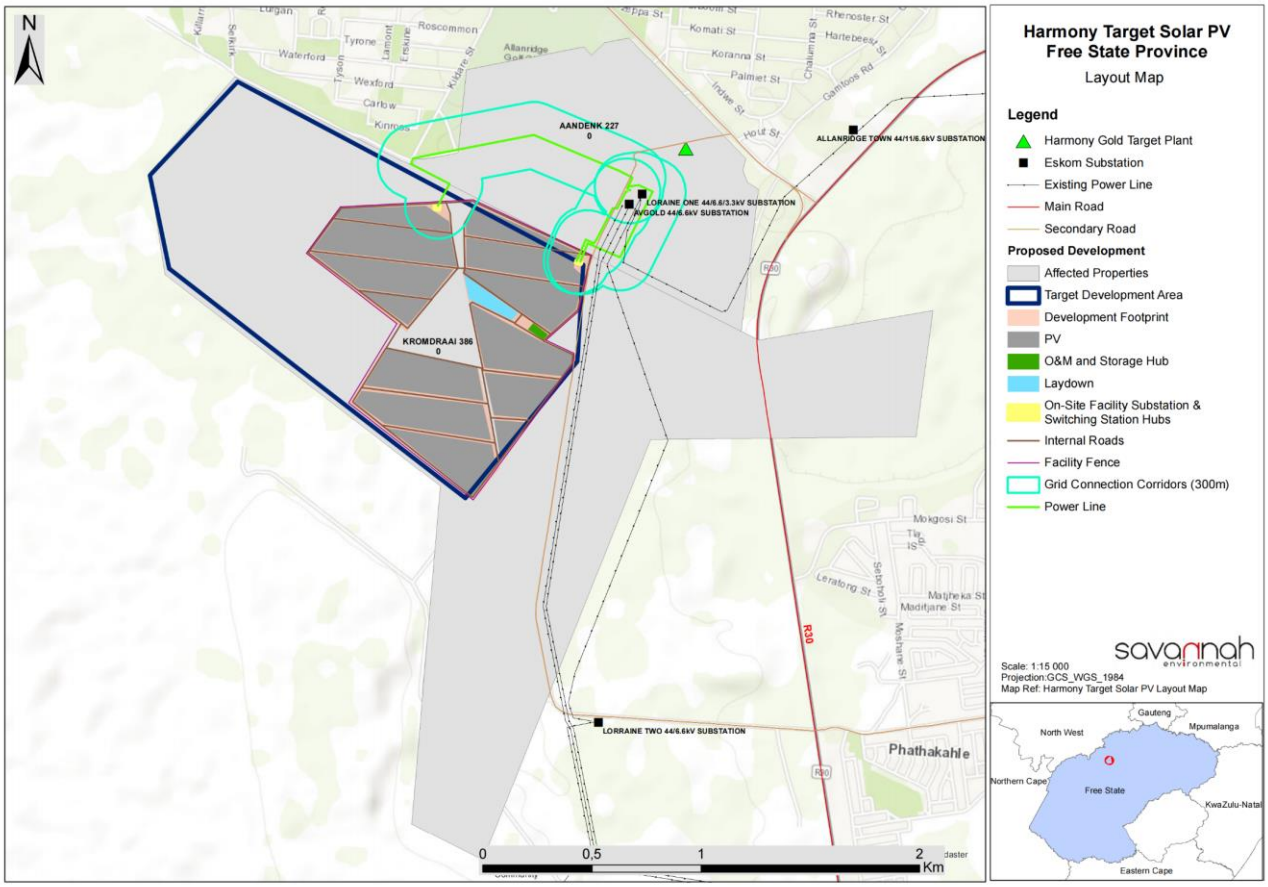

Figure 2: Site Development Plan.

Three alternative grid corridors (300 m in width) have been assessed (Figure 2). These are described as follows:

- **<u>Alternative 1:</u>** A 300 m wide corridor between the switching substation located on the Harmony Target Solar PV Facility and the Avgold Substation via an overhead power line (~750 m in length). The corridor exits the facility from the north-east corner of the development footprint and

follows existing Eskom power lines to the east of the development area as well as an unnamed mine access road. The route skirts around the Loraine One Substation to access the south side of the Avgold Substation (located directly south-west of the Loraine One Substation).

- **Alternative 2:** A 300 m wide corridor between the switching substation located on the Harmony Target Solar PV Facility and the Avgold Substation via an overhead power line (~440 m in length). The corridor exits the facility from the north-east corner of the development footprint, and follows a secondary mine access road to access the south side of the Avgold Substation (located 400 m north-east of the site).
- **Alternative 3:** A 300 m wide corridor between the switching substation located on the Harmony Target Solar PV Facility and the Avgold Substation via an overhead power line (~1.5 km in length). The corridor exits the facility from the north-west corner of the development footprint, and follows the farm boundary for approximately 200 m west before turning north and then east to follow an unnamed mine access road for approximately 570 m. at the junction with the secondary road, the route turns south to access the south side of the Avgold Substation.

The site is accessible via the R30 and an unnamed secondary road/mine access road. The site is situated within an extensive relatively flat plain, with some scattered, slightly irregular undulating plains and hills, bisected by non-perennial watercourses and interspersed with small to medium sized water bodies, mostly associated with water storage relating to the surrounding urban, mining and agricultural activities. The area under assessment includes an area of approximately 245 Ha, a portion (~105 Ha) of which will be utilised for the proposed PV facility. The proposed overhead powerline(s) will connect the PV facility with the electrical network within the Target Mine area.

The proposed development footprint is indicated in Figure 3 below.

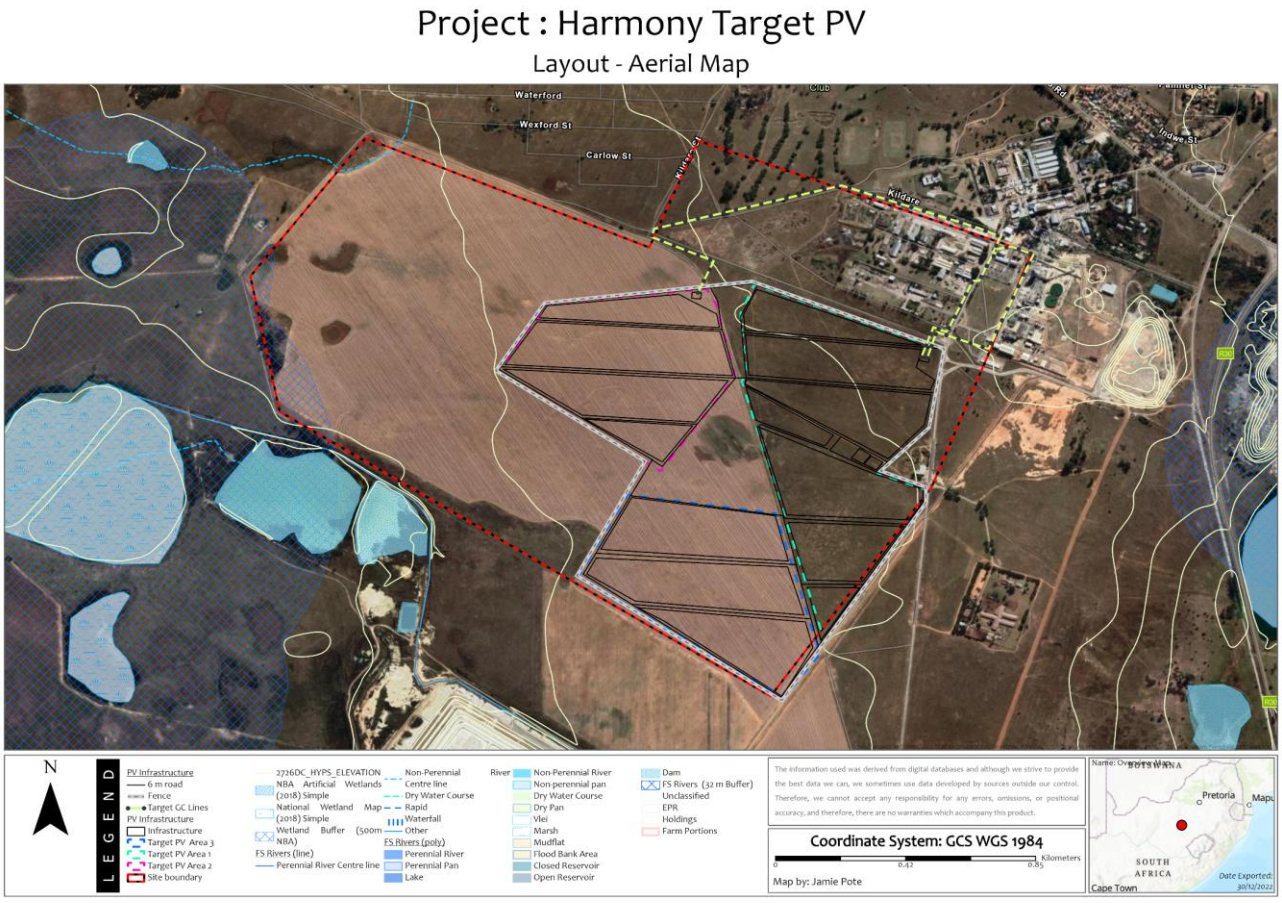

Figure 3: Locality Map (Aerial Photos).

1.2.2 Aspects of the project that could potentially have Biodiversity related Impacts

The key components of the project and their respective impacts upon terrestrial biodiversity and ecological processes include the following:

COMPONENT	POTENTIAL BIODIVERSITY AND ECOLOGICAL IMPACTS
PV Facility	
The construction of the proposed facility will require selective and localised clearing for PV infrastructure.	The terrestrial environment will permanently be impacted where vegetation clearing is required to construct the PV facility and will be limited to the footprint area as well as any additional area for cut and fill requirements.
Overhead Powerline	
The construction of the proposed facility will require selective clearing for pylon construction.	The terrestrial environment will permanently be impacted where vegetation clearing is required to construct any pylons and will be limited to a minimal area where the pylon foundations will be constructed as well as a limited temporary work area surrounding this, which will likely self-rehabilitate to pre-construction conditions with 2 years.
Access \Roads	
The construction of the proposed facility will require selective clearing of vegetation along any access roads for construction and operation.	Access roads will be required to access the various PV facilities during construction as well as during operations for maintenance purposes. It is likely that the road will be heavily used during construction phase after which traffic will be relatively light, dependant on maintenance needs.

1.3 Methodology and Approach

The proposed **Harmony Target PV** footprint will be assessed. The purpose of the specialist study is to assess the impacts of the proposed activity in line with the authorities' requirements for Terrestrial Biodiversity Assessment and Plant Species Assessment for the proposals and, as a minimum will include the following:

1. A comprehensive desktop study and identify potential risks for a vegetation and flora assessment report relating to of the site and immediate surrounding area. This will include the relevant Regional Planning frameworks and review of previous studies.
2. A single site visit to assess the following:
    a. Verification of findings of previous specialists.
    b. Broad level Field survey of vegetation, flora, and habitats present (including any riparian vegetation or wetland vegetation).
    c. Verify and update species list, identifying, highlighting, and locating *flora* species that are of Conservation Concern, Threatened, Red Data species and species requiring permits for destruction/relocation in terms of NEMBA and any respective Provincial Ordinances. Mapping of any populations of such species observed during the site visit.
    d. Mapping of the various habitat units and assessment of habitat integrity, ecological sensitivity, levels of degradation and transformation, alien invasion and flora species of special concern, the outcome being a detailed sensitivity map ranked into high, medium, or low classes.
    e. The proposed fee includes a single site visit only but depending on when the initial site visit is undertaken, additional follow-up visits in different seasons may be required, in order to meet the species assessment protocol requirements.
3. Detailed reporting will be comprised of a *Draft Terrestrial Biodiversity Assessment Report* (for public review and comment) and a *Final Terrestrial Biodiversity Assessment Report* for submission. The draft and final detailed reports will address the following (as per the gazetted Terrestrial Biodiversity Assessment Protocol):
    a. Indicate any assumptions made and gaps in available information. Assessment of all the vegetation types and habitat units within the relevant Regional Planning Frameworks.

b. A detailed flora species list highlighting the various species of special concern categories (endemic, threatened, Red Data species and other protected species requiring permits for destruction/relocation and invasive/exotic weeds). Clearly indicate the need for any further permitting/licensing or detailed studies to specification of animal and plant species protocols.
c. Faunal assessment will be compromised of a general fauna desktop assessment, as well as specific taxa specialist assessments, which would include on-site assessments as required and camera trapping. It is not anticipated that any methods requiring fauna capture will be followed.
d. Description and assessment of the habitat units and site sensitivities ranked into high, medium, or low classes based on sensitivity and conservation importance. A standard methodology has been developed based on other projects in the specific area.
e. A habitat sensitivity map will be compiled, indicting the sensitivities as described above, inclusive of a riparian delineation for the aquatic report.
f. A map indicating buffers to accommodate Regional Planning requirements (if required).
g. Assessment of Impacts and Mitigation Measure, as well as specific measure that may be required for alternative development plans.
h. A comprehensive EMPr for inclusion in the reports and EMP with specific management actions for construction and Operation.
i. Address any comments raised by IAP's or identified in the project in the final draft and final report.

1.3.1 Site visit

A site visit was conducted on 27 June 2022, during winter. Although the site falls within a summer rainfall area, for the purposes of this report, the site visit is deemed to be adequate as the site is generally significantly transformed. The site visit and assessment were undertaken by Mr Jamie Pote, SACNASP registered ecological scientist with a BSc (Hons) degree in Botany and a BSc degree in Botany and environmental Science, with nearly 20 years' experience undertaking ecological assessments.

1.4 Purpose of Report

1.4.1 Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes

This report has been compiled to fulfil the requirement for a **Terrestrial Biodiversity Assessment** as per the 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 NEMA (GNR 320), **as gazetted on 20 March 2020.** This report is undertaken as supporting information as part of a greater environmental application process and is compliant in terms of the requirements in the above regulations in terms of Terrestrial Biodiversity.

In terms of the 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 NEMA, gazetted **on 30 October 2020**, relating to requirements relating specifically to the **Terrestrial Plant species theme**, this report includes these flora species requirements. The terrestrial biodiversity assessment also gives consideration of fauna, as per protocol requirements for terrestrial biodiversity reporting.

The principles that guide this process include protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources which are fundamental to sustainable development. Since the ecology of a landscape is a function of the relationships between living organisms, including humans, and their physical environment, this terrestrial biodiversity or ecological assessment report will consider not only vegetation but also flora and fauna as well as the

physical environment in which they occur, which will determine the ecological processes that are affected within the site and immediate surrounds (area of influence).

Refer to Section 8.10: Appendix I: Site Sensitivity Verification Report.

1.4.2 Data sources and references

A comprehensive list of references, including data sources is provided in Section 8.1. Data sources that have been were for this report include the following:

- National (DFFE) Web Based Environmental Screening Tool (referred to as NEST in this report) – to generate the sites potential environmental sensitivity.
- National Vegetation Map 2018 (NVM, 2018), Mucina & Rutherford (2006) and National Biodiversity Assessment (NBA, 2019) – description of vegetation types, species (including endemic) and vegetation unit conservation status.
- National and Regional Legislation including Provincial Nature Conservation Ordinances and NEM:BA Threatened or Protected Species (ToPS).
- Botanical Database of Southern Africa (BODATSA) and New Plants of Southern Africa (POSA) – lists of plant species and potential species of concern found in the general area (SANBI)
- International Union for Conservation of Nature (IUCN) – Red List of Threatened Species
- Animal Demography Unit Virtual Museum (VM) – potential faunal species
- Global Biodiversity Information Facility (GBIF) – potential faunal species
- Southern African Bird Atlas Project 2 (SABAP2) – for bird species records
- National Red Books and Lists – mammals, reptiles, frogs, dragonflies & butterflies
- National Freshwater Ecosystem Priority Areas assessment (NFEPA, 2011) – important catchments
- National Protected Areas Expansion Strategy (NPAES, 2018) and South Africa Protected Area database (2020) – protected area information
- Free State Conservation Plan (2016) – bioregional plan
- SANBI BGIS – All other biodiversity GIS datasets
- Aerial Imagery – Google Earth, Esri, Chief Surveyor General (http://csg.dla.gov.za)
- Cadastral and other topographical country data – Chief Surveyor General (http://csg.dla.gov.za)
- Other sources include peer-reviewed journals, regional and local assessments and studies in the general location of the project and its area of influence, landscape prioritization schemes (Key Biodiversity Areas), systematic conservation planning assessments and plans (as above), and any pertinent masters and doctoral theses, among others.

A Glossary and list of Abbreviations is provided in Section 8.6 Appendix E: Abbreviations and Glossary.

1.4.3 Assumptions, Uncertainties and Gaps in Knowledge

The findings and recommendations of this report may be susceptible to the following uncertainties and limitation:

- Any botanical surveys based upon a limited sampling time-period, may not reflect the actual species composition of the site due to seasonal variations in flowering times. Additionally, the composition of fire adapted vegetation may vary depending on level of maturity or time since last burn. As far as possible, site collected data has been supplemented with desktop and database-centred distribution data.
- No assessment has been made of aquatic processes relating to any wetlands, pans and rivers/seeps and/or estuaries outside of the scope of those having an influence on the terrestrial biodiversity.

2 Policy

2.1 Company Policy

No company policy is applicable to this assessment.

2.2 Legislation Framework

In terms of NEMA EIA Regulations (07 April 2014, as amended), the following specific listing notices have bearing on this report[1]:

Listing Notice 1 (GNR 327):

1. The development of facilities or infrastructure for the generation of electricity from a renewable resource where—
(i) the electricity output is more than 10 megawatts but less than 20 megawatts; or
(ii) the output is 10 megawatts or less, but the total extent of the facility covers an area in excess of 1 hectare.

Activity 1 would be triggered as the total extent of the facility will exceed 1 hectare.

12. The development of:
(ii) infrastructure or structures with a physical footprint of 100 square metres or more.
where such development occurs—
(a) within a watercourse.
(b) in front of a development setback; or
(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse: —

Watercourses are present on site and the listed activity would be triggered if such an activity was to take place.

19. The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;
but excluding where such infilling, depositing, dredging, excavation, removal or moving—
~~(a) will occur behind a development setback;~~
~~(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;~~
~~(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.~~
~~(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or~~
~~(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.~~

This listed activity may be triggered, due to several watercourses being present, which may require crossings or other curt and fill activities, depending on final layout.

27. The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—

1 *The listed activities itemized are only those with Biodiversity relevance to this report and is not a complete list.*

~~(i) the undertaking of a linear activity; or~~
~~(ii) maintenance purposes undertaken in accordance with a maintenance management plan.~~

Indigenous vegetation is present on site and the listed activity would be triggered as it will exceed 1 Ha.

Listing Notice 2 (GNR):

15. The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for—
~~(i) the undertaking of a linear activity; or~~
~~(ii) maintenance purposes undertaken in accordance with a maintenance management plan.~~

The PV footprint will require the clearing of greater than 20 Ha of indigenous[2] vegetation, hence Activity 15 would likely be triggered, requiring a full Scoping and EIA process.

Listing Notice 3 (GNR 324):

4. The development of a road wider than 4 metres with a reserve less than 13,5 metres
b. Free State
i. Outside urban areas:
~~(aa) A protected area identified in terms of NEMPAA, excluding disturbed areas; (bb) National Protected Area Expansion Strategy Focus areas;~~
~~(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;~~
~~(dd) Sites or areas identified in terms of an international convention;~~
(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;
~~(ff) Core areas in biosphere reserves; or~~
(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA~~or from the core areas of a biosphere reserve, excluding disturbed areas; or~~
~~ii. Inside urban areas:~~
~~(aa) Areas zoned for use as public open space;~~
~~(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; or~~
~~(cc) Areas within urban protected areas.~~

The listed activity will be triggered if access roads exceed the threshold (wider than 4 m) and occur within designated critical biodiversity areas *and*/or within 5 km of a nature reserve. The site is not within 5 km of a nature reserve *and is* within ESA and not CBA and t*hus will not be* triggered i*f road exceeds 4 m in width.*

12. The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.
b. Free State
~~i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;~~
ii. Within critical biodiversity areas identified in bioregional plans;

[2] "Indigenous vegetation" refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.

~~iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; or~~
iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.

The listed activity would be triggered if clearing of indigenous vegetation (natural areas) exceeds 300 m^2 and occurs within designated critical biodiversity areas or within 100 m of a watercourse or wetland. The site is *within an ESA and not a CBA but may result in the clearance of greater than 300 m^2 within 100 m of watercourses.*

14. The development of -
~~(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or~~
(ii) infrastructure or structures with a physical footprint of 10 square metres or more;
where such development occurs -
(a) within a watercourse;
~~(b) in front of a development setback; or~~
(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;
~~excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.~~
b. Free State
i. Outside urban areas:
~~(aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas;~~
~~(cc) World Heritage Sites;~~
~~(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;~~
~~(ee) Sites or areas identified in terms of an international convention;~~
(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;
~~(gg) Core areas in biosphere reserves; or~~
~~(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or~~
~~ii. Inside urban areas:~~
~~(aa) Areas zoned for use as public open space; or~~
~~(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, zoned for a conservation purpose.~~

It is unlikely the activity will require construction of structures with a physical footprint of more than 10 square meters within a watercourse or within 32 metres of a watercourse, and the site does not fall within designated critical biodiversity areas as per a systematic conservation plan.

Implications:

- The proposed activity exceeds listing notice criteria limits for clearance of indigenous vegetation, hence triggering a Basic Assessment application.
- Critical Biodiversity Areas and watercourses are present, hence the respective Listing Notice 3 activities will be triggered as above, hence a Basic Assessment application is required.
- The activity will require clearing of more than 20 Ha of indigenous vegetation, hence a full Scoping and EIA process will be required.

Other potentially relevant legislation, which will be evaluated as required, includes the following:

- NEMA: Environmental management principles set out in NEMA, and other Specific Environmental Management Acts (SEMA's) should guide decision making throughout the project life cycle to reflect the objective of sustainable development. One of the most important and relevant principles is that disturbance of ecosystems, loss of biodiversity, pollution and degradation of environment and sites that constitute the nation's cultural heritage should be avoided, minimised or as a last option remedied. This is supported by the Biodiversity Act as it relates to loss of biodiversity.
- Liability for any environmental damage, pollution, or ecological degradation: Arising from all -related activities occurring inside or outside the area to which the permission/right/permit relates is the responsibility of the rights holder. The National Water Act and NEMA both oblige any person to take all reasonable measures to prevent pollution or degradation from occurring, continuing or reoccurring (polluter pays principle). Where a person/company fails to take such measures, a relevant authority may direct specific measures to be taken and, failing that, may carry out such measures and recover costs from the person responsible.
- Public participation: Public consultation and participation processes prior to granting licences or authorisations can be an effective way of ensuring that the range of ways in which the activities impact on the environment, social and economic conditions are addressed, and taken into account when the administrative discretion to grant or refuse the licence is made. No specific public participation is undertaken as part of this assessment; however, it will be undertaken as part of the environmental application for which this report has been compiled. As part of that process, any comments raised in that process will be addressed as required. Where applicable, local persons, including landowners and residents, will be informally interviewed, where information pertaining to the terrestrial environment may provide value or information.
- Constitution of Republic of South Africa (1996): Section 24(a) of the Constitution states that everyone has the right '*to an environment that is not harmful to their health or well-being*'. Construction activities must comply with South African constitutional law by conducting their activities with due diligence and care for the rights of others.
- National Forests Act 84 of 1998 with Amendments: Lists Protected trees, requiring permits for removal Department of Agriculture, Forestry and Fisheries). Section (3)(a) of the National Forests Act stipulate that '*natural forests must not be destroyed save in exceptional circumstances where, in the opinion of the Minister, a proposed new land use is preferable in terms of its economic, social or environmental benefits*'.
- Provincial Nature and Environmental Conservation Ordinances: Lists Protected species, requiring permits for removal.
- The National Water Act (No. 36 of 1998): Requires that provision is made both in terms of water quantity and quality for 'the reserve', namely, to meet the ecological requirements of freshwater systems and basic human needs of downstream communities. It is essential in preparing an EMP that any impacts on water resources be they surface water or groundwater resources, and/ or impacts on water quality or flow, are carefully assessed and evaluated against both the reserve requirement and information on biodiversity priorities. This information will be required in applications for water use licenses or permits and/or in relation to waste disposal authorisations.
- Conservation of Agricultural Resources Act 43 of 1993: Lists Alien invasive species requiring removal.
- Sustainable Development Goals: Goal 15: Life on Land: Protect, restore, and *promote sustainable use of terrestrial ecosystems*, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. The approach, assessment methodology and recommendations contained within this report are in line with this sustainable development goal.

2.3 Systematic Planning Frameworks Summary

A screening of Systematic Planning Framework for the region was undertaken (summarised in Table 1), that included the following features:

- Critically Endangered, Endangered and Vulnerable Ecosystems.
- Critical Biodiversity Areas and Ecological Support Areas.
- River, Estuarine and Wetland Freshwater Ecosystem Priority Areas (FEPAs) and buffers.
- Regional Planning Frameworks (Free State Conservation Plan)
- Protected Areas (and buffers) and Protected Area Expansion Strategy (PAES).
- Critical Habitat for endemic, protected and threatened species.

A summary of the key implications of the respective ecological receptors and indicators is provided in the sections below and further information is also provided in Section 8.4: Appendix D: Systematic Planning Frameworks.

Table 1: Summary of Regional Planning Biodiversity features.

FEATURE[3]	DESCRIPTION	IMPLICATIONS/COMMENT
National Environmental Screening Tool (Terrestrial Biodiversity) [refer to Figure 4 to Figure 7]	Very High Terrestrial Biodiversity sensitivity Low Plant species sensitivity Low & Medium Animal Species sensitivity Low Aquatic Sensitivity	CBA 1, ESA 2 & Endangered Ecosystem Animal & Plant species potentially present include only *Hydroprogne caspia* (animal) and sensitive areas are peripheral to the affected site. River, Wetland & FEPA quinary catchment features are potentially present in the vicinity.
National Vegetation Map (NVM, 2018) & National Biodiversity Assessment (2018) [refer to Figure 8]	Vaal-Vet Sandy Grassland	Endangered
Critically Endangered and Endangered Ecosystems (NBA, 2018) [refer to Figure 8]	Vaal-Vet Sandy Grassland	Near natural or natural areas are designated CBA and transformed areas as ESA, indicating significant loss of natural habitat.
Vulnerable Ecosystems (NBA, 2018) [refer to Figure 8]	None	N/A
Free State Conservation Plan (2016): Terrestrial [refer to *Figure 9*]	Most of site area is designated ESA 2, with a patch of CBA 1 in the north-west corner of the site, most likely associated with possible natural or near natural vegetation.	Development of any designated CBA area (or any natural or near natural vegetation) should be avoided as far as possible due to the elevated status of the vegetation unit. Development of any designated ESA areas should ensure that ecological connectivity within the broader landscape is maintained.
Protected Areas (SAPAD, 2022) [Refer to Figure 10]	None directly affected nor in close proximity.	No protected areas nor any ecological processes associated with them are affected by the proposed development. The nearest SAPAD protected areas s include the Newlands Game Ranch (20,6 km SE), the De Rust Private Nature Reserve (21,7 km E), and the Bloudrif Reserve (41 km NW).
Strategic Water Source Areas (SWSA)	Not situated within any designated SWSA (nearest is the Maloti Drakensberg SWSA, roughly 180 km SE)	N/A

[3] Refer to Figure 8 to Figure 11.

FEATURE[3]	DESCRIPTION	IMPLICATIONS/COMMENT
[Refer to Figure 11]		
NPAES (2018) [Refer to Figure 10]	No National Protected Area Expansion Strategy areas in close proximity.	No NPAES nor any ecological processes associated with them are affected by the proposed development.
Freshwater Ecosystem Priority Areas (FEPA's) [refer to Figure 11]	None	N/A
Regional Hotspots & Regions of Endemism	None	N/A
Important Bird Areas (IBA's) [refer to Figure 10]	None (nearest IBA – the Sandveld & Bloemhof Dam Reserve is located approx. 45 km NW)	N/A
World Heritage Sites	None	N/A
Key Biodiversity Areas (KBA's) [refer to Figure 10]	The site is not located within or near any Key Biodiversity Areas.	The specific activity is unlikely to have any impact on designated Key Biodiversity Areas or ecological processes associated with such sites.
Marine/Coastal areas	None	N/A
RAMSAR sites	None	N/A
Within 32 m of Watercourses [refer to Figure 11]	The surrounding area does have numerous non-perennial watercourses, and it is possible that infrastructure (as a minimum) may occur within 32 m of such features.	Any crossings of watercourses should be kept to minimum. Aquatic habitat should be excluded from development footprint.
Within 100 m of Rivers [refer to Figure 11]	No perennial rivers are situated within or near the site.	N/A
Within 500 m of Wetlands [refer to Figure 11]	Extensive wetland habitat is associated with the surrounding dams. Small wetlands were observed on or directly adjacent to the site that are not identified by the respective wetland databases. Falls within designated Dry Highveld Grassland Wetland Veg Cluster.	Wetland habitat is present in the vicinity of the site. Refer to the respective site assessment sections. Such habitat should be excluded from the development footprint. Site footprint is within 500 m of these wetlands.
Estuaries	None	N/A
Forest	None	N/A
Surrounding Land Uses	Mostly agriculture (dryland pastures) and mining.	High levels of disturbance are likely present in the surrounding landscape associated with agriculture and mining, with limited patches of intact or semi-intact vegetation likely remaining.
Critical Habitat for listed endemic/ protected species	Several endemic or other protected species are known from the broader area; however, the region is not known to be a biodiversity hotspot. None are flagged for the proposed footprint.	

Implications:

- Vaal-Vet Sandy Grassland has an elevated conservation status (Endangered).
- The site is primarily within a designated Ecological Support Areas with a small patch of Critical Biodiversity Area (FSCP, 2016).

2.3.1 National Environmental Screening Tool

The DFFE Screening Tool (dated 02/06/2022) indicates the following:

- Terrestrial Biodiversity is *Very High* (Figure 4).
- Plant species sensitivity is Low (Figure 5).
- Animal Species sensitivity is Low & Medium (Figure 6).
- Aquatic Sensitivity is Low (Figure 7)

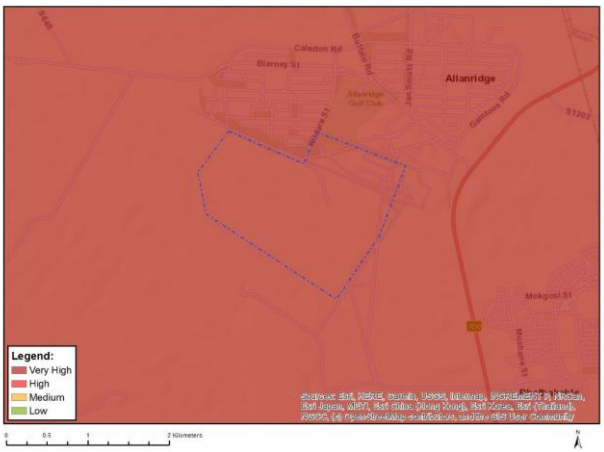

Figure 4: Terrestrial Biodiversity Sensitivity.

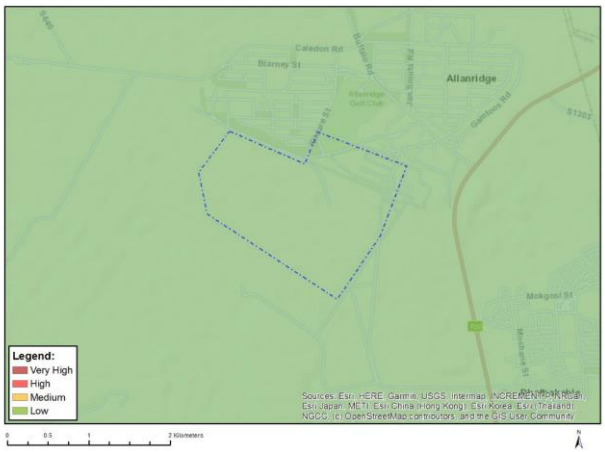

Figure 5: Terrestrial Plant Species Sensitivity.

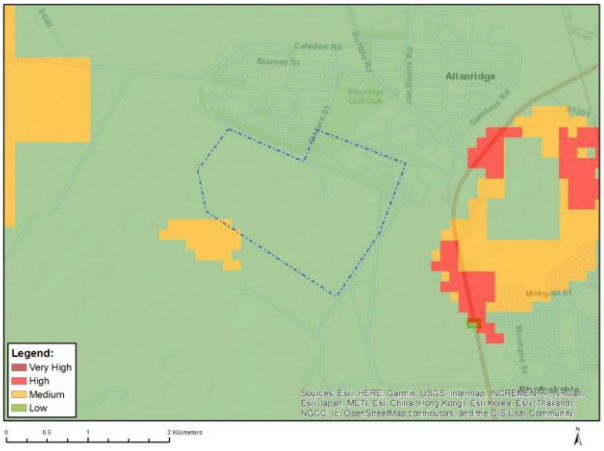

Figure 6: Terrestrial Animal Species Sensitivity.

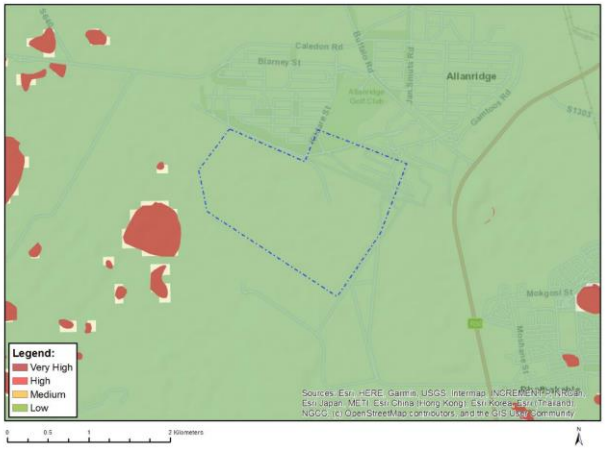

Figure 7: Aquatic Sensitivity.

Terrestrial Sensitivity	**Feature(s) in proximity (Taaibos)**
Very High	Critical Biodiversity Area 1, Ecological Support Area 2 & Endangered ecosystem
High	None
Medium	None
Low	None
Plant Sensitivity	**Feature(s) in proximity**
Very High	None

Terrestrial Sensitivity	**Feature(s) in proximity (Taaibos)**
High	None
Medium	None
Low	Present
Animal Sensitivity	**Feature(s) in proximity**
Very High	None
High	None
Medium	*Hydroprogne caspia* (bird)
Low	*None*
Aquatic Sensitivity	**Feature(s) in proximity**
Very High	None
High	None
Medium	None
Low	Present

As apparent from the DFFE National Environmental Screening Tool, the following can be deducted:

1. The **Terrestrial Biodiversity Theme** is Very High, mainly Ecological Support Area (ESA) 2, with Critical Biodiversity Area (CBA) 1 patches, and within an Endangered ecosystem covering the site and broader surrounding area. It is noted that it is likely that the entire site is likely to have been transformed at some stage historically, for agriculture and any vegetation present is likely secondary regeneration. The site visit and assessment will clarify this further.
2. The **Plant Species Theme** is Low with no flagged species of conservation concern. The site visit will assess the presence or likely presence of any other species of conservation concern, including those requiring permits for removal.
3. The **Animal Species Theme** is Low with Medium and High sensitivity area in the broader area, associated with the bird species *Hydroprogne caspia* (Caspian Tern). This association is related to the waterbodies and associated riparian vegetation and the species the site is unlikely to provide suitable habitat being transformed, other than as an occasional transient visitor.
4. The **Aquatic Theme** is Low, with no watercourses or wetlands/pans flagged by the screening tool. It is noted that analysis of aerial photographs does indicate some possible, although severely disturbed, aquatic features within the site, which will require demarcation to avoid such areas.

The site assessment will physically screen for the presence of these, and other possible species or ecological risks not identified in the screening tool. Not all features are directly affected, but being in proximity, the risks associated with the activity will be investigated further and addressed in the report.

2.3.2 Vegetation of Southern Africa

The National Vegetation Map, as depicted in Figure 8, designates the project area to have *Vaal-Vet Sandy Grassland* (NBA, 2019), having an ***Endangered*** status (NBA, 2019). Much of the vegetation unit is transformed, being prime agricultural land, with remnant patches comprising natural and near natural (sometimes secondary) remaining. Elements depicted in dark green represent remnant natural vegetation and light green represents transformed or previously transformed vegetation. A general description of the vegetation unit is provided in Section 8.4: Appendix D: Systematic Planning Frameworks (as per Mucina & Rutherford, 2006) as a reference point for the baseline vegetation

composition.

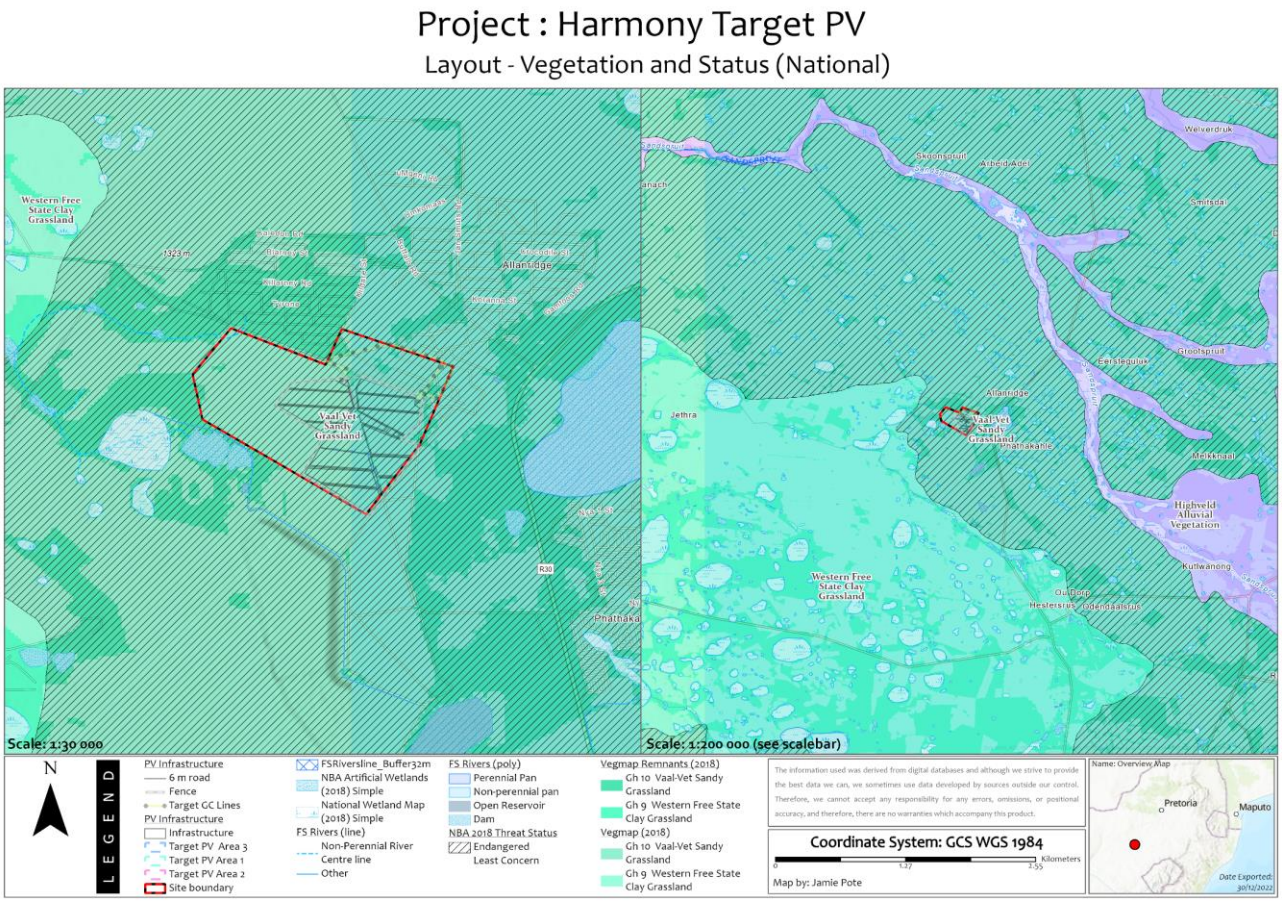

Figure 8: Vegetation of Southern Africa (National).

The project area is generally characterised by plains-dominated landscape with some scattered, slightly irregular undulating plains and hills. Mainly low-tussock grasslands with an abundant karroid element. Dominance of *Themeda triandra* is an important feature of this vegetation unit. Locally low cover of *T. triandra* and the associated increase in *Elionurus muticus, Cymbopogon pospischilii* and *Aristida congesta* is attributed to heavy grazing and/or erratic rainfall.

Also depicted in Figure 8, is the relative transformation, where darker colours represent remaining natural vegetation. As is evident in the figure, most of the site footprint that was assessed is not considered as being remining habitat (i.e., it has been transformed at some point either historically, or recently, as it is based on land cover and transformation analyses. The entire PV footprint is situated within transformed or secondary vegetation, including most within currently or recently cultivated lands and a small area of old lands (approximately 10 years).

2.3.3 National Biodiversity Assessment

The NBA is the primary tool for monitoring and reporting on the state of biodiversity in South Africa and informs policies, strategic objectives, and activities for managing and conserving biodiversity more effectively. Ecosystem protection level is an indicator that tracks how well represented an ecosystem type is in the protected area network. It has been used as a headline indicator in national reporting in South Africa since 2005.

The ecosystem status categorisation is based on a complex set of criteria, but for the purposes of this reporting, can be summarised as follows (NBA, 2019; IUCN RLE, 2017):

STATUS	DESCRIPTION
Least Concern	These ecosystems have lost only a small proportion (~more than 80 % remains) of their original natural habitat and are largely intact (although they may be degraded to varying degrees, for example by invasive alien species, overgrazing, or overharvesting from the wild).
Vulnerable	Vulnerable terrestrial ecosystems have lost some (~more than 60 % remains) of their original natural habitat and their functioning will be compromised if they continue to lose natural habitat.
Endangered	Endangered terrestrial ecosystems have lost significant amounts (~less than 40 % remains) of their original natural habitat, so their functioning is compromised.
Critically Endangered	Critically Endangered terrestrial ecosystems have lost significant amounts (~less than 20 % remains) of their original natural habitat, and therefore considered to have an extremely high risk of collapse.

The outcome of the most recent National Biodiversity Assessment (2018) indicate that Vaal-Vet Sandy Grassland currently has an *Endangered* conservation status (Table 1), which indicates that less than 40 % of the unit remains, and that ecosystem functioning is compromised, and further loss of natural habitat should be avoided.

Implications:

- Vaal-Vet Sandy Grassland is of conservation concern (Endangered).
- Where intact, the vegetation assessed on site is typical of the vegetation unit, although the proposed footprint is within areas having secondary vegetation and/or transformed (cultivated lands). Refer to Section 3.1 for specific description.
- Several South Africa endemic species are recorded from the represented vegetation units, some having localised distributions and others are widespread. Refer to Sections 3.1.8 and 8.3.

2.3.4 Free State Biodiversity Plan: Terrestrial

The Free State Conservation Plan (2016) designates the following CBA categories, based on national standards:

- Protected Areas
- Critical Biodiversity Area 1 & Critical Biodiversity Area 2
- Ecological Support Area 1 & Ecological Support Area 2
- Other & Degraded

While no Free State Biodiversity Plan guideline report is available, national, and other regional reporting guidelines for Critical Biodiversity Areas can be consulted. The *Western Cape Biodiversity Spatial Plan Handbook* (*Pool-Stanvliet, Duffell-Canham, Pence & Smart, 2017*) is generally considered to be the accepted norm and is based on national standards, and more information is provided in Appendix D: Systematic Planning Frameworks: Section 8.4.3 for the purposes of this report.

The following can be deduced for the site regarding the categories:

- Critical Biodiversity Area 1: *Areas in a natural condition that are required to meet biodiversity targets*, for species, ecosystems or ecological processes and infrastructure. Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate in these areas. **Present, peripheral to the PV footprint.**
- Critical Biodiversity Area 2: *Areas in a degraded or secondary condition* that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. Maintain in a

functional, natural, or near-natural state, with no further loss of natural habitat. These areas should be rehabilitated. **Not present.**

- Ecological Support Area 1: Areas that are not essential for meeting biodiversity targets, but that *play an important role in supporting the functioning of PA's or CBA's and* are often vital for delivering ecosystem services. Maintain in a functional, near-natural state. **Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised. Present, peripheral to the footprint.**
- Ecological Support Area 2: Areas that are not essential for meeting biodiversity targets, but that *play an important role in supporting the functioning of PA's or CBA's* and are often vital for delivering ecosystem services. Restore and/or **manage to minimise impact on ecological infrastructure functioning; especially soil and water-related services. Entire PV footprint.**

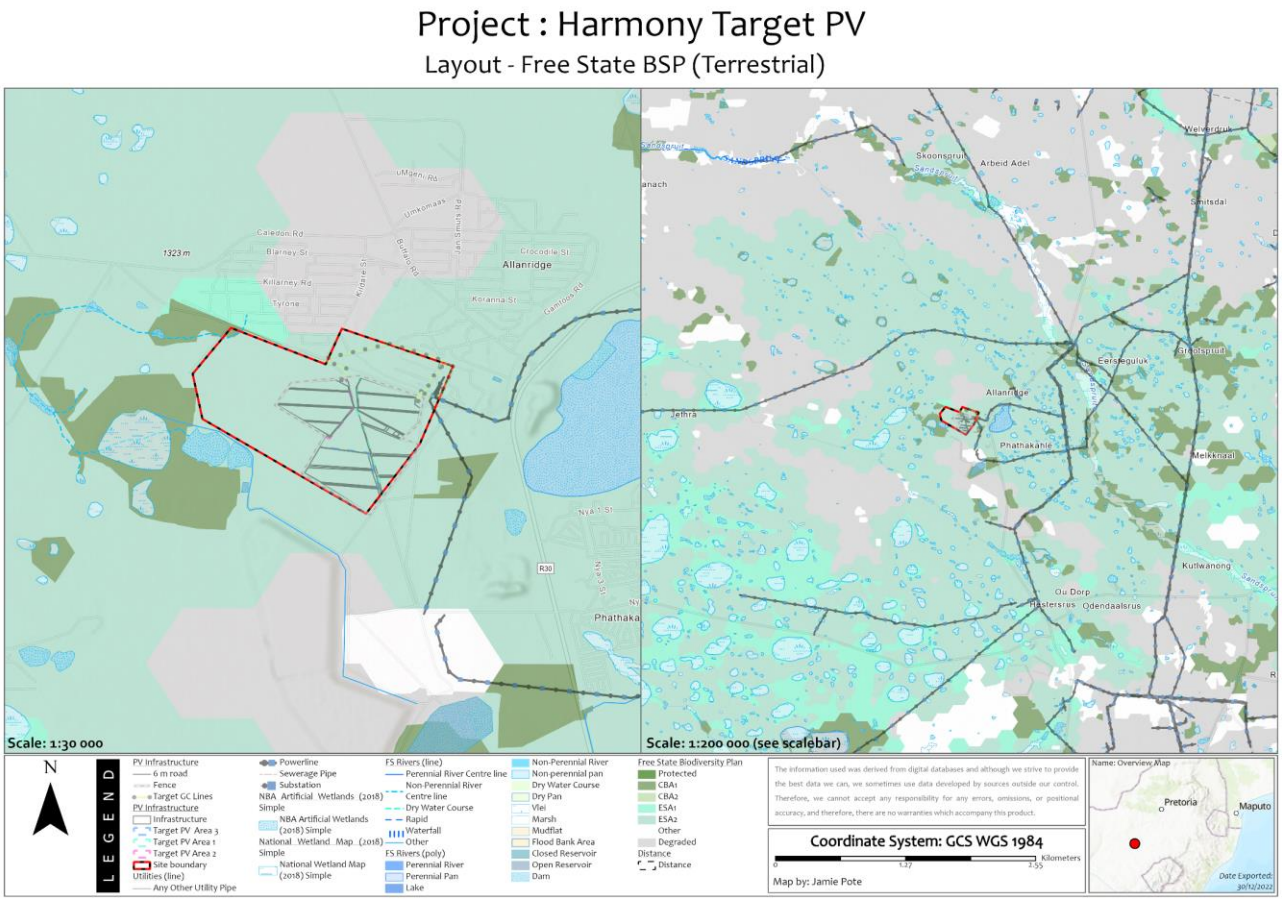

Figure 9: Free State Biodiversity Plan (2016) – Terrestrial.

The site falls almost entirely within an ESA 2 designated area, with a small patch of CBA 1 within the site, as well as adjacent to an ESA 1 designated area, both on the north-western corner (Figure 9). The site is broadly surrounded by a patchwork of CBA 1, ESA 1, and ESA 2. The entire PV footprint is situated within ESA 2 designated areas and has been designed to avoid CBA 1 and ESA 1 areas.

The purpose of **critical biodiversity** designated areas is to retain remnant patches of intact or semi-intact natural vegetation that will represent long term conservation of the vegetation unit. Since the vegetation unit has an Endangered status, such patches should be considered to be irreplaceable, but are subject to on-site verification.

The purpose of **ecological support areas** (or corridors) is to provide intact pathways for long-term biological movement. They also support the natural movement of species between populations to ensure

population viability. Landscape corridors are aligned with areas that have maximum amounts of remaining natural habitat. Local corridors are fine-scale corridors that contribute to connectivity.

Implications:

- Land use guidelines indicate that while ESA sites are not essential for meeting biodiversity targets, they play an important role both in delivering ecosystem services as well as supporting ecological functioning and connectivity. Some habitat loss is generally acceptable within these areas; however, ecological functioning and connectivity should not be compromised.
- The terrestrial biodiversity or ecological assessment contained in this report will determine requirements in terms of retaining ecological processes and specific recommendations, however it is anticipated that ecological processes and connectivity will not be significantly affected.

2.3.5 Other Biodiversity Sector Plans

The site is outside of the planning domain of any other Biodiversity Sector Plans.

2.3.6 Protected Areas

The South Africa Protected Areas Database (SAPAD) database, a comprehensive database of various protected area categories, is updated on a quarterly basis, and provides a comprehensive source of all national and private nature reserves, world heritage sites and other formal legally protected conservation areas situated within South Africa (Figure 10).

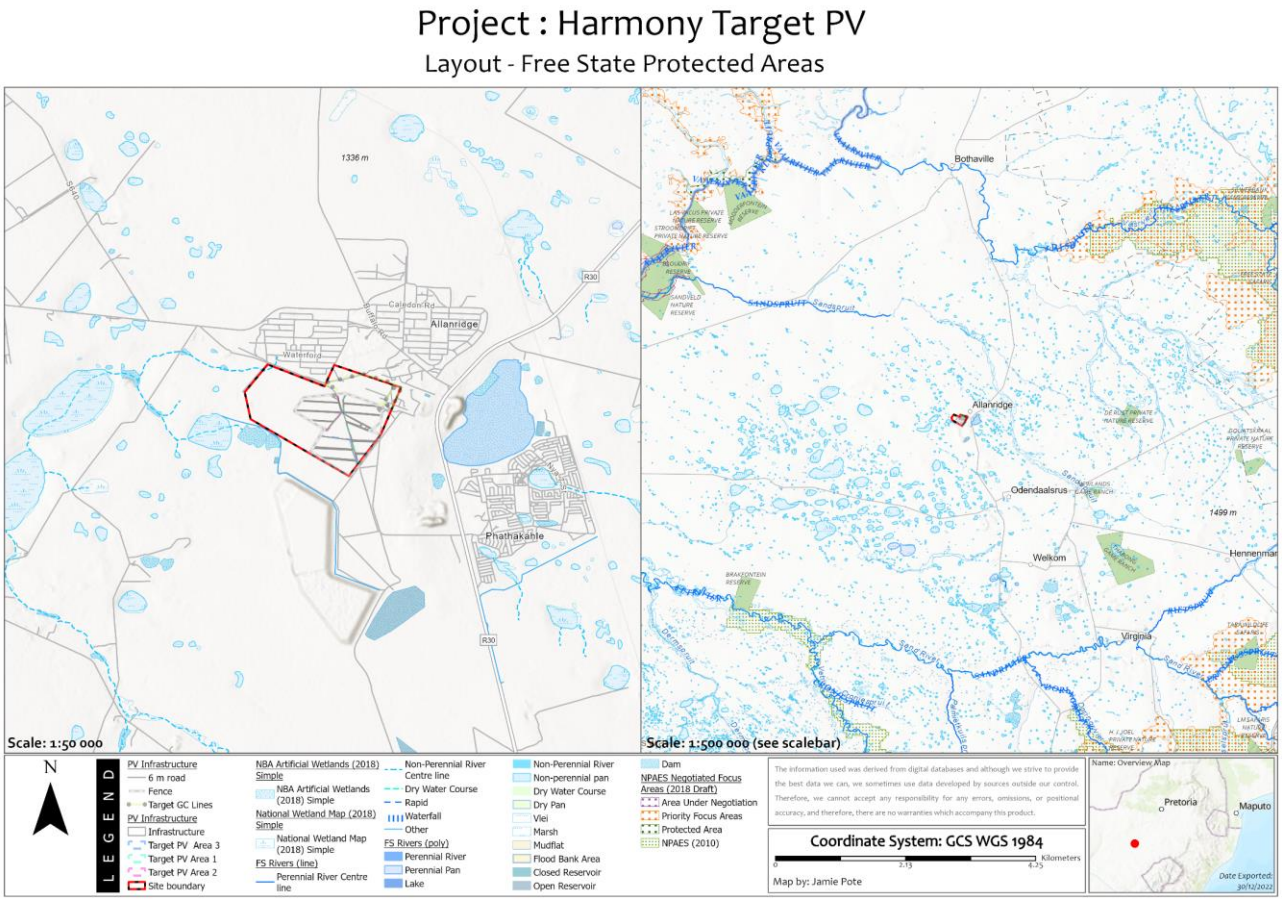

Figure 10: Protected Areas and NPAES in vicinity.

When projects are located in legally protected and internationally recognized areas, clients should ensure that project activities are consistent with any national land use, resource use, and management criteria (including Protected Area Management Plans, National Biodiversity Strategy and Action Plans (NBSAP's), or similar documents).

No Protected Areas or NPAES areas are situated within 20 km of the site. No protected areas, NPAES areas nor any ecological processes associated with them are directly affected nor likely to be indirectly affected.

Implications:

- The activity will have no direct, indirect, or cumulative impact on any protected environment or NPAES area.

2.3.7 Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) project responds to the high levels of threat prevalent in river, wetland, and estuary ecosystems of South Africa. It provides strategic spatial priorities for conserving the country's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or '*FEPAs*'.

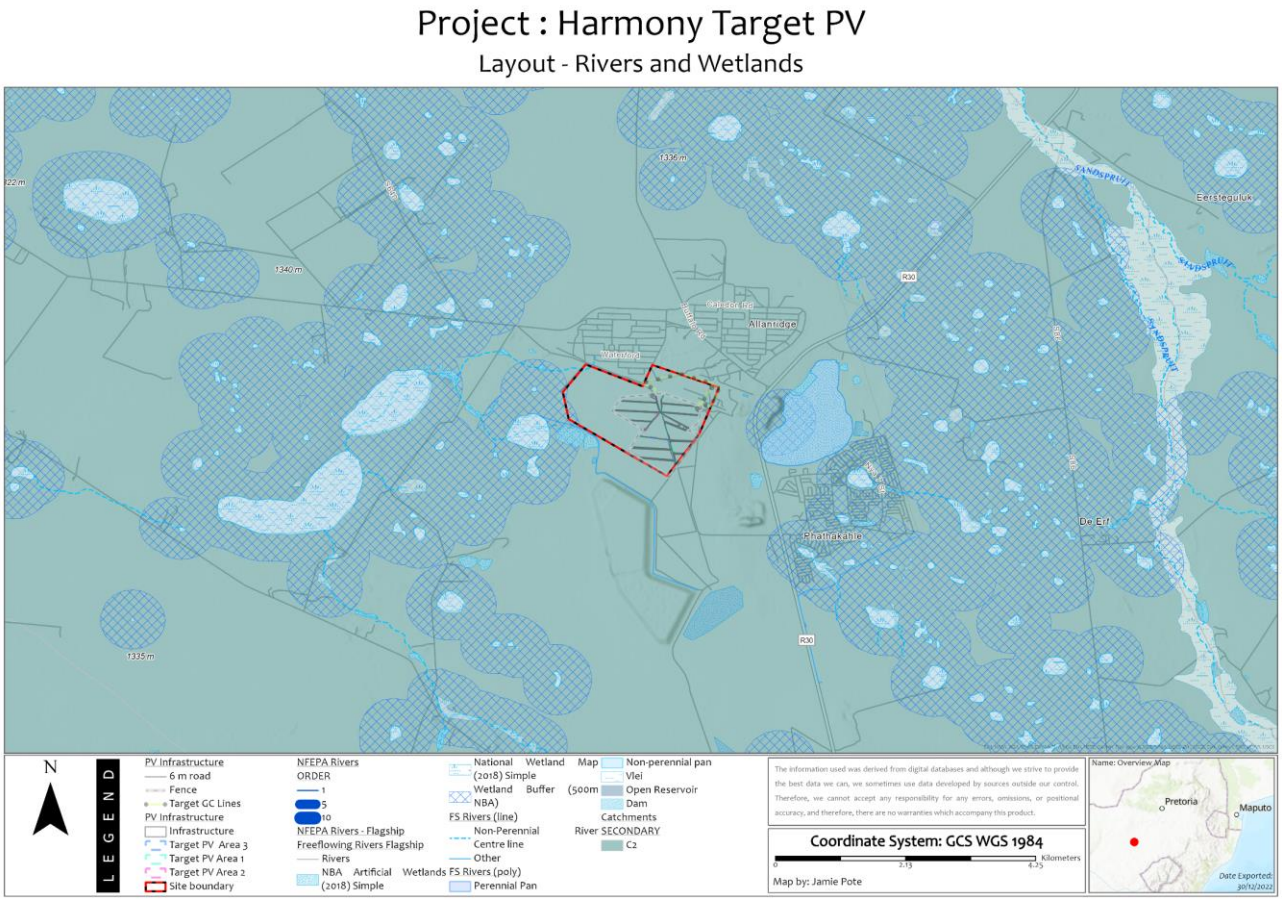

Figure 11: Rivers and Wetlands.

Concerning terrestrial fauna and flora components associated with Freshwater Ecosystem Priority Areas, the proposed site abuts several watercourses, natural wetlands, and artificial wetlands (dams), as per the

National Biodiversity Assessment wetland map (NBA, 2019). The site assessment will include any wetland or riparian habitat that is not depicted in the national wetlands map (See Section 3.1.4: Aquatic Habitat).

Implications:

- The national wetland map does not indicate any natural wetlands or watercourses within the site, other than on the edge of the south-western and north-western corners. Refer to Section 3.1.4: Aquatic Habitat for site assessment findings.
- As a precautionary measure a 500 m exclusion buffer is also included around the man-made dam on the south-west corner of the site.

2.3.8 Strategic Water Source Areas

Strategic water source areas (Figure 11) are those that supply substantial downstream economies and urban centres. These water source areas are vital to the national economy. Strategic water source areas are those that supply substantial downstream economies and urban centres. These water source areas are vital to the national economy.

The site is not situated within any Strategic Water Source Area, and the specific activity is unlikely to have an impact on any downstream Strategic Water Source area, as it will not alter water flows.

Implications:

- There is unlikely to be any significant impacts to any critical water supply to downstream economies and urban centres because of development of this site, which is small in size and will not significantly affect water flow or catchment runoff.

2.3.9 Key Biodiversity Areas

Important Bird Areas

Important Bird and Biodiversity Areas (IBA's) are sites of international significance for the conservation of the world's birds and other biodiversity. They also provide essential benefits to people, such as food, materials, water, climate regulation and flood attenuation, as well as opportunities for recreation and spiritual fulfilment.

Implications:

- The proposed activity is situated outside of any *designated IBA's* and while the site may have occasional visits from transient bird or other faunal species known from nearby IBA's, no direct or indirect impact is anticipated as the disturbance will not be significantly above current baseline levels, being in close proximity to a busy surfaced provincial road.

2.3.10 Preliminary Regional Planning Risk Assessment Summary

A summary of the potential risks and issues identified includes the following:

1. **Critical Biodiversity Area 1 (CBA 1)** – CBA 1 designated areas are those that have been identified as priority areas to be retained in order to meet conservation targets. The land use guidelines for CBA 1 designated areas recommend no further development. The designation may not necessarily be based on the condition of the habitat, species composition, ecological connectivity, or overall ecological value since it is largely based on a statistical analysis process, which will be assessed during the assessment phase, based on the proposed layout. Peripheral to site and footprint.
2. **Critical Biodiversity Area 2 (CBA 2)** – As for above, however these areas are deemed to be degraded but deemed priority areas. The land use recommendations for CBA 2 designated areas are broadly speaking restore and maintain to meet conservation targets. None flagged.
3. **Ecological Support Area 1 (ESA 1)** – not essential for meeting biodiversity targets, maintain in a functional, near-natural state. Some loss is acceptable as long as it does not compromise landscape ecological functioning and connectivity.

Ecological Support Area 2 (ESA 2) - not essential for meeting biodiversity targets, maintain in a functional, near-natural state and/or restore where transformed or degraded. Some loss is acceptable as long as it does not compromise landscape ecological functioning and connectivity.

4. **Endangered Ecosystem** - Vaal-Vet Sandy Grassland currently has an Endangered conservation status, meaning that is under threat and further avoidable loss of intact vegetation is not advisable.
5. **Aquatic CBA and/or Freshwater Ecosystem Priority Areas** – None flagged in desktop assessment.
6. **National Protected Area Expansion Strategy Areas (NPAES)** – No National PAES areas overlay with the site, nor are in vicinity.
7. **Watercourses, Rivers, and Wetlands** – None flagged during the desktop phase, site assessment confirms presence of several watercourse and wetland features.
8. **Rocky Dolerite Hills, Ridges, and Outcrops** – None present.

3 Biodiversity Risk Identification and Assessment

3.1 Baseline Biodiversity Description

3.1.1 Site Locality

The proposed project consists of an area to the south of Harmony Target Mine, situated to the south-west of Allanridge (located north-west of Welkom) within the Free State province (Figure 12), in an extensive relatively flat plain, with some scattered, slightly irregular undulating plains and hills, bisected by non-perennial watercourses and interspersed with small to medium sized water bodies, mostly associated with water storage relating to the surrounding urban, mining and agricultural activities in the surrounding area. The area under assessment includes an area of approximately 245 Ha, a portion of which will be utilised for the proposed PV facility. The proposed PV facility as depicted in Figure 12 is comprised of 3 blocks, Area 1, approximately 39.3 Ha, Area 2 25.4 Ha and Areas 3 26.7 Ha in extent, having a combined area, including associated infrastructure of approximately 105 Ha.

The proposed overhead powerline(s) will connect the PV facility with the electrical network within the Target Mine area. The proposed grid connection comprises three OHL alternatives as depicted in Figure 12, connecting the PV facility to the Target substation to the north, including the following:

- Alternative 1 on the east side (~750 m in length),
- Alternative 2, located centrally (~440 m in length), and
- Alternative 3 on the west side (~1.5 km in length).

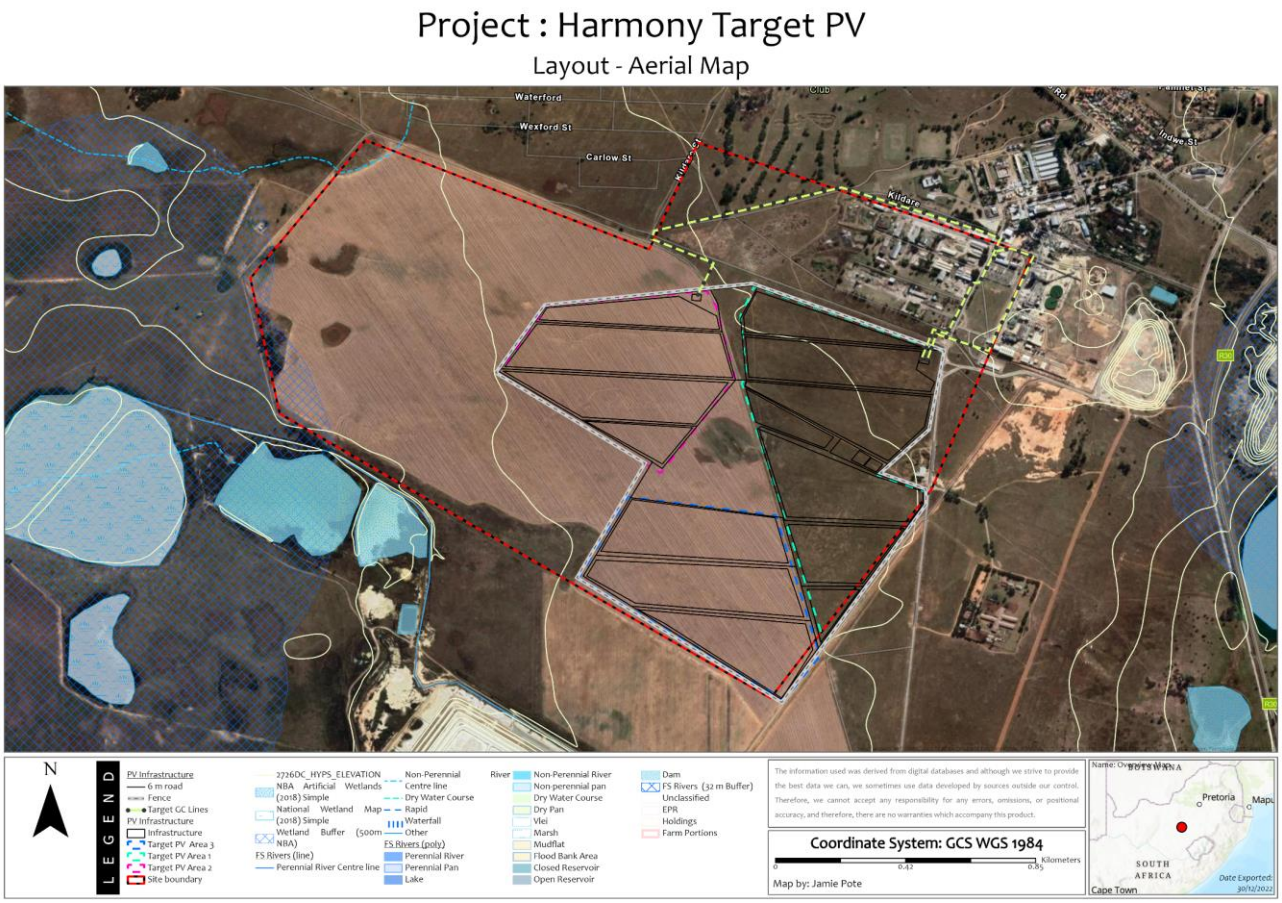

Figure 12: Aerial Photograph of the site and surrounding area.

A large portion of the site assessed, as assessed by the red-black dashed line in Figure 12 comprises currently or recently (within 2 years) cultivated lands (soya) with a portion of old lands (~10 years since cultivated) and a few remnant pockets od natural or secondary vegetation that appears to have been undisturbed for greater than 10 years. No vegetation on site appears to be original indigenous vegetation.

The non-perennial watercourses are generally single narrow channels surrounded by extensive wetland/pan/seep areas that are seasonally inundated with standing water, some for short time periods. Much of these have been transformed by agriculture related land clearing. Although mostly transformed, these watercourses including rivers and drainage lines, as well as the wetlands, pans and seep areas are an important and significant ecological component of the arid landscape, being an integral part of many of the faunal species' habitat and should be avoided, inclusive of a buffer (recommended minimum 32 m).

3.1.2 Topography and Drainage

The general area is bisected by an intricate network of drainage lines and watercourses (Figure 3), primarily non-perennial. These watercourses drain into the Sandspruit River (Class C: Moderately Modified) to the north of the site, which is a tributary of the Vaal River (Class D: Largely Modified), to the north-west.

3.1.3 Terrestrial Landscape Features (Habitat)

Overview

The project area is generally characterised by plains-dominated landscape with some scattered, slightly irregular undulating plains and hills. Mainly low-tussock grasslands with an abundant karroid element in natural remnant vegetation. Dominance of *Themeda triandra* is an important feature of this vegetation

unit. Locally low cover of *T. triandra* and the associated increase in *Elionurus muticus, Cymbopogon pospischilii* and *Aristida congesta* is attributed to heavy grazing and/or erratic rainfall. Karroid elements tend to be absent within the footprint, most likely a result of secondary nature of the vegetation due to historical and recent cultivation.

The landscape is somewhat undulating and incised by several south and westward draining non-perennial drainage lines, with seeps and wetlands also prevalent, having a distinct riparian vegetation comprised of obligate aquatic species including several sedge species. The assessment area is situated across a level to slightly south-facing slope that is largely either cultivated or having secondary grassland vegetation (old lands). The undulating slope is bisected by seep areas and poorly defined drainage lines with several wetland areas. All drainage lines, wetlands and seeps have been historically cultivated (ploughed), although the wetlands have regenerated to some extent with no recent ploughing evident (within the last 2 – 5 years). All seep areas are within cultivated areas but aerial photograph and on-site observations indicate elevated water content which does negatively influence crop growth to some extent. It is likely that the wetland areas are no longer cultivated due to presence of seasonal standing water which will affect crop growth, hence riparian elements have regenerated, and they are no longer ploughed or cultivated.

Recently cultivated areas contain no indigenous or natural vegetation other than indigenous weedy pioneer species and occasional grasses as well as several exotic weed species that are common to such agricultural areas in the region including Blackjack, Mexican Poppy, Thorn Apple and Kikuyu grass.

Secondary grassland areas include common grasses including *Aristida congesta, Chloris virgata, Cymbopogon caesius, Cynodon dactylon, Digitaria argyrograpta, Elionurus muticus, Eragrostis chloromelas, Heteropogon contortus, Panicum gilvum, Setaria sphacelata, Brachiaria serrata* and occasional *Themeda triandra,* which is not common and indicative of the secondary and disturbed nature of the site. Within thew grassy mozaic, herbaceous species include *Stachys spathulata, Barleria macrostegia, Berkheya onopordifolia, Helichrysum caespititium, Hermannia depressa, Monsonia burkeana, Rhynchosia adenodes, Selago densiflora* and *Vernonia oligocephala*. Small shrubs occurring occasionally include *Felicia muricata, Pentzia globosa* and *Helichrysum* spp. Geophytic and succulent herbs include *Bulbine narcissifolia, Ledebouria marginata* and *Tripteris aghillana* are also present, mostly confined to areas not recently disturbed.

This offers habitat for a limited suite of animal species, although animals have largely been displaced by people. In the surrounding area, lack of topological complexity, including slope and aspect, limit the availability of microhabitats for a diverse range of different species.

The habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the localised impact associated with the site footprint would in general be of low to very low significance with implementation of recommended mitigation measures.

Figure 14 to Figure 21 include general photographs of the terrestrial portions of the site, which includes Secondary grassland (near natural), Old lands (secondary grassland), Old lands (pastures), Wetland, Cultivated Lands and Transformed areas.

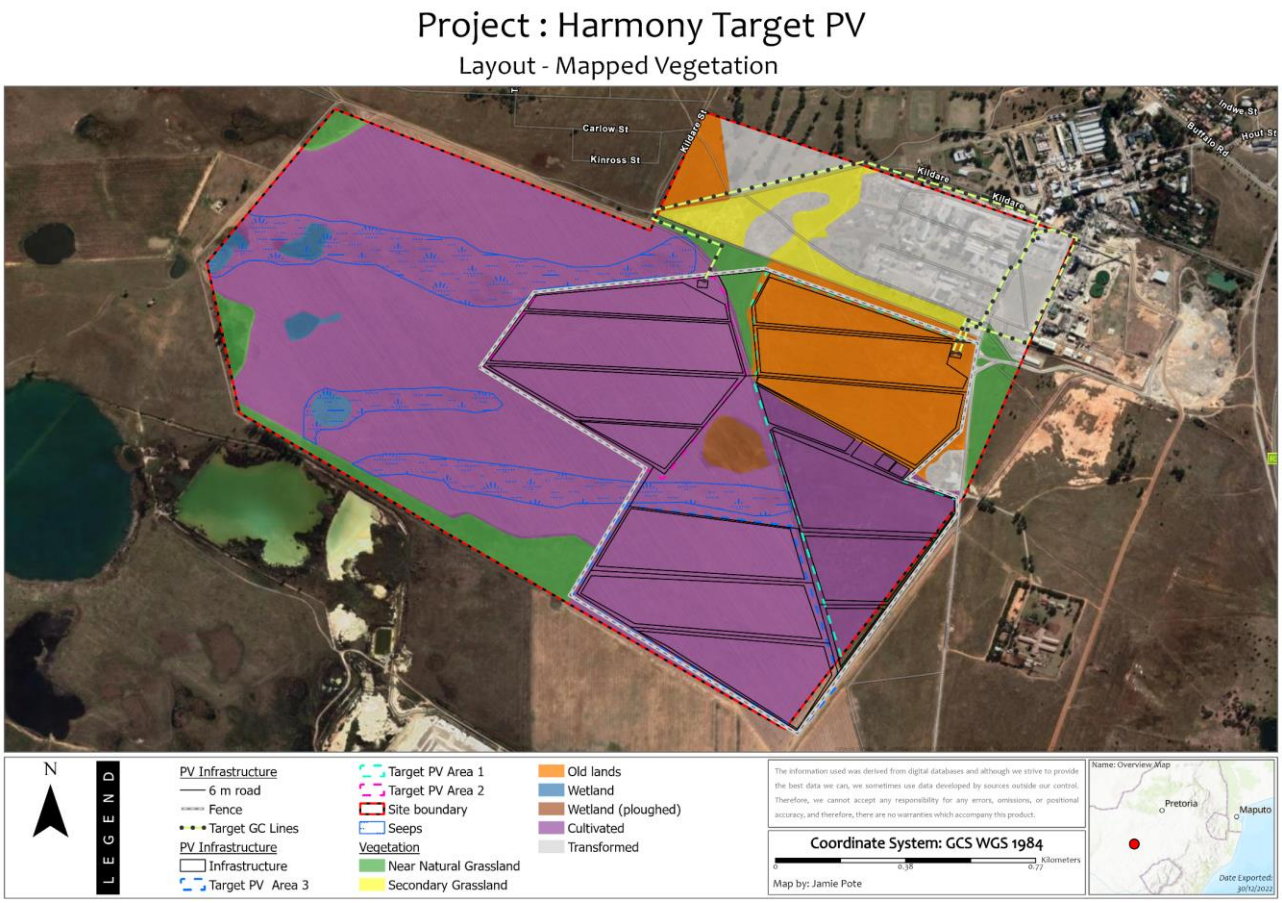

Figure 13: Mapped vegetation.

Vegetation on site (Figure 13) includes the following:

- Secondary grassland (near-natural): Small pockets of vegetation that most closely represent near-natural grassland, but most likely includes areas that were at one time cultivated but have not been recently cultivated. Slightly high species diversity is noted in these areas and include herbs, shrubs and geophytes that are generally absent from other areas, where cultivation has been more recent (most likely longer than ~10 years)
- Old lands (secondary grassland): Intermediate between the secondary grassland and the near natural, lower diversity but still some represented (within ~10 years).
- Wetland: Areas where seasonal standing water is present. Most areas have been ploughed over at some time historically, but still having wetland functionality with several sedges and other facultative and obligate wetland species (Cyperaceae) currently present (refer Figure 27 to Figure 30).
- Cultivated Lands: Currently cultivated lands with remnants of crops still present (soya). Some of the wetland habitat is within this category but has still been delineated as wetland habitat.
- Transformed: Includes all buildings, roads, and other hardened surfaces.

Figure 14: Patch of older secondary grassland (near natural).

Figure 15: Patch of older secondary grassland (near natural).

Figure 16: Secondary grassland

Figure 17: Secondary grassland

Figure 18: Old lands (pastures).

Figure 19: Old lands (pastures).

Figure 20: Cultivated lands (soya)

Figure 21: Cultivated lands (soya)

Timeline Analysis

Analysis of aerial imagery, ~October 2013 to most recent, ~May 2022 (Figure 22 to Figure 26) indicate that the entire are has been ploughed within the last 10 years (~2013, Figure 23).

The entire western portion of the site is currently ploughed (excluding wetlands as depicted in the site vegetation map below. PV blocks 2 & 3 are entirely within areas that have been continuously cultivated for several years. The southern portion of Block 1 is currently cultivated (not depicted in the most recent aerial photographs). The northern portion of Block 1 is currently secondary grassland (old lands) but from historical available aerial imagery it appears to have been cultivated during 2013, hence is less than 10 years old.

Figure 22: Historical Aerial Imagery (Google Earth 10/2013).

Figure 23: Historical Aerial Imagery (Google Earth 12/2014).

Figure 24: Historical Aerial Imagery (Google Earth 01/2020).

Figure 25: Historical Aerial Imagery (Google Earth 03/2022).

Figure 26: Historical Aerial Imagery (Google Earth: 05/2022).

3.1.4 Aquatic Habitat

Aquatic systems do not function in isolation and in terms of ecological processes, the aquatic systems are very closely linked to the terrestrial system. Perennial, non-perennial watercourses, and wetlands/dams are present in the wider area with several wetlands in the assessed area (Figure 27 to Figure 30). Most of these wetlands have been ploughed in the past but are clearly vegetated with several sedges and other facultative and obligate wetland species.

This report does not include an aquatic assessment, as per the reporting protocols, but as these areas will provide habitat for numerous species that would not occur in the terrestrial habitat, despite being heavily disturbed, they are considered to be no-go areas.

Figure 27: Wetland area near eastern boundary.

Figure 28: Wetland area near eastern boundary.

Figure 29: Wetland area near southern boundary.

Figure 30: Wetland area near southern boundary.

3.1.5 Present Ecological State (Terrestrial)

In summary, the following general observations can be noted regarding the site:

- Alien invasion is generally *low to very low* within the site with some patches in the northern part.
- Erosion and erosion risk is generally *low to very low* across the site, being relatively flat but with sandy soils that could be susceptible to erosion.
- The grassland vegetation on site has varying levels of degradation, mostly transformed consisting of cultivated and old lands having secondary vegetation but with some pockets of near-pristine but likely secondary grassland vegetation.

- Based on site observations, surrounding land use, proximity to cultivated areas and suitability to cultivation, the entire site appears to have been transformed at some stage or another in the past.

3.1.6 Flora

Several endemic and range restricted species are known from the surrounding area. None are likely to be present. Note, there is a residual very-low possibility that these species could be present, and cannot be discounted without extensive seasonal sampling, which is generally outside the scope of such an assessment, unless a specific risk is identified. Due to the localised nature of the impact, as well as the level of degradation of the site, the risk of a species suffering any significant loss is low.

3.1.7 Fauna

The habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the local impact associated with the footprint would be of low significance if mitigation measures are adhered to.

Mammals

Larger mammal species are unlikely present due to proximity to human habitation, including the mine, however, the site could provide transient habitat for species such as Bush Duiker (*Sylvicapra grimmia*) and Common Warthog (*Phacochoerus africanus*). Should any be occasionally present, they are likely to be mobile species that would move away from disturbance during construction and with intact habitat available in the immediate surrounds are unlikely be negatively affected by the development.

Small mammals within the habitat are generally mobile and likely to be transient to the area. As with all construction sites there is a latent risk that there will be some accidental mortalities. Generally, these small mammals are mobile and will vacate the area once construction commences. This risk is unlikely to exceed current baseline risks associated with the nearby mine area and agriculture related disturbance. Burrowing small mammal species including the Ground squirrel (*Geosciurus inauris*) and Yellow Mongoose (*Cynictis penicillata*) are present on the site and/or in the surrounding area.

The risk of species of special concern being impacted significantly is low, and it is unlikely that there will be any impact to populations of such species because of the activity. A faunal search and rescue is unlikely to be required before commencement.

Avifauna and Bats

The proposed activity is unlikely to pose any significant risk to birds or bats, other than displacement from a limited, already significantly disturbed area. The secondary grassland and cultivated areas will provide suitable habitat for common and widespread species such as Helmeted Guineafowl (*Numida meleagris*), Northern Black Korhaan (*Eupodotis afraoides*), Swainson's Francolin (*Pternistis swainsonii*), Double-banded Courser (*Smutsornis africanus*), Common Quail (*Coturnix coturnix*) and Orange River Francolin (Scleroptila gutturalis). Occasional visitors for foraging may also include Black-winged Kite (*Elanus caeruleus*), Pallid Harrier (*Circus macrourus*) & Little Swift (*Apus affinis*). Other birds, more strongly associated with the extensive water bodies and wetland/vlei areas in the surrounding area include Black-headed Heron (*Ardea melanocephala*), Whiskered Tern (*Chlidonias hybrida*) and Caspian Tern (*Hydroprogne caspia*), may be occasional visitors. None of these species are likely to be significantly impacted other than minor displacement, with plentiful similar habitat in the surrounding area.

Reptiles

Reptiles such as lizards are less mobile compared to mammals, and some mortalities could arise, however none of conservation concern are likely present. It is unlikely that a faunal search and rescue be conducted

before commencement. Should any reptiles be found during constructions, a retile handler should be on called.

Amphibians

Since the footprint covers terrestrial habitat, amphibians are not anticipated to be found to occur in abundance, in particular species of conservation concern. Amphibians are likely present in the nearby wetlands and vleis which could occasionally traverse the site, but not anticipated to be an impact of significance.

Invertebrates

No invertebrate or insect species noted to have an elevated conservation status are known from the broader area and are not anticipated to be of significance, even though the site is likely to serve as habitat for an abundance of seasonal insects and other invertebrates.

3.1.8 Species of Special Concern occurring in the region

Several endemic and range restricted species are known from the general surrounding area and there is a residual likelihood that they could be present, but cannot be discounted without comprehensive seasonal sampling, which is generally outside the scope of such an assessment, unless a specific risk is identified. Due to the localised nature of the impact, with vegetation clearing only required for site development, as well as the level of degradation, the risk of a species suffering any significant population loss is low. There is always a residual risk to species for any activity.

Red Listed, Endemic and Protected Flora

No flora Species of Conservation Concern are flagged in the National Environmental Screening Tool (designated NEST in this report). The assessment will independently screen for any flora species including those that may require permits in terms of regional legislation for removal.

As per Table 2, the site falls within the broader distribution range of Vulnerable, Endangered, Critically Endangered, Endemic and/or protected flora species. Due to the limited footprint and cultivated and/or secondary nature of the proposed PV footprint, which will likely rehabilitate to pre-construction conditions on completion (i.e., secondary grassland), these species are unlikely to be significantly affected by the proposed activity. Furthermore, none were found to occur within the site during the assessment period, including areas having secondary vegetation and /or remnant pockets of near natural vegetation.

Since the project footprint is surrounded by extensive outlying areas of natural habitat, any disturbance as a direct result of the activity during the construction phase is unlikely to pose a significant negative impact to flora species or suitable habitat. The site is also highly disturbed and/or transformed.

Table 2: Flora Species of Special Concern.

SCIENTIFIC NAME	FAMILY	STATUS[4]	COMMENT/PRESENCE
Lessertia phillipsiana	Fabaceae	End , Least Concern	Known from vegetation unit. Not recorded during site visit.
Boophone disticha	Amaryllidaceae	FSNCO, Least Concern	Present, few individuals mostly in remnant vegetation pockets excluded from PV footprint.

[4] IUCN - Critically Endangered (**CR**), Endangered (**EN**), Vulnerable (**VU**), Least Concern (**LC**); **End** – Endemic; **FSNCO** – Free State Nature Conservation Ordinance (8 of 1969); **Ex**, Exotic/Invasive/Weed; **NFA** – National Forest Act; **ToPS** – Threatened or Protected Species.

SCIENTIFIC NAME	FAMILY	STATUS[4]	COMMENT/PRESENCE
Bulbine narcissifolia	Asphodelaceae	FSNCO, Least Concern	Known from vegetation unit. Widespread species. Present
Ledebouria marginata	Hyacinthaceae	FSNCO, Least Concern	Known from vegetation unit. Not Recorded during site visit.

Listed species (Table 2) were flagged from various database sources, including the National environmental Screening Tool, as occurring in the region and having an elevated status. All were cross-checked for distribution overlay and were actively screened for presence/absence on site. Other species may be endemic, but distribution range has been checked and are generally widespread. Sensitive species names have not been included.

A pre-commencement flora search and rescue procedure is likely to be required before construction commences including respective FSNCO permits.

Red Listed and Protected Fauna

A single faunal bird species (*Hydroprogne caspia*) is flagged in the National Environmental Screening Tool (designated NEST in this report). This species is likely associated with the waterbodies surrounding the site and thus not likely to be directly affected, within the scope of this terrestrial assessment. This does not preclude the species from being present within the site, however this is outside of the scope of this assessment. It may be transient to the site occasionally and being in proximity to the waterbodies, it could provide seasonal nesting habitat. Since suitable habitat is present in the surrounding area and it is likely that grassland habitat will regenerate once the PV facility is completed and will no longer be cultivated, it is likely that any impacts to this species would be temporary and insignificant. Post construction disturbance is not likely to exceed current disturbance levels to this species.

The assessment has also screened for any other fauna species including those that may require permits in terms of regional legislation for removal, none of significance were observed other than widespread species typical of the habitat and area. A single reptile species (Sungazer or Giant Girdled Lizard) was noted during public consultation as occurring in similar grassland habitat in the region. The site visit confirms that this species is not present and unlikely to occur under status quo conditions due to ongoing cultivation off the site. The site is also not within the expected distribution range of this species and is not flagged by the National Environmental Screening Tool.

Table 3: Fauna Species of Conservation Concern

SCIENTIFIC NAME	FAMILY	STATUS[5]	COMMENT/PRESENCE
BIRDS			
Hydroprogne caspia (Caspian Tern)	Laridae	Least Concern	This species does not meet the criterion for a Vulnerable status, having a large range, increasing and large population. This species has a cosmopolitan but scattered distribution across North America, Europe, Asia, Africa, and Australasia. The habitat is largely confined to the coast, also occurring inland on fresh or saline wetlands, reservoirs and sewage ponds. It is thus most likely associated primarily with the nearby waterbodies and the specific site is unlikely to provide irreplaceable habitat, bearing in mind the baseline elevated levels of disturbance on the site and in the surrounding area.

[5] **NEST** – National Environmental Screening Tool (Very High, High, Medium, Low); **ToPS** – Threatened or Protected Species [NEM:BA]; IUCN: Least Concern (**LC**), Near Threatened (**NT**), Vulnerable (**VU**), Endangered (**EN**), Critically Endangered (**CR**); **FSNCO** – Free State Nature Conservation Ordinance (8 of 1969); **CITIES** - Conservation for International Trade in Endangered Species.

SCIENTIFIC NAME	FAMILY	STATUS[5]	COMMENT/PRESENCE
Smaug (Cordylus) giganteus (Sungazer or Giant Girdled Lizard)			Not flagged in screening tool and site is peripheral to known distribution. Raised as a concern during public consultation process. No evidence of presence on site and not likely to be preferred or suitable habitat due to extensive historical cultivation. Remnant pockets of vegetation are small and unlikely to provide suitable or safe habitat in the future.

As per Table 2, no Endangered, Critically Endangered or Vulnerable fauna species were confirmed to be present nor are known to be present in the affected area. Listed species (Table 2) were flagged from various database sources, including the National environmental Screening Tool, as occurring in the region and having an elevated status. All were cross-checked for distribution overlay and were actively screened for presence/absence on site. Other species may be endemic, but distribution range has been checked and are generally widespread. Sensitive species names have not been included.

Due to the limited footprint within a predominantly cultivated landscape, faunal species are unlikely to be significantly affected by the proposed activity. *Table 3* lists species having an elevated conservation status or are listed in terms of the National Environmental Screening Tool.

Since the project footprint is surrounded by extensive outlying areas of natural habitat, any disturbance or displacement associated with increased activity or habitat destruction as a direct result of the activity during the construction phase is unlikely to pose a significant negative impact to faunal species.

A pre-construction fauna search and rescue is unlikely to be required before commencement, but is recommended as a precautionary measure. .

Alien Invasive Species

Invasive alien plants have a significant negative impact on the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and sub-surface water. Landowners are under legal obligation to control alien plants occurring on their properties. Alien Invasive Plants require removal according to the Conservation of Agricultural Resources Act 43 of 1983 (CARA) and the National Environmental Management: Biodiversity Act (10 of 2004; NEMBA): Alien and Invasive Species Lists (GN R598 and GN R599 of 2014), refer to Section 8.5.6: Alien Invasive Species for more information. Alien control programs are long-term management projects and a clearing plan, which includes follow up actions for rehabilitation of the cleared area, is essential. This will save time, money and significant effort. Collective management and planning with neighbours allow for more cost-effective clearing and maintenance considering aliens seeds as easily dispersed across boundaries by wind or water courses. All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing. A general rule of thumb is to first target lightly infested areas before tackling densely invaded areas and prioritize sensitive areas such as riverbanks and wetlands. Alien grasses are among the worst invaders in lowland ecosystems adjacent to farms but are often the most difficult to detect and control.

A few exotic invasive and other weed species were noted within the broader site, generally occurring as scattered individuals or localised clumps, mostly weedy species such as Mexican Poppy and Blackjack, being common and abundant in disturbed areas and around cultivated lands. Trees such as Gum trees, Syringa, Pine tree and Brazilian Peppers are likely planted for landscaping and/or shade purposes and only large trees were noted with minimal regeneration, all being outside of the proposed footprint area. A weed management programme, as part of the construction contract including an after-care period will be required, until such time as natural vegetation has become adequately re-established. A two year after-

care period is recommended. A list of species is included in Table 4. Some species listed are not within the site but may be introduced during construction from the adjacent area.

Table 4: Alien (exotic) invasive and other weed species and status.

SCIENTIFIC NAME	COMMON NAME	FAMILY	STATUS[6]	PRESENCE
Agave sisalana	Sisal		CARA 2	Present, few individuals
Argemone mexicana	Mexican Poppy	Asteraceae	CARA 1b	Present, common around lands in recently disturbed areas
Cirsium vulgare	Scotch Thistle	Asteraceae	CARA 1b	Present, few individuals
Datura spp.	Thorn Apple	Solanaceae	CARA 1b	Present, few individuals
Eucalyptus spp	Gum tree	Myrtaceae	CARA 1b	Present, few individuals
Jacaranda mimosifolia	Jacaranda	Bignoniaceae	Not listed in EC	Not Present
Melia azedarach	Syringa	Meliaceae	CARA 1b	Present, few individuals
Opuntia aurantiaca	Jointed Cactus	Cactaceae	CARA 1b	Not Present
Opuntia ficus-indica	Prickly Pear	Cactaceae	CARA 1b	Present, few individuals
Pennisetum clandestinum	Kikuyu	Poaceae	CARA 1b	Present
Pinus sp.	Pine tree	Pinaceae		Present, few individuals
Salix babylonica	Willow	Salicaceae	Not listed	Present, few individuals
Schinus terebinthifolius	Brazilian Pepper	Anacardiaceae		Present, few individuals
Solanum mauritianum	Bugweed	Solanaceae	CARA 1b	Not Present
Solanum sisymbriifolium	Wild tomato	Solanaceae	CARA 1b	Present, few individuals

Eradication protocol

The act required the removal of these species, being the responsibility of the landowner, as described in Section 8.5.6: Alien Invasive Species. It is likely that the disturbed areas will be prone to alien infestation after construction is completed and follow up maintenance period will be required.

Specific eradication and management procedures must be stipulated in the EMP as to the methods to be implemented to remove and control the various alien invasive species as they tend to require species specific techniques. A management plan should be incorporated into the EMP, and a detailed action plan compiled and implemented by the ECO. All removed trees must either be removed from site or disposed of at a registered waste disposal facility. Alternatively, the plant material can be mulched using a woodchipper on site. And seed-bearing material is to be disposed of at a registered landfill.

3.1.9 Terrestrial Vegetation Sensitivity Assessment

An overall Biodiversity Sensitivity assessment, incorporating key vegetation and ecological indicators was undertaken and includes the following key criteria:

- relative levels of *intactness* i.t.o. overall loss of indigenous vegetation cover.
- presence, diversity, and abundance of *species of special concern* (weighted in favour of local endemic species).
- extent of *invasion* (severity and overall ecological impact), as well as the degree to which successful rehabilitation could take place.
- overall degradation incorporating above factors.
- relative importance of the vegetation communities relative to regional conservation status – indicated as vulnerability of the area because of loss.

Intactness

Three basic classes are differentiated as follows:

[6] CARA - Conservation of Agricultural Resources Act (1993); National List of Invasive Species in Terms Sections 70(1), 71(3) and 71A (2016). Refer to Section 2.2 & Table 7 for detailed procedures and requirements.

- **Low**: > 75 % of original vegetation has been removed or lost; and/or no species of special concern present that are critically endangered, endangered or endemic with highly localised distribution.
- **Moderate**: 25 – 75 % of original vegetation has been removed/lost; and or presence of species of special concern but not having high conservation status or high levels of endemicity or highly localised distributions.
- **High**: < 25 % of original vegetation has been removed or lost; and or presence of species with a highly endemicity and or high conservation status (endangered or critically endangered).

Intactness for the site is Low to Very Low, with some near natural secondary vegetation patches.

Alien Invasion

Three classes are differentiated as follows:

- **Low**: no or few scattered individuals.
- **Moderate**: individual clumps of invasives present but cover less than 50% or original area.
- **High**: dense, impenetrable stands of invasives present, or cover > 50 % of area with substantial loss functioning. Rehabilitation will most likely require specialised techniques over an extended period (> 5 years).

Alien invasion for the site is variable but overall Low.

Degradation

Overall Degradation is determined from the above alien invasion and intactness scores, according to the following matrix:

INTACTNESS	INVASION		
	LOW	MODERATE	HIGH
High	Pristine	Near Pristine	Moderately Degraded
Moderate	Near Pristine	Moderately Degraded	Severely Degraded
Low	Moderately Degraded	Severely Degraded	Transformed

Degradation for the site is High to Very High.

Overall Sensitivity score

Overall Biodiversity Sensitivity of the vegetation within the site is calculated according to the following matrix which combines degradation and overall conservation status of the vegetation units of the site.

DEGRADATION	CONSERVATION STATUS			
	LEAST THREATENED	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED
Severely degraded/ Transformed	Very Low	Low	Moderate	Moderate – High
Moderately degraded	Low	Moderate	High	High
Ecologically Pristine or near Pristine	Moderate	Moderate – High	High	Very High (No-Go area)

Refer to Figure 31 For overall sensitivity map.

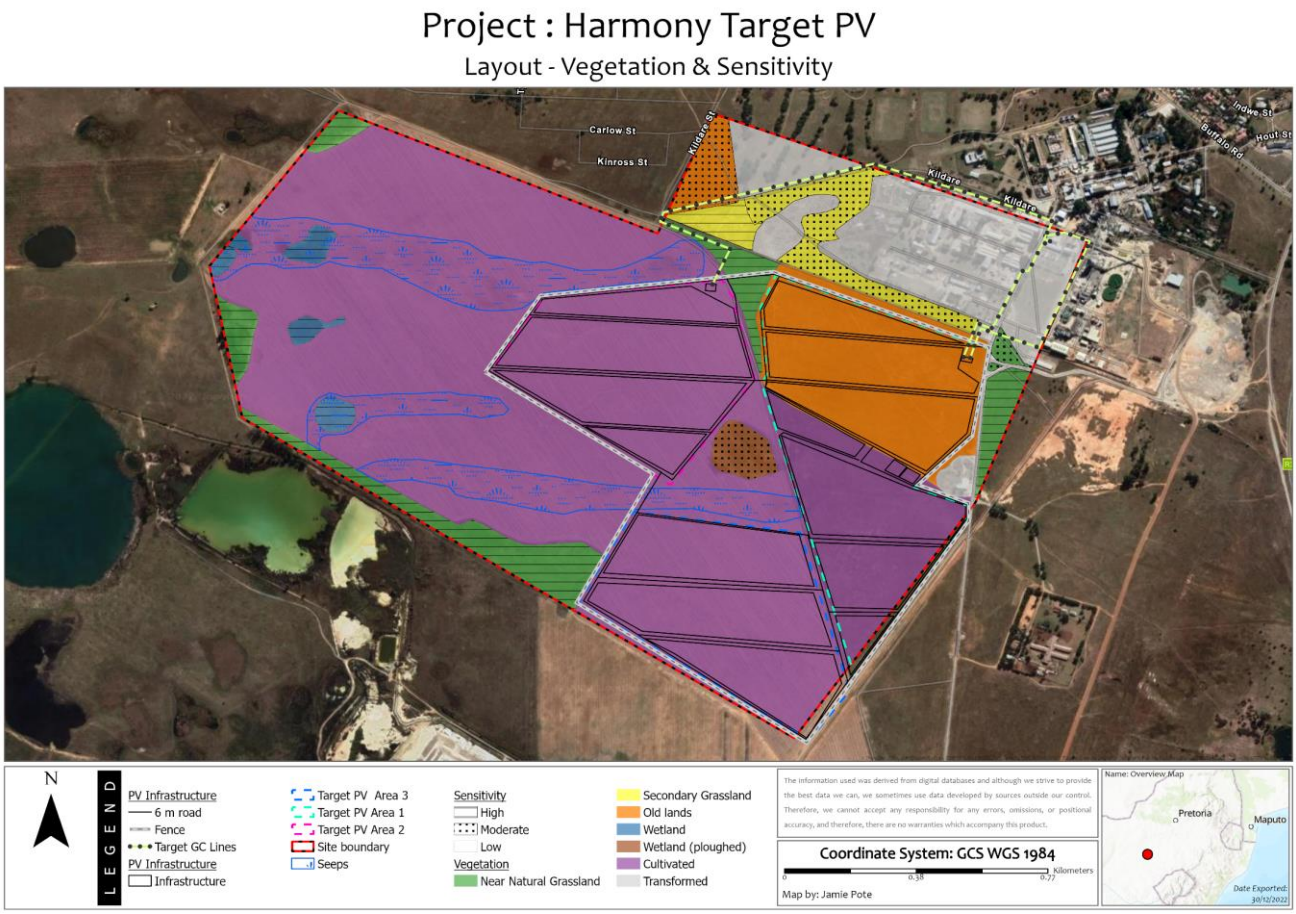

Figure 31: Overall Sensitivity.

The site sensitivity can be summarised as follows:

- Areas scoring an overall LOW sensitivity include the portions of the site that are completely transformed or severely degraded, that have a low conservation status, or where there is very dense alien infestation. Loss of these areas will not significantly compromise the current conservation status of the vegetation unit at a regional level, nor is its loss likely to compromise the ecological functioning of surrounding areas. Low sensitivity areas include all portions of site that has been cultivated including cultivated areas and old lands as well as any other transformed or significantly disturbed areas where ecological functioning is substantially compromised.
- Areas scoring an overall MODERATE sensitivity include the portions of natural vegetation that is mostly intact, but not having specific biodiversity related issues of significance or where proposed activity will have limited overall impact and recovery will be good with minimal intervention. Moderate sensitivity areas include near-natural but disturbed or secondary regenerated grassland vegetation in less disturbed areas.
- Areas scoring an overall HIGH sensitivity include those areas having intact vegetation and deemed to have a sensitivity, including being within intact Critical Biodiversity Areas and connectivity corridors, or are deemed critical habitat for fauna and/or flora species that are considered to be vulnerable and/or have confirmed presence of species of conservation concern. High sensitivity terrestrial areas include wetlands and patches of remnant grassland vegetation that appears to have some near natural to natural elements.
- Areas scoring an overall VERY HIGH sensitivity (No-Go Areas) include areas having a Critically Endangered or Endangered conservation status, or that are irreplaceable in terms of Critical Biodiversity Areas or are critical habitat (refer to Section 3.1.10) for any faunal species that is endangered or critically endangered. For the purposes of this assessment no specific Very High sensitivity terrestrial areas have been identified but would include irreplaceable habitat.

3.1.10 Critical Habitat

The following Critical Habitat features have been identified within the site:

1. Criterion 1: Habitat for Critically Endangered (CR) and/or Endangered (EN) species
    - No Endangered or Critically Endangered Flora species were recorded. Several species known from general area were screened to confirm that most likely localities do not overlap with the site.
    - No other Endangered Mammals, Reptiles, Amphibians, or Invertebrates are known to be present on the site or will be affected (other than temporary displacement during construction).
2. Criterion 2: Habitat for Endemic or restricted-range species
    - Several range restricted flora species are potentially present in the surrounding area and vegetation types, none of which were confirmed to be present.
3. Criterion 3: Habitat for Migratory or congregatory species
    - No such terrestrial habitat will be directly or indirectly affected.
4. Criterion 4: Habitat for Highly threatened and/or unique ecosystems
    - No such terrestrial habitat will be directly or indirectly affected.
5. Criterion 5: Habitat for Key evolutionary processes
    - No such terrestrial habitat will be directly or indirectly affected.

3.1.11 Other Important or Sensitive Habitat

Special Habitats include areas that are rare within a region, or which support important species, ecosystems or ecological processes. Species of Special Concern refers to red data species and important habitats include the locations where these species are known to occur. The following are generally considered to be important habitats, none of which none are present within the site.

FEATURE	DESIRED STATE
Rocky Outcrops	No rocky outcrop habitat of significance is directly affected.
Wetland habitat	Wetlands are present
Priority Estuaries	None
Forest	None
Fynbos	None
Colonies or Populations of Threatened or Protected Species	No colonies or populations of threatened or protected species are present or in proximity to the activity that may be directly or indirectly affected.

3.1.12 No-Go Areas

The wetland areas, including disturbed or ploughed wetlands are considered no-go areas as well as remnant patches of grassland vegetation excluding old lands.

3.1.13 Potential Development Footprints

The proposed site is suitable for the proposed activity.

3.2 Risks and Potential Impacts to Biodiversity

3.2.1 Assessment of Impacts

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase must be assessed in terms of the following criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The **duration**, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
    - 0 is small and will have no effect on the environment
    - 2 is minor and will not result in an impact on processes
    - 4 is low and will cause a slight impact on processes
    - 6 is moderate and will result in processes continuing but in a modified way
    - 8 is high (processes are altered to the extent that they temporarily cease)
    - 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the **status**, which will be described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.
- the *degree* to which the impact can be *mitigated*.

The **significance** is calculated by combining the criteria in the following formula:

S = (E + D + M)P
S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

- **< 30 points: Low** (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- **60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area).

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

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

"***Residual Risk***", means the risk that will remain after all the recommended measures have been undertaken to mitigate the impact associated with the activity (Green Leaves III, 2014).

Assessment of impacts is summarised in the tables below. The rating values as per the above criteria are included for each impact identified during the assessment.

Nature: *Permanent or temporary loss of indigenous vegetation cover as a result of the activity.*			
Impact description: Site clearing before construction will result in the blanket clearing of vegetation within the affected footprint.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long term (4)	Operation of the site will be long term (± 25-year anticipated lifespan). Some revegetation to current levels will occur within the PV footprint once construction is completed.	**Medium Negative (35)**
Extent	Local (1)	The impact will be restricted to the site only.	
Magnitude	Low (2)	Approximately three quarters of the proposed PV site is within existing cultivated lands and the remaining portion is in old lands which is comprised of secondary grassland vegetation.	
Probability	Definite (5)	The possibility of the impact high	
Mitigation/Enhancement Measures			
Mitigation: • Blanket clearing of vegetation must be limited to the site. No clearing outside of footprint to take place.			

• Topsoil must be striped and stockpiled separately during site preparation and replaced on completion where revegetation will take place. • Any site camps and laydown areas requiring clearing must be located within already disturbed areas away from watercourses.			
Post Mitigation/Enhancement Measures			
Duration	Long term (4)	Operation of the site will be long term (± 25-year anticipated lifespan). Some revegetation to current levels will occur within the PV footprint once construction is completed.	**Low Negative (25)**
Extent	Local (1)	The impact will be restricted to the site only.	
Magnitude	Low (0)	No primary vegetation will be cleared if the footprint does not exceed the designated footprint and the small portion of secondary grassland (old lands) has minimal ecological value.	
Probability	Definite (5)	The possibility of the impact is high	
Cumulative impacts: Since most of the footprint is within currently cultivated lands and only a small portion is within old lands, cumulative impact to terrestrial biodiversity locally and regionally will be negligible. Furthermore, it is likely that vegetation regrowth within the PV footprint will occur after construction and these areas will not be cultivated for the duration of the project, hence cumulative impacts would be negligible.			
Residual Risks: Residual risks include possible clearing of natural or near natural vegetation outside of the proposed footprint.			

Nature: *Loss of flora species of conservation concern during pre-construction site clearing activities.*			
Impact description: Species of conservation concern are present within the affected area (old lands only), which could be destroyed during site clearing. All species are widespread species and removal will not result in any significant impact to any flora species or population.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long term (4)	Operation of the site will be long term (± 25-year anticipated lifespan). Some revegetation, potentially including regeneration of species of conservation concern, to current levels will occur within the PV footprint once construction is completed.	**Low Negative (21)**
Extent	Local (1)	The impact will be restricted to the site only.	
Magnitude	Low (2)	Approximately three quarters of the proposed PV site is within existing cultivated lands and the remaining	

		portion is in old lands which is comprised of secondary grassland vegetation.	
Probability	Probable (3)	The possibility of the impact is Medium.	
Mitigation/Enhancement Measures			
Mitigation: • A search and rescue would be recommended before construction commences. Any flora search and rescue will likely include a few individuals of widespread, cosmopolitan or common but protected species. • Respective permits to be obtained beforehand.			
Post Mitigation/Enhancement Measures			
Duration	Long term (4)	Clearing of the site will be long term (± 25-year anticipated lifespan). Some revegetation, potentially including regeneration of species of conservation concern, to current levels will occur within the PV footprint once construction is completed.	**Low Negative (15)**
Extent	Local (1)	The impact will be restricted to the site only.	
Magnitude	Low (0)	All species are widespread species and removal will not result in any significant impact to any flora species or population.	
Probability	Probable (3)	The possibility of the impact is Medium.	
Cumulative impacts: Since most of the footprint is within currently cultivated lands and only a small portion is within old lands, cumulative impact to flora species locally and regionally will be negligible. All species are widespread species and removal will not result in any significant impact to any flora species or population. Furthermore, it is likely that some flora species will regenerate within the footprint once construction is completed, hence cumulative impacts would be negligible. No species having an elevated conservation status were found to be present within the project footprint.			
Residual Risks: Residual risks include possible clearing of areas outside of the proposed footprint, or not relocating any species, but are likely to be negligible.			

Nature: *Loss of fauna species of conservation concern and potential loss of faunal habitat.*			
Impact description: Faunal species of conservation concern are present within the affected area (old lands only), which could be destroyed during site clearing. All species are widespread species and removal will not result in any significant impact to any flora species or population. Species may include transient fauna species. Activities associated with site preparation and killing of perceived dangerous fauna, may lead to increased mortalities among faunal species.			
	Rating	**Motivation**	**Significance**

Prior to Mitigation			
Duration	Long term (4)	Operation of the site will be long term (± 25-year anticipated lifespan). Fauna species may return to the project site once construction is completed, including transient species. The operation of the site is unlikely to pose any significant risk to such species.	**Low Negative (21)**
Extent	Local (1)	The impact will be restricted to the site only.	
Magnitude	Low (2)	Approximately three quarters of the proposed PV site is within existing cultivated lands and the remaining portion is in old lands which is comprised of secondary grassland vegetation. Faunal composition is thus low but may include transient species.	
Probability	Probable (3)	The possibility of the impact is Medium.	
Mitigation/Enhancement Measures			
Mitigation: • Blanket clearing of vegetation must be limited to the footprint. • The habitats and microhabitats present on the project site are not unique and are widespread in the general area, hence the local impact associated with the footprint would be of low significance if mitigation measures are adhered to. • Small mammals within the habitat on and around the affected area are generally mobile and likely to be transient to the area. They will most likely vacate the area once construction commences. As with all construction sites there is a latent risk that there will be some accidental mortalities. Specific measures are made to reduce this risk. The risk of species of special concern is low, and it is unlikely that there will be any impact to populations of such species because of the activity. • Reptiles such as lizards are less mobile compared to mammals, and some mortalities could arise. It is recommended that a faunal search and rescue be conducted before construction commences, although experience has shown that there could still be some mortalities as these species are mobile and may thus move onto site once construction is underway. A retile handler should be on call for such circumstances. • Should any amphibian migrations occur between wetland areas during construction, appropriate measures (including temporarily suspending works in the affected area) should be implemented. • A pre-commencement faunal search and rescue is recommended, but not necessarily required. Respective permits to be obtained beforehand. • No animals are to be harmed or killed during the course of operations including use of snares.			
Post Mitigation/Enhancement Measures			
Duration	Long term (4)	Operation of the site will be long term (± 25-year anticipated lifespan). Fauna species may return to the project site once construction is completed, including transient	**Low Negative (15)**

		species. The operation of the site is unlikely to pose any significant risk to such species.	
Extent	Local (1)	The impact will be restricted to the site only.	
Magnitude	Low (0)	Approximately three quarters of the proposed PV site is within existing cultivated lands and the remaining portion is in old lands which is comprised of secondary grassland vegetation. Faunal composition is thus low but may include transient species.	
Probability	Probable (3)	The possibility of the impact is Medium.	
Cumulative impacts: Since most of the footprint is within currently cultivated lands and only a small portion is within old lands, cumulative impact to faunal species locally and regionally will be negligible. All fauna species are widespread species and removal will not result in any significant impact to any fauna species or population. Furthermore, it is likely that some fauna species will return to the project footprint once construction is completed, hence cumulative impacts would be negligible. No species having an elevated conservation status were found to be present within the project footprint.			
Residual Risks: Residual risks include possible clearing of areas outside of the proposed footprint, killing of perceived harmful fauna during construction or not relocating any species, but are likely to be negligible.			

Nature: *Invasion by exotic and alien invasive species could occur as a result of construction.*			
Impact description: Exotic (weed) and alien invasive species may proliferate during and after construction in disturbed areas. Areas disturbed during construction, having no vegetation cover, including temporary stockpile areas, are often susceptible to invasion by weedy and alien invasive species, which can not only become invasive but also prevent natural flora from becoming established.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long term (4)	Operation of the site will be long term (± 25-year anticipated lifespan). This risk is highest during and just after construction but can perpetuate for the duration of operations if not adequately managed.	**Low Negative (21)**
Extent	Local (1)	The impact will be restricted to the site only.	

Magnitude	Low (2)	The magnitude is generally proportionate to the level of disturbance and how well and quickly mitigation is implemented.	
Probability	Probable (3)	The possibility of the impact is Medium.	
Mitigation/Enhancement Measures			
Mitigation: • Alien species (including alien invasive trees) and weeds must be removed from the site as per CARA/NEMBA requirements. • A suitable weed management strategy to be implemented during construction and operation phases as outlined in the EMPr section of this report. It is imperative that any actions are implemented timeously as once alien and weed species generate seeds, the problem is exacerbated. • After clearing and construction is completed, an appropriate cover may be required, should natural re-establishment of grasses not take place in a timely manner along road verges. This will also minimise dust.			
Post Mitigation/Enhancement Measures			
Duration	Long term (4)	Operation of the site will be long term (± 25-year anticipated lifespan). This risk is highest during and just after construction but can perpetuate for the duration of operations if not adequately managed.	**Low Negative (15)**
Extent	Local (1)	The impact will be restricted to the site only.	
Magnitude	Low (0)	The magnitude is generally proportionate to the level of disturbance and how well and quickly mitigation is implemented.	
Probability	Probable (3)	The possibility of the impact is Medium.	
Cumulative impacts: Since most of the footprint is currently cultivated lands, these areas are generally subject to weed proliferation, hence it is unlikely that impacts ro risks will exceed current conditions locally or regionally.			
Residual Risks: Residual risks are primarily related to inadequate initial and ongoing implementation of the weed management plan.			

Nature: *Disturbances to ecological processes may occur as a result of the activity.*			
Impact description: Activity may result in disturbances to ecological processes.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long term (4)	Operation of the site will be long term (± 25-year anticipated lifespan). Some revegetation to current levels will occur	**Low Negative (14)**

		within the PV footprint once construction is completed.	
Extent	Local (1)	The impact will be restricted to the site and local surrounding area only.	
Magnitude	Low (2)	Approximately three quarters of the proposed PV site is within existing cultivated lands and the remaining portion is in old lands which is comprised of secondary grassland vegetation. Disruptions to ecological processes are thus unlikely to exceed current levels. The area is already significantly fragmented and intact areas surrounding the site will support ongoing ecological processes.	
Probability	Improbable (2)	The possibility of the impact is low.	
Mitigation/Enhancement Measures			
Mitigation: • Blanket clearing of vegetation must be limited to the development footprint, and the area to be cleared must be demarcated before any clearing commences. • Rehabilitation or revegetation should be implemented on completion of construction.			
Post Mitigation/Enhancement Measures			
Duration	Long term (4)	Operation of the site will be long term (± 25-year anticipated lifespan). Some revegetation to current levels will occur within the PV footprint once construction is completed.	**Low Negative (10)**
Extent	Local (1)	The impact will be restricted to the site only.	
Magnitude	Low (0)	Approximately three quarters of the proposed PV site is within existing cultivated lands and the remaining portion is in old lands which is comprised of secondary grassland vegetation. Disruptions to ecological processes are thus unlikely to exceed current levels.	
Probability	Improbable (2)	The possibility of the impact is Medium	
Cumulative impacts: Since most of the footprint is within currently cultivated lands and only a small portion is within old lands, as well as being within an area already significantly fragmented, cumulative impact to ecological processes both locally and regionally will be negligible. Furthermore, it is likely that vegetation regrowth within the PV footprint will occur after construction and these areas will not be cultivated for the duration of the project, hence cumulative impacts would be negligible as ecological processes are likely to persist during operation.			
Residual Risks:			

Residual risks include possible clearing of natural or near natural vegetation outside of the proposed footprint.

Nature: *Aquatic and Riparian processes and may be affected by the activity and erosion risk may be elevated.*			
Impact description: *Diversion and increased velocity of surface water flows during construction and operation could alter the hydrological regime and result in changes to water quality as well as loss of riparian vegetation / aquatic habitat. Removal of vegetation cover and soil disturbance during construction may result in some areas being susceptible to soil erosion, in particular during unexpected heavy rainfall.*			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long term (4)	Operation of the site will be long term (± 25-year anticipated lifespan). All aquatic features have been identified and excluded from the site footprint.	**Low Negative (21)**
Extent	Local (1)	The impact will be restricted to the site and immediate surrounds only.	
Magnitude	Low (2)	Approximately three quarters of the proposed PV site is within existing cultivated lands, hence the activity is unlikely to exceed current levels.	
Probability	Probable (3)	The possibility of the impact Medium	
Mitigation/Enhancement Measures			
Mitigation: • No activity to occur within watercourses or wetlands. • Stormwater discharge into watercourses to be protected against erosion. • Suitable measures must be implemented in areas that may be susceptible to erosion (such as slopes) and all Any excavations or excavated areas must be protected from erosion. • Topsoil must be stripped and stockpiled separately and protected from erosion and replaced on completion. • If natural vegetation re-establishment does not occur natural (grassland typically regenerates well with minimal intervention), a suitable local grass seed mix must be applied.			
Post Mitigation/Enhancement Measures			
Duration	Long term (4)	Operation of the site will be long term (± 25-year anticipated lifespan). All aquatic features have been identified and excluded from the site footprint.	**Low Negative (15)**
Extent	Local (1)	The impact will be restricted to the site and immediate surrounds only.	
Magnitude	Low (0)	Approximately three quarters of the proposed PV site is within existing cultivated lands, hence the activity is unlikely to exceed current levels.	
Probability	Probable (3)	The possibility of the impact Medium	
Cumulative impacts:			

Since most of the footprint is within currently cultivated lands, baseline disturbance and risks relating to aquatic features as well as erosion is already elevated. Aquatic areas have been excluded from the site development plan, hence cumulative impacts locally and regionally will be negligible.
Residual Risks: Residual risks include inadequate protection from flooding or erosion (including stockpiles topsoil) as a result of unexpected heavy rainfall, mostly during construction and early after construction is completed (until vegetation cover is established). This risk does not exceed current risks relating to the site being mostly cultivated lands.

3.2.2 Assessment of Cumulative Impacts

As per requirements of the EIA Regulations, specialists are required to assess the cumulative impacts. In this regard, please refer to the methodology below that will need to be used for the assessment of Cumulative Impacts.

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). This section should address whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

The proposed activity will not result in any unacceptable loss or impact on the site or regionally, regardless of any other projects proposed in the area.

Nature: *Activity may result in cumulative impacts to terrestrial ecology.*		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: • Blanket clearing of vegetation must be limited to the site. No clearing outside of footprint to take place. • Additional mitigation measures as decribed above are to be implemented.		

The proposed development site has a long history of transformation and is surrounded by an urban, mining and agricultural area. The impacts on the terrestrial environment are therefore likely to be minimal. Habitat and species represented in and around such transformed areas are often cosmopolitan generalists with a wide range of habitat types. Due to the elevated status of the vegetation unit, disturbance to remnant natural or near natural pockets of habitat should be avoided or limited to linear activities such as access roads or powerline crossings.

The above impacts can be summarised as follows:

- Impacts relating to loss of vegetation and disruption to ecological processes are deemed to be **medium** before mitigation and **low** after mitigation.
- Impacts relating to disturbance and displacement of faunal habitat and faunal species of conservation concern are deemed to be **low** before and after mitigation. Any impact is likely to be temporary during construction.
- Impacts relating to disturbance of flora species of conservation concern located in the site will be **low** before mitigation and after mitigation.
- All other impacts are assessed to be of **low** significance before mitigation and after the implementation of the mitigation measures.

3.2.3 Terrestrial Biodiversity Impact Reversibility

Grasslands are generally resilient and any impacts, excluding hardening of surfaces or removal of topsoil will be reversible to some extent. The grassland represented on site is likely all secondary grassland to varying degrees and reversibility in these areas will be high where the site will be able to revegetate to a pre-construction state with implementation of minimal rehabilitation.

3.2.4 Impacts and Risks to Irreplaceable Biodiversity Resources

While the site is situated within a vegetation type having an elevated status (Endangered), due to the current ecological state, where the site is secondary grassland to varying degrees, as well as within currently cultivated areas, risks to irreplaceable biodiversity resources will be low. Several bird species and other faunal species may occasionally traverse the site, but with extensive, be it fragmented, similar habitat in the surrounding area, this is not deemed to be irreplaceable, bearing in mind the anticipated limited footprint. Furthermore, the alternative land use for the site would likely be rotational cultivation which will in its own way also pose similar risks. It is thus unlikely that the proposed activity and associated infrastructure would provide any direct or indirect risk to any species or population, specifically as it will not significantly exceed current baseline risks, which are locally high due to mining and agricultural activities.

3.2.5 Environmental Management Plan

Refer to included Environmental Management Plan included as Section 8.7: Appendix F: Biodiversity Environmental Management Plan.

3.3 Findings, Outcomes and Recommendations

3.3.1 Summary of Findings

- Areas scoring an overall LOW sensitivity include the portions of the site that are completely transformed or severely degraded, that have a low conservation status, or where there is very dense alien infestation. Loss of these areas will not significantly compromise the current conservation status of the vegetation unit at a regional level, nor is its loss likely to compromise the ecological functioning of surrounding areas. Low sensitivity areas include all portions of site that has been cultivated including cultivated areas and old lands as well as any other transformed or significantly disturbed areas where ecological functioning is substantially compromised.
- Areas scoring an overall MODERATE sensitivity include the portions of natural vegetation that is mostly intact, but not having specific biodiversity related issues of significance or where proposed activity will have limited overall impact and recovery will be good with minimal intervention. Moderate sensitivity areas include near-natural but disturbed or secondary regenerated grassland vegetation in less disturbed areas.
- Areas scoring an overall HIGH sensitivity include those areas having intact vegetation and deemed to have a sensitivity, including being within intact Critical Biodiversity Areas and connectivity corridors, or are deemed critical habitat for fauna and/or flora species that are considered to be vulnerable and/or have confirmed presence of species of conservation concern. High sensitivity terrestrial areas include wetlands and patches of remnant grassland vegetation that appears to have some near natural to natural elements.
- Areas scoring an overall VERY HIGH sensitivity (No-Go Areas) include areas having a Critically Endangered or Endangered conservation status, or that are irreplaceable in terms of Critical Biodiversity Areas or are critical habitat (refer to Section 3.1.10) for any faunal species that is endangered or critically endangered. For the purposes of this assessment no specific Very High sensitivity terrestrial areas have been identified but would include irreplaceable habitat.
- No-go areas – wetland and seep areas are deemed to be no go areas, although they are significantly disturbed as a result of historical cultivation practices. All such areas have been delineated and avoided in the revised PV layout.
- Cumulative impacts because of the development of the site, are negligible.

All impacts are assessed to be of ***low significance after mitigation*** and specific mitigation measures are outlined in the impact assessment section above as well as in the general Environmental Management Plan (Section 8.7: Appendix F: Biodiversity Environmental Management Plan). Impacts are anticipated to be as follows:

- Impacts relating to loss of vegetation and disruption to ecological processes are deemed to be **medium** before mitigation and **low** after mitigation.
- Impacts relating to disturbance and displacement of faunal habitat and faunal species of conservation concern are deemed to be **low** before and after mitigation. Any impact is likely to be temporary during construction.
- Impacts relating to disturbance of flora species of conservation concern located in the site will be **low** before mitigation and after mitigation.
- All other impacts are assessed to be of **low** significance before mitigation and after the implementation of the mitigation measures.

It is likely that the construction of the PV facility, which will limit future agricultural use, may have positive impact in that it will allow natural successional revegetation of grassland within the footprint and without ongoing ploughing, in the long term, a more climax grassland vegetation may persist.

3.3.2 Recommendations

- It is the conclusion of this terrestrial biodiversity assessment that the proposed PV development can be constructed within acceptable terrestrial biodiversity impact limits providing the recommended mitigation actions are adhered to.
- The implementation of the management actions relating to flora and fauna as well erosion and stormwater management and post construction rehabilitation will minimise biodiversity impacts.
- While the grid connection overhead powerlines will have a limited terrestrial biodiversity impact and the difference between the 3 alternatives is likely to be negligible, Alternative 2 (central) would have the least impact, being the most direct and shortest route passing through transformed areas, followed by Alternative 1 (east). Alternative 3 (west) would potentially have the greatest terrestrial biodiversity impact as it passes through more naturally vegetated areas and is considerably longer (i.e. more pylons) than the other alternatives. Regrading terrestrial biodiversity, it is recommended that Alternatives 1 and 2 are considered, while Alternative 3 should be avoided, unless technical or safety reasons preclude the other alternatives.

3.4 Site Preparation and Vegetation Clearing Plan

The following flora relocation plan is recommended for inclusion in the EMP and Flora removal permit applications:

- A pre-commencement fauna relocation is unlikely to be required but is recommended. Most faunal species in proximity are likely to vacate the area once earth moving equipment commences clearing and construction, however some species may require manual relocation.
- A pre-commencement flora relocation is also recommended required, but will be limited to a few individuals
- Topsoil must be stripped and stockpiled adjacent to the construction site for replacement and /or rehabilitation after construction of the PV facility. Additional measures should be implemented to stabilise eroded areas where necessary.

3.5 Rehabilitation and Landscaping Plan

- On completion of construction, the surface of any work areas, especially if compacted due to hauling and dumping operations shall be scarified to a depth of at least 200 mm and graded to an even surface condition and the previously stored topsoil will be returned to its original depth over the area.
- The disturbed areas can be seeded with suitable grasses and local indigenous seed mix, if deemed to be required, however, vegetation is likely to re-establish without input.
- Excavations may not be used for the dumping of construction wastes.
- Waste (non-biodegradable refuse) will not be permitted to be deposited in the excavations and must be disposed of appropriately.
- Final rehabilitation *must* comply with the requirements mentioned in the Rehabilitation Plan.

3.6 Open Space Management/Conservation Plan

None are applicable for this project.

3.7 Maintenance Management Plan

Ongoing maintenance is likely to be required in the long-term, which could include re-excavation of portions of the facility for maintenance/replacement of defective components and repairs where applicable. All measures of this report, including the EMPr should be adhered for any such maintenance requirements. Any excavated areas must be stabilised and rehabilitated as per the measures indicated in this report.

4 Organizational Capacity and Competency

Successful Implementation will be in part be dependent on the organisational capacity and competency of the applicant and any implementing agents. The following aspects are likely to pose risk to the successful mitigation of the project:

- Budget constraints – budget allocated for environmental management tends to be inadequate for construction projects.
- Organisational Structure – implementing agents may or may not have adequate capacity and competency to ensure appropriate and adequate environmental management.

5 Emergency Preparedness and Response

Emergency Preparedness Plan must be included in the EMPr and should address specific measures relating to the following emergency risks:

- Fire management and response
- Spill management and incident response
- Waste management and incident response
- Response to emergency site shutdown, including labour and protest actions.

6 Stakeholder Engagement

Possible Stakeholders relating to Biodiversity could include the following key groups:

- Neighbouring Property Owners
- Local Regional and National Conservation Authorities

No Stakeholder Engagement was conducted specifically by the Specialist. Stakeholder Engagement will be undertaken by the EAP as part of the environment application public participatory process. Any comments raised relating to Biodiversity will be addressed by the specialist in the final report.

7 Monitoring and Review

Key monitoring activities should include the following:

1. Pre-construction
   a) Ensure flora permits are in place timeously (PNCO only) – allow at least 1 or 2 months before commencement.
   b) Environmental Awareness and training (EAT) – Ensure all labour are informed and plant operators are aware of risks, issues, dos and don'ts and no-go areas.
2. Bush clearing
   a) Ensure working plant has no oil or hydraulic leaks
   b) Check delineated footprints area not exceeded
3. Construction
   a) Regular checks on trenches for trapped animals and possible drowning risks
   b) Regular checks of fences for snares
4. Rehabilitation
   a) Check quality of topsoil and weed free
   b) Check for weed regrowth and manage timeously (before seed is set)
5. Operation monitoring
   a) Weed management on ongoing basis
   b) Erosion to be addressed on ongoing basis

8 Appendices

8.1 Appendix A: References

General Reference Sources

- Acocks, J. P. H. 1988. *Veld Types of South Africa*. Memoirs of the Botanical Survey of South Africa, No 57. Botanical Research Institute, Department of Agriculture and Water Supply, South Africa.
- Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. 2014. Edited by Michael F. Bates, William R. Branch, Aaron M. Bauer, Marius Burger, Johan Marais, Graham J. Alexander & Marienne S. de Villiers. SANBI, Pretoria.
- Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. & Marienne S. de Villiers. (Eds). 2014. *Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland.* SANBI, Pretoria.
- Bland, L.M., Keith, D.A., Miller, R.M., Murray, N.J. and Rodríguez, J.P. (eds.) (2016). *Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria*, Version 1.0. Gland, Switzerland: IUCN. ix + 94pp.
- Bromilow, C. 2001. *Problem Plants of South Africa*. A Guide to the Identification and Control of More than 300 Invasive Plants and Other Weeds. Briza Publications. Pp 258
- Child M.F., Roxburgh L., Do Linh San E., Raimondo D., Davies-Mostert H.T. 2016. *The Red List of Mammals of South Africa, Swaziland and Lesotho.* South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.
- Collins, N.B. 2015. *Free State Province Biodiversity Plan: CBA map*. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs. Internal Report.
- Collins, N.B. 2016. *Free State Province Biodiversity Plan: Technical Report v1.0*. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs.
- Council for Scientific and Industrial Research. NFEPA river FEPAs 2011 [vector geospatial dataset] 2011. Available from the Biodiversity GIS website, downloaded on 20 July 2020.
- Council for Scientific and Industrial Research. NFEPA rivers 2011 [vector geospatial dataset] 2011. Available from the Biodiversity GIS website, downloaded on 20 July 2020.
- Council for Scientific and Industrial Research. NFEPA wetland clusters 2011 [vector geospatial dataset] 2011. Available from the Biodiversity GIS website, downloaded on 20 July 2020.
- Council for Scientific and Industrial Research. NFEPA wetlands vegetation 2011 [vector geospatial dataset] 2011. Available from the Biodiversity GIS website, downloaded on 20 July 2020.
- Cowling, R.M., Richardson, D.M. & Pierce, S.M. 1997. Vegetation of Southern Africa. Cambridge University Press.
- Esler, K.J., Milton, S.J. & Dean, W.R.J. 2006. Karroo Veld: Ecology and Management. Briza Publications.
- Fuggle, R. F. & Rabie, M. A. 2003. *Environmental Management in South Africa*. Juta & Co, Johannesburg.
- Germishuizen, G. & Meyer, N.L. (eds). 2003. *Plants of southern Africa: An annotated checklist*. Strelitzia, 14. Pretoria: National Botanical Institute.
- Golding, J. (Ed.) 2002. *Southern African Plant Red Data Lists*. Southern African Botanical Diversity Network Report No 14.
- Henderson, L. 2001. *Alien Weeds and Invasive Plants*. Plant Protection Research Institute Handbook No 12. Agricultural Research Council. Pp 300.
- Hilton-Taylor, C. 1996. *Red Data List of Southern African Plants*. National Botanical Institute.
- Hockey PAR, Dean WRJ and Ryan PG 2005. Roberts – Birds of southern Africa, VIIth ed. The Trustees of the John Voelcker Bird Book Fund, Cape Town.
- International Finance Corporation. 2012. *Performance Standards on Environmental and Social Sustainability*.

- Low, A.B. & Rebelo, A.G. 1998. *Vegetation of South Africa, Lesotho and Swaziland*. Pretoria: Department of Environmental Affairs and Tourism.
- Marnewick MD, Retief EF, Theron NT, Wright DR, Anderson TA. 2015. *Important Bird and Biodiversity Areas of South Africa*. Johannesburg: BirdLife South Africa.
- Mecenero, S., Ball, J.B., Edge, D.A., Hamer, M.L., Hening, G.A., Krüger, M., Pringle, R.L., Terblanche, R.F. & Williams, M.C. (Eds). 2013. *Conservation assessment of butterflies of South Africa, Lesotho and Swaziland:* Red List and atlas. Saftronics (Pty) Ltd., Johannesburg and Animal Demography Unit, Cape Town.
- Minter LR, Burger M, Harrison JA, Braack HH, Bishop PJ & Kloepfer D (Eds). 2004. *Atlas and Red Data book of the frogs of South Africa, Lesotho and Swaziland.* SI/MAB Series no. 9. Smithsonian Institution, Washington, D.C.
- Minter LR, Burger M, Harrison JA, Braack HH, Bishop PJ & Kloepfer D (eds). 2004. Atlas and Red Data book of the frogs of South Africa, Lesotho and Swaziland. SI/MAB Series no. 9. Smithsonian Institution, Washington, D.C.
- Mucina, L. & Rutherford, M.C. (Eds). 2006. *The vegetation of South Africa, Lesotho and Swaziland*, in Strelitzia 19. South African National Biodiversity Institute, Pretoria.
- Myers, N., Mittermeir, R.A., Mittermeir, C.G., De Fonseca, G.A.B. & Kent, J. 2000. *Biodiversity hotspots for conservation priorities*. Nature, 403: 853–858.
- Nel, J., Colvin, C., Le Maitre, D., Smith, J., Haines, I. 2013. Defining South Africa's Water Source Areas. WWF South Africa & Council for Scientific & Industrial Research (CSIR).
- Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., van Deventer, H., Funke, N., Swart, E.R., Smith-Ado, L.B., Mbona, N., Downsborough, L. & Nienaber, S. 2011. *Technical Report for the National Freshwater Ecosystem Priority Areas project.* Report to the Water Research Commission, WRC Report No. 1801/2/11. ISBN 978-1-4312-0149-5.
- Pienaar, K. 2000. *The South African What Flower is That*? Struik Publishers (Pty) Ltd. Cape Town.
- Powrie, L.W. 2013. A database of biodiversity taxon names in South Africa for copy-and-paste into reports or documents. South African National Biodiversity Institute, Cape Town. Obtained from SANBI on 20 July 2020.
- Powrie, L.W. 2013. *A list of South African biodiversity terms and common names for spell checking*. South African National Biodiversity Institute, Cape Town. Downloaded from www.sanbi.org on 20 July 2020.
- Powrie, L.W. 2013. *A list of South African botanical names for spell checking*. South African National Biodiversity Institute, Cape Town. Downloaded from www.sanbi.org 18 July 2020.
- Powrie, L.W. 2013. *A list of South African physical feature names for spell checking*. South African National Biodiversity Institute, Cape Town. Downloaded from www.sanbi.org on 20 July 2020.
- Powrie, L.W. 2013. *A list of South African zoological and other (including fungi and lichen) names for spell checking*. South African National Biodiversity Institute, Cape Town. Downloaded from www.sanbi.org on 20 July 2020.
- Rouget, M., Reyers, B., Jonas, Z., Desmet, P., Driver, A., Maze, K., Egoh, B. & Cowling, R.M. 2004. *South African National Spatial Biodiversity Assessment 2004: Technical Report. Volume 1: Terrestrial Component.* Pretoria: South African National Biodiversity Institute.
- Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (Eds.). 2019. *South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm*. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.
- South African National Biodiversity Institute (SANBI). 2019. *National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report.* South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries, Pretoria. Pp. 1–214.
- Stirton, C. H. 1987. *Plant Invaders: Beautiful, but Dangerous*. The Department of Nature and Environmental Conservation of the Cape Province Administration. Galvin and Sales, Cape Town.
- Taylor, M.R., Peacock, F., and Wanless, R.M. 2015. Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland.

- Taylor, P.B., Navarro, R.A., Wren-Sargent, M., Harrison, J.A. & Kieswetter, S.L. 1999. *Coordinated waterbird Counts in South Africa, 1992-1997.* Avian Demography Unit, Cape Town.
- Turpie, J.K., Wilson, G. & Van Niekerk, L. 2012. *National Biodiversity Assessment 2011: National Estuary Biodiversity Plan for South Africa*. Anchor Environmental Consulting, Cape Town. Report produced for the Council for Scientific and Industrial Research and the South African National Biodiversity Institute.
- UN Natural Value Initiative. 2009. *The Ecosystem Services Benchmark,* 2009.
- Van Wyk, A.E. & Smith, G.F. 2001. *Regions of Floristic Endemism*: A Review with Emphasis on Succulents, Umdaus Press.
- Weather Bureau. 1988. Climate of South Africa – Climate statistics up to 1984 (WB40). Government Printer, Pretoria.
- Young, D.J., Harrison, J.A, Navarro, R.A., Anderson, M.A., & Colahan, B.D. (Eds). 2003. *Big birds on farms: Mazda CAR Report 1993-2001.* Avian Demography Unit: Cape Town.

Web Databases

- Animal Demographic Unit: http://vmus.adu.org.za
- Conservation International: http://www.biodiversityhotspots.org
- Fitzpatrick Institute of African Ornithology (2022). MammalMAP Virtual Museum. Accessed at http://vmus.adu.org.za/?vm=MammalMAP on 2022-07-20.
- Fitzpatrick Institute of African Ornithology (2022). OrchidMAP Virtual Museum. Accessed at http://vmus.adu.org.za/?vm=OrchidMAP on 2022-07-20.
- Fitzpatrick Institute of African Ornithology (2022). PHOWN Virtual Museum. Accessed at http://vmus.adu.org.za/?vm=PHOWN on 2022-07-20.
- FitzPatrick Institute of African Ornithology (2022). ScorpionMAP Virtual Museum. Accessed at http://vmus.adu.org.za/?vm=ScorpionMAP on 2022-07-20.
- Fitzpatrick Institute of African Ornithology (2022). SpiderMAP Virtual Museum. Accessed at http://vmus.adu.org.za/?vm=SpiderMAP on 2022-07-20.
- Global Biodiversity Information Facility (GBIF): http://gbif.org
- International Union for Conservation of Nature (IUCN) Redlist: http://iucnredlist.org
- Millennium Ecosystem Assessment (MEA). 2005: https://www.millenniumassessment.org
- Plants of Southern Africa: http://newposa.sanbi.org
- South African National Biodiversity Institute (SANBI) Redlist: http://redlist.sanbi.org
- South African Bird Atlas Project: http://sabap2.birdmap.africa
- United Nations Environment Programme (UNEP), *A to Z Areas of Biodiversity Importance:* http://www.biodiversitya-z.org
- United Nations Environment Programme (UNEP), *World Database on Protected Areas*, Protected Planet: http://www.protectedplanet.net
- World Resources Institute (WRI): https://www.wri.org

8.2 Appendix B: Site Photographic Record





















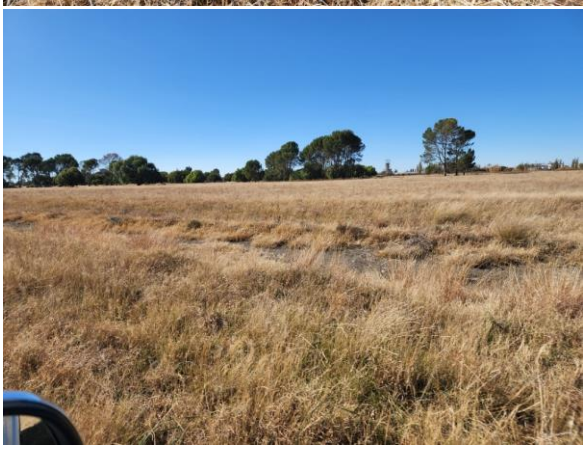
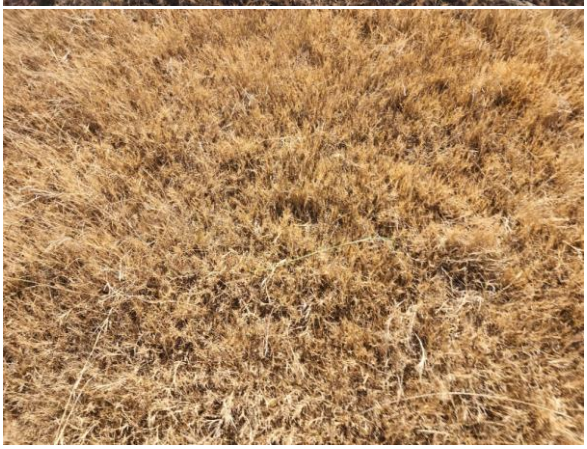

























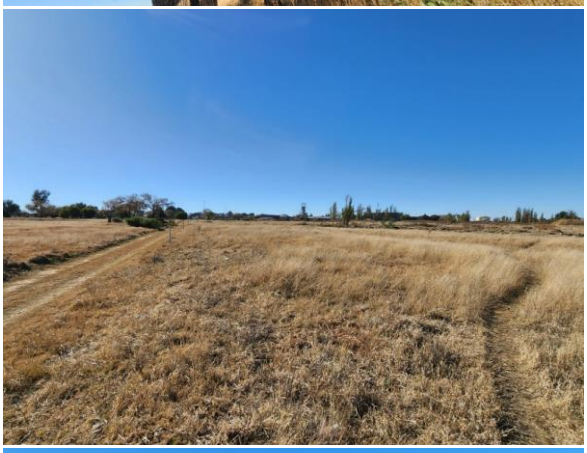





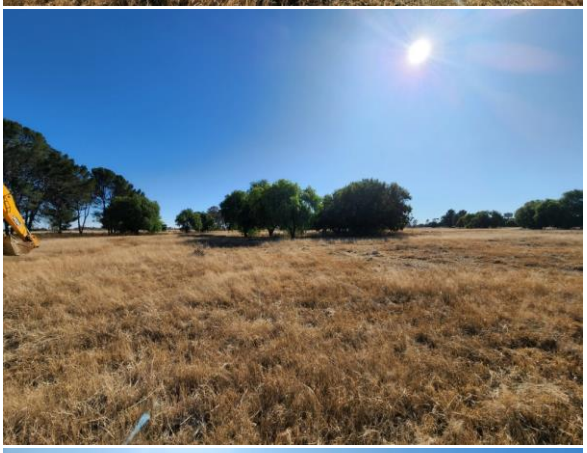













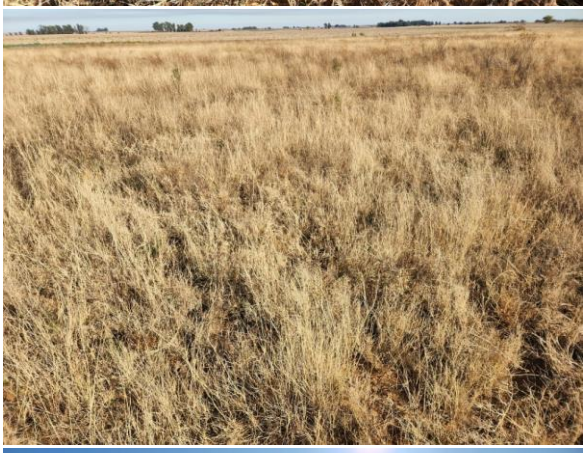




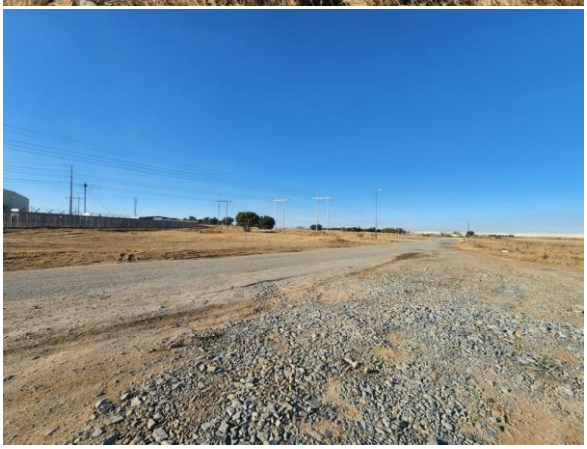

8.3 Appendix C: Flora and Fauna Species Lists

8.3.1 Flora

Marked species were flagged from various database sources as occurring in the region and having an elevated status. All were cross checked for distribution overlay and were actively screened for presence/absence on site.

SCIENTIFIC NAME	FAMILY	STATUS[7]	COMMENT/PRESENCE
Anthephora pubescens	Poaceae		
Anthospermum rigidum subsp. pumilum	Rubiaceae		
Aristida congesta	Poaceae		Present
Barleria macrostegia	Acanthaceae		
Berkheya onopordifolia var. onopordifolia	Asteraceae		Present
Boophone disticha	Amaryllidaceae	FSNCO	Present
Brachiaria serrata	Poaceae		Present
Bulbine narcissifolia	Asphodelaceae	FSNCO	Present
Chamaesyce inaequilatera	Euphorbiaceae		
Chloris virgata	Poaceae		Present
Cymbopogon caesius	Poaceae		Present
Cymbopogon pospischilii	Poaceae		
Cynodon dactylon	Poaceae		Present
Digitaria argyrograpta	Poaceae		Present
Digitaria eriantha	Poaceae		
Elionurus muticus	Poaceae		Present
Eragrostis chloromelas	Poaceae		Present
Eragrostis curvula	Poaceae		
Eragrostis lehmanniana	Poaceae		
Eragrostis obtusa	Poaceae		
Eragrostis plana	Poaceae		Present
Eragrostis superba	Poaceae		
Eragrostis trichophora	Poaceae		Present
Felicia muricata	Asteraceae		Present
Geigeria aspera var. aspera	Asteraceae		
Helichrysum caespititium	Asteraceae		Present
Helichrysum dregeanum	Asteraceae		Present
Helichrysum paronychioides	Asteraceae		
Hermannia depressa	Malvaceae		Present
Heteropogon contortus	Poaceae		Present
Hibiscus pusillus	Malvaceae		
Ledebouria marginata	Hyacinthaceae	FSNCO	Not Recorded during site visit
Lessertia phillipsiana	Fabaceae	End	Not Recorded during site visit
Monsonia burkeana	Geraniaceae		
Panicum coloratum	Poaceae		
Panicum gilvum	Poaceae		

[7] IUCN - Critically Endangered (**CR**), Endangered (**EN**), Vulnerable (**VU**), Least Concern (**LC**); **End** – Endemic; **FSNCO** – Free State Nature Conservation Ordinance (8 of 1969).; **Ex**, Exotic/Invasive/Weed; **NFA** – National Forest Act; **ToPS** – Threatened or Protected Species.

SCIENTIFIC NAME	FAMILY	STATUS[7]	COMMENT/PRESENCE
Pentzia globosa	Asteraceae		Present
Pogonarthria squarrosa	Poaceae		
Rhynchosia adenodes	Fabaceae		Present
Selago densiflora	Scrophulariaceae		
Setaria sphacelata	Poaceae		Present
Stachys spathulata	Lamiaceae		Present
Themeda triandra	Poaceae		Present
Tragus berteronianus	Poaceae		Present
Trichoneura grandiglumis	Poaceae		
Tripteris aghillana var. integrifolia	Asteraceae		
Triraphis andropogonoides	Poaceae		
Vernonia oligocephala	Asteraceae		
Ziziphus zeyheriana	Rhamnaceae		

8.3.2 Fauna

Marked species were flagged from various database sources as occurring in the region and having an elevated status. All were cross checked for distribution overlay and were actively screened for presence/absence on site.

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
MAMMALS			
Cryptomys sp.	Mole-rats		May be transient
Cryptomys hottentotus	Southern African Mole-rat	LC	May be transient
Aepyceros melampus	Impala	LC	Not Present
Alcelaphus buselaphus	Hartebeest		Not Present
Alcelaphus buselaphus caama	Red Hartebeest	LC	Not Present
Antidorcas marsupialis	Springbok	LC	Not Present
Connochaetes gnou	Black Wildebeest	LC	Not Present
Connochaetes taurinus	Blue Wildebeest	LC	Not Present
Damaliscus lunatus lunatus	(Southern African) Tsessebe	VU	Not Present
Damaliscus pygargus phillipsi	Blesbok	LC	Not Present
Damaliscus pygargus pygargus	Bontebok	VU	Not Present
Hippotragus equinus	Roan Antelope	EN	Not Present
Hippotragus niger niger		VU	Not Present
Kobus ellipsiprymnus	Waterbuck	LC	Not Present
Kobus leche	Lechwe	NThr	Not Present
Oryx gazella	Gemsbok	LC	Not Present
Pelea capreolus	Vaal Rhebok	NThr	Not Present
Raphicerus campestris	Steenbok	LC	May be transient
Redunca arundinum	Southern Reedbuck	LC	Not Present

[8] **IUCN** - Critically Endangered (**CR**), Endangered (**EN**), Vulnerable (**VU**), Least Concern (**LC**), Near Threatened (NThr); End – Endemic; **FSNCO** – Free State Nature Conservation Ordinance (8 of 1969).; **Ex**, Exotic/Invasive/Weed; **NFA** – National Forest Act; **ToPS** – Threatened or Protected Species; **NT** – Not Threatened (Not IUCN)

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Redunca fulvorufula	Mountain Reedbuck	LC	Not Present
Sylvicapra grimmia	Bush Duiker	LC	May be transient
Syncerus caffer	African Buffalo	LC	Not Present
Taurotragus oryx	Common Eland	LC	Not Present
Tragelaphus angasii	Nyala	LC	Not Present
Tragelaphus scriptus	Bushbuck	LC	Not Present
Tragelaphus strepsiceros	Greater Kudu	LC	May be transient
Canis mesomelas	Black-backed Jackal	LC	May be transient
Vulpes chama	Cape Fox	LC	May be transient
Chlorocebus pygerythrus	Vervet Monkey	LC	May be transient
Papio ursinus	Chacma Baboon	LC	May be transient
Dama dama	Fallow Deer	Ex	Not Present
Equus quagga	Plains Zebra	NThr	Not Present
Equus zebra hartmannae	Hartmann's Mountain Zebra	VU [A3bcd]	Not Present
Caracal caracal	Caracal	LC	May be transient
Felis nigripes	Black-footed Cat	VU	May be transient, unlikely
Leptailurus serval	Serval	NThr	May be transient, unlikely
Panthera leo	Lion	LC	Not Present
Giraffa giraffa giraffa	South African Giraffe	LC	Not Present
Atilax paludinosus	Marsh Mongoose	LC	May be transient
Cynictis penicillata	Yellow Mongoose	LC	Present
Herpestes sanguineus	Slender Mongoose	LC	May be transient
Suricata suricatta	Meerkat	LC	May be transient
Hyaena brunnea	Brown Hyena	NThr	Not present
Proteles cristata	Aardwolf	LC	May be transient, unlikely
Hystrix africaeaustralis	Cape Porcupine	LC	May be transient
Lepus capensis	Cape Hare	LC	May be transient
Lepus saxatilis	Scrub Hare	LC	May be transient
Elephantulus myurus	Eastern Rock Elephant Shrew	LC	May be transient
Smutsia temminckii	Ground Pangolin	VU	May be transient, unlikely
Aethomys granti	Grant's Rock Mouse	LC	May be transient
Aethomys namaquensis	Namaqua Rock Mouse	LC	May be transient
Desmodillus auricularis	Cape Short-tailed Gerbil	LC	May be transient
Gerbilliscus brantsii	Highveld Gerbil	LC	May be transient
Gerbilliscus leucogaster	Bushveld Gerbil	LC	May be transient
Mastomys sp.	Multimammate Mice		May be transient
Mastomys coucha	Southern African Mastomys	LC	May be transient
Mastomys natalensis	Natal Mastomys	LC	May be transient
Mus (Nannomys) indutus	Desert Pygmy Mouse	LC	May be transient
Mus (Nannomys) minutoides	Southern African Pygmy Mouse	LC	May be transient
Otomys auratus	Southern African Vlei Rat	NThr	May be transient
Rattus rattus	Roof Rat	LC	May be transient
Rhabdomys pumilio	Xeric Four-striped Grass Rat	LC	May be transient

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Aonyx capensis	African Clawless Otter	NThr	May be transient, unlikely
Dendromus melanotis	Gray African Climbing Mouse	LC	May be transient, unlikely
Malacothrix typica	Large-eared African Desert Mouse	LC	May be transient, unlikely
Mystromys albicaudatus	African White-tailed Rat	VU	May be transient, unlikely
Steatomys krebsii	Kreb's African Fat Mouse	LC	May be transient, unlikely
Orycteropus afer	Aardvark	LC	May be transient, unlikely
Pedetes capensis	South African Spring Hare	LC	May be transient, unlikely
Procavia capensis	Cape Rock Hyrax	LC	May be transient, unlikely
Paraxerus cepapi	Smith's Bush Squirrel	LC	May be transient, unlikely
Xerus inauris	South African Ground Squirrel	LC	May be transient, unlikely
Crocidura hirta	Lesser Red Musk Shrew	LC	May be transient, unlikely
Crocidura maquassiensis	Makwassie Musk Shrew	VU	May be transient, unlikely
Crocidura mariquensis	Swamp Musk Shrew	NThr	May be transient, unlikely
Suncus varilla	Lesser Dwarf Shrew	LC	May be transient, unlikely
Phacochoerus africanus	Common Warthog	LC	May be transient, unlikely
Sus scrofa	Wild Boar	Ex	May be transient, unlikely
Thryonomys swinderianus	Greater Cane Rat	LC	May be transient, unlikely
Neoromicia capensis	Cape Serotine	LC	May be transient, unlikely
Scotophilus sp.	House Bats		May be transient, unlikely
Genetta genetta	Common Genet	LC	May be transient, unlikely
BIRDS[9]			
Hydroprogne (Sterna) caspia	Caspian Tern	VU (SA), LC (Intl)	This species does not meet the criterion for a Vulnerable status, having a large range, increasing and large population. This species has a cosmopolitan but scattered distribution across North America, Europe, Asia, Africa, and Australasia. The habitat is largely confined to the coast, also occurring inland on fresh or saline wetlands, reservoirs and sewage ponds. It is thus most likely associated primarily with the nearby waterbodies and the specific site is unlikely to provide irreplaceable habitat, bearing in mind the baseline elevated levels of disturbance on the site and in the surrounding area.
Accipiter melanoleucus	Black Sparrowhawk (Goshawk)		May be transient
Accipiter ovampensis	Ovambo Sparrowhawk		May be transient
Aquila pennatus	Booted Eagle		May be transient
Buteo [augur] rufofuscus	Jackal Buzzard		May be transient
Buteo buteo	Steppe (Common) Buzzard		May be transient
Circaetus [gallicus] pectoralis	Black-chested (Breasted) Snake-Eagle		May be transient
Elanus caeruleus	Black-shouldered (Winged) Kite		May be transient
Haliaeetus vocifer	African Fish-Eagle		May be transient

[9] **BLSA** – Birdlife South Africa

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Melierax canorus	Southern Pale Chanting Goshawk		May be transient
Micronisus (Melierax) gabar	Gabar Goshawk		May be transient
Milvus aegyptius	Yellow-billed Kite		May be transient
Polyboroides typus	African Harrier-Hawk (Gymnogene)		May be transient
Calandrella [brachydactyla] cinerea	Red-capped Lark		May be transient
Calendulauda sabota	Sabota Lark		May be transient
Chersomanes albofasciata	Spike-heeled Lark		May be transient
Eremopterix leucotis	Chestnut-backed Sparrowlark (Finchlark)		May be transient
Mirafra africana	Rufous-naped Lark		May be transient
Spizocorys conirostris	Pink-billed Lark		May be transient
Alcedo cristata	Malachite Kingfisher		May be transient
Alopochen aegyptiaca	Egyptian Goose	LC	May be transient
Anas capensis	Cape Teal		May be transient
Anas erythrorhyncha	Red-billed Teal (Duck)		May be transient
Anas hottentota	Blue-bill Teal (Hottentot Teal)		May be transient
Anas smithii	Cape Shoveler		May be transient
Anas sparsa	African Black Duck		May be transient
Anas undulata	Yellow-billed Duck		May be transient
Anser anser subsp. domesticus	Domestic Goose		May be transient
Netta erythrophthalma	Southern Pochard		May be transient
Oxyura maccoa	Maccoa Duck	NT (SA), NT (Intl)	May be transient, unlikely
Plectropterus gambensis	Spur-winged Goose		May be transient
Sarkidiornis melanotos	Knob-billed Duck		May be transient
Tadorna cana	South African Shelduck		May be transient
Anhinga rufa	African Darter		May be transient
Apus affinis	Little Swift		May be transient
Apus barbatus	African Black (Black) Swift		May be transient
Ardea cinerea	Grey Heron		May be transient
Ardea goliath	Goliath Heron		May be transient
Ardea melanocephala	Black-headed Heron		May be transient
Ardeola ralloides	Squacco Heron		May be transient
Bubulcus ibis	Cattle Egret		May be transient
Egretta alba	Great Egret		May be transient
Egretta ardesiaca	Black Heron		May be transient
Egretta garzetta	Little Egret		May be transient
Egretta intermedia	Yellow-billed (Intermediate) Egret		May be transient
Ixobrychus sturmii	Dwarf Bittern		May be transient
Nycticorax nycticorax	Black-crowned Night-Heron		May be transient
Burhinus capensis	Spotted Thick-knee (Dikkop)		May be transient
Ceryle rudis	Pied Kingfisher		May be transient

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Charadrius pallidus	Chestnut-banded Plover	NT (SA), NT (Intl)	May be transient, unlikely
Charadrius pecuarius	Kittlitz's Plover		May be transient
Charadrius tricollaris	Three-banded Plover		May be transient
Vanellus armatus	Blacksmith Lapwing (Plover)		May be transient
Vanellus coronatus	Crowned Lapwing (Plover)		May be transient
Ciconia abdimii	Abdim's Stork	NT (SA), LC (Intl)	May be transient, unlikely
Ciconia ciconia	White Stork		May be transient
Mycteria ibis	Yellow-billed Stork	EN (SA), LC (Intl)	May be transient, unlikely
Apalis thoracica	Bar-throated Apalis		May be transient
Calamonastes fasciolatus	Barred Wren-Warbler		May be transient
Cisticola aridulus	Desert Cisticola		May be transient
Cisticola chiniana	Rattling Cisticola		May be transient
Cisticola fulvicapillus [fulvicapilla]	Neddicky (Piping Cisticola)		May be transient
Cisticola juncidis	Zitting (Fan-tailed) Cisticola		May be transient
Cisticola tinniens	Levaillant's (Tinkling) Cisticola		May be transient
Prinia flavicans	Black-chested Prinia		May be transient
Colius colius	White-backed Mousebird		May be transient
Colius striatus	Speckled Mousebird		May be transient
Urocolius indicus	Red-faced Mousebird		May be transient
Columba guinea	Speckled (Rock) Pigeon		May be transient
Oena capensis	Namaqua Dove		May be transient
Streptopelia capicola	Cape Turtle (Ring-necked) Dove		May be transient
Streptopelia semitorquata	Red-eyed Dove		May be transient
Streptopelia senegalensis	Laughing (Palm) Dove		May be transient
Coracias garrulus	European Roller	NT (SA), LC (Intl)	May be transient, unlikely
Coracias naevia (C. naevius)	Purple (Rufous-crowned) Roller		May be transient
Corvus albus	Pied Crow		May be transient
Chrysococcyx caprius	Dideric (Diederik) Cuckoo		May be transient
Halcyon albiventris	Brown-hooded Kingfisher		May be transient
Dendrocygna bicolor	Fulvous (Whistling) Duck		May be transient
Dendrocygna viduata	White-faced (Whistling-) Duck		May be transient
Thalassornis leuconotus	White-backed Duck		May be transient
Dicrurus adsimilis	Fork-tailed Drongo		May be transient
Amadina erythrocephala	Red-headed Finch		May be transient
Estrilda astrild	Common Waxbill		May be transient
Estrilda erythronotos	Black-faced Waxbill		May be transient
Uraeginthus [Granatina] granatina	Violet-eared Waxbill		May be transient
Lagonosticta rhodopareia	Jameson's Firefinch		May be transient

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Lagonosticta senegala	Red-billed Firefinch		May be transient
Ortygospiza atricollis	Quailfinch		May be transient
Pytilia melba	Green-winged (Melba) Pytilia (Finch)		May be transient
Uraeginthus angolensis	Blue Waxbill		May be transient
Falco amurensis	Amur (Eastern Red-footed) Falcon (Kestrel)		May be transient
Falco biarmicus	Lanner Falcon	VU (SA), LC (Intl)	May be transient, unlikely
Falco naumanni	Lesser Kestrel		May be transient
Falco rupicoloides	Greater Kestrel		May be transient
Falco rupicolus	Rock Kestrel		May be transient
Falco vespertinus	Red-footed (Western Red-footed) Falcon (Kestrel	NT (SA), NT (Intl)	May be transient, unlikely
Serinus atrogularis	Black-throated Canary		May be transient
Serinus flaviventris	Yellow Canary		May be transient
Emberiza impetuani	Lark-like Bunting		May be transient
Emberiza tahapisi	Cinnamon-breasted (Rock) Bunting		May be transient
Glareola nordmanni	Black-winged Pratincole	NT (SA), NT (Intl)	May be transient, unlikely
Rhinoptilus africanus	Double-banded Courser		May be transient
Hirundo albigularis	White-throated Swallow		May be transient
Hirundo cucullata	Greater Striped-Swallow		May be transient
Hirundo dimidiata	Pearl-breasted Swallow		May be transient
Hirundo fuligula	Rock Martin		May be transient
Hirundo rustica	Barn (European) Swallow		May be transient
Hirundo spilodera	South African Cliff-Swallow		May be transient
Riparia cincta	Banded Martin		May be transient
Riparia paludicola	Brown-throated (Plain) Martin		May be transient
Actophilornis africanus	African Jacana		May be transient
Lanius collaris	Southern Fiscal		May be transient
Lanius collurio	Red-backed Shrike		May be transient
Lanius minor	Lesser Grey Shrike		May be transient
Chlidonias hybridus	Whiskered Tern		May be transient
Chlidonias leucopterus	White-winged Tern		May be transient
Larus cirrocephalus	Grey-headed Gull		May be transient
Lybius torquatus	Black-collared Barbet		May be transient
Trachyphonus vaillantii	Crested Barbet		May be transient
Tricholaema leucomelas	Acacia Pied Barbet		May be transient
Batis molitor	Chinspot Batis		May be transient
Batis pririt	Pririt Batis		May be transient
Laniarius atrococcineus	Crimson-breasted Shrike		May be transient
Tchagra australis	Brown-crowned (headed) Tchagra		May be transient

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Merops apiaster	European Bee-eater		May be transient
Merops bullockoides	White-fronted Bee-eater		May be transient
Merops hirundineus	Swallow-tailed Bee-eater		May be transient
Merops persicus	Blue-cheeked Bee-eater		May be transient
Merops pusillus	Little Bee-eater		May be transient
Terpsiphone viridis	African Paradise-Flycatcher		May be transient
Anthus sp.	Pipits (unidentified)		May be transient
Anthus cinnamomeus	African (Grassveld/Grassland) Pipit		May be transient
Anthus leucophrys	Plain-backed Pipit		May be transient
Anthus vaalensis	Buffy Pipit		May be transient
Macronyx capensis	Cape (Orange-throated) Longclaw		May be transient
Motacilla capensis	Cape Wagtail		May be transient
Cercomela familiaris	Familiar Chat		May be transient
Cercomela sinuata	Sickle-winged Chat		May be transient
Cercotrichas (Erythropygia) paena	Kalahari Scrub-Robin		May be transient
Cossypha caffra	Cape Robin-chat		May be transient
Cossypha humeralis	White-throated Robin-Chat		May be transient
Muscicapa striata	Spotted Flycatcher		May be transient
Myrmecocichla formicivora	Ant-eating Chat		May be transient
Oenanthe pileata	Capped Wheatear		May be transient
Psophocichla litsipsirupa	Groundscraper Thrush		May be transient
Saxicola torquata	African (Common) Stonechat		May be transient
Sigelus silens	Fiscal Flycatcher		May be transient
Nectarinia [Cinnyris] talatala	White-bellied (breasted) Sunbird		May be transient
Numida meleagris	Helmeted Guineafowl		May be transient
Afrotis afraoides	Northern Black Korhaan (split)		May be transient
Eupodotis caerulescens	Blue Korhaan	LC (SA), NT (Intl)	May be transient, unlikely
Anthoscopus minutus	Cape (Southern) Penduline-Tit		May be transient
Parus cinerascens	Ashy Tit		May be transient
Passer diffusus	Southern Greyheaded Sparrow (split)		May be transient
Passer domesticus	House Sparrow		May be transient
Passer melanurus	Cape Sparrow		May be transient
Phalacrocorax africanus	Reed (Long-tailed) Cormorant		May be transient
Phalacrocorax lucidus	White-breasted (Great) Cormorant		May be transient
Pternistis swainsonii	Swainson's Spurfowl (Francolin)		May be transient
Scleroptila levaillantoides	Orange River Francolin		May be transient
Phoenicopterus minor	Lesser Flamingo		May be transient

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Phoenicopterus roseus	Greater Flamingo	NT (SA), LC (Intl)	May be transient, unlikely
Campethera abingoni	Golden-tailed Woodpecker		May be transient
Dendropicos fuscescens	Cardinal Woodpecker		May be transient
Jynx ruficollis	Red-throated Wryneck		May be transient
Amblyospiza albifrons	Thick-billed (Grosbeak) Weaver		May be transient
Euplectes afer	Yellow-crowned (Golden) Bishop		May be transient
Euplectes albonotatus	White-winged Widowbird		May be transient
Euplectes orix	Southern Red (Red) Bishop		May be transient
Euplectes progne	Long-tailed Widowbird		May be transient
Philetairus socius	Sociable (Social) Weaver		May be transient
Plocepasser mahali	White-browed Sparrow-Weaver		May be transient
Ploceus velatus	Southern Masked-Weaver		May be transient
Quelea quelea	Red-billed Quelea		May be transient
Sporopipes squamifrons	Scaly-feathered Finch		May be transient
Podiceps cristatus	Great Crested Grebe		May be transient
Podiceps nigricollis	Black-necked Grebe		May be transient
Tachybaptus ruficollis	Little Grebe (Dabchick)		May be transient
Pycnonotus nigricans	African Red-eyed Bulbul		May be transient
Fulica cristata	Red-knobbed Coot		May be transient
Gallinula chloropus	Common Moorhen		May be transient
Porphyrio madagascariensis	African Purple (Purple) Swamphen (Gallinule)		May be transient
Rallus caerulescens	African Rail		May be transient
Himantopus himantopus	Black-winged Stilt		May be transient
Recurvirostra avosetta	Pied (Avocet) Avocet		May be transient
Rhinopomastus cyanomelas	Common Scimitarbill		May be transient
Rostratula benghalensis	Greater Painted-snipe	NT (SA), LC (Intl)	May be transient, unlikely
Sagittarius serpentarius	Secretarybird	VU (SA), VU (Intl)	May be transient
Calidris minuta	Little Stint		May be transient
Gallinago nigripennis	African (Ethiopian) Snipe		May be transient
Philomachus pugnax	Ruff		May be transient
Tringa glareola	Wood Sandpiper		May be transient
Tringa nebularia	Common Greenshank		May be transient
Tringa stagnatilis	Marsh Sandpiper		May be transient
Scopus umbretta	Hamerkop		May be transient
Asio capensis	Marsh Owl		May be transient
Bubo africanus	Spotted Eagle-Owl		May be transient
Struthio camelus	Common Ostrich		May be transient
Acridotheres tristis	Common Myna		May be transient
Creatophora cinerea	Wattled Starling		May be transient

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Lamprotornis nitens	Cape Glossy (Glossy) Starling		May be transient
Spreo bicolor	Pied (African Pied) Starling		May be transient
Acrocephalus palustris	Marsh (European Marsh) Warbler		May be transient
Eremomela icteropygialis	Yellow-bellied Eremomela		May be transient
Parisoma (Sylvia) subcaeruleum	Chestnut-vented Tit-Babbler		May be transient
Phylloscopus trochilus	Willow Warbler		May be transient
Stenostira scita	Fairy Flycatcher (Warbler)		May be transient
Sylvia communis	Common (Whitethroat) Whitethroat		May be transient
Bostrychia hagedash	Hadeda Ibis		May be transient
Platalea alba	African Spoonbill		May be transient, unlikely
Plegadis falcinellus	Glossy Ibis		May be transient, unlikely
Threskiornis aethiopicus	African Sacred (Sacred) Ibis		May be transient, unlikely
Turdus smithi	Karoo Thrush (split)		May be transient, unlikely
Vidua chalybeata	Village Indigobird		May be transient, unlikely
Vidua funerea	Dusky Indigobird		May be transient, unlikely
Vidua macroura	Pin-tailed Whydah		May be transient, unlikely
Vidua paradisaea	Long-tailed (Paradise) Paradise-Whydah		May be transient, unlikely
Vidua purpurascens	Purple Indigobird		May be transient, unlikely
Vidua regia	Shaft-tailed Whydah		May be transient, unlikely
Zosterops pallidus	Orange River White-eye (split)	LC	May be transient, unlikely
Streptopelia senegalensis	Laughing (Palm) Dove		May be transient, unlikely
Philetairus socius	Sociable Weaver	LC	May be transient, unlikely
Plocepasser mahali	White-browed Sparrow-Weaver	LC	May be transient, unlikely
Ploceus velatus	Southern Masked Weaver	LC	May be transient, unlikely
REPTILES			
Agama aculeata distanti	Distant's Ground Agama	LC	May be transient
Agama atra	Southern Rock Agama	LC	May be transient
Monopeltis capensis	Cape Worm Lizard	LC	May be transient
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	May be transient
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	May be transient
Dasypeltis scabra	Rhombic Egg-eater	LC	May be transient
Cordylus vittifer	Common Girdled Lizard	LC	May be transient
Karusasaurus polyzonus	Karoo Girdled Lizard	LC	May be transient
Smaug giganteus	Giant Girdled Lizard	VU	May be transient, unlikely. Not recorded.
Elapsoidea sundevallii media	Highveld Garter Snake		May be transient
Hemachatus haemachatus	Rinkhals	LC	May be transient
Lygodactylus capensis	Common Dwarf Gecko	LC	May be transient

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Pachydactylus capensis	Cape Gecko	LC	May be transient
Meroles squamulosus	Common Rough-scaled Lizard	LC	May be transient
Nucras holubi	Holub's Sandveld Lizard	LC	May be transient
Nucras intertexta	Spotted Sandveld Lizard	LC	May be transient
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard	LC	May be transient
Aparallactus capensis	Black-headed Centipede-eater	LC	May be transient
Atractaspis bibronii	Bibron's Stiletto Snake	LC	May be transient
Boaedon capensis	Brown House Snake	LC	May be transient
Lamprophis aurora	Aurora House Snake	LC	May be transient
Lycophidion capense capense	Cape Wolf Snake	LC	May be transient
Prosymna bivittata	Two-striped Shovel-snout	LC	May be transient
Psammophis crucifer	Cross-marked Grass Snake	LC	May be transient
Psammophis leightoni	Cape Sand Snake	VU	May be transient
Psammophylax tritaeniatus	Striped Grass Snake	LC	May be transient
Pseudaspis cana	Mole Snake	LC	May be transient
Leptotyphlops scutifrons subsp. ?	Peters' Thread Snake (subsp. ?)	LC	May be transient
Pelomedusa galeata	South African Marsh Terrapin	NE	Unlikely on site, may be in nearby dams
Acontias gracilicauda	Thin-tailed Legless Skink	LC	May be transient
Panaspis wahlbergii	Wahlberg's Snake-eyed Skink	LC	May be transient
Trachylepis capensis	Cape Skink	LC	May be transient
Trachylepis punctatissima	Speckled Rock Skink	LC	May be transient
Trachylepis varia sensu lato	Common Variable Skink Complex	LC	May be transient
Psammobates oculifer	Serrated Tent Tortoise	LC	May be transient
Stigmochelys pardalis	Leopard Tortoise	LC	May be transient
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC	May be transient
Varanus albigularis albigularis	Rock Monitor	LC	May be transient
Varanus niloticus	Water Monitor	LC	May be transient
Bitis arietans arietans	Puff Adder	LC	May be transient
AMPHIBIANS			
Schismaderma carens	Red Toad	LC	
Sclerophrys capensis	Raucous Toad	LC	
Sclerophrys garmani	Olive Toad	LC	
Sclerophrys gutturalis	Guttural Toad	LC	
Sclerophrys poweri	Power's Toad	LC	
Kassina senegalensis	Bubbling Kassina	LC	
Phrynobatrachus mababiensis	Dwarf Puddle Frog	LC	
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	
Xenopus laevis	Common Platanna	LC	

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Ptychadena anchietae	Plain Grass Frog	LC	
Amietia delalandii	Delalande's River Frog	LC	
Amietia fuscigula	Cape River Frog	LC	
Cacosternum boettgeri	Common Caco	LC	
Pyxicephalus adspersus	Giant Bull Frog	NThr	
Tomopterna cryptotis	Tremelo Sand Frog	LC	
INVERTEBRATES			
BUTTERFLIES			
Utetheisa pulchella			
Rhodometra sacraria		NT	
Afrogegenes sp.			
Coeliades forestan forestan	Striped policeman	LC	
Eretis umbra umbra	Small marbled elf	LC	
Kedestes lepenula	Chequered ranger	LC	
Larsenia gemella	Twin swift	LC	
Leucochitonea levubu	White-cloaked skipper	LC	
Pelopidas thrax	White-branded swift	LC	
Spialia delagoae	Delagoa sandman	LC	
Spialia ferax	Striped sandman	LC	
Spialia mafa mafa	Mafa sandman	LC	
Spialia nanus	Dwarf sandman	LC	
Spialia spio	Mountain sandman	LC	
Aloeides damarensis damarensis	Damara russet	LC	
Aloeides henningi	Hillside russet	LC	
Aloeides pierus	Veined russet	LC	
Anthene livida livida	Pale ciliate blue	LC	
Azanus jesous	Topaz babul blue	LC	
Azanus moriqua	Black-bordered babul blue	LC	
Azanus ubaldus	Velvet-spotted babul blue	LC	
Cacyreus marshalli	Common geranium bronze	LC	
Chilades trochylus	Grass jewel blue	LC	
Cigaritis mozambica	Mozambique silverline	LC	
Crudaria leroma	Silver-spotted grey	LC	
Cupidopsis jobates jobates	Tailed meadow blue	LC	
Eicochrysops messapus mahallakoaena	Cupreous ash blue	LC	
Harpendyreus notoba	Salvia mountain blue	LC	
Lampides boeticus	Pea blue	LC	
Lepidochrysops letsea	Free State giant cupid	LC	
Lepidochrysops patricia	Patrician giant cupid	LC	
Lepidochrysops plebeia plebeia	Twin-spot giant cupid	LC	
Leptomyrina henningi henningi	Plain black-eye	LC	
Leptotes jeanneli	Jeannel's zebra blue	LC	

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Leptotes pirithous pirithous	Common zebra blue	LC	
Lycaena clarki	Eastern sorrel copper	LC	
Oraidium barberae	Dwarf blue	LC	
Tarucus sybaris sybaris	Dotted pierrot	LC	
Thestor basutus basutus	Basuto skolly	LC	
Thestor protumnus aridus	Boland skolly	LC	
Tuxentius melaena melaena	Black pie	LC	
Zintha hintza hintza	Hintza pierrot	LC	
Zizeeria knysna knysna	African grass blue	LC	
Zizula hylax	Tiny grass blue	LC	
Acraea lygus	Lygus acraea	LC	
Acraea neobule neobule	Wandering donkey acraea	LC	
Acraea oncaea	Window acraea	LC	
Acraea stenobea	Suffused acraea	LC	
Aeropetes tulbaghia	Table mountain beauty	LC	
Byblia ilithyia	Spotted joker	LC	
Catacroptera cloanthe cloanthe	Pirate	LC	
Charaxes jahlusa rex	Pearl-spotted charaxes	LC	
Charaxes saturnus saturnus	Foxy charaxes	LC	
Danaus chrysippus orientis	African plain tiger	LC	
Hypolimnas misippus	Common diadem	LC	
Junonia hierta cebrene	Yellow pansy	LC	
Junonia oenone oenone	Dark blue pansy	LC	
Junonia orithya madagascariensis	African blue pansy	LC	
Melanitis leda	Common evening brown	LC	
Phalanta phalantha aethiopica	African leopard	LC	
Physcaeneura panda	Dark-webbed ringlet	LC	
Precis archesia archesia	Garden inspector	LC	
Telchinia rahira rahira	Marsh telchinia	LC	
Telchinia serena	Dancing telchinia	LC	
Vanessa cardui	Painted lady	LC	
Ypthima impura paupera	Impure three-ring	LC	
Papilio demodocus demodocus	Citrus swallowtail	LC	
Belenois aurota	Pioneer caper white	LC	
Catopsilia florella	African migrant	LC	
Colias electo electo	African clouded yellow	LC	
Colotis evagore antigone	Small orange tip	LC	
Colotis evenina evenina	African orange tip	LC	
Eurema brigitta brigitta	Broad-bordered grass yellow	LC	
Mylothris agathina agathina	Eastern dotted border	LC	

SCIENTIFIC NAME	COMMON NAME	STATUS[8]	COMMENT/PRESENCE
Pinacopteryx eriphia eriphia	Zebra white	LC	
Pontia helice helice	Southern meadow white	LC	
Teracolus agoye bowkeri	Speckled sulphur tip	LC	
Teracolus subfasciatus	Lemon traveller	LC	
SCORPIONS			
Uroplectes triangulifer		ToPS	
SPIDERS			
Nephila senegalensis	Banded-legged golden orb-web spider		
Harpactira hamiltoni	Baboon Spider	ToPS	

8.4 Appendix D: Systematic Planning Frameworks

8.4.1 Vegetation of Southern Africa

A general description of the vegetation units is provided below (as per Mucina & Rutherford, 2006, as amended) as a reference point for the baseline vegetation composition.

Vaal-Vet Sandy Grassland (Gh 10)

VT 50 Dry Cymbopogon–Themeda Veld (47%), VT 48 Cymbopogon–Themeda Veld (sandy) (24%) (Acocks 1953). LR 37 Dry Sandy Highveld Grassland (74%) (Low & Rebelo 1996).

Distribution North-West and Free State Provinces: South of Lichtenburg and Ventersdorp, stretching southwards to Klerksdorp, Leeudoringstad, Bothaville and to the Brandfort area north of Bloemfontein. **Altitude** 1 220–1 560 m, generally 1 260–1 360 m.

Vegetation & Landscape Features Plains-dominated landscape with some scattered, slightly irregular undulating plains and hills. Mainly low-tussock grasslands with an abundant karroid element. Dominance of *Themeda triandra* is an important feature of this vegetation unit. Locally low cover of *T. triandra* and the associated increase in *Elionurus muticus, Cymbopogon pospischilii* and *Aristida congesta* is attributed to heavy grazing and/or erratic rainfall.

Geology & Soils Aeolian and colluvial sand overlying sandstone, mudstone and shale of the Karoo Supergroup (mostly the Ecca Group) as well as older Ventersdorp Supergroup andesite and basement gneiss in the north. Soil forms are mostly Avalon, Westleigh and Clovelly. Dominant land type Bd, closely followed by Bc, Ae and Ba.

Climate Warm-temperate, summer-rainfall climate, with overall MAP of 530 mm. High summer temperatures. Severe frost (37 days per year on average) occurs in winter.

Conservation Endangered. Target 24%. Only 0.3% statutorily conserved in the Bloemhof Dam, Schoonspruit, Sandveld, Faan Meintjies, Wolwespruit and Soetdoring Nature Reserves. More than 63% transformed for cultivation (ploughed for commercial crops) and the rest under strong grazing pressure from cattle and sheep. **Erosion** very low (85.3%) and low (11%).

GROWTH FORM	DESCRIPTION/SPECIES
Grasses	*Anthephora pubescens (d), Aristida congesta (d), Chloris virgata (d), Cymbopogon caesius (d), Cynodon dactylon (d), Digitaria argyrograpta (d), Elionurus muticus (d), Eragrostis chloromelas (d), E. lehmanniana (d), E. plana (d), E. trichophora (d), Heteropogon contortus (d), Panicum gilvum (d), Setaria sphacelata (d), Themeda triandra (d), Tragus berteronianus (d), Brachiaria serrata, Cymbopogon pospischilii, Digitaria eriantha, Eragrostis curvula, E. obtusa, E. superba, Panicum coloratum, Pogonarthria squarrosa, Trichoneura grandiglumis, Triraphis andropogonoides*
Herbs	*Stachys spathulata (d), Barleria macrostegia, Berkheya onopordifolia var. onopordifolia, Chamaesyce inaequilatera, Geigeria aspera var. aspera, Helichrysum caespititium, Hermannia depressa, Hibiscus pusillus, Monsonia burkeana, Rhynchosia adenodes, Selago densiflora, Vernonia oligocephala.*
Low Shrubs	*Felicia muricata (d), Pentzia globosa (d), Anthospermum rigidum subsp. pumilum, Helichrysum dregeanum, H. paronychioides, Ziziphus zeyheriana.*
Geophytic Herbs	*Bulbine narcissifolia, Ledebouria marginata.*
Succulent Herbs	*Tripteris aghillana var. integrifolia.*
Endemic Taxa	*Lessertia phillipsiana* (herb)

References *Louw (1951), Morris (1973, 1976), Bredenkamp & Bezuidenhout (1990), Kooij et al. (1990b, 1992), Bezuidenhout et al. (1994a).*

8.4.2 National Biodiversity Assessment

The NBA is the primary tool for monitoring and reporting on the state of biodiversity in South Africa and informs policies, strategic objectives, and activities for managing and conserving biodiversity more effectively. The NBA is especially important for informing the National Biodiversity Strategy and Action Plan (NBSAP), the National Biodiversity Framework (NBF) and the National Protected Area Expansion Strategy (NPAES), and also informs other national strategies and frameworks across a range of sectors,

such as the National Spatial Development Framework, the National Water and Sanitation Master Plan and the National Biodiversity Economy Strategy. Ecosystem protection level is an indicator that tracks how well represented an ecosystem type is in the protected area network. It has been used as a headline indicator in national reporting in South Africa since 2005. It is computed by intersecting maps of ecosystem types and ecological condition with the map of protected areas. Ecosystem types are then categorised based on the proportion of the biodiversity target for each ecosystem type that is included in one or more protected areas. For terrestrial ecosystems, biodiversity targets are set for each ecosystem type using established species–area accumulation curves (ranging between 16 % and 34%). The status categorisation is based on a complex set of criteria, but for the purposes of this reporting, can be summarised as follows (NBA, 2019; IUCN RLE, 2017):

STATUS	DESCRIPTION
Least Concern	These ecosystems have lost only a small proportion (~more than 80 % remains) of their original natural habitat and are largely intact (although they may be degraded to varying degrees, for example by invasive alien species, overgrazing, or overharvesting from the wild).
Vulnerable	Vulnerable terrestrial ecosystems have lost some (~more than 60 % remains) of their original natural habitat and their functioning will be compromised if they continue to lose natural habitat.
Endangered	Endangered terrestrial ecosystems have lost significant amounts (~less than 40 % remains) of their original natural habitat, so their functioning is compromised.
Critically Endangered	Critically Endangered terrestrial ecosystems have lost significant amounts (~less than 20 % remains) of their original natural habitat, and therefore considered to have an extremely high risk of collapse.

8.4.3 Free State Bioregional Plan

Much of the current conservation effort in South Africa is focused on promoting land-use practices that reconcile development opportunities and spatial planning at a landscape scale, with the over-arching goal of maintaining and increasing the resilience of ecosystems, especially in the face of climate change. This landscape approach to biodiversity conservation involves working within and beyond the boundaries of protected areas to manage biodiversity within a mosaic of land-uses.

One of the primary aims is to achieve economic goals whilst the health of ecosystems is maintained, and the loss of important or threatened species or habitats is avoided. Creating functional connectivity in landscapes is a key aspect of promoting ecosystem resilience (the ability of the ecosystem to absorb a certain amount of change yet remain functional). Ecosystem resilience can be maintained or built through an approach that focuses on intact areas, maintaining biodiversity priority areas in a natural or near-natural state, maximising connectivity between these areas and maximising the diversity of species and ecosystems. Resilient ecosystems can:

- Maintain the ecological and evolutionary processes that allow biodiversity to persist in these ecosystems;
- Better-withstand human-induced pressures (from, for example, too frequent fires);
- Adapt to the impacts of climate change, such as increased rainfall variability;
- Mitigate the effects of climate change by continuing to capture and store carbon;
- Deliver ecosystem services, such as the provision of clean water and flood attenuation.

The main purpose of a biodiversity sector plan is to ensure that the most recent and best quality spatial biodiversity information can be accessed and used to inform land-use and development planning, environmental assessments and authorisations, and natural resource management. A biodiversity sector plan achieves this by providing a map (or maps) of terrestrial and freshwater areas that are important for conserving biodiversity pattern and ecological processes – these areas are called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). The maps are provided together with

contextual information on biodiversity, and land-use guidelines that can be incorporated into the policies and decisions of a wide range of sectors. A Biodiversity Sector Plan is based on a fine-scale systematic biodiversity plan (1:50 000 or finer), and has boundaries aligned with administrative boundaries (such as a municipality or groups of municipalities).

A Biodiversity Conservation Plan can be used to guide conservation action (such as identifying priority sites for expansion of protected areas), or to feed spatial biodiversity priorities into planning and decision-making in a wide range of cross-sectoral planning processes and instruments such as provincial and municipal integrated development plans and spatial development frameworks, land-use management schemes, environmental management frameworks and environmental management plans. The flowing core categories are designated:

- Protected Areas: Areas that are formally protected by law and recognised in terms of the Protected Areas Act (this includes contract protected areas declared through the biodiversity stewardship programme).
- Critical Biodiversity Areas (CBAs): Areas that are required to meet biodiversity targets for species, ecosystems or ecological processes. These include:
- All areas required to meet biodiversity pattern targets and to ensure continued existence and functioning of species and ecosystems, special habitats and species of conservation concern;
- Critically Endangered ecosystems; and
- Critical linkages (corridor 'pinch-points') to maintain connectivity.

CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species.

- Ecological Support Areas (ESAs): Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of protected areas or CBAs and for delivering ecosystem services. In the terrestrial assessment they support landscape connectivity and strengthen resilience to climate change. ESAs need to be maintained in at least a functional and often natural state, supporting the purpose for which they were identified. They include features such as riparian habitat surrounding rivers or wetlands, corridors, over-wintering sites for Blue Cranes, and so on.
- Other Natural Areas (ONAs): Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions.
- Moderately or Heavily Modified Areas (sometimes called 'transformed'): Areas that have been heavily modified by human activity so that they are by-and-large no longer natural, and do not contribute to biodiversity targets. Some of these areas may still provide limited biodiversity and ecological infrastructural functions but, their biodiversity value has been significantly and, in many cases, irreversibly compromised.

Table 5: Summary of map categories shown in the terrestrial CBA map, and their meanings.

MAP CATEGORY	DESCRIPTION	SUB- CATEGORY	DESCRIPTION
Protected Areas	Areas that are formally protected by law and recognised in terms of the Protected Areas Act, including contract protected areas declared through the biodiversity stewardship programme.	National Parks & nature Reserves	Includes formally proclaimed national Parks, nature Reserves, Special nature Reserve, and Forest nature Reserves.

MAP CATEGORY	DESCRIPTION	SUB- CATEGORY	DESCRIPTION
		Protected Environments: Natural	Includes Protected Environments, declared in terms of Protected Areas Act (Act 57 of 2003, as amended).
		Protected Environments: Modified	Heavily modified areas in formally proclaimed Protected Environments.
Critical Biodiversity Areas (CBA)	All areas required to meet biodiversity pattern and process targets; critically Endangered ecosystems, critical linkages (corridor pinch-points) to maintain connectivity; CBAs are areas of high biodiversity value that must be maintained in a natural state.	CBA: Irreplaceable	This category includes: (1) Areas required to meet targets and with irreplaceability values of more than 80%. (2) critical linkages or pinch-points in the landscape that must remain natural; (3) critically Endangered Ecosystems.
		CBA: Optimal	The CBA Optimal Areas (previously called 'important and necessary' in the MBCP) are the areas optimally located to meet both the various biodiversity targets and other criteria defined in the analysis. Although these areas are not 'irreplaceable' they are the most efficient land configuration to meet all biodiversity targets and design criteria.
Ecological Support Areas (ESA)	Areas that are not essential for meeting targets, but that play an important role in supporting the functioning of CBAs and that deliver important ecosystem services	ESA: Landscape corridor	The best option to support landscape-scale ecological processes, especially allowing for adaptation to the impacts of climate change.
		ESA: Local corridor	Finer-scale alternative pathways that build resilience into the corridor network by ensuring connectivity between climate change focal areas, reducing reliance on single landscape-scale corridors.
		ESA: Species Specific	Areas required for the persistence of particular species. Although these may be production landscapes, a change in land-use may result in loss of this species from the area. (Only one species-specific ESA was included in the analysis — an over-wintering site for blue cranes).
		ESA: Protected Area Buffers	Areas surrounding protected areas that moderate the impacts of undesirable land-uses that may affect the ecological functioning or tourism potential of PA's. Buffer distance varies according to reserve status: national Parks — 10 km; nature Reserves — 5 km buffer; Protected Environments — 1 km buffer.
Other Natural Areas (ONA)	Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions.		
Moderately or Heavily Modified Areas	Areas in which significant or complete loss of natural habitat and ecological function has taken place due to activities such as ploughing, hardening of	Heavily Modified	All areas currently modified to such an extent that any valuable biodiversity and ecological functions have been lost.

MAP CATEGORY	DESCRIPTION	SUB- CATEGORY	DESCRIPTION
	surfaces, open-cast mining, cultivation and so on.		
		Moderately Modified: Old lands	Old, cultivated lands that have been allowed to recover (within the last 80 years), and support some natural vegetation. Although biodiversity pattern and ecological functioning may have been compromised, the areas may still play a role in supporting biodiversity and providing ecosystem services.

Networks of ecological corridors

Ecological corridors of natural and near-natural land ensure connectivity between various spatial elements in the land- scape. They link key protected areas with climate change refugia and other features of the landscape that promote adaptation to the effects of climate change. Two types of ecological corridors are differentiated:

- Landscape corridors, which are the best large-scale options for linking areas that are important for climate change resilience across provinces.
- Local corridors, which take effect at a finer scale to make the network of landscape corridors more robust to disturbance; they provide alternative pathways and critical linkages that should not be lost in the land- scape.

Because of the technology used in the development of Systematic Planning it was possible to minimise the presence of 'narrow bottlenecks' and avoid including large areas of modified land in the network of ecological corridors, wherever possible. Special attention was also paid to ensuring seamless alignment with ecological corridors that have been identified in the biodiversity plans of KwaZulu-Natal, Free State and Gauteng.

Areas important for climate change resilience

The spatial analysis undertaken identified parts of the landscape where it is likely that ecosystems will be most able to maintain a stable ecological composition and structure in the face of climate change, based on a range of possible future climate change scenarios (NBA 2011; Holness, pers. comm.). These areas are referred to as areas important for climate change resilience. They include diverse landscapes such as:

- Local refugia (e.g. kloofs and south facing slopes): Areas important for landscape connectivity (e.g. riparian corridors)
- Areas with steep temperature, precipitation and altitude gradients (e.g. south-facing slopes);
- Areas of high biotic diversity where many different habitat and biome types are found in close proximity and plant endemism is high.

Desired Management Objectives

The desired management objective for a parcel of land, or freshwater feature, refers to the ecological condition in which it should be maintained. These not only determine the ecological state or condition in which the land or freshwater feature should be maintained, but also provide the broad direction for appropriate land- or resource-use activities and management practices. Only those land- or resource-use activities that are compatible with maintaining the desired management objective should be encouraged. Different categories on the CBA maps have specific desired management objectives, according to their biodiversity priority (Table 6). In broad terms, the biodiversity priority areas need to be maintained in a healthy and functioning condition, whilst those that are less important for biodiversity can be used for a variety of other land-uses.

Table 6: Map categories, definitions, and desired management objectives

Map Category	Definition	Desired Management Objectives
Protected Areas	Those areas that are proclaimed as protected areas under national or provincial legislation, including gazetted Protected Environments.	Areas that are meeting biodiversity targets and therefore must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity.
Critical Biodiversity Areas (CBAs)	Areas that are required to meet biodiversity targets, for species, ecosystems, or ecological processes.	Must be kept in a natural state, with no further loss of habitat. Only low-impact, biodiversity-sensitive land-uses are appropriate.
Ecological Support Areas (ESAs)	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of protected areas or CBAs and for delivering ecosystem services.	Maintain in a functional, near-natural state, but some habitat loss is acceptable. A greater range of land-uses over wider areas is appropriate, subject to an authorisation process that ensures the underlying biodiversity objectives are not compromised.
Other natural Areas (ONAs)	Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem.	An overall management objective should be to minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. These areas offer the greatest flexibility in terms of management objectives and permissible land-uses, but some authorisation may still be required for high-impact land-uses.
Heavily or Moderately Modified Areas	Areas that have been modified by human activity to the extent that they are no longer natural, and do not contribute to biodiversity targets. These areas may still provide limited biodiversity and ecological infrastructural functions, even if they are never prioritised for conservation action.	Such areas offer the most flexibility regarding potential land-uses, but these should be managed in a biodiversity-sensitive manner, aiming to maximise ecological functionality and authorisation is still required for high-impact land-uses. Moderately modified areas (old lands) should be stabilised and restored where possible, especially for soil carbon and water-related functionality.

The general guideline recommendations for these categorisations are described below.

Land-use guidelines for terrestrial Critical Biodiversity Areas (CBAs)

Critical Biodiversity Areas are required to meet biodiversity targets and need to be maintained in a healthy natural state.

Irreplaceable CBAs are the most important biodiversity areas in the province, outside of the protected area network. They represent the last remaining options for securing critical biodiversity and ecosystems and for achieving biodiversity targets. If these areas suffer any further loss of habitat or ecological function, it is likely that the biodiversity targets will not be met and the status of species and ecosystems will decline.

Some CBAs are considered irreplaceable because they form what are called 'critical linkages or pinch-points, or because they incorporate threatened ecosystems. critical linkages are highly constrained areas within a natural landscape that are vital for maintaining the linkage and ecological integrity of the corridor network. If these critical linkages are lost, it would result in disruption of the corridor network.

Optimal CBAs have an irreplaceability of less than 80% but are the most optimally located and the most efficient solution (i.e., occupying the smallest possible area) to meet biodiversity targets as well as other criteria such as avoiding high-cost areas where there are competing land-uses. There may be

options to achieve the targets elsewhere, but these will require more land or may lead to increasing conflict between competing land uses.

Permissible land uses are those that are compatible with maintaining the natural vegetation cover of CBAs in a healthy ecological state, and that do not result in loss or degradation of natural habitat. Some low-intensity agricultural land-uses, such as grazing of livestock, may be acceptable in CBAs, on condition that best-practice guidelines aimed at benefiting the biodiversity assets and reducing the vulnerability of each site are implemented. An example of such best-practice guidelines is the recently released grazing and burning guidelines for managing grasslands for biodiversity and livestock production (SANBI, 2014). Land uses that should not be in terrestrial CBAs because they cause loss of natural habitat or ecosystem functionality, include:

- Any form of mining or prospecting.
- Extensive or intensive grazing that results in species diversity being lost through selective- or over-grazing.
- conversion of natural habitat for intensive agriculture (cultivation) or plantation forestry.
- Expansion of existing settlements or residential, commercial or industrial infrastructure.
- new hard infrastructure, and linear developments such as roads, railways and pipelines.
- complete-barrier fencing (i.e. game-proof fences) in in CBA (or ESA) corridors.
- Linear infrastructure of any sort that disrupts the connectivity of CBA (or ESA) corridors.

Land-use guidelines for terrestrial Ecological Support Areas

Ecological support areas (ESAs) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBAs and deliver important ecosystem services. They facilitate landscape connectivity, promote resilience to climate change, and buffer elements of the landscape including protected areas and sites that are important for the survival of individual species.

ESA: Landscape and Local Corridors: The purpose of ecological corridors is to provide intact pathways for long-term biological movement. Landscape-scale corridors represent the best option for promoting resilience to climate change and the persistence of biodiversity as they provide pathways for the movement of plants and animals in response to environmental change. They also support the natural movement of species between populations to ensure population viability. Landscape corridors are aligned with areas that have maximum amounts of remaining natural habitat. Local corridors are fine-scale corridors that contribute to connectivity between climate change refugia. They represent alternative pathways for movement of species, and thus lessen impacts on critical linkages and landscape-scale corridors and provide networks that are more resistant to disturbance.

ESA: Species-Specific Sites: These are areas required for the persistence of specific species. Only one area, an important over-wintering site for blue cranes, that is shared with Gauteng, and which comprises a matrix of natural and cultivated lands, was identified as an ESA in the MBSP.

ESA: Protected Area Buffers: These are areas around protected areas where changes in land-use may affect the ecological functioning or tourism potential of the adjacent protected area. The purpose of buffer zones is to reduce the impacts of undesirable land-uses on the environment, and to provide opportunities for tourism. Modification of the natural habitat within the buffer zones may have negative impacts on the zonation and management plan of the adjacent protected area.

Permissible land-uses: There is more flexibility in terms of options for compatible land-uses in ESAs than there is in CBAs. However, ESAs do need to remain ecologically functional, which means that they need

to be maintained in at least a near-natural state, although some loss of biodiversity pattern through a variety of land uses is acceptable.

Land-use guidelines for terrestrial Other Natural Areas

The overall purpose of these land-use guidelines is to promote the effective management of biodiversity as required in Section 41(a) of the Biodiversity Act (Act 10 of 2004, as amended) and in terms of the National Environmental Management Act (Act 107 of 1998, as amended). The guidelines provide advice on which land-uses and activities are most compatible with maintaining the ecological integrity of CBAs and ESAs, and other parts of the landscape, based on the desired management objectives for the land and the anticipated impact of each land-use activity on biodiversity patterns and ecological processes. The land-use guidelines have been developed in consultation with some planners from other sectors, and in a way that aims to minimise potential conflict between land uses. However, their focus is on identifying land-uses that are biodiversity compatible. They should, therefore, be used in conjunction with any other sector-specific guidelines that may be available for the province.

Land-use guidelines are presented below for terrestrial and freshwater ecosystems. These guidelines are intended primarily to guide planning and decision-making in terrestrial and freshwater Critical Biodiversity Areas and Ecological Support Areas on land outside of protected areas. However, brief guidelines are also provided for certain categories of protected areas, such as Protected Environments, in which a range of land uses other than biodiversity conservation is possible. In the sections that follow, general recommendations are given for each category on the CBA maps, relating to desired management objectives and appropriate land uses.

Other natural Areas (OnAs) are not required to meet biodiversity targets, and so are not identified as a priority. They do, however, retain much of their natural character. The biodiversity in these non-priority landscapes may still be of value and contribute to maintenance of viable species populations and natural ecosystem functioning and Other natural Areas may provide essential ecological infrastructure and ecosystem services.

Permissible land uses: ONA's offer the greatest flexibility in terms of management objectives and permissible land-uses and are generally recommended (along with Modified Areas) as the sites for higher-impact land-uses. However, because ONAs may still have significant ecological, aesthetic and social value, they should not be regarded as 'ecological wastelands' or areas where 'anything goes.' Planners are still required to give due consideration to assessing environmental factors, socio-economic efficiency, aesthetics and impacts on the sense-of-place in making decisions about the location of land uses in these areas. Environmental authorisation may still be required for high-impact land-us- es in terms of the listed activities in the EIA Regulations, and other relevant legislation.

Land-use guidelines for terrestrial Heavily or Moderately Modified Areas

Heavily modified areas are those in which significant or complete loss of natural habitat and ecological functioning has taken place due to activities such as ploughing, hardening of surfaces, mining, cultivation, and other activities that modify natural habitat. Even so, they may include small remnants of natural habitat such as the patches or strips of natural habitat that survive between cultivated lands, along river-lines and ridges and in open spaces in towns. These disconnected remnants are often biologically impoverished, highly vulnerable to damage and have limited likelihood of being able to persist but may contain residual biodiversity value or may provide ecological infrastructure or certain ecosystem services.

Moderately Modified - Old Lands (sometimes called 'old fields' in other documents) are those areas that were used for cultivation or mining in the past (within the last 80 years) but are no longer used for

these purposes and have been left to re-vegetate. These old lands are areas where biodiversity pattern and ecological function have been seriously compromised in the past, but they may still play an important role in the provision of ecosystem services or may provide important habitats for certain animal species. For example, old lands can provide important feeding grounds for birds such as blue cranes, and disused mine shafts can provide suitable habitats for certain bats.

Permissible land-uses: Heavily modified areas are those preferred for intensive land-uses such as the construction of settlements, industrial development and other
land-uses that have a high impact. These land-uses should still be located and managed in ways that maintain any residual ecological functionality, and that does not impact negatively on species for which these modified sites may be important. In some cases, restoration may be advisable.

8.4.4 Other Biodiversity Sector Plans

The site is outside of the planning domain of any other Biodiversity Sector Plans.

8.4.5 Strategic Water Source Areas

Strategic water source areas (Figure 32) are those that supply substantial downstream economies and urban centres. These water source areas are vital to the national economy. Strategic water source areas are those that supply substantial downstream economies and urban centres. These water source areas are vital to the national economy.
Strategic water source areas can be regarded as natural "*water factories*", supporting growth and development needs that are often far away. Deterioration of water quality and quantity in these areas can have a disproportionately large negative effect on the functioning of downstream ecosystems and the overall sustainability of growth and development in the regions they support. Appropriate management of these areas, which often occupy only a small fraction of the land surface area, can greatly support downstream sustainability of water quality and quantity.

In South Africa, such management is particularly important for enhancing downstream water quality and quantity. Not only are the country's surface water resources extremely limited – South Africa is considered to be one of the driest countries (per capita), with 98 per cent of its surface water already developed – but the country also has a growing water quality problem.

Overloading with nutrients and other pollutants from urban, agricultural and industrial waste has resulted in many dams shifting to an algae-dominated, or eutrophic, state. Sixty-five per cent of the country's dams are now estimated to be eutrophic or borderline eutrophic, with most of these algal blooms containing cyanobacteria (blue-green algae) that is toxic to human health. This renders water of high quality unavailable if not treated, which coupled with failing water infrastructure, represents a major challenge to water security in the near future. Water managers are inevitably faced with finding new and innovative ways of improving both water quality and quantity to meet the increasing water demands of the country. Managing strategic water source areas is one way to meet this challenge.

Figure 32: South Africa Water Source Areas [Source: Nel, et al, 2013]

8.4.6 Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) project responds to the high levels of threat prevalent in river, wetland and estuary ecosystems of South Africa. It provides strategic spatial priorities for conserving the country's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or '*FEPAs*'.

Biodiversity targets set minimum, quantitative requirements for biodiversity conservation. They reflect scientific best judgement and will need to be refined as knowledge evolves. Quantitative biodiversity targets were set for fish species, river ecosystem types, wetland ecosystem types, priority estuaries, wetland clusters and free-flowing rivers:

1. Threatened and near-threatened freshwater fish species – all populations (100%) of considered to be critically endangered or endangered species, and at least ten populations of species that are in the International Union for Conservation of Nature (IUCN) vulnerable or near threatened categories and some populations of special concern (e.g., very restricted distributions in South Africa)
2. River ecosystem types – 20% of total length per type
3. Wetland ecosystem types – 20% of total area per type
4. Wetland clusters – 20% of total area per wetland vegetation group
5. Free-flowing rivers – 20% of total length per ecoregion group
6. Priority estuaries – 100% of all priority estuaries, which already took into account biodiversity targets of 20% for estuary ecosystem types and habitat, 50% of the populations of threatened species; 40% of the populations of exploited estuarine species; 30% of the populations of all other estuarine species.

Terrestrial and aquatic resources are interdependent, with one affecting the other. For example, to ensure the healthy functioning of rivers, wetlands and estuaries, it is essential to protect mountain catchment areas where the water originates, and to safeguard riverside vegetation because these plants prevent soil erosion, sedimentation and water pollution (Vromans et al., 2012).

The health of a river ecosystem is largely dependent on the presence of natural vegetation or "riparian habitat" along its banks, including good vegetative cover within the surrounding landscape (catchment area). Riparian bank vegetation filters pollutants, helps maintain water temperatures, supplies organic matter ('food') in support of aquatic life (fish, insects etc.) and acts as a buffer to adjacent land-uses. The roots of the riparian plants also reduce the effects of floods, by binding riverbanks and thus preventing erosion. Furthermore, bank storage is increased by slowing run off during floods. For these reasons, it is essential that new developments are separated from a river and its "riparian habitat" by a buffer area.

8.4.7 Key Biodiversity Areas

Important Bird Areas

Important Bird and Biodiversity Areas (IBA's) are sites of international significance for the conservation of the world's birds and other biodiversity. They also provide essential benefits to people, such as food, materials, water, climate regulation and flood attenuation, as well as opportunities for recreation and spiritual fulfilment. By conserving IBA's, we look after all the ecosystem goods and services they provide, which means in effect that we support a meaningful component of the South African economy (such as water management and agriculture). Since the late 1970s, more than 12 000 IBA's have been identified in virtually all of the world's countries and territories, both on land and at sea. In 1998, 122 South African IBA's were identified and listed in Barnes (1998). This inventory was revised to 112 IBA's in 2015. IBA's have also had considerable and increasing relevance when responses have been developed to several wider environmental issues, such as habitat loss, ecosystem degradation, climate change and the sustainable use of resources. The core aims of the IBA Programme are:

- To identify, monitor and conserve the sites and habitats that support South Africa's priority bird species.
- To develop a network of partners, from grassroots to national level, who collaborate to conserve IBA's.
- To gather new data regularly and monitor IBA's in order to track status and trends across the network and so that up-to-date information can be passed on to decision-makers, enabling them to take appropriate conservation action.
- To confirm periodically that existing IBA's continue to meet the selection criteria and to identify other critical sites that may qualify for recognition as IBA's as new information becomes available.
- To build capacity in the IBA Programme by sourcing funding, and to acquire and develop appropriate skills in staff and volunteers so that these objectives can be implemented at a regional scale.

The extension of the IBA approach to several other wildlife groups has led to the identification of Important Plant Areas, Prime Butterfly Areas, Important Mammal Areas and Key Biodiversity Areas for Freshwater Biodiversity. South Africa is also the first mega diverse country to practically test the Key Biodiversity Areas (KBA's) standards across a full range of species groups and ecosystems but is not yet published.

8.5 Vegetation and Ecological Processes and Corridors

8.5.1 Critical Biodiversity Areas

Given that the objective of CBAs is to identify biodiversity priority areas which should be maintained in a natural to near natural state, development within these areas is not encouraged. The following issues need to be considered when considering development within a CBA:

- Are there alternative areas within the site but outside of the CBA that could be developed?
- Does the project undermine the overall ecological functioning of the broad CBA area?
- Can mitigation measures reduce the impact of the development on ecological processes?

8.5.2 Ecosystem Processes

Distinct ecological processes are generally associated with surface geology and soils, climate, topography, drainage systems, and the make-up of the remaining native vegetation. These features could be missed or only partly incorporated into land use plans unless they are specifically identified and targeted. Ideally, areas maintaining adaptive diversification (e.g., environmental gradients) or containing historically isolated populations should be identified and protected. The spatial aspect of ecological processes also needs to be determined and such insights incorporated in conservation planning. Finally, connectivity within these areas should be ensured to maintain species migration and gene flow. However, the spatial components of processes have rarely been considered in conservation planning – an approach that is also especially useful for development planning in biodiversity hotspots. Three types of ecological processes are discussed below.

8.5.3 Ecosystem Services

"*Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fibre; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services, recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling*". (Millennium Ecosystem Assessment (MEA), 2005)

Terrestrial (or land) ecosystems provide valuable ecosystem services that contribute to human well-being. They can provide[10]:

- buffers against natural hazards such as fire and floods®
- carbon sequestration (storage), important for reducing the impacts of climate change®
- regulation of water supply®
- grazing for wild animals and livestock®
- natural spaces for recreation & tourism®
- the air we breathe®
- spiritual, ritual and ceremonies®
- horticultural & wildflower industries
- natural heritage®
- food, timber, fibre and medicinal plants®

Rivers are central to human welfare and economic development. They provide:

- water for agricultural, industrial and domestic uses®

[10] Within the study area, terrestrial ecosystem services are marked (e).

- flood attenuation and regulation®
- food and medicinal plants ®
- transport and/or purification of biodegradable wastes®
- tourism, recreational and cultural use®
- enhanced property values

Estuaries, together with an associated buffer of natural vegetation, perform several valuable functions, especially in relation to:

- subsistence fishing
- commercial fisheries (as they provide a refuge for commercial fishes when they are young)
- wildlife habitat e.g., nursery and refuge (providing habitat for amphibians, birds, fish and mammals for all or portions of their life cycles)
- tourism, recreational, cultural use and craft materials
- enhanced property values

Ecological corridors provide valuable ecosystem services that are often impossible or very costly to replicate or offset. For example, they:

- support the migration (movement) and long-term survival of plant and animal species and their ecological processes (e.g., fire, pollination, seed dispersal), in response to global climate change
- are important areas for storing carbon to reduce the impacts of global climate change
- are important areas for regulating water supply (e.g., filtering and storing drinking water, keeping excess nutrients out of wetlands and rivers, ensuring a high-water yield from mountain catchments)
- supply good quality water from mountain catchment areas, both surface and groundwater.
- the supply of water quality and quantity is not only for human consumption but for ensuring the survival of downstream estuaries, wetlands (vleis) and streams (which in turn provide us with other ecosystem services).
- are of important scenic value, contributing to tourism and the 'sense of place'. ®
- Coastal & marine areas
- Subsistence & commercial fishing (food)
- Medicinal & Cosmetic resources e.g., kelp & microscopic plants for the feed, food, cosmetics, & pharmaceutical industries.
- Mining (sand and heavy mineral)
- Recreational value (sport and fishing)
- Retail value (market-value of housing) ®

Net Primary production®: This critical ecological process involves the process of photosynthesis – which translates into the amount of carbon plants can fix on an annual basis. This is important for each LM within the district as the amount of carbon fixed translates directly into the amount of forage produced and thus made available for grazing. Consequently, livestock management directly impacts upon forage production as overgrazing reduces the vegetations' ability to maintain this ecosystem process. This ecological process is especially significant for the ORT, as the main land use comprises of livestock grazing. Therefore, this factor has a direct bearing on both the amount of food available for livestock, and the amount of plant material available regarding reducing runoff in wetland areas.

Water production: In more arid areas, many municipalities and towns rely on groundwater or local water resources to supply to town with drinking water. Thus, the higher rainfall areas are key recharge zones for these groundwater resources. Consequently, land use management of these catchment areas are critical for the maintenance of the quality and quantity of water sourced from each area. For example, water courses and wetlands that have been cleared for agricultural purposes, or overgrazed,

will not only cause soil erosion, but most importantly cause increased water runoff, thus reducing the amount of water that feeds back into the water table for consumption. Groundwater is also a critical resource for agriculture and food production.

Species movement corridors and climatic refuges: Global climate change is undoubtedly a threat in the coming decades. A key action to mitigate its effects is the maintenance of species' ability to migrate to new locations as the climatic conditions which they require move across the landscape. These corridor and refuge migration strategies occur on both a micro and macro level. On the macro scale corridors provide for species movement at landscape scales. This entails the ability of fauna and flora to undertake large scale movements towards areas which continue to provide the conditions required by a species for growth and reproduction. Movements could entail migrations of up to hundreds of kilometres, and corridors of mostly natural or near natural vegetation across the landscape are needed to permit this to occur. Climactic refuges can be localized areas that have moderated climates – such as mountain kloofs and south facing slopes. These areas provide cooler habitats where species under threat from changing climates can colonise or species and vegetation not widely found in surrounding area.

8.5.4 Ecological Support Areas

These include supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may be an ecological process area that connects and therefore sustains Critical Biodiversity Areas or a terrestrial feature. The ESA'S are not well defined in the ECBCP (refer to Section 2.3.5). ESAs are generally extensions to the CBA area incorporating small areas that are perhaps no longer natural, or are comprised of secondary vegetation, generally following the drainage line ecological corridors within the wider surrounding landscape that will improve connectivity.

8.5.5 Critical/Important Terrestrial Habitats

Special Habitats include areas that are rare within a region, or which support important species, ecosystems or ecological processes. Species of Special Concern refers to red data species and important habitats include the locations where these species are known to occur. Red data species are plant, animal or other organisms (e.g., reptiles, insects etc) that have been assessed and classified according to their potential for extinction in the near future. All known species are listed in the Red Data Book and classified as Extinct, Critically Endangered, Endangered, Vulnerable, Near Threatened or Least Concern. Red Data species are those species classified as Extinct, Critically Endangered, Endangered or Vulnerable. Some of the red data species are listed within the NEMBA Threatened or Protected Species (TOPS), and some are protected by provincial ordinances. Critical habitats include those areas that are known locations for such red data species that are under threat of extinction.

8.5.6 Alien Invasive Species

On 18 September 2020, the Minister of Environmental Affairs published the Alien and Invasive Species Regulations ("the Regulations") which came into effect on the 18 October 2020 in a bid to curb the negative effects of IAPs. The Regulations call on landowners and sellers of land alike to assist the Department of Environmental Affairs to conserve our indigenous fauna and flora and to foster sustainable use of our land. Non-adherence to the Regulations by a landowner or a seller of land can result in a criminal offence punishable by a fine of up to R 5 million (R 10 million in case of a second offence) and/or a period of imprisonment of up to 10 years.

Category 1a and 1b listed invasive species must be controlled and eradicated. Category 2 plants may only be grown if a permit is obtained, and the property owner ensures that the invasive species do not spread beyond his or her property. The growing of Category 3 species is subject to various exemptions and prohibitions. Some invasive plants are categorised differently in different provinces. For example:

the Spanish Broom plant is categorised as a category 1b (harmful) invasive plant in Eastern Cape and Western Cape, but it is a category 3 (less harmful) invasive plant in the other seven provinces.

Invasive alien plants have a significant negative impact on the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and sub-surface water. Landowners are under legal obligation to control alien plants occurring on their properties. Alien Invasive Plants require removal according to the Conservation of Agricultural Resources Act 43 of 1983 (CARA) and the National Environmental Management: Biodiversity Act (10 of 2004; NEMBA): Alien and Invasive Species Lists (GN R598 and GN R599 of 2014). Alien control programs are long-term management projects and a clearing plan, which includes follow up actions for rehabilitation of the cleared area, is essential. This will save time, money and significant effort. Collective management and planning with neighbours allow for more cost-effective clearing and maintenance considering aliens seeds as easily dispersed across boundaries by wind or water courses. All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing. A general rule of thumb is to first target lightly infested areas before tackling densely invaded areas and prioritize sensitive areas such as riverbanks and wetlands. Alien grasses are among the worst invaders in lowland ecosystems adjacent to farms but are often the most difficult to detect and control.

Eradication protocol

The act required the removal of these species, being the responsibility of the landowner, as described in Table 7 below.

Table 7: Legislation regarding invasive alien species.

The National Environmental Management Act: Alien and Invasive Species Act (18 September 2020) stipulates the following:

6. Control measures

(1) In order to achieve the objects of this Act the Minister may prescribe control measures which shall be complied with by land users to whom they apply.

(2) Such control measures may relate to –

(I) the control of weeds and invader plants.

(3) A control measure may –

(a) contain a prohibition or an obligation with regard to any matter referred to in subsection (2).

(5) Any land user who refuses or fails to comply with any control measure which is binding on him, shall be guilty of an offence.

In this regard, Government Notice R. 598 – National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Regulations, 2014 (Gazette number 37885), dated August 2014, further stipulates the following:

CHAPTER 2: CATEGORIES OF LISTED INVASIVE SPECIES

2. Category 1a: Listed Invasive Species

(1) Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combatted or eradicated.

(2) A person in control of a Category 1a Listed Invasive Species must-

(a) comply with the provisions of section 73(2) of the Act.

(b) immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and

© allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species.

If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must combat or eradicate the listed invasive species in accordance with such programme.

3. Category 1b: Listed Invasive Species

(1) Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled.

(2) A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act.

(3) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.

(4) A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.

4. Category 2: Listed Invasive Species

(1) Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be.

(2) Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit.

(3) A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.

(4) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.

(5) Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3.

(6) Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

5. Category 3: Listed Invasive Species

(1) Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

(2) Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.

(3) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.

CHAPTER 7: ISSUING, AMENDMENT AND CANCELLATION OF PERMITS

29. Sale or transfer of alien and listed invasive species

(1) If a permit-holder sells a specimen of an alien or listed invasive species or sells the property on which a specimen of an alien or listed invasive species is under the permit-holder's control, the new owner of such specimen or such property must apply for a permit in terms of Chapter 7 of the Act.

(2) The new permit-holder contemplated in sub-regulation (1) will be subject to the same conditions as the permit-holder who has sold the specimen of an alien or listed invasive species, or the property on which a specimen of an alien or listed invasive species occurs, unless specific circumstances require all such permit conditions to be revised, in which case full reasons must be giving in writing by the issuing authority.

(3) The seller of any immovable property must, prior to the conclusion of the relevant sale agreement, notify the purchaser of that property in writing of the presence of listed invasive species on that property.

CHAPTER 9: COMPLIANCE AND ENFORCEMENT

35. Offences and penalties

(1) Any offence committed in terms of section 101 of the Act shall, upon conviction, carry the penalties referred to in section 102 of the Act.
(2) Any person who contravenes or fails to comply with a provision of these regulations is guilty of an offence and is liable, on conviction, to-
(a) a fine not exceeding five million rand, and in the case of a second or subsequent conviction, to a fine not exceeding R 10 million; or
(b) imprisonment for a period not exceeding 10 years; or
© to both such fine and imprisonment.

The seller of any immovable property must also, prior to the conclusion of the relevant sale agreement, notify the purchaser of that property in writing of the presence of listed IAPs on the property. Property sales agreements dated 1 October 2014 and onwards, should also incorporate a clause in terms of which the purchaser acknowledges that he has acquainted himself with the extent and the nature of the property he is buying and that he accepts the property as such, including the vegetation on the property.

Specific eradication and management procedures must be stipulated in the EMP as to the methods to be implemented to remove and control the various alien invasive species as they tend to require species specific techniques. A management plan should be incorporated into the construction EMP, and a detailed action plan compiled and implemented by the ECO. Any seed-bearing material is to be disposed of at a registered landfill.

8.6 Appendix E: Abbreviations and Glossary

8.6.1 Abbreviations

CARA	Conservation of Agricultural Resources Act, Act 43 of 1983
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs (*now DEFF, see below*)
DFFE	The Department of Environmental Affairs was renamed the Department of Forestry Fisheries and the Environment, incorporating the forestry and fisheries functions from the previous Department of Agriculture, Forestry and Fisheries.
DEMC	Desired Ecological Management Class
DWS	Department of Water Affairs and Sanitation
DWAF	Department of Water Affairs and Forestry (former department name)
EA	Environmental Authorisation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMC	Ecological Management Class
EMP	Environmental Management Plan
EMPr	Environmental Management Programme report
ER	Environmental Representative
ESS	Ecosystem Services
IAP's	Interested and Affected Parties
IEM	Integrated Environmental Management
LM	Local Municipality
masl	meters above sea level
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act, Act 107 of 1998
NFA	National Forests Act
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NFA	National Forest Act, Act 84 of 1998
PEMC	Present Ecological Management Class
PES	Present Ecological State
PNCO	Provincial Nature and Environment Conservation Ordinance (No. 19 of 1974).
RDL	Red Data List
RHS	Right Hand Side
RoD	Record of Decision
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SoER	State of the Environment Report
SSC	Species of Special Concern
ToPS	Threatened of Protected Species
ToR	Terms of Reference
+ve	Positive
-ve	Negative

8.6.2 Glossary

Alien Invasive Species (AIS)	An alien species whose introduction and/or spread threaten biological diversity (Convention on Biological Diversity). Note: "*Alien invasive species*" is considered to be equivalent to "*invasive alien species*". An alien species which becomes established in natural or semi-natural ecosystems or habitat, is an agent of change, and threatens native biological diversity (*IUCN*).
Best Environmental Practice	The application of the most appropriate combination of environmental control measures and strategies (Stockholm Convention).
Best Management Practice	Established techniques or methodologies that, through experience and research, have proven to lead to a desired result (BBOP).
Biodiversity	Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.
Biodiversity Offset	Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure and ecosystem function and people's use and cultural values associated with biodiversity (BBOP).
Bioremediation	The use of organisms such as plants or microorganisms to aid in removing hazardous substances from an area. Any process that uses microorganisms, fungi, green plants, or their enzymes to return the natural environment altered by contaminants to its original condition.
Boundary	Landscape patches have a boundary between them which can be defined or fuzzy (Sanderson and Harris, 2000). The zone composed of the edges of adjacent ecosystems is the boundary.
Connectivity	The measure of how connected or spatially continuous a corridor, network, or matrix is. For example, a forested landscape (the matrix) with fewer gaps in forest cover (open patches) will have higher connectivity.
Corridors	Have important functions as strips of a landscape differing from adjacent land on both sides. Habitat, ecosystems or undeveloped areas that physically connect habitat patches. Smaller, intervening patches of surviving habitat can also serve as "steppingstones" that link fragmented ecosystems by ensuring that certain ecological processes are maintained within and between groups of habitat fragments.
Critically Endangered (CR)	A category on the IUCN Red List of Threatened Species which indicates a taxon is considered to be facing an extremely high risk of extinction in the wild (*IUCN*).
Cultural Ecosystem Services	The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience, including, e.g., knowledge systems, social relations, and aesthetic values (Millennium Ecosystem Assessment).
Cumulative Impacts	The total impact arising from the project (under the control of the developer), other activities (that may be under the control of others, including other developers, local communities, government) and other background pressures and trends which may be unregulated. The project's impact is therefore one part of the total cumulative impact on the environment. The analysis of a project's incremental impacts combined with the effects of other projects can often give a

	more accurate understanding of the likely results of the project's presence than just considering its impacts in isolation (BBOP).
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat(IUCN).
Degraded Habitat/Land	Land that has been impacted upon by human activities (including introduction of invasive alien plants, light to moderate overgrazing, accelerated soil erosion, dumping of waste), but still retains a degree of its original structure and species composition (although some species loss would have occurred) and where ecological processes still occur (albeit in an altered way). Degraded land is capable of being restored to a near-natural state with appropriate ecological management.
Disturbance	An event that significantly alters the pattern of variation in the structure or function of a system, while fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. Disturbance is generally considered a natural process.
Ecological Processes	Ecological processes typically only function well where natural vegetation remains, and where the remaining vegetation is well-connected with other nearby patches of natural vegetation. Loss and fragmentation of natural habitat severely threatens the integrity of ecological processes. Where basic processes are intact, ecosystems are likely to recover more easily from disturbances or inappropriate actions if the actions themselves are not permanent. Conversely, the more interference there has been with basic processes, the greater the severity (and longevity) of effects. Natural processes are complex and interdependent, and it is not possible to predict all the consequences of loss of biodiversity or ecosystem integrity. When a region's natural or historic level of diversity and integrity is maintained, higher levels of system productivity are supported in the long run and the overall effects of disturbances may be dampened.
Ecology	Ecology (from Greek: οἶκος, "house" and -λογία, "study of") is the study of the relationships between living organisms, including humans, and their physical environment. Ecology considers organisms at the individual, population, community, ecosystems, and biosphere level. Ecology overlaps with the closely related sciences of biogeography, evolutionary biology, genetics, ethology and natural history. Ecology is a branch of biology, and it is not synonymous with environmentalism.
Ecosystem Status	Ecosystem status of terrestrial ecosystems is based on the degree of habitat loss that has occurred in each ecosystem, relative to two thresholds: one for maintaining healthy ecosystem functioning, and one for conserving the majority of species associated with the ecosystem. As natural habitat is lost in an ecosystem, its functioning is increasingly compromised, leading eventually to the collapse of the ecosystem and to loss of species associated with that ecosystem (Millennium Ecosystem Assessment).
Ecosystem Services	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. Supporting Ecosystem services are those that are necessary for the maintenance of all other ecosystem services. Some examples include biomass production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitat.
Ecosystem	All the organisms of a habitat, such as a lake or forest, together with the physical environment in which they live. A dynamic complex of plant, animal and micro-

	organism communities and their non-living environment interacting as a functional unit.
Ecotone	The transitional zone between two communities. Ecotones can arise naturally, such as a lakeshore, or can be human created, such as a cleared agricultural field from a forest. The ecotonal community retains characteristics of each bordering community and often contains species not found in the adjacent communities. Classic examples of ecotones include fencerows; forest to marshlands transitions; forest to grassland transitions; or land-water interfaces such as riparian zones in forests. Characteristics of ecotones include vegetational sharpness, physiognomic change, and occurrence of a spatial community mosaic, many exotic species, ecotonal species, spatial mass effect, and species richness higher or lower than either side of the ecotone.
Edge	The portion of an ecosystem near its perimeter, where influences of the adjacent patches can cause an environmental difference between the interior of the patch and its edge. This edge effect includes a distinctive species composition or abundance in the outer part of the landscape patch. For example, when a landscape is a mosaic of perceptibly different types, such as a forest adjacent to a grassland, the edge is the location where the two types adjoin. In a continuous landscape, such as a forest giving way to open woodland, the exact edge location is fuzzy and is sometimes determined by a local gradient exceeding a threshold, as an example, the point where the tree cover falls below thirty-five percent.
Emergent Tree	Trees that grow above the top of the canopy
Endangered (En)	Endangered terrestrial ecosystems have lost significant amounts (more than 60 % lost) of their original natural habitat, so their functioning is compromised. A taxon (species) is Endangered when the best available evidence indicates that it meets any of the criteria for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild (*IUCN*).
Endemic	A plant or animal species, or a vegetation type, which is naturally restricted to a defined region or limited geographical area. Many endemic species have widespread distributions and are common and thus are not considered to be under any threat. They are however noted to be unique to a region, which can include South Africa, a specific province or a bioregion, vegetation type, or a localised area. In cases where it is highly localised or known only from a few or a few localities, and is under threat, it may be red listed either in terms of the South Africa Threatened Species Programme, NEMBA Threatened or Protected Species (ToPS) or the IUCN Red List of Threated Species.
Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.
Exotic	Non-indigenous; introduced from elsewhere, may also be a *weed* or alien *invasive* species. Exotic species may be invasive or non-invasive.
Ecological Structure	The composition, or configuration, and the proportion of different patches across the landscape. Relates to species diversity, the greater the diversity, the more complex the structure. A description of the organisms and physical features of environment including nutrients and climatic conditions.
Ecological Function	How each of the elements in the landscape interacts based on its life cycle events [Producers, Consumers, Decomposers Transformers]. Includes the capacity of natural processes and components to provide goods and services that satisfy human needs, either directly or indirectly.
Ecological Pattern	The contents and internal order of the landscape, or its spatial (and temporal) components. May be homogenous or heterogenous. Result from the ecological processes that produce them.

Ecological Process	Includes *Physical processes* [Climate (precipitation, insolation), hydrology, geomorphology]; *Biological processes* [Photosynthesis, respiration, reproduction]; *Ecological processes* [Competition, predator-prey interactions, environmental gradients, life histories]
Fragmentation (Habitat Fragmentation)	The 'breaking apart' of continuous habitat into distinct pieces. Causes land transformation, an important current process in landscapes as more and more development occurs.
Habitat Banking	A market where credits from actions with beneficial biodiversity outcomes can be purchased to offset the debit from environmental damage. Credits can be produced in advance of, and without ex-ante links to, the debits they compensate for, and stored over time (IEEP).
Habitat	The home of a plant or animal species. Generally, those features of an area inhabited by animal or plant which are essential to its survival.
IFC PS6	International Finance Corporation Performance Standard 6 – A standard guiding biodiversity conservation and sustainable management of living natural resources for projects financed by the International Finance Corporation (IFC)
Indicator	Information based on measured data used to represent an attribute, characteristic, or property of a system.
Indicator species	A species whose status provides information on the overall condition of the ecosystem and of other species in that ecosystem. They reflect the quality and changes in environmental conditions as well as aspects of community composition.
Indigenous	Native; occurring naturally in a defined area.
Indigenous Species (Native species)	A species that has been observed in the form of a naturally occurring and self-sustaining population in historical times (*Bern Convention 1979*). A species or lower taxon living within its natural range (past or present) including the area which it can reach and occupy using its natural dispersal systems (*modified after the Convention on Biological Diversity*)
Indirect Impact	Impacts triggered in response to the presence of a project, rather than being directly caused by the project's own operations (BBOP)
Intact Habitat / Vegetation	Land that has not been significantly impacted upon by man's activities. These are ecosystems that are in a near-pristine condition in terms of structure, species composition and functioning of ecological processes.
Intrinsic Value	The inherent worth of something, independent of its value to anyone or anything else.
Keystone Species	Species whose influence on ecosystem function and diversity are disproportionate to their numerical abundance. Although all species interact, the interactions of some species are more profound and far-reaching than others, such that their elimination from an ecosystem often triggers cascades of direct and indirect changes on more than a single trophic level, leading eventually to losses of habitats and extirpation of other species in the food web.
Landscape	An area of land that contains a mosaic of ecosystems, including human-dominated ecosystems (Millennium Ecosystem Assessment).
Landscape Approach	Dealing with large-scale processes in an integrated and multidisciplinary manner, combining natural resources management with environmental and livelihood considerations (FAO).
Landscape connectivity	The degree to which the landscape facilitates or impedes movement among resource patches.
Least threatened / Least Concern (LC)	These ecosystems have lost only a small proportion (more than 80 % remains) of their original natural habitat and are largely intact (although they may be degraded to varying degrees, for example by invasive alien species, overgrazing, or overharvesting from the wild).

	A taxon (species) is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category (IUCN).
Matrix	The "*background ecological system*" of a landscape with a high degree of connectivity.
Natural Forest (Indigenous Forest)	The definition of "*natural forest*" in the National Forests Act of 1998 (NFA) Section 2(1)(xx) is as follows: 'A natural forest means a group of indigenous trees • whose crowns are largely contiguous • or which have been declared by the Minister to be a natural forest under section 7(2) This definition should be read in conjunction with Section 2(1)(x) which states that 'Forest' includes: • A natural forest, a woodland, and a plantation • The forest-produce in it; and • The ecosystems which it makes up. The legal definition must be supported by a technical definition, as demonstrated by a court case in the Umzimkulu magisterial district, relating to the illegal felling of Yellowwood (Podocarpus latifolius) and other species in the Gonqogonqo forest. From scientific definitions (also see Appendix B) we can define natural forest as: • A generally multi-layered vegetation unit • Dominated by trees that are largely evergreen or semi-deciduous • The combined tree strata have overlapping crowns, and crown cover is >75% • Grasses in the herbaceous stratum (if present) are generally rare • Fire does not normally play a major role in forest function and dynamics except at the fringes • The species of all plant growth forms must be typical of natural forest (check for indicator species) • The forest must be one of the national forest types
Near Threatened (NT)	A taxon (species) is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future (IUCN).
Patch	A term fundamental to landscape ecology, is defined as a relatively homogeneous area that differs from its surroundings. Patches are the basic unit of the landscape that change and fluctuate, a process called patch dynamics. Patches have a definite shape and spatial configuration and can be described compositionally by internal variables such as number of trees, number of tree species, height of trees, or other similar measurements.
Protected Area	A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.
Range restricted species	Species with a geographically restricted area of distribution. Note: Within the IFC PS6, restricted range refers to a limited extent of occurrence (EOO): • For terrestrial vertebrates and plants, restricted-range species are defined as those species that have an EOO less than 50,000 square kilometres (km2).
Refugia	A location which supports an isolated or relict population of a once more widespread species. This isolation can be due to climatic changes, geography, or human activities such as deforestation and overhunting.
Resilience	The capacity of a natural system to recover from disturbance (OECD).

Rehabilitation	Measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised. Rehabilitation emphasizes the reparation of ecosystem processes, productivity and services, whereas the goals of restoration also include the re-establishment of the pre-existing biotic integrity in terms of species composition and community structure (BBOP).
Restoration	The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. An ecosystem has recovered when it contains sufficient biotic and abiotic resources to continue its development without further assistance or subsidy. It would sustain itself structurally and functionally, demonstrate resilience to normal ranges of environmental stress and disturbance, and interact with contiguous ecosystems in terms of biotic and abiotic flows and cultural interactions (IFC).
Riparian	Pertaining to, situated on or associated with the banks of a watercourse, usually a river or stream.
River Corridors	River corridors perform several ecological functions such as modulating stream flow, storing water, removing harmful materials from water, and providing habitat for aquatic and terrestrial plants and animals. These corridors also have vegetation and soil characteristics distinctly different from surrounding uplands and support higher levels of species diversity, species densities, and rates of biological productivity than most other landscape elements. Rivers provide for migration and exchange between inland and coastal biotas.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED).
Terrestrial	Occurring on, or inhabiting, land.
Threatened Species	Umbrella term for any species categorised as Critically Endangered, Endangered or Vulnerable by the IUCN Red List of Threatened Species (*IUCN*). Any species that is likely to become extinct within the foreseeable future throughout all or part of its range and whose survival is unlikely if the factors causing numerical decline or habitat degradation continue to operate (EU).
Traditional Ecological Knowledge	Knowledge, innovations and practices of indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health, horticulture, and forestry (CBD).
Transformation	In ecology, transformation refers to adverse changes to biodiversity, typically habitats or ecosystems, through processes such as cultivation, forestry, drainage of wetlands, urban development or invasion by alien plants or animals. Transformation results in habitat fragmentation – the breaking up of a continuous habitat, ecosystem, or land-use type into smaller fragments.
Transformed Habitat/Land	Land that has been significantly impacted upon as a result of human interferences/disturbances (such as cultivation, urban development, mining, landscaping, severe overgrazing), and where the original structure, species composition and functioning of ecological processes have been irreversibly altered. Transformed habitats are not capable of being restored to their original states.
Tributary	A small stream or river flowing into a larger one.

Untransformed Habitat/Land	Land that has not been significantly impacted upon by man's activities. These are ecosystems that are in a near-pristine condition in terms of structure, species composition and functioning of ecological processes.
Vulnerable (Vu)	Vulnerable terrestrial ecosystems have lost some (more than 60 % remains) of their original natural habitat and their functioning will be compromised if they continue to lose natural habitat. A taxon (species) is Vulnerable when the best available evidence indicates that it meets any of the criteria for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild (*IUCN*).
Watercourse	Natural or man-made channel through or along which water may flow. A river or spring; a natural channel in which water flows regularly or intermittently; a wetland, lake or dam into which, or from which, water flows. and a reference to a watercourse includes, where relevant, its bed and banks;
Weed	An indigenous or non-indigenous plant that grows and reproduces aggressively, usually a ruderal pioneer of disturbed areas. Weeds may be unwanted because they are unsightly, or they limit the growth of other plants by blocking light or using up nutrients from the soil. They can also harbour and spread plant pathogens. Weeds are generally known to proliferate through the production of large quantities of seed.
Wetlands	A collective term used to describe lands that are sometimes or always covered by shallow water or have saturated soils, and where plants adapted for life in wet conditions usually grow.
Catchment	In relation to a watercourse or watercourses or part of a watercourse, means the area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points.
Estuary	a partially or fully enclosed body of water - (a) which is open to the sea permanently or periodically; and (b) within which the sea water can be diluted, to an extent that is measurable, with fresh water drained from land.
Instream habitat	Includes the physical structure of a watercourse and the associated vegetation in relation to the bed of the watercourse;
Riparian Habitat	Includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.

8.7 Appendix F: Biodiversity Environmental Management Plan

Specific measures relating to management of Biodiversity Impacts that must be included I the project Environmental Management Programme (EMPr). This Environmental Management Plan (EMP) contains guidelines, operating procedures and rehabilitation control requirements, which will be binding on the holder of the environmental authorisation after approval of the EMP. The impacts identified and listed in the report will be managed / controlled as set out under mitigating measures. and as detailed in this section for the more significant impacts during the construction or operational phases.

8.7.1 Protection of Flora and Fauna

The following actions must be implemented at construction phase.

- Search and rescue operations for Species of Conservation Concern *must* be undertaken before the commencement of site clearing activities.
- Indigenous vegetation encountered on the sites that are to be conserved and left intact.
- It is important that clearing activities are kept to the minimum and take place in a phased manner. This allows animal species to move into safe areas and prevents wind and water erosion of the cleared areas.
- Stripped vegetation *should* be temporarily stored during operations and to be used later to stabilise slopes. This excludes exotic invasive species.
- No animals are to be harmed or killed during the course of operations.
- Workers are NOT allowed to collect any flora or snare any faunal species. All flora and fauna remain the property of the landowner and *must* not be disturbed, upset or used without their expressed consent.
- It is the responsibility of the Contractor to provide sufficient fuel for cooking and heated as needed by the staff.
- No domestic animals are permitted on the sites.
- Trees and shrubs that are directly affected by the operations may be felled or cleared but only by the expressed written permission of the ECO.
- Rehabilitation of vegetation of the site *must* be done as described in the Rehabilitation Plans.

Flora search and Rescue

The following flora relocation plan is recommended:

- Once the final layout has been determined the botanist will be consulted in order to finalise the plant relocation and vegetation clearing plan.
- Respective permits to be obtained.
- Flora search and rescue is to be conducted before vegetation clearing takes place.
- Areas should only be stripped of vegetation as and when required and once species of special concern have been relocated for that area.
- Once site clearing is to commence, the area to be cleared of vegetation will be surveyed by the vegetation and plant search and rescue team clearing under the supervision of the botanist to identify and remove species suitable for rescue and commence removal of plants.
- These species are to be replanted immediately in a suitable area of similar vegetation, where future development is unlikely to occur, or within a protected area.

8.7.2 Alien and Invasive Plan Management Plan

The following mitigation measures have been identified in order to ensure that the introduction and spread of alien invasive vegetation is minimised:

- Alien species must be removed from the site as per the National Environmental Management: Biodiversity Act (No. 10 of 2004) requirements.
- A suitable weed management strategy must be implemented in the construction phase and carried through the operational phase.
- Weeds and alien species *must* be cleared by hand before the rehabilitation phase of the areas. Removal of alien plants are to be done according to the Working for Water Guidelines.
- The Contractor is responsible for the removal of alien species within all areas disturbed during construction activities. Disturbed areas include (but are not limited to) access roads, construction camps, site areas and temporary storage areas.
- In consultation with relevant authorities, the Engineer may order the removal of alien plants (when necessary). Areas within the confines of the site are to be included.
- All alien plant material (including brushwood and seeds) should be removed from site and disposed of at a registered waste disposal site. Should brushwood be utilised for soil stabilization or mulching, it must be seed free.
- After clearing is completed, an appropriate cover crop may be required, should natural re-establishment of grasses not take place in a timely manner.

8.7.3 Fires

- The Contractor must ensure that an emergency preparedness plan is in place in order to fight accidental fires or veld fires, should they occur. The adjacent landowners/users/managers *should* also be informed or otherwise involved.
- Enclosed areas for food preparation should be provided and the Contractor *must* strictly prohibit the use of open fires for cooking and heating purposes.
- The use of branches of trees and shrubs for fire-making *must* be strictly prohibited.
- The Contractor *should* take all reasonable and active steps to avoid increasing the risk of fire through their activities on-site. No fires may be lit except at places approved by the ECO.
- The Contractor *must* ensure that the basic fire-fighting equipment is to the satisfaction of the Local Emergency Services.
- The Contractor *must* supply all living quarters, site offices, kitchen areas, workshop areas, materials, stores and any other relevant areas with tested and approved fire-fighting equipment.
- Fires and "hot work" *must* be restricted to demarcated areas.
- A braai facility may be considered at the discretion of the Contractor and in consultation with the ECO. The area *must* be away from flammable stores. All events must be under management's supervision and a fire extinguisher *will* be immediately available. "Low-smoke" fuels must be used (e.g., charcoal) and smoke control regulations, if applicable, must be considered.
- The Contractor *must* take precautions when working with welding or grinding equipment near potential sources of combustion. Such precautions include having a suitable, tested and approved fire extinguisher immediately at hand and the use of welding curtains.

8.7.4 Soil Aspects

- Sufficient topsoil must be stored for later use during decommissioning, particularly from outcrop areas.
- Topsoil shall be removed from all areas where physical disturbance of the surface will occur.
- All available topsoil shall be removed after consultation with the botanist and horticulturalist prior to commencement of any operations.
- The removed topsoil shall be stored on high ground within the site footprint outside the 1:50 flood level within demarcated areas.
- Topsoil shall be kept separate from overburden and shall not be used for building or maintenance of roads.
- The stockpiled topsoil shall be protected from being blown away or being eroded. The application of a suitable grass seed/runner mix will facilitate this and reduce the minimise weeds.

8.7.5 Dust

- To manage complaints relation to impacts on the nearby communities, a dust register *will* be developed.
- If required, water spray vehicles *will* be used to control wind cause by strong winds during activities on the works.
- No over-watering of the site or road surfaces.
- Wind screens *should* be used to reduce wind and dust in open areas.

8.7.6 Infrastructural Requirements

Topsoil

- Topsoil shall be removed from all areas where physical disturbance of the surface will occur.
- All available topsoil shall be removed after consultation with the Regional Manager prior to commencement of any operations.
- The removed topsoil shall be stored on high ground within the footprint outside the 1:50 flood level within demarcated areas (Appendix 1)
- Topsoil shall be kept separate from overburden and shall not be used for building or maintenance of roads.
- The stockpiled topsoil shall be protected from being blown away or being eroded. The use of a suitable grass seed/runner mix will facilitate soil protection and minimise weeds/weed growth.

Stormwater and Erosion Control

- Stormwater Management Plans *must* be developed for the site and should include the following:
    - The management of stormwater during construction.
    - The installation of stormwater and erosion control infrastructure.
    - The management of infrastructure after completion of construction.
- Temporary drainage works may be required to prevent stormwater to prevent silt laden surface water from draining into river systems in proximity to the site. Stormwater *must* be prevented from entering or running off site.
- To ensure that site is not subjected to excessive erosion and capable of drainage runoff with minimum risk of scour, their slopes *should* be profiled at a maximum 1:3 gradient.
- Diversion channels *should* be constructed ahead of the open cuts, and above emplacement areas and stockpiles to intercept clean runoff and divert it around disturbed areas into the natural drainage system downstream of the site.
- Rehabilitation is necessary to control erosion and sedimentation of all eroded areas (where works will take place).
- Existing vegetation *must* be retained as far as possible to minimise erosion problems.
- It is importation that the rehabilitation of site is planned and completed in such a way that the runoff water will not cause erosion.
- Visual inspections *will* be done on a regular basis with regard to the stability of water control structure, erosion and siltation.
- Sediment-laden runoff from cleared areas *must* be prevented from entering rivers and streams.
- No river or surface water may be affected by silt emanating from the site.

Site Office / Camp Sites

- No site offices or camp sites will be constructed on the site under current operating conditions, existing structures will be used.

Operating Procedures in the Site

- Construction shall only take place within the approved demarcated site.

- Construction may be limited to the areas indicated by the Regional Manager on assessment of the application.
- The holder of the environmental authorisation shall ensure that operations take place only in the demarcated areas as described in this report.
- Watering to minimise the effect of dust generation should be carried out as frequently as necessary. Noise should also be kept within reason.
- No workers will be allowed to damage or collect any indigenous plant or snare any animal.
- Grass and vegetation of the immediate environment or adapted grass / vegetation will be re-established on completion of construction activities, where applicable.
- No firewood to be collected on site and the lighting of fires must be prohibited.
- Cognisance is to be taken of the potential for endangered species occurring in the area. It is considered unlikely, however, that these species will be affected by the proposed activity.

Excavations

Whenever any excavation is undertaken, the following procedures shall be adhered to:

- Topsoil shall be handled as described in this EMP.
- Excavations shall take place only within the approved demarcated site.
- Excavations must follow the contour lines where possible.
- The construction site will not be left in any way to deteriorate into an unacceptable state.
- The excavated area must serve as a final depositing area for waste rock and overburden during the rehabilitation process.
- Once excavations have been filled with overburden, rocks and coarse natural materials and profiled with acceptable contours (including erosion control measures), the previous stored topsoil shall be returned to its original depth over the area.
- The area shall be fertilised, if necessary, to allow vegetation to establish rapidly. The site shall be seeded with a local or adapted indigenous seed mix in order to propagate the locally occurring flora.

Rehabilitation of Processing and Excavation Areas

- On completion of construction, the surface of the processing areas especially if compacted due to hauling and dumping operations shall be scarified to a depth of at least 200 mm and graded to an even surface condition and the previously stored topsoil will be returned to its original depth over the area.
- The area shall be fertilised, if necessary, to allow vegetation to establish rapidly. The site shall be seeded with suitable grasses and local indigenous seed mix.
- Excavations may be used for the dumping of construction wastes. This *shall* be done in such a way as to aid rehabilitation.
- Waste (non-biodegradable refuse) will not be permitted to be deposited in the excavations.
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the activity, be corrected and the area be seeded with a vegetation seed mix to his or her satisfaction. This *must* be done in conjunction with the ECO.
- Final rehabilitation *must* comply with the requirements mention in the Rehabilitation Plan.

8.7.7 Rehabilitation Plan

Rehabilitation Objective

The overall objective of the rehabilitation plan is to minimize adverse environmental impacts associated with the activity whilst maximizing the future utilization of the property. Significant aspects to be borne in mind in this regard is, revegetation of undeveloped footprint and stability and

environmental risk. The depression and immediate area of the working must also be free of alien vegetation. Additional broad rehabilitation strategies / objectives include the following:

- Rehabilitating the worked-out areas to take place concurrently within prescribed framework established in the EMP.
- All infrastructure, equipment, plant and other items used during the construction period will be removed from the site.
- Waste material of any description, including scrap, rubble and tyres, will be removed entirely from the site and disposed of at a recognised landfill facility. It will not be permitted to be buried or burned on site.
- Final rehabilitation shall be completed within a period specified by the Regional Manager.

Topsoil and Subsoil Replacement

Topsoil and subsoil will be stripped and stockpiled separately and only used in rehabilitation work towards the end of the operation. This is in contract to the gravel activity where rehabilitation and topsoil replacement was earmarked at the completion of each phase.
Stripped overburden will be backfilled into the worked-out areas where needed. Stripped topsoil will be spread over the re-profiled areas to an adequate depth to encourage plant regrowth. The vegetative cover will be stripped with the thin topsoil layer to provide organic matter to the relayed material and to ensure that the seed store contained in the topsoil is not diminished. Reseeding may be required should the stockpiles stand for too long and be considered barren from a seed bank point of view. Stockpiles should ideally be stored for no longer than a year.
The topsoil and overburden will be keyed into the reprofiled surfaces to ensure that they are not eroded or washed away. The topsoiled surface will be left fairly rough to enhance seedling establishment, reduce water runoff and increase infiltration.

Revegetation

All prepared surfaces will be seeded with suitable grass species to provide an initial ground cover and stabilize the soil surface. The following grass seed that is commonly available and suitable.

Botanical name	Common name	Approx seed mixture /Ha
Cynodon dactylon	Kweek	12 kg/ Ha
Eragrostis curvula	Weeping Love Grass	6 kg/ Ha
Eragrostis tef	Teff	2 kg/ Ha
Digitaria eriantha	Smuts Grass	4 kg/ Ha
Other indigenous veld grasses can be added to the seed mix		± 4 kg/Ha

The overall revegetation plan will, therefore, be as follows:

- Ameliorate the aesthetic impact of the site
- Stabilise disturbed soil and rock faces
- Minimize surface erosion and consequent siltation of natural water course located on site
- Control wind-blown dust problems
- Enhance the physical properties of the soil
- Re-establish nutrient cycling
- Re-establish a stable ecological system

Every effort must be made to avoid unnecessary disturbance of the natural vegetation during operations.

Drainage and Erosion Control

To control the drainage and erosion at site the following procedures will be adopted:

- Areas where construction is completed should be rehabilitated immediately.
- Areas to be disturbed in future activities will be kept as small as possible (i.e., conducting the operations in phases), thereby limiting the scale of erosion.
- Slopes will be profiled to ensure that they are not subjected to excessive erosion but capable of drainage runoff with minimum risk of scour (maximum 1:3 gradient).
- All existing disturbed areas will be re-vegetated to control erosion and sedimentation
- Existing vegetation will be retained as far as possible to minimize erosion problems.

Visual Impacts Amelioration

The overall visual impact of the proposed activities will be minimised by the following mitigating measures:

- Confining the footprint to an area as small as possible
- Re-topsoiling and vegetating all disturbed areas

8.7.8 Monitoring and Reporting

Adequate management, maintenance and monitoring will be carried out annually by the applicant to ensure successful rehabilitation of the property until a closure certificate is obtained.
To minimise adverse environmental impacts associated with operations it is intended to adopt a progressive rehabilitation programme, which will entail carrying out the proposed rehabilitation procedures concurrently with activity.

8.7.9 Closure objectives and extent of alignment to pre-construction environment

Closure Objectives

The closure of the site will involve removal of all debris and rehabilitation of areas disturbed during the construction phase of the project. This will comprise the scarification of compacted areas, reshaping of areas, topsoiling and rehabilitating all prepared surfaces.

8.8 Appendix G: Declaration, Specialist Profile and Registration

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economic, small business development,
tourism and environmental affairs
FREE STATE PROVINCE

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for environmental authorisation and waste management licence in terms of the-
(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014 as amended; and
(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 718, 2009

PROJECT TITLE

PROPOSED HARMONY TARGET PHOTOVOLTAIC FACILITY

Specialist:	Jamie Pote		
Contact person:			
Postal address:	Postnet Suite 57, P Bag X13130, Humewood, Port Elizabeth		
Postal code:	6013	Cell:	
Telephone:		Fax:	
E-mail:	jamiepote@live.co.za		
Professional affiliation(s) (if any)			

Project Consultant:	Savannah Environmental		
Contact person:	Ansoné Esterhuizen		
Postal address:	PO Box 148, Sunninghill, Gauteng		
Postal code:	2157	Cell:	
Telephone:		Fax:	
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economic, small business development,
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FREE STATE PROVINCE

4.2 The specialist appointed in terms of the Regulations_

I, **Jamie Pote** , declare that --

General declaration:

- 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.

Signature of the specialist:

N/A

Name of company (if applicable):

02/01/2023

Date:

SUID-AFRIKAANSE POLISIEDIENS
RELIEF D
2023 -01- 02
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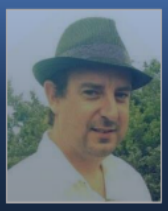

Jamie Pote

SENIOR ECOLOGIST AND ENVIRONMENTAL SCIENTIST

CONTACT

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jamiepote@live.co.za
Port Elizabeth, South Africa
Linkedin.com
Jamiepote
Bluesky-SA

EDUCATION

Bachelor of Science
Rhodes University
2001 (Botany & Environmental Science)

Bachelor of Science (Honours)
Rhodes University
2002 (Botany)

Professional Natural Scientist
SACNASP
2016

SERVICES

Terrestrial Biodiversity/Ecological Assessments
Environmental & Ecological Risk-Assessments
Bioremediation, Restoration & Rehabilitation Plans
Environmental Management Plans & Programmes
GIS Mapping & Analysis & Web maps
Alien Invasive Management (Terrestrial)
Environmental Auditing & Monitoring (ECO)
Flora Search & Rescue & Relocation
Independent Environmental & Ecological review
Permit and License applications
Environmental & Mining Applications

ABOUT ME

16 years broad professional experience in Biodiversity, Ecological and Vegetation Assessments on over 220 projects in southern, western and central Africa. Senior Environmental Consultant and EAP on over 50 projects in the mining, infrastructure, housing and agricultural sectors. Environmental monitoring and auditing on over 50 civil infrastructure and construction projects. Have managed all aspects of projects from inception through to implementation. GIS mapping and analytics.

EXPERIENCE AND CLIENTS

Key Sectors

- *Wind, Solar Energy Facilities*
- *Infrastructure and Housing*
- *Agriculture and Forestry*
- *Mining and Industrial*

Key Projects

- *Over 220 independent Biodiversity/Ecological Assessments throughout southern, western and central Africa.*
- *Mining applications and construction auditing on over 40 projects and more than 300 gravel borrow pits for the Eastern Cape Department of Roads and Public Works, Department of Transport and the South African National Roads Agency (SANRAL) throughout the Eastern Cape.*
- *South-End Precinct Mixed Use Development for Mandela Bay Development Agency - Environmental application, Ecological assessments and Construction monitoring.*
- *Coega Development Corporation IDZ projects – Ecological assessments, Flora search & rescue and Construction monitoring.*
- *Environmental applications, construction monitoring and auditing for a wide range of projects, including infrastructure and housing for various clients including the Department of Transport and SANRAL.*
- *Various agricultural expansion and infrastructure projects.*
- *Various wind and solar energy and associated infrastructure projects.*
- *Numerous infrastructure projects including electrical, water and roads.*
- Various Environmental Management and Rehabilitation Plans.

SACNASP
South African Council for Natural Scientific Professions

herewith certifies that

Jamie Robert Claude Pote

Registration Number: 115233

is a registered scientist

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

Ecological Science (Professional Natural Scientist)

Effective **20 July 2016** Expires **31 March 2023**

Chairperson

Chief Executive Officer

To verify this certificate scan this code

MR JAMIE POTE BSC (HONS) PR.SCI.NAT.

PROJECT EXPERIENCE

PERFORMANCE STANDARD BIODIVERSITY AND CRITICAL HABITAT ASSESSMENTS

- Critical Habitat & Biodiversity Assessment - Roggeveld Wind Energy Project 2020
- Biodiversity Assessment for Kalukundi Copper/Cobalt Mine, Democratic Republic of Congo 2008

WIND FARM AND PHOTOVOLTAIC INFRASTRUCTURE PROJECTS

- Ecological Assessment for Windcurrent Wind Farm, Eastern Cape 2012
- Ecological Assessment for Universal Windfarm, NMB 2011
- Ecological Assessment for Inca Energy Windfarm, Northern Cape 2011
- Ecological Assessment for Broadlands Photovoltaic Farm, Eastern Cape 2011
- Botanical Assessment for Electrawinds Windfarm Coega, NMB 2010
- Botanical Assessment and Open Space Management Plan for Mainstream WEF Phase 2, Eastern Cape 2010

SPECIALISED ECOLOGICAL REPORTS

- Rehabilitation Plan for Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017
- Green Star Rating Ecological Assessment for SANRAL office, Bay West City, NMBM 2015
- Section 24G Assessment and Rehabilitation Plan for Bingo Farm, Eastern Cape 2014
- Mapping and Ecological services for Congo Agriculture, Republic of Congo 2013
- Rehabilitation Plan for Nieu Bethesda, Eastern Cape 2011
- Mapping of pipeline for Kenton Water Board, Eastern Cape 2010
- Rehabilitation Plan for N2 Upgrade - Coega to Colchester, NMB 2010
- Representative for landowner group for Seaview burial Park, NMB 2010
- Botanical Sensitivity Analysis for LSDF, Greenbushes-Hunters Retreat, NMB 2008
- Forestry Rehabilitation Assessment Report for Amahlathi Forest Rehabilitation, Eastern Cape 2007
- Botanical & Riparian Assessment for Orange River Weirs-Boegoeberg, Douglas Dam and Sendelingsdrif, Northern Cape 2006
- Botanical Assessment for State of the Environment Report for Chris Hani District Municipality SoER, Eastern Cape 2003

GENERAL INFRASTRUCTURE DEVELOPMENT PROJECTS

- Ecological Assessment for Vermaak Boerdery Hydro Turbine (Cookhouse), Eastern Cape 2020
- Ecological Assessment for Amalinda crossing, BCM, Eastern Cape 2019
- Ecological Assessment for Cookhouse Bridge rehabilitation and temporary deviation, Eastern Cape 2019
- Ecological Assessment for Nelson Mandela University Access Road, NMB 2019
- Botanical Assessment for Zachtevlei Dam (Lady Grey), Eastern Cape 2017
- Botanical Assessment for Gcebula River bridge (Peddie), Eastern Cape 2017
- Botanical Assessment for Kouga Dam wall upgrade, Eastern Cape 2012
- Botanical Assessment for Jansenville Cemetery, Eastern Cape 2009
- Botanical Assessment for Radar Mast construction for South African Weather Service – BCM & NMB 2008
- Botanical Assessment and GIS mapping for golf course realignment for East London Golf Course, BCM, Eastern Cape 2007
- Botanical Assessment for PE Airport Extention, NMB 2006
- Botanical Assessment for Kidd's Beach Desalination Plant, BCM, Eastern Cape 2006

ROAD AND RAILWAY INFRASTRUCTURE PROJECTS

- Ecological Assessment for CDC IDZ Mn Terminal, conveyor and railway line, NMB 2013

- Ecological Assessment Review for Penhoek Road widening, Eastern Cape 2012
- Ecological Assessment for R61 road widening, Eastern Cape 2012
- Botanical Assessment for Chelsea RD - Walker Drive Ext., NMB 2010
- Botanical Assessment for Motherwell - Blue Water Bay Road, NMB 2010
- Ecological Assessment for Port St John Road, Eastern Cape 2010
- Botanical Basic Assessment for Bholani Village Rd, Port St Johns, Eastern Cape 2009
- Botanical Report, EMP and Rehab Plan for Coega-Colchester N2 Upgrade, NMB 2009
- Botanical Assessment for Manganese Conveyor Screening Report, NMB 2008
- Ecological Assessment for Road Layout for Whiskey Creek- Kenton, Eastern Cape 2006

MINING PROJECTS

- Ecological Assessment for Bochum Borrow Pits, Limpopo 2013
- Ecological Assessment and Mining and Rehabilitation Plan for Greater Soutpansberg Mining Project, Limpopo (3 proposed Mines) 2013
- Ecological Assessment for Thulwe Road Borrow Pits, Limpopo 2013
- Ecological Assessment and Mining and Rehabilitation Plan for Baghana Mining, Ghana 2010
- Botanical Assessment for Zwartenbosch Quarry, Eastern Cape 2008
- Botanical description & map production for Quarry - Rudman Quarry, Eastern Cape 2008
- Botanical Basic Assessment, Rehab Plan & Maps for Borrow Pit - Rocklands/Patensie, Eastern Cape 2008
- Botanical Assessment & Maps for Sandman Sand Gravel Mine, Eastern Cape 2008
- Botanical Assessment & GIS maps for Shamwari Borrow Pit, Eastern Cape 2008
- Detailed Botanical Assessment, EMP and Rehab Plan for Kalukundi Copper/Cobalt Mine, Democratic Republic of Congo 2008
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit Humansdorp/Oyster Bay, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Cala, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Camdeboo, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Somerset East, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Nkonkobe, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Ndlambe, Eastern Cape 2008
- Botanical Assessment, Rehab Plan & Maps for AWRM - Blue Crane Route, Eastern Cape 2008
- Botanical Assessment, EMP and Rehabilitation Plan for AWRM - Cathcart, Eastern Cape 2008
- Botanical Assessment, GIS maps and Rehab Plan for Mthatha Prospecting, Eastern Cape 2008
- Regional Botanical Map for mining prospecting permit, Welkom 2008
- Botanical Assessment for Scoping Report and Detailed Botanical Assessment and Rehab Plan for Elitheni Coal Mine, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Oyster Bay, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Bathurst/GHT, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit – Jeffreys Bay, Eastern Cape 2007
- Botanical Assessment, Rehab Plan & Maps for Borrow Pit - Storms river/Kareedouw, Eastern Cape 2007
- Biophysical Assessment for Humansdorp Quarry, Eastern Cape 2006
- Botanical Assessment, Rehab Plan & Maps for Quarry-Cathcart & Somerset East, Eastern Cape 2006
- Botanical Assessment, Rehab Plan & Maps for Quarry - Despatch Quarry, NMB 2006
- GIS Mapping & Botanical Assessment and Rehab Plan for Quarry - JBay Crushers, Eastern Cape 2006
- Botanical Assessment, EMP and Rehabilitation Plan for Polokwane Silicon Smelter, Limpopo 2006
- Application for Mining Permit for Bruce Howarth Quarry, Eastern Cape 2006

POWERLINE INFRASTRUCTURE PROJECTS

- Ecological Assessment: Dieprivier-Karreedouw 132kV Powerline realignment, Kouga LM 2016
- Eskom Ecological Walkdown: Dieprivier-Karreedouw 132 kV Powerline, Kouga LM 2016
- Eskom Solar one Ecological Walkdown: Nieuwehoop 400 kV powerline 2015
- Rehabilitation Plan and Auditing for Grassridge-Poseidon Powerline Rehab, Eastern Cape 2013
- Ecological Assessment for Dieprivier Karreedouw 132kV Powerline, Eastern Cape 2012

- Flora and Fauna search and Rescue plan for Van Stadens Windfarm Powerline, NMB 2012
- Botanical Assessment for Dedisa-Grassridge Powerline, Eastern Cape 2010
- Ecological Assessment for Grahamstown-Kowie Powerline, Eastern Cape 2010
- Species of Special Concern Mapping Transmission Line for San Souci to Nivens Drift 132kV powerline, NMB 2009
- Botanical Assessment for Eskom Powerline - Albany-Kowie, Eastern Cape 2009
- Botanical Assessment for Eskom 132 kV Dedisa Grassridge Power line-Coega, NMB 2006
- Botanical Assessment for Eskom Power line – Tyalara-Wilo, Eastern Cape 2006
- Botanical Assessment for Steynsburg - Teebus 132 kV powerline, Eastern Cape 2004

PIPELINE INFRASTRUCTURE PROJECTS

- Terrestrial Biodiversity Assessment for Thornhill Phase 2 Sanitation Link, Ndlambe, Eastern Cape 2020
- Botanical Assessment for Ngqamakhwe Regional Water Supply Scheme (Phase 3) 2018
- Ecological Assessment for Butterworth Emergency Bulk Water Supply Scheme 2017
- Ecological Assessment for Karringmelkspruit Emergency Bulk Water Supply (Lady Grey) 2017
- Ecological Assessment for Wanhoop-Willowmore Bulk Water Supply, Eastern Cape 2016
- Ecological Assessment for Steytlerville Bulk Water Supply, Eastern Cape (Phase 4) 2013
- Ecological Assessment for Steytlerville Bulk Water Supply, Eastern Cape (Phase 5) 2013
- Detailed Ecological Assessment for Suikerbos Pipeline, Gauteng 2012
- Basic Botanical Assessment for Wanhoop farm pipeline, Eastern Cape 2010
- Basic Botanical Assessment for Chatty Sewer, NMB 2010
- Species of Special Concern Mapping for Seaview Pipeline, NMB 2009
- Species of Special Concern Mapping for Chelsea Bulk Water Pipeline, NMB 2009
- Map Production for Russell Rd Stormwater, NMB 2008
- Basic Botanical Assessment for Albany Pipeline, Eastern Cape 2008
- Environmental Risk Assessment for Elands River pipeline, Eastern Cape 2007
- Detailed Botanical Assessment for Motherwell Pipeline, NMB 2007
- Detailed Botanical Assessment, GIS maps for Erasmuskloof Pipeline, Eastern Cape 2007
- Botanical & Floristic Report for Hankey pipeline, Eastern Cape 2006
- Detailed Botanical Assessment for Port Alfred water pipeline, Eastern Cape 2004

HOUSING DEVELOPMENT PROJECTS

- Terrestrial Biodiversity Assessment for Erf 1820 Mthatha, KSDM, Eastern Cape 2020
- Ecological Assessment for Erf 599 Walmer Mixed Use Development, Nelson Mandela Bay 2019
- Ecological Assessment for erf 14, Kabega, Port Elizabeth 2017
- Ecological Assessment for Fairwest Rental Housing, Port Elizabeth 2017
- Ecological Assessment for Hankey Housing, Kouga District Municipality 2015
- Ecological Assessment for Lebowakgoma Housing, Limpopo 2013
- Ecological Assessment for Giyani Development, Limpopo 2013
- Ecological Assessment for Palmietfontein Development, Limpopo 2013
- Ecological Assessment for Seshego Development, Limpopo 2013
- Botanical Assessment for Sheerness Road, BCM, Eastern Cape 2013
- Ecological Assessment for Ethembeni Housing, NMB 2012
- Ecological Assessment for Pelana Housing, Limpopo 2012
- Flora Search and Rescue Plan for Kwanobuhle Housing, Western Cape 2011
- Botanical Assessment for The Crags 288/03, Western Cape 2010
- Ecological Assessment Revision Report for Fairview Housing, NMB 2010
- Botanical Assessment, EMP and Open Space Management Plan for Hornlee Housing Development, Western Cape 2010
- Botanical Assessment for Little Ladywood, Western Cape 2010
- Botanical Assessment and Open Space Management Plan for Motherwell NU31, NMB 2010
- Botanical Assessment and Open Space Management Plan for Plett 443/07, Western Cape 2010

- Botanical Assessment for Willow Tree Farm, NMB 2010
- Botanical Assessment for Kouga RDP Housing, Eastern Cape 2009
- Botanical Assessment for Fairview Erf 1226 (Wonderwonings), NMB 2009
- Species List Compilation for Zeekoerivier Humansdorp, Eastern Cape 2009
- Botanical Assessment for Woodlands Golf Estate (Farm 858), BCM, Eastern Cape 2009
- Botanical Assessment for Plettenberg Bay - 438/4, Western Cape 2009
- Vegetation Assessment for Kwanokuthula RDP housing project, Western Cape 2008
- Site screening assessment for Greenbushes Site screening, NMB 2008
- Botanical Assessment for Fairfax development, Eastern Cape 2008
- Botanical Assessment for Plettenberg Bay Brakkloof 50&51, Western Cape 2008
- Botanical Assessment, GIS mapping for Theescombe Erf 325, NMB 2008
- Site Screening for Mount Road, NMB 2008
- Botanical Assessment for Greenbushes Farm 40 Swinburne 404, NMB 2008
- Botanical Assessment for Greenbushes 130, NMB 2008
- Botanical Assessment for Greenbushes Kuyga no. 10, NMB 2008
- Botanical Assessment for Plettenberg Bay - 438/24, Western Cape 2007
- Botanical Assessment for Plettenberg Bay - Olive Hills 438/7, Western Cape 2007
- Botanical Assessment for Gonubie Portion 809/9, BCM, Eastern Cape 2006
- Botanical Assessment for Glengariff Farm 723, BCM, Eastern Cape 2006
- Botanical Assessment for Gonubie Portion 809/10, BCM, Eastern Cape 2006
- Botanical Assessment for Gonubie Portion 809/4 & 5, BCM, Eastern Cape 2006
- Botanical Assessment for Plettenberg bay - Ladywood 438/1&3, Western Cape 2006
- Botanical Assessment and Rehab Plan for Winterstrand Desalination Plant, BCM 2006
- Botanical Assessment for Bosch Hoogte, NMB 2006
- Botanical Assessment for Plettenberg bay Farm 444/38, Western Cape 2006
- Botanical Assessment for Plettenberg Bay - 444/27, Western Cape 2006
- Botanical Assessment for Leisure Homes, BCM, Eastern Cape 2006
- Botanical Basic Assessment for Trailees Wetland Assessment, Eastern Cape 2005
- Botanical Assessment and Rehab Plan for Arlington Racecourse - PE, NMB 2005
- Botanical Assessment for Smart Stone, NMB 2005
- Botanical Assessment for Peninsular Farm (Port Alfred), Eastern Cape 2005
- Botanical Assessment for Mount Pleasant - Bathurst, Eastern Cape 2005
- Botanical Assessment and RoD amendments for Colchester Erven 1617 & 1618 (Riverside), NMB 2005
- Basic Botanical Assessment for Parsonsvlei 3/4, Eastern Cape 2005
- Botanical Assessment for Bridgemead – Malabar PE, NMB 2004

AGRICULTURAL PROJECTS

- Ecological Assessment for Citrus expansion on Hitgeheim Farm, Sunland, Eastern Cape 2015
- Ecological Assessment for Doornkraal Pivot (Hankey), Eastern Cape 2014
- Ecological Assessment for Citrus expansion on Farm 960, Patensie 2014
- Ecological Assessment for Tzaneen Chicken Farm, Limpopo 2013
- Botanical Assessment and Open Space Management Plan for Kudukloof, NMB 2010
- Botanical Assessment and Open Space Management Plan for Landros Veeplaats, NMB 2010
- Botanical Assessment and Flora Relocation Plan for Wildemans Plaas, NMB 2006

GOLF ESTATE AND RESORT DEVELOPMENT PROJECTS

- Species List& Comments Report for Kidds Beach Golf Course, BCM, Eastern Cape 2009
- Botanical Assessment for Plettenberg Bay -Farm 288/03, Western Cape 2009
- Botanical Assessment for Rockcliff Golf Course, BCM, Eastern Cape 2008
- Botanical Assessment for Rockcliff Resort Development, BCM, Eastern Cape 2007
- Botanical Assessment, EMP and Rehabilitation Plan for Tiffendel Ski Resort, Eastern Cape 2006

MIXED USE DEVELOPMENT PROJECTS

- Ecological Assessment for South-End Precinct Mixed Use Development, Nelson Mandela Bay 2018
- Botanical Assessment, EMP and Open Space Management Plan for Bay West City, NMB 2010
- Botanical Assessment, GIS maps, Open Space and Rehab Plans for Fairview Erf 1082, NMB 2009
- Botanical Assessment and GIS maps for Utopia Estate PE, NMB 2008
- Botanical Assessment and GIS mapping for Madiba Bay Leisure Park, NMB 2007
- Botanical Assessment and GIS mapping for Madiba Bay Leisure Park, NMB 2007
- Botanical Basic Assessment for Cuyler Manor (Farm 320), Uitenhage, NMB 2007

BUSINESS AND INDUSTRIAL DEVELOPMENT PROJECTS

- Ecological Assessment for Parsonsvlei Erf 984 & 1134 Parsonsvlei, NMB 2020
- Ecological Assessment for Walmer Erf 11667 - Bidfood Warehousing Development, NMB 2020
- Ecological Assessment for Portion 87 of the Farm Little Chelsea No 10, NMB 2020
- Ecological Assessment for Bay West City ENGEN Service Station, NMB 2015
- Ecological Assessment for Green Star grading for SANRAL, NMB 2014
- Ecological Assessment for OTGC Tank Farm, NMB 2012
- Botanical Assessment and Open Space Management Plan for Petro SA Refinery, Coega IDZ, NMB 2010
- Botanical Assessment for Bluewater Bay Erf 805, NMB 2009
- Ecological Assessment for Bay West City, NMB 2007
- Botanical Assessment for Kenton Petrol Station, Eastern Cape 2005
- Botanical Assessment and RoD amendments for Colchester Petrol Station, NMB 2005

ECO-ESTATE DEVELOPMENT PROJECTS

- Botanical Re-Assessment of Swanlake Eco Estate, Aston Bay, Eastern Cape 2018
- Detailed Botanical Assessment and Open Space Management Plan for Olive Hills, Western Cape 2010
- Botanical Assessment and EMP for Zwartenbosch Road, Eastern Cape 2010
- Botanical Assessment - Poultry Farm for Coega Kammaskloof Farm 191, NMB 2008
- Botanical Assessment - Housing development for Coega Ridge, NMB 2008
- Botanical Assessment, Rehabilitation Plan, EMP and GIS maps for Amanzi Estate, NMB, 2008
- Botanical Assessment for Roydon Game farm, Queenstown, Eastern Cape 2007
- Botanical Assessment for Winterstrand Estate (Farm 1008), BCM, Eastern Cape 2007
- Botanical Assessment for Homeleigh Farm 820, BCM, Eastern Cape 2007
- Botanical Basic Assessment, Rehab Plan & Maps for Candlewood, Tsitsikamma, Western Cape 2007
- Botanical Assessment, EMP and Rehab Plan for Carpe Diem Eco development, Eastern Cape 2007
- Botanical Assessment, EMP and Rehabilitation Plan for Seaview Eco-estate, NMB 2006
- Botanical Assessment for Kidd's Beach portion 1076, BCM, Eastern Cape 2006
- Botanical Assessment for Palm Springs, Kidds Beach East London, BCM, Eastern Cape 2006
- Botanical Assessment for Nahoon Farm 29082, BCM, Eastern Cape 2006
- Botanical Assessment for Rosehill Farm, Eastern Cape 2005
- Botanical Assessment for Resolution Game Farm, Eastern Cape 2005
- Botanical Assessment for Gonubie Portion 809/11, BCM, Eastern Cape 2005
- Botanical Assessment for Kidd's Beach portion 1075, BCM, Eastern Cape 2005

FLORA AND FAUNA RELOCATION PLANS, PERMITS AND IMPLEMENTATION

- Flora Search and Rescue for Nelson Mandela University Phase 2 & 3 Residences, Eastern Cape 2020
- Flora Search and Rescue for Fairwest Housing Estate, Nelson Mandela Bay, Eastern Cape 2019
- Flora Search and Rescue for Utopia Estate, Nelson Mandela Bay, Eastern Cape 2019
- Flora Search and Rescue for Citrus expansion on Boschkraal Citrus Farm, Sunland, Eastern Cape 2018
- Flora Search and Rescue for Wanhoop pipeline, Willowmore, Eastern Cape 2018
- Flora Search and Rescue for Citrus expansion on Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017

- Flora Search and Rescue for Steytlerville Bulk Water Supply, Eastern Cape (Phase 5) 2016
- Flora Search and Rescue for Citrus expansion on Farm 960, Patensie (AIN du Preez Boerdery) 2016
- Flora Search and Rescue for Steytlerville Bulk Water Supply & WTW, Eastern Cape (Phase 4) 2015
- Flora and Fauna Search and Rescue for Riversbend Citrus Farm, NMB 2014
- Flora and Fauna Search and Rescue for Mainstream Windfarm, Eastern Cape 2013
- Flora Search and Rescue for Steytlerville Bulk Water Supply, Eastern Cape (Phase 1, 2 & 3) 2013
- Flora and Fauna Search and Rescue for OTGC Tank Farm, Coega IDZ, NMB 2013
- Flora and Fauna Search and Rescue for Jeffreys Bay School, Eastern Cape 2013
- Flora Search and Rescue Plan for Red Cap Wind Farm, Eastern Cape 2012
- Flora Relocation for Disco Poultry Farm, NMB 2010
- Flora Relocation for Mainstream Windfarm, Eastern Cape 2010

ENVIRONMENTAL MANAGEMENT PLANS

- Final Environmental Management Programme (EMPr) and Maintenance Management Plan for South End Precinct Mixed Use Zone, Nelson Mandala Bay Municipality 2020
- Final Environmental Management Programme (EMPr) for Coega Land-Based Aquaculture Development Zone (ADZ), Coega Industrial Development Zone (IDZ), Nelson Mandela Bay Municipality 2019
- Basic Botanical Assessment for Kromensee EMP (Jeffries Bay), Eastern Cape 2010
- Wetland Management Plan for NMB Portnet, NMB 2010
- Baseline Botanical Study, Vegetation mapping and EMP for Local Nature Reserve for Plettenberg Bay Lookout LNA, Western Cape 2009
- Biodiversity & Ecological Processes for Bathurst-Commonage, Eastern Cape 2006
- EMP for Kromensee EMP (Jeffries Bay), Eastern Cape 2006
- Floral Survey for Mbotyi Conservation Assessment, Eastern Cape 2005
- Identifying and Assessment on Aquatic Weeds for Pumba Private Game Reserve, Eastern Cape 2005

ENVIRONMENTAL MANAGEMENT, AUDITING, COMPLIANCE AND MONITORING PROJECTS

- ECO for DRPW IRM Road Maintenance projects, Baviaans LM 2019
- ECO for DRPW IRM Road Maintenance projects, Senqu LM 2019
- ECO for DRPW IRM Road Maintenance projects, Kouga/Koukamma LM 2019
- ECO for DRPW IRM Road Maintenance projects, Sakhisizwe/Engcobo LM 2019
- ECO for DRPW IRM Road Maintenance projects, Elundini LM 2019
- ECO for DRPW IRM Road Maintenance projects, Emalahleni/Intsika Yethu LM 2019
- ECO for Construction of Fairwest Village Housing Project 2019
- ECO for Construction of Utopia Estate 2019
- ECO for Construction of NMU West End Student Residences Phases 1 & 3 2019
- ECO for DRPW IRM Road Maintenance projects, Raymond Mahlaba LM 2018
- ECO for DRPW IRM Road Maintenance projects, Inkwanca (Enoch Mgijima) LM 2018
- ECO for Citrus expansion on Farm 960, Patensie (AIN du Preez Boerdery) 2017
- ECO for Citrus expansion on Hitgeheim Farm (Farm 960), Sunland, Eastern Cape 2017
- DEO for improvement of national route R67 section 5 from Whittlesea (km 0.00) to Swart Kei river (km 15.40) – Murray & Roberts 2017
- ECO for SANRAL RRP Road Maintenance projects, Mbizana LM 2017
- ECO and Botanical Specialist for the special maintenance of national route R61 Section 2 from Elinus Farm (km 42.2) to N10 (km 85.0) (SANRAL) 2016
- Environmental Control Officer (ECO): Construction of NSRI Slipway - Port Elizabeth Harbour 2016
- ECO for SANRAL RRP Road Maintenance projects, Mbashe LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Nkonkobe LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Mbizana LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Senqu LM 2016
- ECO for SANRAL RRP Road Maintenance projects, Elundini LM 2016

- ECO and Environmental Management for closure of Bushmans River Landfill site 2016
- ECO for DRPW IRM Road Maintenance projects, Amahlathi Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Makana/Ndlambe Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Mbashe/Mqume Municipality 2015
- ECO for DRPW IRM Road Maintenance projects, Port St Johns, Mbizana, Ingquza Hill LM's 2015
- ECO for Riversbend Citrus Farm, NMB 2014
- ECO for Alfred Nzo DM Road resurfacing - DR08071, DR08649, DR08092, DR08418, DR08452, DR08015, DR08085, DR08639 & DR08073, Eastern Cape - MSBA 2014
- ECO Audits for Koukamma Flood Damage Road Repairs – Hatch Goba 2014
- EMP and ECO for Utopia Estate, NMB 2013
- Final EMP submission for Seaview Garden Estate, NMB 2012
- ECO audits for NMB Road surfacing, NMB (multiple contacts) 2011
- EMP submission and ECO for Seaview Garden Estate, NMB 2010
- ECO for Mainstream Windfarm wind monitoring mast installation, Eastern Cape 2010
- EMP and ECO for Sinati Golf Estate EMP, BCM, Eastern Cape 2009
- Flora Relocation Plan and Permit application for Wildemans Plaas, NMB 2006

BASIC ASSESSMENT APPLICATION PROJECTS (DEDEAT)

- Basic Assessment Application for Parsonsvlei Erf 984 & 1134 Parsonsvlei 2020
- Basic Assessment Application for Vermaak Boerdery Hydro Turbine (Cookhouse) 2020
- Basic Assessment Application for Walmer Erf 11667 Bidfood Warehousing Development 2020
- Basic Assessment Application for Portion 87 of the Farm Little Chelsea No 10 2020
- Basic Assessment Application for Nelson Mandela University Access Road, NMB 2019
- Basic Assessment Application for Erf 599 Walmer Mixed Use Development, Nelson Mandela Bay 2019
- Basic Assessment Application for Cookhouse Bridge rehabilitation and temporary deviation 2019
- Basic Assessment Application for Erf 14 Kabega, NMBM 2017
- Basic Assessment Application for Hankey Housing, Kouga District Municipality 2017
- Basic Assessment Application for Fairwest Rental Housing, Nelson Mandela Bay 2017
- Basic Assessment Application for Citrus expansion on Hitgeheim Farm, Sunland, Eastern Cape 2015
- Basic Assessment Application for Hankey Housing, Kouga District Municipality 2015
- Basic Assessment Application for Citrus expansion on farm 960, Patensie (AIN du Preez Boerdery) 2014
- Basic Assessment Application for South-End Precinct Mixed Use Development, Nelson Mandela Bay 2018

ENVIRONMENTAL SCREENING PROJECTS

- Environmental Screening Report for Proposed Life Hospital parking expansion, NMB 2019
- Environmental Screening Report for Erf 984 & 1134 development, Parsonsvlei, NMB 2019
- Environmental Screening Report for proposed Khayalethu School, Buffalo City 2018
- Environmental Screening Report for Proposed Housing Development of Erf 8700, Kabega Park, NMB 2017
- Environmental Screening Report for Proposed Housing Development of Erf 14, Kabega Park, NMB 2017
- Environmental Screening Report for Proposed Fairwest Social Housing project, Fairview, NMB 2016
- Environmental Screening Report for Development of Little Chelsea No 25, NMB 2016
- Terrestrial Vegetation Risk Assessment for proposed Skietnek Citrus Farm development (Kirkwood) 2015
- Preliminary Environmental Risk Assessment: NSRI Slipway Port Elizabeth 2015
- Environmental Screening Report for Proposed Development of a Dwelling on Erf 899, Theescombe 2015
- Environmental Screening Report for Proposed Development on Erf 559, Walmer, Port Elizabeth 2015
- Environmental Screening Report for Proposed Housing Scheme Development of Erf 8709, Wells Estate 2015
- Environmental Screening Report for Development of Portion 10 of Little Chelsea No 87, NMB 2015

MINING PERMIT/ENVIRONMENTAL MANAGEMENT PROGRAMME APPLICATIONS (DMR)

- Mining BAR/EMP's for Blue Crane Route LM Borrow Pits – (DoT) 2019
- Mining BAR/EMP's for 24 Borrow Pits in 6 districts within the Eastern Cape– (SANRAL) 2018
- Mining BAR/EMP's for Ingquza Hill LM Borrow Pits – (SANRAL) 2017
- Mining BAR/EMP's for Baviaans LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Senqu LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Kouga/Koukamma LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Inkwanca (Enoch Mgijima) LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Kouga/Koukamma LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Sakhisizwe/Engcobo LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Raymond Mahlaba LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Camdeboo LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Elundini LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Emalahleni/Intsika Yethu LM Borrow Pits – (DRPW) 2017
- Mining BAR/EMP's for Nkonkobe LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Mbhashe LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Mbizana LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Senqu LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Elundini LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Emalahleni LM Borrow Pits – (SANRAL) 2016
- Mining BAR/EMP's for Emalahleni LM Borrow Pits – (DRPW) 2016
- Mining BAR/EMP's for Ikwezi/Baviaans LM Borrow Pits – (DRPW) 2016
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - MR00716 (Tarkastad) (DRPW) 2015
- Mining BAR/EMP's for Chris Hani DM Borrow Pits – Intsika Yethu and Emalahleni (DRPW) 2015
- Mining BAR/EMP's for Joe Gqabi DM Borrow Pits – Senqu (DRPW) 2015
- Mining BAR/EMP's for Makana/Ndlambe LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Amahlathi LM Borrow Pits – Amatole (DRPW) 2015
- Mining BAR/EMP's for Mbashe/Mqume LM Borrow Pits – Amatole (DRPW) 2015
- Mining BAR/EMP's for Sundays River Valley LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Kouga LM Borrow Pits – Sarah Baartman (DRPW) 2015
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - MR00716 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR02581 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08041, DR08247, DR08248 & DR08504 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08599, DR08601 & DR08570 (DRPW) 2014
- Mining BAR/EMP's for Chris Hani DM Borrow Pits - DR08235, DR08551 & DR08038 (DRPW) 2014
- Mining BAR/EMP's for Alfred Nzo DM Borrow Pits - DR08092, DR08093 & DR08649 (DRPW) 2014
- Mining BAR/EMP's for Alfred Nzo DM Borrow Pits - DR08090, DR08412, DR08425, DR08129, DR08109, DR08106, DR08104 & DR08099 – Matatiele (DRPW)

SECTION 24G APPLICATIONS

- 12 000 ML Dam constructed on farm 960, Patensie (MGM Trust) 2015
- Illegal clearing of 20 Ha of lands on Hitgeheim Farm, Sunland, Eastern Cape 2015

GIS AND IT DEVELOPMENT

- Development of *iAuditor* Environmental Audit templates (DRPW audits) 2014
- Landsat Image classification and analysis (Congo Agriculture) 2010
- Development of GIS databases and mapping tools for Manifold GIS software 2008

CONFERENCES AND PUBLICATIONS

- Pote, J., Shackleton, C.M., Cocks, M. & Lubke, R. 2006. Fuelwood harvesting and selection in Valley Thicket, South Africa. Journal of Arid Environments, 67: 270-287.
- Pote, J., Cocks, M., Dold, T., Lubke, R.A. and Shackleton, C. 2004. The homegarden cultivation of indigenous medicinal plants in the Eastern Cape. Indigenous Plant Use Forum, 5 - 8 July 2004, Augsburg Agricultural School, Clanwilliam, Western Cape.
- Pote, J. & Lubke, R.A. 2003. The selection of indigenous species suitable for use as fuelwood and building materials as a replacement of invasive species that are currently used by the under-privileged in the Grahamstown commonage. Working for Water Inaugural Research Symposium 19 - 21 August 2003, Kirstenbosch. Poster presentation.
- Pote, J. & Lubke, R.A. 2003. The screening of indigenous pioneer species for use as a substitute cover crop for rehabilitation after removal of woody alien species by WfW in the grassy fynbos biome in the Eastern Cape. Working for Water Inaugural Research Symposium 19 - 21 August 2003, Kirstenbosch, South Africa.

OTHER RESEARCH EXPERIENCE

- Resource assessment of bark stripped trees in indigenous forests in Weza/Kokstad area (June 2000; Dr C. Geldenhuis & Mr. M. Kaplin).
- Working for Water research project for indigenous trees for woodlots (December 2000/January 2001; Prof R.A. Lubke, Rhodes University).
- Project coordinator and leader of the REFYN project – A BP conservation gold award: Conservation and Restoration of Grassy-Fynbos. A multidisciplinary project focusing on management, restoration and public awareness/education (2001 – 2002).
- Conservation Project Management Training Workshops: Royal Geographical Society, London 2001 – Fieldwork Techniques, Habitat Assessment, Biological Surveys, Project Planning, Public Relations and Communications, Risk Assessment, Conservation Education
- Selection and availability of wood in Crossroads village, Eastern Cape, South Africa. Honours Research Project 2002. Supervisors: Prof. R.A. Lubke & Prof. C. Shackleton.
- Floral Morphology, Pollination and Reproduction in Cyphia (LOBELIACEAE). Honours Research Project 2002. Supervisor: Mr. P. Phillipson.
- Forestry resource assessment of bark-stripped species in Amatola District (December 2002; Prof R.A. Lubke).
- Homegarden Cultivation of Medicinal Plants in the Amathole area. Postgraduate Research Project (2003-2005; Prof R.A. Lubke, Prof C.M. Shackleton and Ms C.M., Cocks).

8.9 Appendix H: Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity

SCOPE

The protocol (*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 (GN 320, 20 March 2020)*) provides the criteria for the assessment and reporting of impacts on terrestrial biodiversity for activities requiring environmental authorisation.

The protocol (*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 NEMA, gazetted on 30 October 2020*), provides the criteria for the assessment and reporting of impacts on plant and animal species for activities requiring environmental authorisation.

These protocols replace the requirements of Appendix 6 of the Environmental Impact Assessment Regulation11.

The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool (https://screening.environment.gov.za/screeningtool). The requirements for terrestrial biodiversity are for landscapes or sites which support various levels of biodiversity. The relevant terrestrial biodiversity data in the screening tool has been provided by the South African National Biodiversity Institute12.

SITE SENSITIVITY VERIFICATION AND MINIMUM REPORT CONTENT REQUIREMENTS

Prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the screening tool must be confirmed by undertaking a site sensitivity verification.

1. The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.
2. The site sensitivity verification must be undertaken using:
   a. a desk top analysis, using satellite imagery,
   b. a preliminary on-site inspection; and
   c. any other available and relevant information.
3. The outcome of the site sensitivity verification must be recorded in the form of a report that:
   a. confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.
   b. contains a motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity; and
   c. is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

TERRESTRIAL BIODIVERSITY SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

11 The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act 107 of 1998).

12 The biodiversity dataset has been provided by the South African National Biodiversity Institute (for details of the dataset, click on the options button to the right of the various biodiversity layers on ther screening tool).

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
1	General Information	
1.1	An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being "very high sensitivity" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment.	✓
1.2	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being 'low sensitivity' for terrestrial biodiversity, must submit a Terrestrial Biodiversity Compliance Statement.	✓
1.3	However, where the information gathered from the site sensitivity verification differs from the designation of 'very high' terrestrial biodiversity sensitivity on the screening tool and it is found to be of a 'low' sensitivity, then a Terrestrial Biodiversity Compliance Statement must be submitted.	✓
1.4	Similarly, where the information gathered from the site sensitivity verification differs from that identified as having a 'low' terrestrial biodiversity sensitivity on the screening tool, a Terrestrial Biodiversity Specialist Assessment must be conducted.	✓
1.5	If any part of the proposed development footprint falls within an area of 'very high' sensitivity, the assessment and reporting requirements prescribed for the 'very high' sensitivity apply to the entire footprint, excluding linear activities for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.	✓
	VERY HIGH SENSITIVITY RATING for terrestrial biodiversity features	
2	Terrestrial Biodiversity Specialist Assessment	
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.	✓
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	✓
2.3	The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:	✓
2.3.1	a description of the ecological drivers or processes of the system and how the proposed development with impact these;	✓
2.3.2	ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	✓
2.3.3	the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	✓
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);	✓

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
2.3.5	a description of terrestrial biodiversity and ecosystems on the preferred site, including:	✓
(a)	main vegetation types;	✓
(b)	threatened ecosystems, including fisted ecosystems as well as locally important habitat types identified;	✓
(c)	ecological connectivity, habitat fragmentation, ecological processes and fine- scale habitats; and	✓
(d)	species, distribution, important habitats (e.g., feeding grounds, nesting sites, etc.) and movement patterns identified;	✓
2.3.6	the assessment must identify any alternative development footprints within the preferred site which would be of 'low' sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	✓
2.3.7	the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:	✓
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 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;	✓
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;	✓
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;	✓
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 I network;	✓
2.3.7.5	Strategic Water Source Areas (SWSAs) including:	✓
(a)	the impact(s) on the terrestrial habitat of SWSA; and	✓

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
(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),	✓
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;	✓
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.	✓
2.4	The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report	✓
3	Terrestrial Biodiversity Specialist Assessment Report	
3.1	The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:	✓
3.1.1	contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	✓
3.1.2	a signed statement of independence by the specialist;	✓
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,	✓
3.1.4	description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modeling used, where relevant;	✓
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;	✓
3.1.6	a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	✓
3.1.7	additional environmental impacts expected from the proposed development;	✓
3.1.8	any direct, indirect, and cumulative impacts of the proposed development;	✓
3.1.9	the degree to which impacts, and risks can be mitigated;	✓
3.1.10	the degree to which the impacts and risks can be reversed;	✓
3.1.11	the degree to which the impacts and risks can cause loss of irreplaceable resources;	✓
3.1.12	proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr),	✓
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,	✓
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 a not; and	✓
3.1.15	any conditions to which this statement is subjected.	✓

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.	✓
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	✓
	LOW SENSITIVITY RATING – for terrestrial biodiversity features	
4	Terrestrial Biodiversity Compliance Statement	✓
4.1	The compliance statement must be prepared by a specialist registered with the SACNASP and having expertise in the field of ecological sciences.	✓
4.2	The compliance statement must:	✓
4.2.1	be applicable to the preferred site and proposed development footprint;	✓
4.2.2	confirm that the site is of 'low' sensitivity for terrestrial biodiversity; and	✓
4.2.3	indicate whether or not the proposed development will have any impact on the biodiversity feature.	✓
4.3	The compliance statement must contain, as a minimum, the following information:	✓
4.3.1	the contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	✓
4.3.2	a signed statement of independence by the specialist;	✓
4.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
4.3.4	a baseline profile description of biodiversity and ecosystems of the site;	✓
4.3.5	the methodology used to verify the sensitivities of the terrestrial biodiversity features on the site, including equipment and modeling used, where relevant;	✓
4.3.6	in the case of a linear activity, confirmation from the terrestrial biodiversity specialist that, in their opinion, based on the mitigation and remedial measures propped, the land can be returned to the current state within two years of completion of the construction phase;	✓
4.3.7	where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;	✓
4.3.8	a description of the assumptions made and any uncertainties or gaps in knowledge or data; and	✓
4.3.9	any conditions to which this statement is subjected.	✓
4.4	A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	✓

ANIMAL SPECIES SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
1	General Information	
1.1	An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "very high" or "high" sensitivity for terrestrial animal species must submit a Terrestrial Animal Species Specialist Assessment Report.	✓

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
1.2	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of "medium sensitivity" for terrestrial animal species must submit either a Terrestrial Animal Species Specialist Assessment Report or a Terrestrial Animal Species Compliance Statement, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.	✓
1.3	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of "low" sensitivity for terrestrial animal species must submit a Terrestrial Animal Species Compliance Statement.	✓
1.4	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "very high" or "high", for terrestrial animal species sensitivity and it is found to be of a "low" sensitivity, then a Terrestrial Animal Species Compliance Statement must be submitted.	✓
1.5	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "low" terrestrial animal species sensitivity and it is found to be of a "very high" or "high" terrestrial animal species sensitivity, a Terrestrial Animal Species Specialist Assessment must be conducted.	✓
1.6	If any part of the development falls within an area of confirmed "very high" or "high" sensitivity, the assessment and reporting requirements prescribed for the "very high" or "high" sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol means, the area on which the proposed development will take place and includes the area that will be disturbed or impacted.	✓
1.7	The Terrestrial Animal Species Specialist Assessment and the Terrestrial Animal Species Compliance Statement must be undertaken within the study area.	✓
1.8	Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.	✓
1.9	Where the nature of the activity is expected to have an impact on SCC beyond the boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species Environmental Assessment Guideline13, and the study area must include the PAOI, as determined.	✓
	VERY HIGH AND HIGH SENSITIVITY RATING for terrestrial animal species	
2	Terrestrial Animal Species Specialist Assessment	✓
	VERY HIGH SENSITIVITY RATING Critical habitat for range-restricted species14 of conservation concern, that have a global range of less than 10 km2.	✓

13 Available at https://bgis.sanbi.org/
14 Species with a geographically restricted area of distribution.

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
	SCC listed on the IUCN Red List of Threatened Species15 or on South Africa's National Red List website16 as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria or listed as Nationally Rare. Species aggregations that represent ≥1% of the global population size of a species, over a season, and during one or more key stages of its life cycle. The number of mature individuals that ranks the site among the largest 10 aggregations known for the species. These areas are irreplaceable for SCC. **HIGH SENSITIVITY RATING** Confirmed habitat for SCC. SCC, listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable, according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare. These areas are unsuitable for development due to a very likely impact on SCC.	
2.1	The assessment must be undertaken by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with a field of practical experience relevant to the taxonomic group ("taxa") for which the assessment is being undertaken.	✓
2.2	The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline17; and must:	✓
2.2.1	identify the SCC which were found, observed or are likely to occur within the study area;	✓
2.2.2	provide evidence (photographs or sound recordings) of each SCC found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility18, immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3);	✓
2.2.3	identify the distribution, location, viability19 and provide a detailed description of population size of the SCC, identified within the study area;	✓
2.2.4	identify the nature and the extent of the potential impact of the proposed development on the population of the SCC located within the study area;	✓
2.2.5	determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases, including the IUCN Red List of Threatened Species, South African Red List of Species, and/or other relevant databases;	✓
2.2.6	determine the potential impact of the proposed development on the habitat of the SCC located within the study area;	✓

15 https://www.iucnredlist.org/
16 This category includes the categories Extremely Rare, Critically Rare, and Rare
17 Available at https://bgis.sanbi.org/
18 The preferred platform is iNaturalist.org but any other national or international virtual museum.
19 the ability to survive and reproduce in the long term.

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
2.2.7	include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, include a motivation for the deviation;	✓
2.2.8	identify any dynamic ecological processes occurring within the broader landscape that might be disrupted by the development and result in negative impact on the identified SCC, for example, fires in fire-prone systems;	✓
2.2.9	identify any potential impact of ecological connectivity in relation to the broader landscape, resulting in impacts on the identified SCC and its long-term viability;	✓
2.2.10	determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC;	✓
2.2.11	discuss the presence or likelihood of additional SCC including threatened species not identified by the screening tool, Data Deficient or Near Threatened Species, as well as any undescribed species20; or roosting and breeding or foraging areas used by migratory species where these species show significant congregations, occurring in the vicinity; and	✓
2.2.12	identify any alternative development footprints within the preferred site which would be of "low" or "medium" sensitivity as identified by the screening tool and verified through the site sensitivity verification.	✓
2.3	The findings of the assessment must be written up in a Terrestrial Animal Species Specialist Assessment Report.	✓
3	Terrestrial Animal Species Specialist Assessment Report	✓
3.1	This report must include as a minimum the following information:	✓
3.1.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae;	✓
3.1.2	a signed statement of independence by the specialist;	✓
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;	✓
3.1.4	a description of the methodology used to undertake the site sensitivity verification, impact assessment and site inspection, including equipment and modelling used where relevant;	✓
3.1.5	a description of the mean density of observations/number of sample sites per unit area21 and the site inspection observations;	✓
3.1.6	a description of the assumptions made and any uncertainties or gaps in knowledge or data;	✓

20 Undescribed species are to be assessed as "High Sensitivity".
21 Species Environmental Assessment Guideline

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
3.1.7	details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported22;	✓
3.1.8	the online database name, hyperlink, and record accession numbers for disseminated evidence of SCC found within the study area;	✓
3.1.9	the location of areas not suitable for development and to be avoided during construction where relevant;	✓
3.1.10	a discussion on the cumulative impacts;	✓
3.1.11	impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	✓
3.1.12	a reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and	✓
3.1.13	a motivation must be provided if there were any development footprints identified as per paragraph 2.2.12 above that were identified as having "low" or "medium" terrestrial animal species sensitivity and were not considered appropriate.	✓
3.2	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	✓
4	MEDIUM SENSITIVITY SPECIES OF CONSERVATION CONCERN CONFIRMATION	
	MEDIUM SENSITIVITY RATING – for terrestrial animal species: Suspected habitat for SCC based either on historical records (prior to 2002) or being a natural area included in a habitat suitability model for this species23. SCC listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare.	✓
4.1	Medium sensitivity data represents suspected habitat for SCC based on occurrence records for these species collected prior to 2002 or is based on habitat suitability modelling.	✓
4.2	The presence or likely presence of the SCC identified by the screening tool must be investigated through a site inspection by a specialist registered with the SACNASP with a field of practice relevant to the taxonomic groups ("taxa") for which the assessment is being undertaken.	✓
4.3	The assessment must be undertaken within the study area.	✓

22 The actual name of the sensitive species may not appear in the final EIA report nor any of the specialist reports released into the public domain. It should be referred to as a sensitive plant or animal and its IUCN extinction risk category should be included e.g., Critically Endangered sensitive plant or Endangered sensitive butterfly.
23 The methodology by which habitat suitability models have been developed are explained within the Species Environmental Assessment Guideline.

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
4.4	The site inspection to determine the presence or likely presence of SCC must be undertaken in accordance with the Species Environmental Assessment Guidelines.	✓
4.5	The site inspection is to confirm the presence, likely presence or confirmed absence of a SCC identified within the site identified as "medium" sensitivity by the screening tool.	✓
4.6	Where SCC are found on site or have been confirmed to be likely present, a Terrestrial Animal Species Specialist Assessment must be submitted in accordance with the requirements specified for "very high" and "high" sensitivity in this protocol.	✓
4.7	Similarly, where no SCC are found on site during the site inspection or the presence is confirmed to be unlikely, a Terrestrial Animal Species Compliance Statement must be submitted.	✓
5	LOW SENSITIVITY RATING – for terrestrial animal species	
	Terrestrial Animal Species Compliance Statement Areas where no natural habitat remains. Natural areas where there is no suspected occurrence of SCC.	✓
5.1	The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Zoological Science or Ecological Science).	✓
5.2	The compliance statement must:	✓
5.2.1	be applicable to the study area;	✓
5.2.2	confirm that the study area, is of "low" sensitivity for terrestrial animal species; and	✓
5.2.3	indicate whether or not the proposed development will have any impact on SCC.	✓
5.3	The compliance statement24 must contain, as a minimum, the following information:	✓
5.3.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the compliance statement including a curriculum vitae;	✓
5.3.2	a signed statement of independence by the specialist;	✓
5.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
5.3.4	a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;	✓
5.3.5	the mean density of observations/ number of samples sites per unit area.	✓
5.3.6	where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;	✓
5.3.7	a description of the assumptions made and any uncertainties or gaps in knowledge or data; and	✓
5.3.8	any conditions to which the compliance statement is subjected.	✓

24 An example of a what is contained in a Compliance Statement for Animal Species Impact Assessment can be found in the Species Environmental Impact Assessment Guideline

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
6	A signed copy of the Terrestrial Animal Species Compliance Statement must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.	✓

PLANT SPECIES SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
1	General Information	
1.1	An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "very high" or "high" sensitivity for terrestrial plant species must submit a Terrestrial Plant Species Specialist Assessment Report.	✓
1.2	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of "medium sensitivity" for terrestrial plant species must submit either a Terrestrial Plant Species Specialist Assessment Report or a Terrestrial Plant Species Compliance Statement, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.	✓
1.3	An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of "low" sensitivity for terrestrial plant species must submit a Terrestrial Plant Species Compliance Statement.	✓
1.4	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "very high" or "high", for terrestrial plant species sensitivity and it is found to be of a "low" sensitivity, then a Terrestrial Plant Species Compliance Statement must be submitted.	✓
1.5	Where the information gathered from the site sensitivity verification differs from the screening tool designation of "low" terrestrial plant species sensitivity and it is found to be of a "very high" or "high" terrestrial plant species sensitivity, a Terrestrial Plant Species Specialist Assessment must be conducted.	✓
1.6	If any part of the development falls within an area of confirmed "very high" or "high" sensitivity, the assessment and reporting requirements prescribed for the "very high" or "high" sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol means, the area on which the proposed development will take place and includes the area that will be disturbed or impacted.	✓
1.7	The Terrestrial Plant Species Specialist Assessment and the Terrestrial Plant Species Compliance Statement must be undertaken within the study area.	✓
1.8	Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.	✓
1.9	Where the nature of the activity is expected to have an impact on SCC beyond the boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species	✓

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
	Environmental Assessment Guideline25, and the study area must include the PAOI, as determined.	
	VERY HIGH AND HIGH SENSITIVITY RATING for terrestrial plant species	
2	Terrestrial Plant Species Specialist Assessment	✓
	VERY HIGH SENSITIVITY RATING Critical habitat for range-restricted species26 of conservation concern, that have a global range of less than 10 km2. SCC listed on the IUCN Red List of Threatened Species27 or on South Africa's National Red List website28 as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria or listed as Nationally Rare. Species aggregations that represent ≥1% of the global population size of a species, over a season, and during one or more key stages of its life cycle. The number of mature individuals that ranks the site among the largest 10 aggregations known for the species. These areas are irreplaceable for SCC. **HIGH SENSITIVITY RATING** Confirmed habitat for SCC. SCC, listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable, according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare. These areas are unsuitable for development due to a very likely impact on SCC.	✓
2.1	The assessment must be undertaken by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with a field of practical experience relevant to the taxonomic group ("taxa") for which the assessment is being undertaken.	✓
2.2	The assessment must be undertaken within the study area.	✓
2.3	The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline29; and must:	✓
2.3.1	Identify the SCC which were found, observed or are likely to occur within the study area;	✓
2.3.2	provide evidence (photographs) of each SCC found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility30, immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3);	✓
2.3.3	identify the distribution, location, viability31 and provide a detailed description of population size of the SCC, identified within the study area;	✓

25 Available at https://bgis.sanbi.org/
26 Species with a geographically restricted area of distribution.
27 https://www.iucnredlist.org/
28 This category includes the categories Extremely Rare, Critically Rare, and Rare
29 Available at https://bgis.sanbi.org/
30 The preferred platform is iNaturalist.org but any other national or international virtual museum.
31 the ability to survive and reproduce in the long term.

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
2.3.4	identify the nature and the extent of the potential impact of the proposed development on the population of the SCC located within the study area;	✓
2.3.5	determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases, including the IUCN Red List of Threatened Species, South African Red List of Species, and/or other relevant databases;	✓
2.3.6	determine the potential impact of the proposed development on the habitat of the SCC located within the study area;	✓
2.3.7	include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, include a motivation for the deviation;	✓
2.3.8	identify any dynamic ecological processes occurring within the broader landscape that might be disrupted by the development and result in negative impact on the identified SCC, for example, fires in fire-prone systems;	✓
2.3.9	identify any potential impact of ecological connectivity in relation to the broader landscape, resulting in impacts on the identified SCC and its long-term viability;	✓
2.3.10	determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC;	✓
2.3.11	discuss the presence or likelihood of additional SCC including threatened species not identified by the screening tool, Data Deficient or Near Threatened Species, as well as any undescribed species32;	✓
2.3.12	identify any alternative development footprints within the preferred site which would be of "low" or "medium" sensitivity as identified by the screening tool and verified through the site sensitivity verification.	✓
2.4	The findings of the assessment must be written up in a Terrestrial Plant Species Specialist Assessment Report.	✓
3	Terrestrial Plant Species Specialist Assessment Report	✓
3.1	This report must include as a minimum the following information:	✓
3.1.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae;	✓
3.1.2	a signed statement of independence by the specialist;	✓
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;	✓
3.1.4	a description of the methodology used to undertake the site sensitivity verification, impact assessment and site inspection, including equipment and modelling used where relevant;	✓
3.1.5	a description of the assumptions made and any uncertainties or gaps in knowledge or data;	✓

32 Undescribed species are to be assessed as "High Sensitivity".

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
3.1.6	a description of the mean density of observations/number of sample sites per unit area33 and the site inspection observations;	✓
3.1.7	details of all SCC found or suspected to occur on site, ensuring sensitive species34 are appropriately reported;	✓
3.1.8	the online database name, hyperlink, and record accession numbers for disseminated evidence of SCC found within the study area;	✓
3.1.9	the location of areas not suitable for development and to be avoided during construction where relevant;	✓
3.1.10	a discussion on the cumulative impacts;	✓
3.1.11	impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	✓
3.1.12	a reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and	✓
3.1.13	a motivation must be provided if there were any development footprints identified as per paragraph 2.3.12 above that were identified as having "low" or "medium" terrestrial plant species sensitivity and were not considered appropriate.	✓
3.2	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	✓
4	MEDIUM SENSITIVITY SPECIES OF CONSERVATION CONCERN CONFIRMATION	
	MEDIUM SENSITIVITY RATING – for terrestrial plant species: Suspected habitat for SCC based either on there being records for this species collected in the past, prior to 2002, or being a natural area included in a habitat suitability model35. SCC listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare.	✓
4.1	Medium sensitivity data represents suspected habitat for SCC based on occurrence records for these species collected prior to 2002 or is based on habitat suitability modelling.	✓
4.2	The presence or likely presence of the SCC identified by the screening tool must be investigated through a site inspection by a specialist registered with the SACNASP with a field of practice relevant to the taxonomic groups ("taxa") for which the assessment is being undertaken.	✓

33 Species Environmental Assessment Guideline
34 The actual name of the sensitive species may not appear in the final EIA report nor any of the specialist reports released into the public domain. It should be referred to as a sensitive plant or animal and its IUCN extinction risk category should be included e.g., Critically Endangered sensitive plant or Endangered sensitive butterfly.
35 The methodology by which habitat suitability models have been developed are explained within the Species Environmental Assessment Guideline.

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
4.3	The assessment must be undertaken within the study area.	✓
4.4	The site inspection to determine the presence or likely presence of SCC must be undertaken in accordance with the Species Environmental Assessment Guidelines.	✓
4.5	The site inspection is to confirm the presence, likely presence or confirmed absence of a SCC identified within the site identified as "medium" sensitivity by the screening tool.	✓
4.6	Where SCC are found on site or have been confirmed to be likely present, a Terrestrial Plant Species Specialist Assessment must be submitted in accordance with the requirements specified for "very high" and "high" sensitivity in this protocol.	✓
4.7	Similarly, where no SCC are found on site during the site inspection or the presence is confirmed to be unlikely, a Terrestrial Plant Species Compliance Statement must be submitted.	✓
5	LOW SENSITIVITY RATING – for terrestrial plant species	
	Terrestrial Plant Species Compliance Statement Areas where no natural habitat remains. Natural areas where there is no suspected occurrence of SCC.	✓
5.1	The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Botanical Science or Ecological Science).	✓
5.2	The compliance statement must:	✓
5.2.1	be applicable to the study area;	✓
5.2.2	confirm that the study area, is of "low" sensitivity for terrestrial plant species; and	✓
5.2.3	indicate whether or not the proposed development will have any impact on SCC.	✓
5.3	The compliance statement36 must contain, as a minimum, the following information:	✓
5.3.1	contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the compliance statement including a curriculum vitae;	✓
5.3.2	a signed statement of independence by the specialist;	✓
5.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	✓
5.3.4	a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;	✓
5.3.5	where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;	✓
5.3.6	a description of the assumptions made and any uncertainties or gaps in knowledge or data;	✓

36 An example of a what is contained in a Compliance Statement for Plant Species Impact Assessment can be found in the Species Environmental Impact Assessment Guideline

TABLE 1:	ASSESSMENT AND REPORTING OF IMPACTS ON TERRESTRIAL BIODIVERSITY	REPORT REFERENCE
5.3.7	the mean density of observations/ number of samples sites per unit area37; and	✓
5.3.8	any conditions to which the compliance statement is subjected.	✓
6	A signed copy of the Terrestrial Plant Species Compliance Statement must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.	✓

37 Refer to the Species Environmental Assessment Guideline

8.10 Appendix I: Site Sensitivity Verification Report

8.10.1 Purpose of Report

The "*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 Act, when applying for Environmental Authorisation*", as published on 20 March, 2020 in National Gazette, No. 43110 in terms of NEMA (Act 107 of 1998) sections 24(5)(a), (h) and 44, lists protocols and minimum report requirements for environmental impacts on terrestrial biodiversity and provides the criteria for the assessment and reporting of impacts on terrestrial biodiversity for activities requiring environmental authorisation. The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the National web based Environmental Screening Tool. Prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration, identified by the screening tool, must be confirmed by undertaking a **site sensitivity verification**, which must include the following.

1. The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.
2. The site sensitivity verification must be undertaken through the use of:
    a. a desk top analysis, using satellite imagery.
    b. a preliminary on -site inspection; and
    c. any other available and relevant information.
3. The outcome of the site sensitivity verification must be recorded in the form of a report that:
    a. confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool.
    b. contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity; and
    c. is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

The National Web Based Screening Tool was used to generate the potential environmental sensitivity of the site which has then been compared to various online and other databases and information sources in order to verify and confirm the validity of the screening tool findings. This was further supported with on-site observations and analysis of most recent aerial photography.

This terrestrial biodiversity site verification has been undertaken as per the requirements of the 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 (GN 320, 20 March 2020).

8.10.2 Data sources and references

Data sources that were utilised for this report include the following:

- National (DFFE) Web Based Screening Tool – to generate the sites potential environmental sensitivity.
- National Vegetation Map 2018 (NVM, 2018), Mucina & Rutherford (2006) and National Biodiversity Assessment (NBA, 2019) – description of vegetation types, species (including endemic) and vegetation unit conservation status.
- National and Regional Legislation including Provincial Nature Conservation Ordinance (P.N.C.O). NEM:BA Threatened or Protected Species (ToPS).
- Botanical Database of Southern Africa (BODATSA) and New Plants of Southern Africa (POSA) – lists of plant species and potential species of concern found in the general area (SANBI.)
- International Union for Conservation of Nature (IUCN) - Red List of Threatened Species.
- Animal Demography Unit Virtual Museum (VM) – potential faunal species.

- Global Biodiversity Information Facility (GBIF) – potential faunal species.
- Southern African Bird Atlas Project 2 (SABAP2) – for bird species records.
- National Red Books and Lists - mammals, reptiles, frogs, dragonflies & butterflies.
- National Freshwater Ecosystem Priority Areas assessment (NFEPA, 2011) - important catchments.
- National Protected Areas Expansion Strategy (NPAES, 2018) and South Africa Protected Area database (2020) – protected area information.
- Critical Biodiversity Areas of the Northern Cape (2016) – Bioregional Plan.
- Namakwa District Biodiversity Sector Plan (2008) – Bioregional Plan.
- Succulent Karoo Ecosystem Planning (SKEP, 2002).
- SANBI BGIS – All other biodiversity GIS datasets.
- Aerial Imagery – Google Earth, ESRI, Chief Surveyor General (http://csg.dla.gov.za).
- Cadastral and other topographical country data - Chief Surveyor General (http://csg.dla.gov.za).
- Other sources include peer-reviewed journals, regional and local assessments, and studies in the general location of the project and its area of influence, landscape prioritization schemes (Key Biodiversity Areas), systematic conservation planning assessments and plans (as above), and any pertinent masters and doctoral theses, among others.

8.10.3 Site visit

A site visit was conducted on 27 June 2022, during winter. Although the site falls within a summer rainfall area, for the purposes of this report, the site visit is deemed to be adequate as the site is generally significantly transformed. The site visit and assessment were undertaken by Mr Jamie Pote, SACNASP registered ecological scientist with a BSc (Hons) degree in Botany and a BSc degree in Botany and environmental Science, with nearly 20 years' experience undertaking ecological assessments.

8.10.4 Assumptions, Uncertainties and Gaps in Knowledge

The findings and recommendations of this report may be susceptible to the following uncertainties and limitation:

- No assessment has been made of aquatic aspects relating to any wetlands, pans and rivers/seeps and/or estuaries outside of the scope of a terrestrial biodiversity report and have been undertaken by an aquatic specialist.
- No specific faunal assessment has been undertaken, but animals have been assessed in term of the terrestrial Biodiversity Assessment requirements.
- Any flora surveys based upon a limited sampling time-period, may not reflect the actual species composition of the site due to seasonal variations in flowering times.
- As far as possible, site collected data has been supplemented with desktop and database-centred distribution data as well as previous studies undertaken in the area.

8.10.5 Site and Activity Description

The proposed project consists of an area to the south of Harmony Target Mine, situated to the south-west of Allanridge (located north-west of Welkom) within the Free State province, in an extensive relatively flat plain, with some scattered, slightly irregular undulating plains and hills, bisected by non-perennial watercourses and interspersed with small to medium sized water bodies, mostly associated with water storage relating to the surrounding urban, mining and agricultural activities. The area under assessment includes an area of approximately 245 Ha, a portion of which will be utilised for the proposed PV facility. The proposed overhead powerline will connect the PV facility with the electrical network within the Target Mine area.

8.10.6 National Environmental Screening Tool

The DFFE Screening Tool (dated 02/06/2022) indicates the following:

- Terrestrial Biodiversity is *Very High* (Figure 33).
- Plant species sensitivity is Low (Figure 34).
- Animal Species sensitivity is Low & Medium (Figure 35).
- Aquatic Sensitivity is Low (Figure 36)

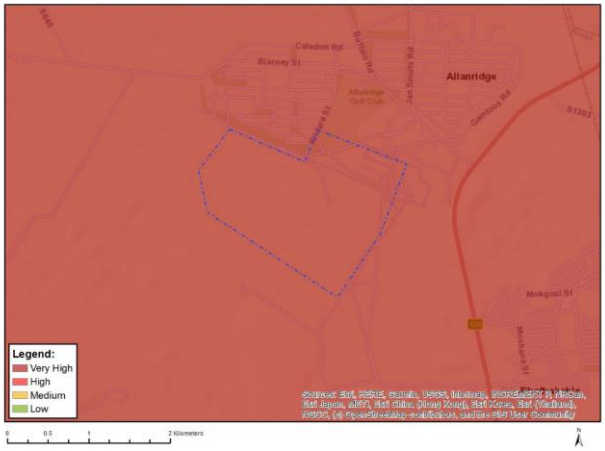

Figure 33: Terrestrial Biodiversity Sensitivity.

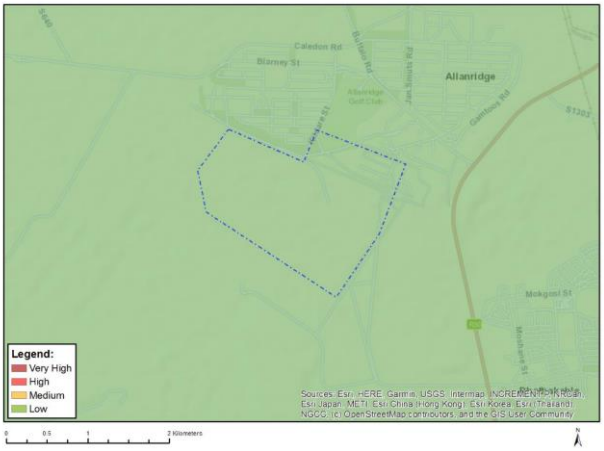

Figure 34: Terrestrial Plant Species Sensitivity.

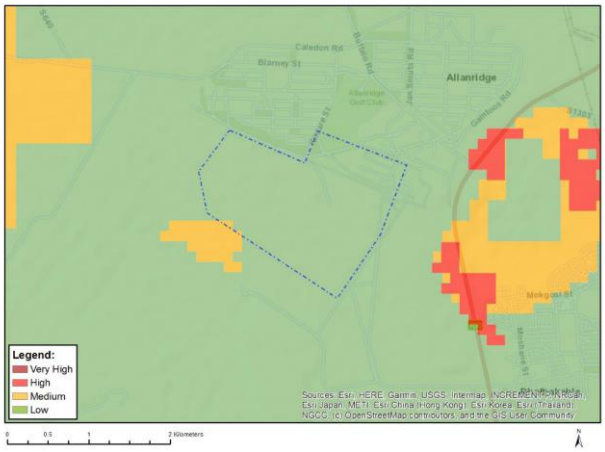

Figure 35: Terrestrial Animal Species Sensitivity.

Figure 36: Aquatic Sensitivity.

Terrestrial Sensitivity	**Feature(s) in proximity (Taaibos)**
Very High	Critical Biodiversity Area 1, Ecological Support Area 2 & Endangered ecosystem
High	None
Medium	None
Low	None
Plant Sensitivity	**Feature(s) in proximity**
Very High	None
High	None
Medium	None
Low	Present
Animal Sensitivity	**Feature(s) in proximity**
Very High	None
High	None
Medium	*Hydroprogne caspia* (bird)

Terrestrial Sensitivity	Feature(s) in proximity (Taaibos)
Low	*None*
Aquatic Sensitivity	**Feature(s) in proximity**
Very High	None
High	None
Medium	None
Low	Present

As apparent from the DFFE National Environmental Screening Tool, the following can be deducted:

1. The **Terrestrial Biodiversity Theme** is Very High, with Critical Biodiversity Area (CBA) 1 & 2, Ecological Support Area (ESA) and an Endangered ecosystem covering the site and broader surrounding area. It is noted that it is likely that the entire site is likely to have been transformed at some stage historically, for agriculture and any vegetation present is likely secondary regeneration. The site visit and assessment will clarify this further.
2. The **Plant Species Theme** is Low with no flagged species of conservation concern. The site visit will assess the presence or likely presence of any other species of conservation concern, including those requiring permits for removal.
3. The **Animal Species Theme** is Low with Medium and High sensitivity area in the broader area, associated with the bird species *Hydroprogne caspia* (Caspian Tern). This association is related to the waterbodies and associated riparian vegetation and the species the site is unlikely to provide suitable habitat being transformed, other than as an occasional transient visitor.
4. The **Aquatic Theme** is Low, with no watercourses or wetlands/pans flagged by the screening tool. It is noted that analysis of aerial photographs does indicate some possible, although severely disturbed, aquatic features within the site, which will require demarcation to avoid such areas.

The site assessment will physically screen for the presence of these, and other possible species or ecological risks not identified in the screening tool. Not all features are directly affected, but being in proximity, the risks associated with the activity will be investigated further and addressed in the report.

8.10.7 Findings, Outcomes and Recommendations

Terrestrial Biodiversity

Site verification of the Terrestrial Biodiversity sensitivities is summarised in Table 8 and depicted in *Figure 37*, where ESA 2 is light green, and CBA 1 is dark green. Rivers and Wetlands are also indicated.

Table 8: Terrestrial Biodiversity Features.

Feature		COMMENT
Ecological Support Area 2	Present	Most of the site is within CBA 2, which corresponds to transformed, secondary vegetation (old lands) and/or cultivated lands within an Endangered and significantly transformed vegetation unit. The entire proposed PV footprint is within ESA 2.
Critical Biodiversity Area 1	Present	A small fragment of CBA 1 on the north-western corner of the site, which is outside of the project footprint and will not be affected directly or indirectly.

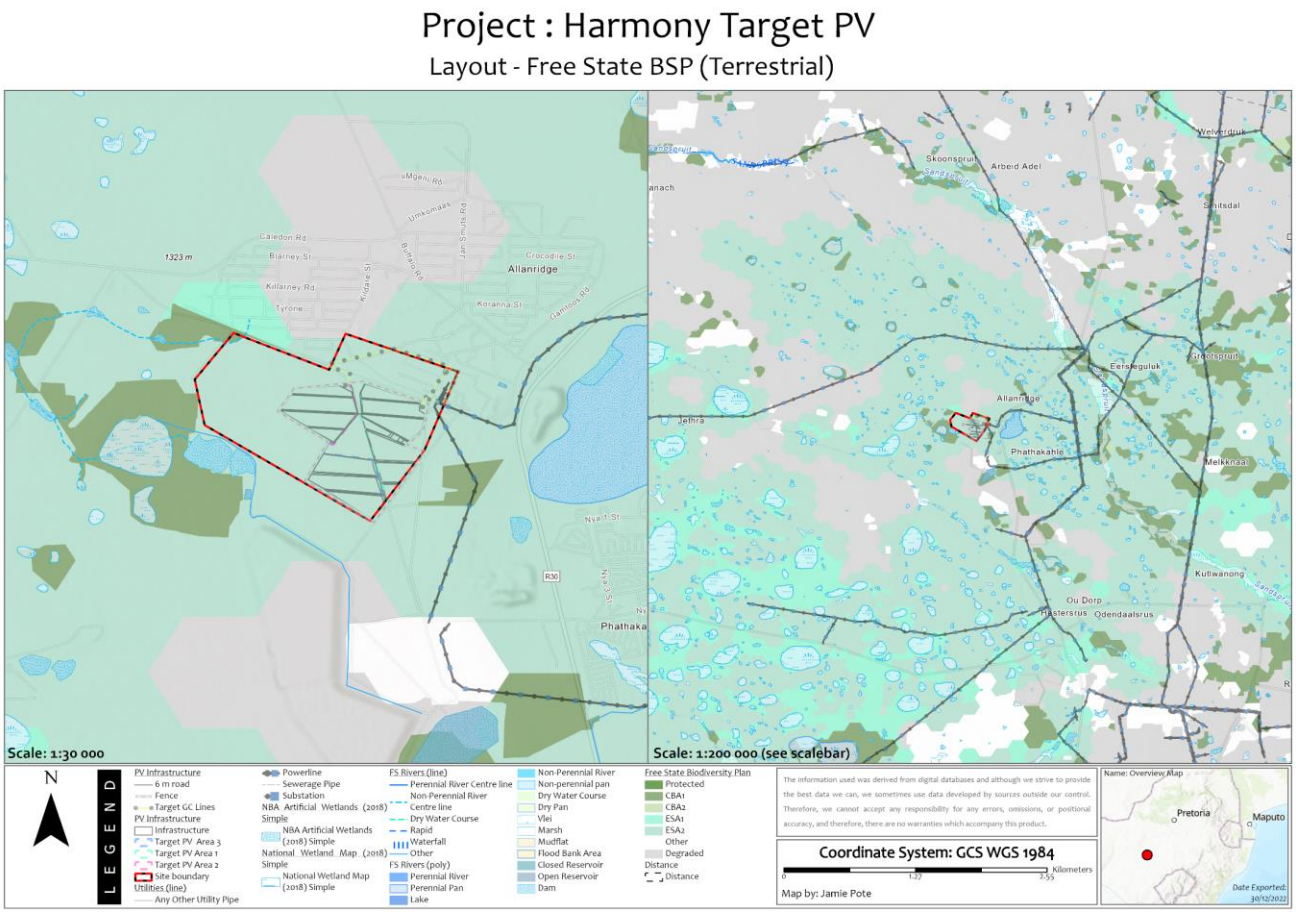

Figure 37: Free State Biodiversity Plan and Rivers and Wetlands.

Plant Species (Flora)

National Environmental Screening Tool flagged no flora species. Further screening of species on the site concluded that no species of conservation concern having an elevated status and/or limited distribution range are confirmed present. Species protected in terms of the Free State Nature Conservation Ordinance were found but are all widespread species; however, a FSNCO permit would none the less be required should they require removal during construction.

Animal Species (Fauna)

A single bird is listed in the screening tool, which is unlikely to be present, as its is mostly associated with the nearby waterbodies and the specific site is unlikely to provide irreplaceable habitat, bearing in mind the elevated baseline levels of disturbance on the site and in the surrounding area.

Aquatic

Wetland and River features are present in the broader area, including several wetlands within the project area, but outside of the proposed PV footprint. These wetlands have all been previously ploughed and the proposed activity is unlikely to significantly increase impacts above baselines levels due to the existing disturbances associated with the surrounding landscape.

8.10.8 Conclusions

While the terrestrial biodiversity screening tool designated the site and project footprint as having an Ecological Support Area 2 designation, the significant current cultivation, historical disturbances and secondary nature of most of the vegetation as well as likely persistent ongoing cultivation of the site

under status quo conditions implies that it is unlikely to provide any conservation value of significance, despite the fact that the vegetation unit has and *Endangered* status regionally. This designation is likely associated with broader landscape level ecological processes to retain ecological connectivity between scattered remnant patches of the endangered vegetation unit and the site development plan will accommodate such connectivity.

The minimal footprint within an already highly disturbed landscape comprising transformed, secondary vegetation (old lands) and/or cultivated lands is unlikely to result in any significant impacts or threats to ecological processes associated with the current ESA 2 designation, as the alternative land use will most likely be ongoing cultivation on the site.

It is likely that the construction of the PV facility, which will limit future agricultural use, may have positive impact in that it will allow natural successional revegetation of grassland within the footprint and without ongoing ploughing, in the long term, a more climax grassland vegetation may persist.

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