Appendix G.5

PLANT SPECIES ASSESSMENT

PLANT SPECIES SPECIALIST ASSESSMENT FOR THE PROPOSED GROOTHOEK WIND ENERGY FACILITY PROJECT

WSP Group Africa Pty (Ltd)

May 2025

Submitted to:
WSP Africa Pty (Ltd)
Building 1, Maxwell Office Park
Waterfall City, Midrand
Gauteng
South Africa

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Contents

List of Figures

List of Tables

Acronyms and Abbreviations

Abbreviation	Explanation
AIS	Alien Invasive Species
AOO	Area of Occupancy
BI	Biodiversity Importance
CA	Conservation Areas
CBA	Critical Biodiversity Areas
CI	Conservation Importance
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EOO	Extent of Occurrence
ESA	Ecological Support Areas
FI	Functional Integrity
FSBSP	Free State Biodiversity Sector Plan
Ha	Hectare
KBA	Key Biodiversity Areas
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NEMPA	National Environmental Management Protected Areas Act
QDS	Quarter Degree Square
RR	Receptor Resilience
SANBI	South African National Biodiversity Institute
SAPAD	South African Protected Areas Database
SCC	Species of Conservation Concern
SEI	Site Ecological Importance
ToPS	Threatened or Protected Species
WEF	Wind Energy Facility

Details of the Expertise of the Specialist

Specialist Information	
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Affiliations	Member of the South African Council of Natural Scientific Professions Member of the South African Wildlife Management Association Member of the South African Association of Botanists
Summary of Past Experience	Andrew Zinn is a terrestrial ecologist with Hawkhead Consulting. In this role, he conducts varied specialist ecology studies, including flora and fauna surveys, for baseline ecological assessments and ecological impact assessments. He has over 15 years of experience working in the fields of ecology and conservation research and is registered as a Professional Natural Scientist (*Pr.Sci.Nat.*) – Ecological Science, with the South African Council of Natural Scientific Professions (SACNASP). Andrew has worked on projects in several African countries including Botswana, Democratic Republic of Congo, Ethiopia, Ghana, Mozambique, South Africa, Tanzania and Zambia.
Refer to Appendix A for a full Curriculum Vitae of Andrew Zinn.	

Declaration of Independence by Specialist

I, Andrew Zinn, declare that I –

- Act as the independent specialist for the undertaking of a specialist section for the proposed Groothoek Wind Energy Facility Project;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Do not have, nor will have, a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity; and
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document.

Andrew Zinn

1. Introduction

Hawkhead Consulting was appointed by WSP Group Africa Pty (Ltd) to conduct the Plant Species Specialist Assessment for the proposed Groothoek Wind Energy Facility (WEF) Project (hereafter referred to as the 'Project'), near Harrismith in the Free State Province, South Africa.

1.1. Scope and Purposes of this Report

This specialist study focused on terrestrial plant species (flora), and was compiled in line with 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', and specifically:

- Protocol for the Specialist Assessment and Minimum Content Requirements for Environmental Impacts on Terrestrial Plant Species.

The primary scope of work included:

- Collating and reviewing information and data on terrestrial vegetation and flora species that occur or potentially occur on-site and in the surrounding landscape;
- Conducting a field programme to collect data on vegetation communities and flora species present on-site, and identify any botanical sensitivities;
- Assessing the suitability of the Proposed project and the potential negative impacts on terrestrial vegetation and flora that may result from proposed Project activities; and
- Recommending mitigation and management measures for inclusion in the proposed Project's Environmental Management Programme (EMP) and/or Biodiversity Management Plan (BMP).

In line with the above scope, the purpose of this report is to; 1) present a baseline description of terrestrial flora species occurring on-site, highlighting the presence/potential presence of species of conservation concern; 2) present the findings of an impact assessment for the proposed Project; 3) recommend applicable biodiversity mitigation and management measures; and 4) provide an impact statement on the appropriateness of the proposed Project with respects to terrestrial plant species conservation.

This report should be read in conjunction with the Terrestrial Biodiversity Specialist Assessment and Animal Species Specialist Assessment reports, as well as any other biodiversity-related reports.

1.2. Project Description

1.2.1. Project Background

The proposed Project forms part of the larger Verkykerskop WEF Cluster development. This proposed development comprises three separate projects, each of which, is part of a separate environmental authorisation process:

- Groothoek WEF (up to 300MW) – focus of this specialist report;
- Kromhof WEF (up to 300MW); and
- Normandien WEF (up to 300MW).

The Verkykerskop WEF Cluster also includes separate project components that are related to supporting infrastructure and will be the focus of separate environmental authorisation processes. These include:

- Groothoek up to 132 kV Grid Connection;
- Normandien up to 132 kV Grid Connection; and
- Kromhof up to 132 kV Grid Connection.

1.2.2. Project Location

The proposed Verkykerskop WEF Cluster is located in the Thabo Mofutsanyane District Municipality and Phumelela Local Municipality, near the town of Harrismith, in the Free State Province of South Africa (**Error! Reference source not found.**).

1.2.3. Project Technical Details

The technical details of the proposed Project are detailed in Table 1.

Table 1: Proposed Project Technical Details

Details	Information
Applicant Name	Groothoek Wind Power (Pty) Ltd
Municipalities	Thabo Mofutsanyana District Municipality Phumelela Local Municipality
Extent	6 170 ha
Buildable area	150 ha
Export Capacity	Up to 300MW
Power system technology	Wind
Number of Turbines	Up to 43
Rotor Diameter	up to 200 m
Hub Height	up to 200 m
Hard Standing Dimensions	up to 0,8 ha per turbine
Turbine Foundations	Excavation up to 4.5 m deep, constructed of reinforced concrete to support the mounting ring. Once tower established, footprint of foundation is covered with soil.
Substation	1 x 33kV/132kV onsite collector substation (IPP Portion) being up to 2 ha.
Powerlines	33kV cabling to connect the wind turbines to the onsite collector substations, to be laid underground where practical.
Construction camp and laydown area	Construction compounds including site office inclusive of Concrete Batching plant of up to 1ha Site office of 4 ha laydown area of 8ha
Internal Roads	Up to 8m in width (operational road surface width excluding V drains and cabling). During construction the disturbed road footprint will be up to 14 m wide including v-drains and trenching for cabling).
O&M Building	O&M office of up to 1 ha.
BESS	• Battery Energy Storage System (BESS) (200MW/800MWh). • Pre-assembled solid state batteries • Export Capacity of up to 800MWh

Details	Information
	• Total storage capacity 200MW • Storage capacity of up to 6-8 hours • The BESS will be housed in containers covering a total approximate footprint of up to 7ha

1.3. Study Spatial Scales

Two spatial scales were considered for this specialist study, namely:

- Local Study Area (LSA): The proposed development footprint for the Groothoek WEF Project, and all areas encompassed by the Project's site boundary - shown in **Error! Reference source not found.**. It is within this 6 170 ha area where direct and indirect impacts on terrestrial biodiversity, flora and fauna receptors are likely to occur; and
- Regional Study Area (RSA): Comprises the entire area of influence for the proposed Verkykerskop WEF Cluster development (approx.19 506 ha). It encompasses all three separate project sites for the proposed Groothoek WEF, Kromhof WEF and Normandien WEF and is also shown in **Error! Reference source not found.**. The RSA formed the spatial focus for the desktop literature and data collation and review and the field programme.

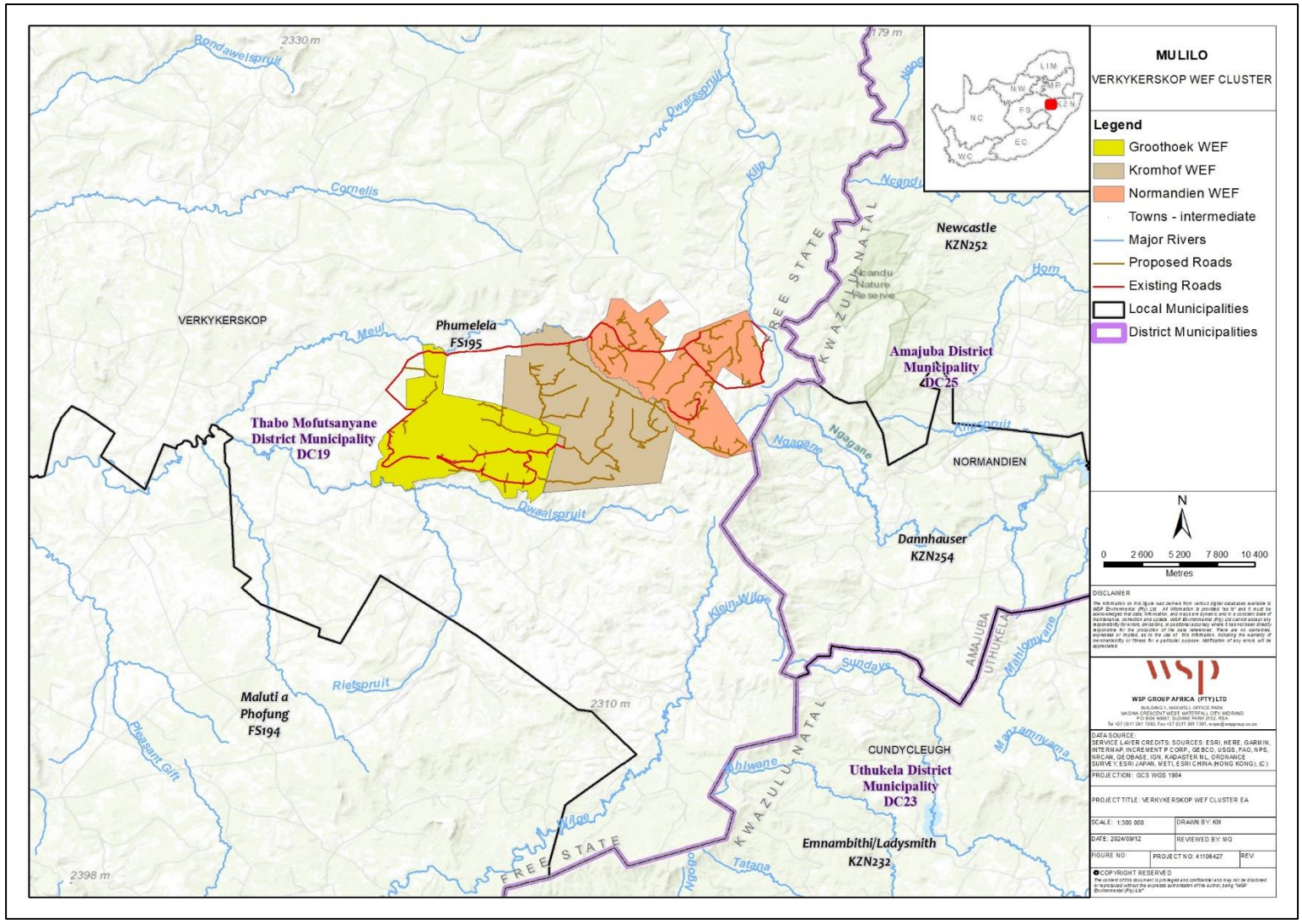
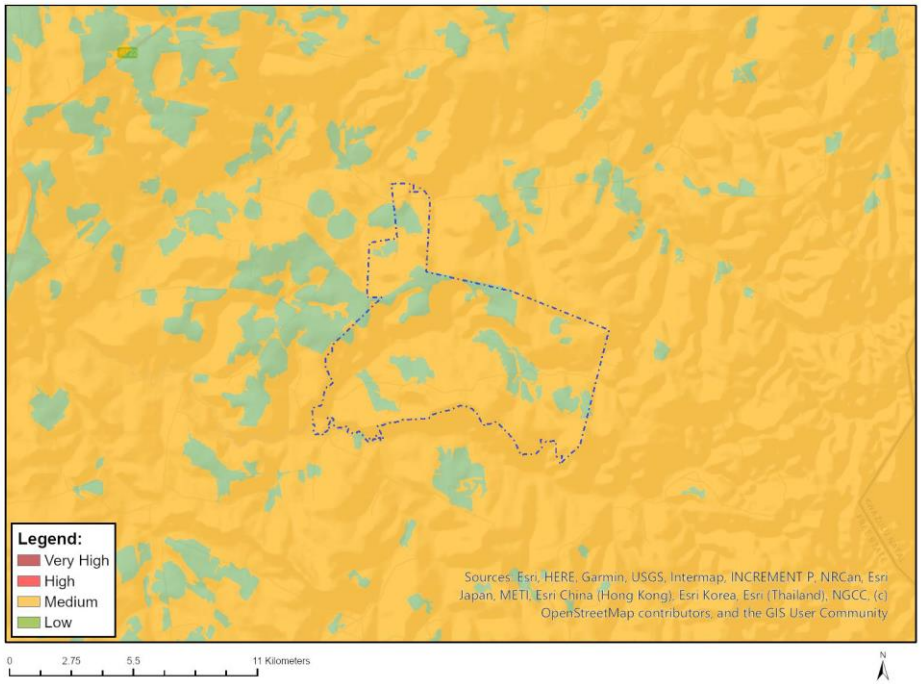


Figure 1: Map showing the location of the proposed Groothoek Project site (i.e. the Local Study Area - yellow) and the broader Regional Study Area for the Verkykerskop WEF Cluster, which also encompasses the Kromhof WEF and Normandien WEF project sites.

1.4. Results of the Environmental Screening Tool

The proposed Project site was assessed at a desktop level using the National Web-based Environmental Screening Tool. According to the National Web Based Screening Tool, the Plant Species Theme for the proposed Project was rated 'Medium' sensitivity on account of the potential presence of two threatened flora species. These species are listed below and discussed in more detail in Section 7.2.1 of this report:



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 1252
Medium	Sensitive species 998

Note: The names of specific taxa that are regarded as being susceptible to overexploitation have been redacted and are not presented in this report. These species are referred to by their assigned 'sensitive species number', *a*s per the species assessment guidelines (SANBI, 2020).

2. Relevant Legislation and Guidelines

Relevant international, national and provincial legislation, as well as associated guidelines and policies that are relevant to the environment and biodiversity, and which were used to guide the Plant Species Specialist Assessment are listed in Table 2.

Table 2: Relevant environmental and biodiversity legislation and guidelines.

Applicable Legislation and Guideline	Relevance to the Proposed Project
National Environmental Management Act, 1998 (Act No 107 of 1998) – NEMA	Section 24 of the NEMA, headed "Environmental Authorisations" sets out the provisions which are to give effect to the general objectives of Integrated Environmental Management, and laid down in Chapter 5 of the NEMA. In terms of section 24(1), the potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority charged by the NEMA with granting of the relevant environmental authorisation. In terms of section 24F (1) of the NEMA no person may commence an activity listed or specified in terms of section 24(2)(a) or (b) unless the competent authority has granted an environmental authorisation for the activity. 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 NEMA (1998), when applying for environmental authorisation, the following is relevant to this study: • Protocol for the specialist assessment and report content requirements for environmental impacts on terrestrial plants.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	The NEMBA is administered by the Department of Forestry, Fisheries and the Environment (DFFE) and provides the framework under the NEMA for the: • Management and conservation of South Africa's biodiversity; • The protection of species and ecosystems that warrant protection; • The fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; and • The establishment and functions of a South African National Biodiversity Institute (SANBI). Amongst other components, the NEMBA includes: • Lists of Critically Endangered, Endangered, Vulnerable and Protected Species (February 2007), with associated amendments (December 2007 and 3 June 2020) (ToPS), published under Section 56(10) of NEMBA; • Threatened or Protected Species Regulations (February 2007); and

Applicable Legislation and Guideline	Relevance to the Proposed Project
	• National list of threatened terrestrial ecosystems for South Africa (2021 revision), published under Section 51(1)(a) of NEMBA. • National Biodiversity Offset Guideline (2023), which provides guidance on the need to develop biodiversity offsets. The purpose of ToPS lists and regulations are to regulate the permit system concerning restricted activities involving specimens of listed threatened or protected species. The primary purpose of listing threatened ecosystems is to reduce the rate of ecosystem and species extinction by identifying 'witness' sites' of exceptionally high conservation value and enabling and facilitating proactive management of these ecosystems. Chapter 5 of NEMBA also provides a list of regulations and guidance concerning alien invasive species, including: • A guideline for Monitoring, Control and Eradication Plans (September 2015); • 2020 Alien and Invasive Species Regulations (September 2020); and • 2016 and 2020 Alien and Invasive Species Lists (March 2021).
National Environmental Management: Protected Areas Act (2003)	• The NEMPA provides the framework under the NEMA for the protection and conservation of South Africa's biodiversity through the establishment of a system of protected areas that represent the country's diverse ecosystems, landscapes, and seascapes; and • The NEMPA sets out mechanisms and processes for declaring and managing protected areas, including protected environments, with an emphasis on intergovernmental cooperation and public involvement.
Nature Conservation Ordinance 8 of 1969 for the Free State Province	The Nature Conservation Ordinance 8 of 1969 provides lists of specially protected and protected flora and fauna: • Schedule 1: Protected Game; and • Schedule 6: Protected Plants.
Other Relevant national and Provincial Policies, Plans and Guidelines	Other relevant policies, plans and guidelines that were considered during this study include: • Species Environmental Assessment Guideline (SANBI, 2020); • National Protected Area Expansion Strategy (2018); and • Free State Biodiversity Sector Plan (2019).

3. Study Methodology

The methodology used for this study included a desktop literature review component and a field programme. The various tasks associated with these components are discussed below:

3.1. Desktop Data Collation and Literature Review

The aim of the desktop literature review component was to collate and review data and information pertaining to terrestrial flora species that may occur on-site (LSA) and in surrounding landscape (RSA), based on historic distribution ranges or recent records. Reviewed literature and data were obtained from a variety of online and literature sources. These are discussed below:

3.1.1. Regional Ecosystems and Vegetation Types

Regional vegetation descriptions relevant to the LSA were obtained from SANBI's Final Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018) and the descriptions in Mucina and Rutherford (2011).

3.1.2. Vegetation and Flora Species Richness

- A list of flora species that have previously been recorded in the broader region, and that potentially occur in the RSA, was obtained from the SANBI's online Botanical Database of Southern Africa (BODATSA); and
- This species list was augmented with the list of flora SCC highlighted by the online environmental sensitivity screening tool.

3.2. Field Programme

The field programme comprised a wet-season field survey, conducted from the 3rd to 8th March 2025. This period coincides with the peak vegetation growing period (November to April) for grassland ecosystems in summer rainfall areas and is therefore an optimal time to assess flora. The sampling methodologies used during the field survey were based, in part, on those recommended in SANBI (2020), and included the following:

- Vegetation was sampled using meander search transects at representative sites in each of the main natural habitat units that were identified across the RSA at a desktop level using aerial imagery prior to the field survey. Thirty-two transects were surveyed across the RSA during the field survey;
- Data collected during flora surveys included habitat character and condition, flora species composition, evidence of current and past disturbances, presence of flora species of conservation concern, and declared alien invasive species;
- Flora nomenclature is based on species names presented on SANBI's Red List of South African Plants website;
- Field data were used to compile a species list for the study area, develop habitat unit descriptions, and provide the basis for habitat suitability assessments for flora species of conservation concern; and
- Vegetation structural classification was based on Edwards (1983).

3.3. Delineation and Mapping of Habitat Units

Mapping of habitat units was conducted using a review and analysis of composite Google Earth aerial imagery, coupled with data and observations obtained during the field survey. These were

integrated with the wetland delineations developed by WSP Group Africa (Pty) Ltd and the Geoterra Imagery land cover as a base-layer.

3.4. Assessment of Species of Conservation Concern

3.4.1. Threatened, Near Threatened and/or Protected Species Status

Species of conservation concern (SCC) were based on the national and provincial Red Lists of threatened/near threatened flora species. Also included in the discussion of flora SCC are species listed as Protected, as per national and provincial legislation. Relevant lists and legislation consulted include:

- Red List of South African Plans (Version 2020), presented by SANBI;
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004) - Threatened or Protected Species List (Notice 389 of 2013) (NEMBA ToPS List, 2007); and
- Free State Nature Conservation Ordinance 8 of 1969, Schedule 6: Protected Plants.

3.4.2. Habitat Suitability Assessments for Species of Conservation Concern

Based on the lists of SCC potentially present on-site, a 'probability of occurrence' of a species in the study area was determined by conducting habitat suitability assessments. The following parameters were used in the assessments:

- Habitat requirements: Most threatened species have very specific habitat requirements. The presence of these habitats in the study area was evaluated;
- Habitat status: The status or ecological condition of available habitat was assessed. Often a high level of habitat degradation will negate the potential presence of sensitive species; and
- Habitat linkage: Dispersal and movement between natural areas are important population-level processes. Habitat connectivity within the study area and to surrounding natural habitat and corridors was evaluated to determine the likely persistence of SCC.

Probability of occurrence is presented in the following categories:

- Recorded: Any SCC observed/documented in or close to the study area;
- Probable: the species is likely to occur in the study area due to suitable habitat and resources being present;
- Possible: The species may occur in the study area due to potential habitat and/or resources; and
- Unlikely: the species will not likely occur in the study area due to lack of suitable habitat and resources, or significant differences in its Area of Occupancy (AOO) compared to its Extent of Occurrence (EOO).

3.5. Alien Invasive Species

Owing to their potential to spread, outcompete and exclude indigenous vegetation, special emphasis was placed on declared alien invasive flora species occurring in the study area. These were categorised according to the National Environmental Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004) - 2020 listing of declared alien and invasive species.

3.6. Flora Species of Medicinal Value

Many common and widespread flora species have medical or cultural utility to humans, and as such have value to local communities. Flora of medicinal value recorded in the study area were therefore identified and their purported uses described based on Van Wyk, *et al*., (2009).

3.7. Assessment of Site Ecological Importance

The ecological importance (sensitivity) of habitat units was determined using the protocol for evaluating site ecological importance (SEI) as published in SANBI's Species Assessment Guideline (SANBI, 2020). SEI is considered to be a function of the biodiversity importance (BI) of a receptor and its resilience to impacts (receptor resilience, RR), as per:

$$SEI = BI + RR.$$

Biodiversity importance is a function of conservation importance (CI) and the functional integrity (FI) of the receptor, as per:

$$BI = CI + FI$$

- **Conservation Importance** is defined as "the importance of a site for supporting biodiversity features of conservation concern present, e.g., populations of International Union for Conservation of Nature (IUCN) threatened and Near Threatened species (CR, EN, VU and NT), Rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes" (SANBI, 2020).
- **Functional Integrity** is defined as "A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts" (SANBI, 2020).
- **Receptor Resilience** is defined as "the intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention" (SANBI, 2020).

For tables detailing the rating criteria for Conservation Importance, Functional Integrity and Receptor Resilience and the scoring matrices, refer to Appendix B. Table 3 presents a guideline for interpreting the SEI (SANBI, 2020).

Table 3: Guidelines for interpreting SEI in the context of the proposed development activities

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

Site Ecological Importance	Interpretation in relation to proposed development activities
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.
Source: SANBI (2020).	

4. Assumptions, Uncertainties and Gaps in Knowledge

The following assumptions, uncertainties and gaps in knowledge are highlighted for the Plant Species Specialist Assessment:

- The flora field survey was conducted in March 2025. The timing of the field survey thus coincided with the peak vegetation growing period (November to April) for grassland ecosystems in summer rainfall areas. It was noted that sufficient rain had fallen prior to the field survey, and vegetation was actively growing and flowering. Conditions at this time were therefore optimal to assess vegetation condition and flora species composition. Seasonality was therefore not considered a study limitation;
- Surveying sites were chosen to represent the range of on-site habitats. However, the RSA is extensive and topographically complex, and accordingly not all areas of natural habitat or proposed development footprints could be surveyed during the field programme;
- In line with the above, it is possible that certain herbaceous taxa (e.g., annuals and geophytes) that are most readily visible or distinguishable at other periods during the wet/growing season, may not have been detected during the field survey; and
- Mapping of habitat units was conducted based on a combined approach, using a study of composite aerial imagery, field observations, and supplementary land cover datasets. Agricultural landscapes are dynamic and subject to ongoing farming activities. It is thus possible that the character of individual habitat patches may change over time.

5. Regional Vegetation Characteristics

The LSA is located in the Grassland Biome, and according to SANBI's regional mapping of South Africa's vegetation types (2018), the entire site comprises Eastern Free State Sandy Grassland (Gm 4) (Figure 2). The general characteristics of the Grassland Biome and Eastern Free State Sandy Grassland are discussed in more detail below:

5.1. Grassland Biome

The regional study area is located in the Grassland Biome, which covers approximately 28% of South Africa and is the dominant biome of the central plateau and inland areas of the eastern subcontinent (SANBI, 2013). Grasslands are typically situated in moist, summer rainfall regions that experience between 400 mm and 2000 mm of rainfall per year. Vegetation consists of a dominant field-layer comprising grasses and herbaceous perennials, with little- to no woody plants present.

South Africa's grassland ecosystems are parsed into five groups, with the study area located in the Mesic Highveld Grasslands group (SANBI 2013). Mesic Highveld Grasslands occur at mid-altitudes and experience warm, wet summers (MAP 700-1200 mm) and cold winters. They are typically highly productive sourveld grasslands that are dominated by long-lived perennial grasses (SANBI, 2013).

Fire is common in Mesic Highveld Grasslands and maintains these ecosystems in a relatively treeless form (SANBI, 2013). Apart from their importance as rich stores of biodiversity, grasslands are critically important water production landscapes, constituting about half of South Africa's Strategic Water Source Areas (SANBI, 2013).

5.2. Eastern Free State Sandy Grassland

Eastern Free State Sandy Grassland is mainly confied to the Free State, with marginal extension into KwaZulu-Natal and Lesotho (Mucina & Rutherford, 2011). The prevailing terrain is flat- to slightly undulating, with certain areas drained by streams and rivers characterised by undulating terrain. Vegetation is characterised by closed grassland, dominated by *Eragrostis curvula, Tristachya leucothrix* and *Themeda triandra*, amongst other grasses and forbs (Mucina & Rutherford, 2011).

In Mucina and Rutherford's (2011) regional vegetation type descriptions, important plant taxa are those species that have a high abundance, a frequent occurrence (not being particularly abundant), or are prominent in the landscape within a particular vegetation type. They recognise the following species as important taxa in Eastern Free State Sandy Grassland vegetation type, amongst others:

Graminoids: *Themeda triandra, Andropogon appendiculatus, Brachiaria serrata, Cymbopogon pospischilii, Digitaria monodactyla, Digitaria tricholaenoides, Cynodon dactylon, Elionurus muticus, Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Heteropogon contortus, Hyparrhenia hirta, Aristida junciformis, Tristachya leucothrix* and *Aristida congesta.*

Herbs: *Berkheya onopordifolia, Berkheya speciosa, Dicoma anomala, Acalypha angustata, Ajuga ophrydis, Anthospermum herbaceum, Berkheya pinnatifida, Crabbea acaulis, pelargonium luridum, Pentanisia prunelloides, Senecio coronatus, Senecio erubescens, Tolpis capensis*, *Haplocarpha scaposa, Helichrysum aureonitens, Helichrysum nudifolium* and *Hilliardiella oligocephala.*

5.3. Nationally and Provincially Threatened Ecosystems

According to the NEMBA Threatened Ecosystems (2021), Eastern Free State Sandy Grassland is not listed as a threatened vegetation type at a national level.

It is noted however, that according to the Free State Biodiversity Sector Plan technical report, the adjusted/provincial status of Eastern Free State Sandy Grassland is Vulnerable, with approximately 40% of the vegetation remaining in a natural condition and the remaining extent (approx. 60%) considered modified (Collins, 2024).

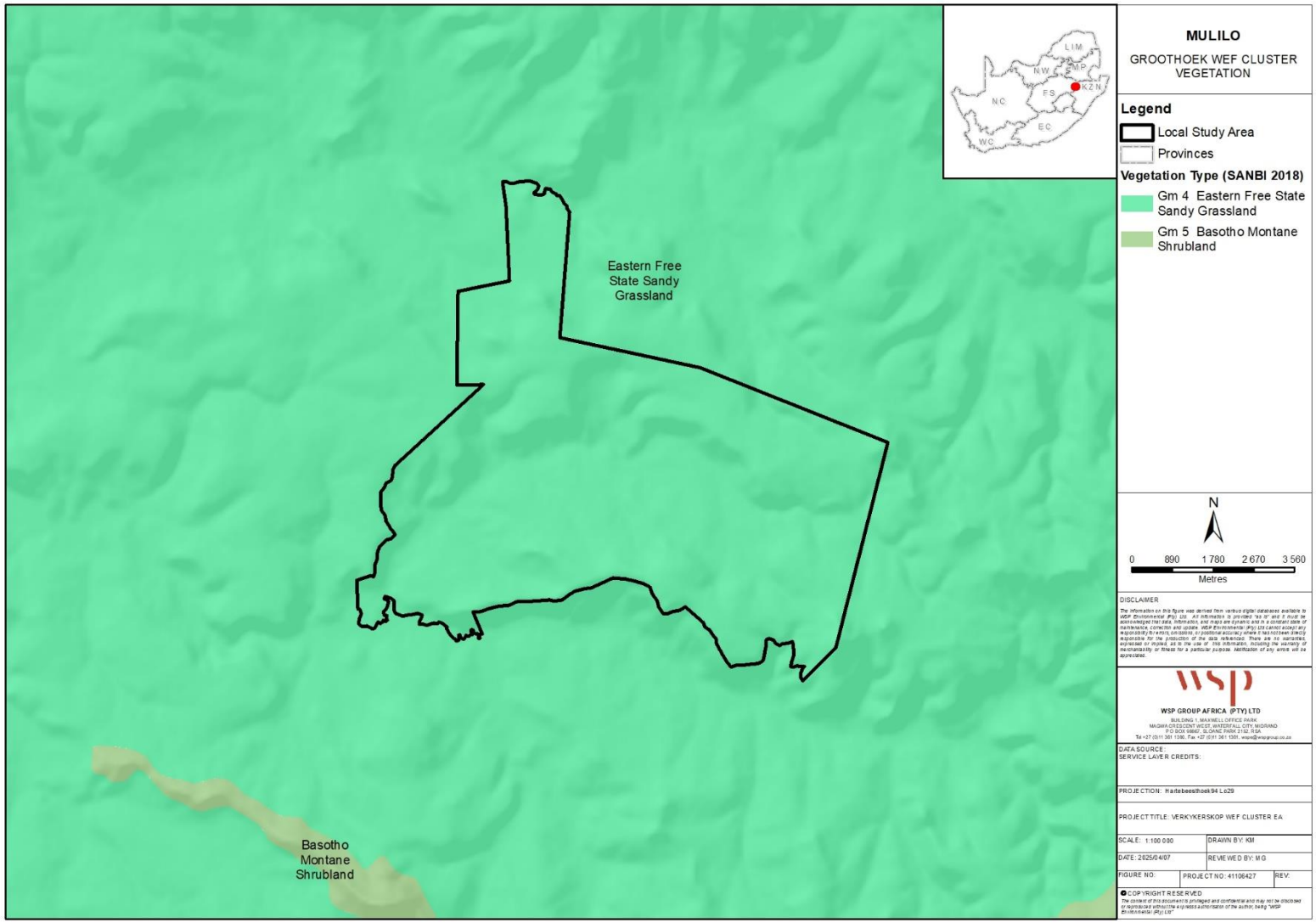


Figure 2: Local study area in relation to the SANBI (2018) vegetation types.

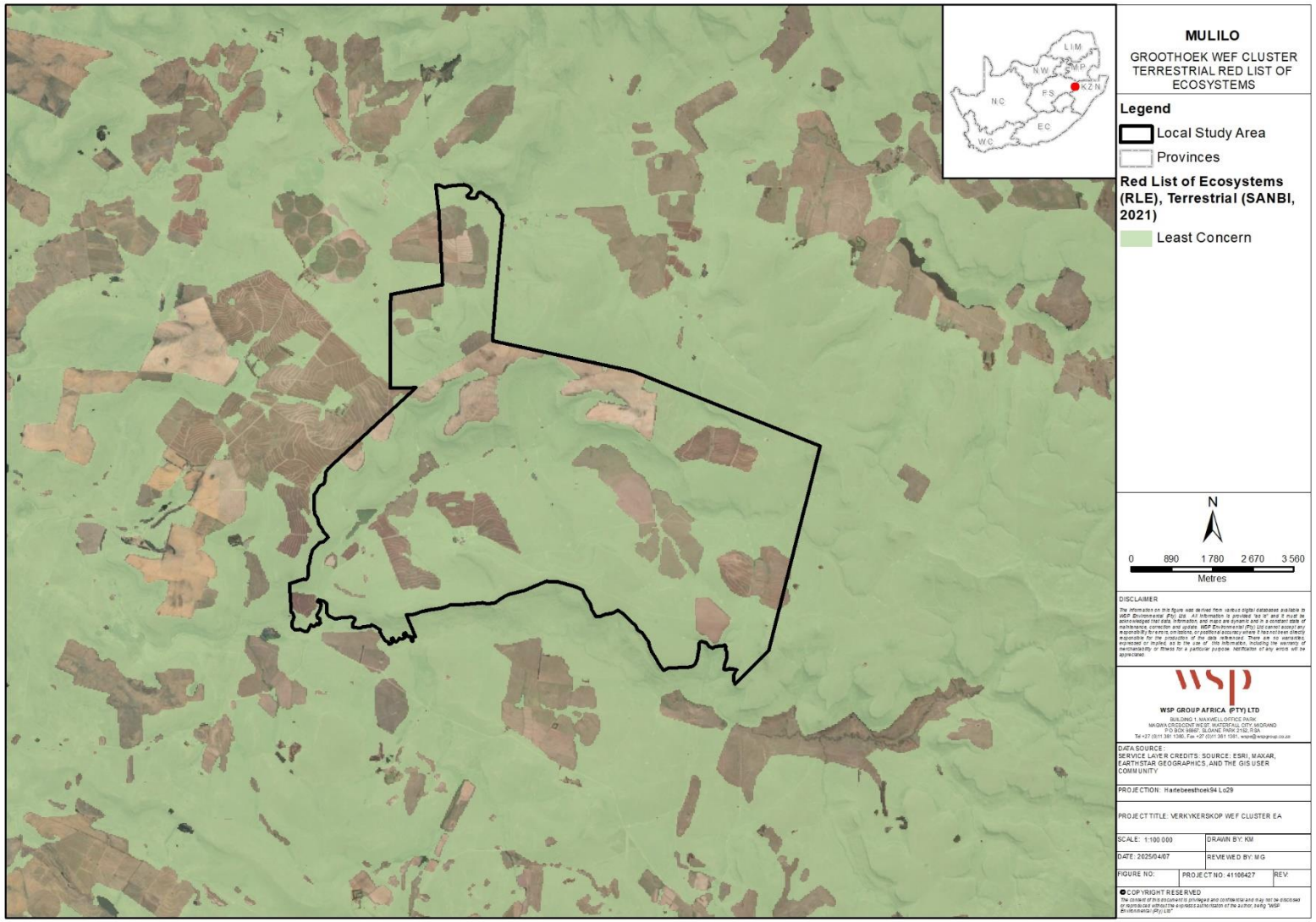


Figure 3: Local study area in relation to delineations of the National Red List of Terrestrial Ecosystems.

6. Landscape Context and Existing Impacts on Flora

The following notes describe the general landscape context and major existing impacts (anthropogenic activities and infrastructure) that were observed during the 2025 field programme:

- The RSA is a rural agricultural landscape, characterised by extensive tracts of natural habitat, with localised patches of modified habitat (cultivated fields);
- Outside of crop growing, the primary agricultural land use is livestock farming with cattle and sheep;
- Linear infrastructure in the RSA includes gravel district roads, farms roads, powerlines and farm fences;
- Alien invasive species (AIS) were noted in the RSA; however, they are not abundant and typically colonise disturbed locations, such as the road verges, edges of cultivated field and other degraded locations; and
- Other anthropogenic activities and infrastructure that have resulted in small-scale and localised habitat modification include farm residences and various agriculture structures (barns).

7. Vegetation and Flora Assessment

7.1. Habitat Units

Based on data collected during the field programme, six primary habitat units comprising three natural habitat units and three modified habitat units, were identified across the RSA, and are relevant to the LSA:

Natural Habitats

- Natural Dry Grassland;
- Rocky Shrubland;
- Moist Grassland (incl. rivers and streams);

Modified Habitats

- Secondary Grassland;
- Cultivated Fields and Grass Pastures; and
- Alien Tree Stands.

Habitat units are described, with accompanying photographs, in the sections below**Error! Reference source not found.Error! Reference source not found.**. A habitat unit map for the LSA is shown in Figure 4.

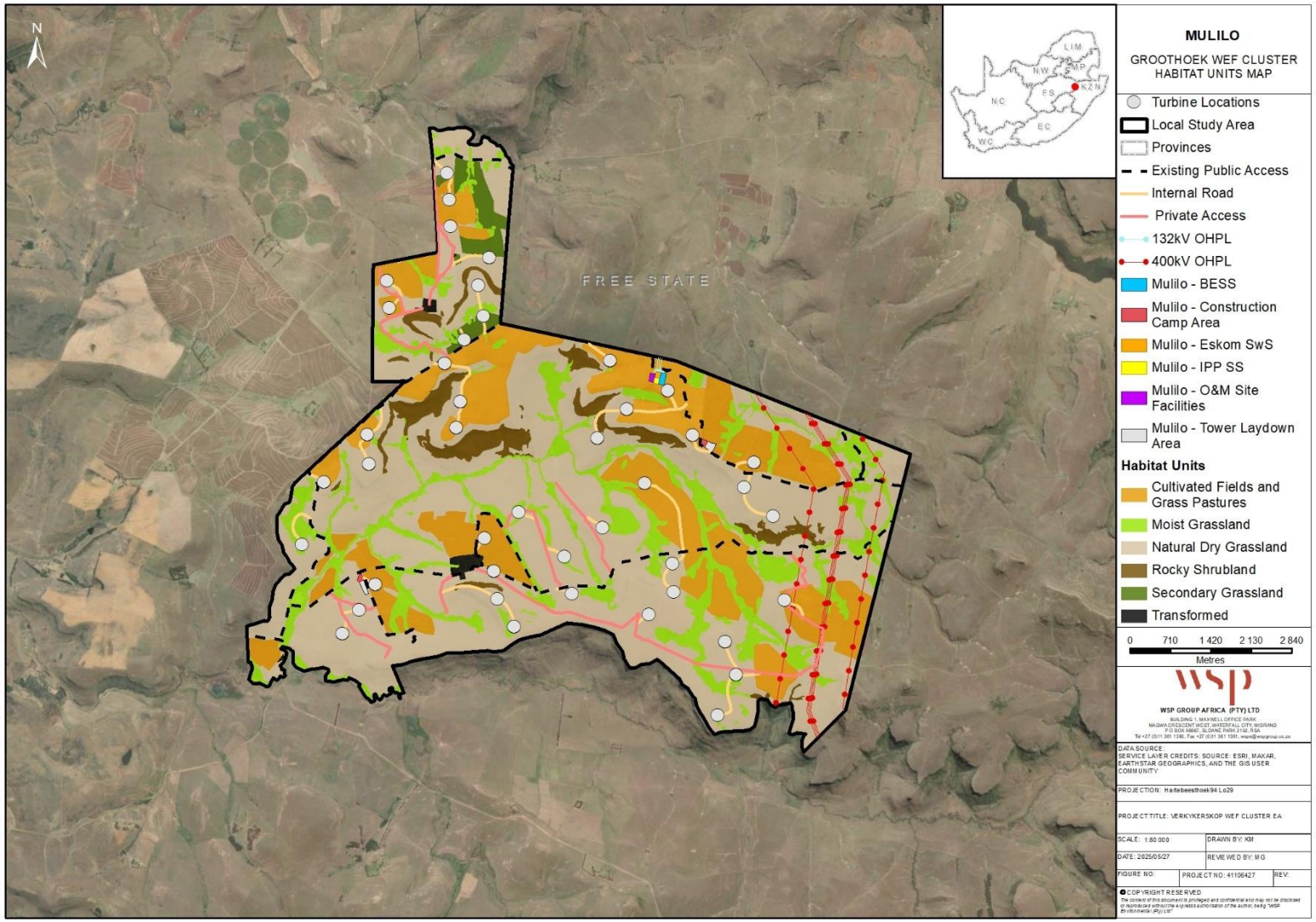


Figure 4: Habitat unit map of the local study area, showing the proposed infrastructure layout. Also shown is the existing Eskom overhead powerline.

7.1.1. Natural Dry Grassland

This is a large and variable habitat unit that covers the extensive rolling hills of the RSA. Structurally, vegetation is characterised by low closed grassland, as per Edwards (1983) structural classification.

Natural Dry Grasslands are characterised by a diverse flora assemblage, comprising a mixture of grasses and forb/herb species. Common grasses recorded include *inter alia*; various *Eragrostis* species such as *Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana* and *Eragrostis racemosa,* as well as *Aristida junciformis, Cymbopogon pospischilii, Sporobolus africanus, Themeda triandra* and *Tristachya leucothrix.*

Common herbs/forbs recorded include *inter alia*; *Berkheya onopordifolia, Berkheya setifera, Commelina africana, Helichrysum nudifolium* var*. nudifolium, Helichrysum rugulosum, Hilliardiella elaeagnoides and Richardia brasiliensis*.* Woody species generally occur at low abundances and as scattered individual small trees and shrubs, with denser woody aggregations present in transition areas between Natural Dry Grassland and areas of Rocky Shrubland. Common woody species recorded include *Diospyros lycioides* subsp. *lycioides, Leucosidea sericea, Searsia dentata, Searsia discolor* and *Seriphium plumosum* (*denotes an alien species).

Common declared alien invasive species recorded in this unit include *Verbena bonariensis* and *Verbena rigida.* Both taxa are listed as NEMBA Category 1b alien invasive species. For a list of all flora species recorded in this habitat unit during the field programme refer to Appendix C.

Sensitivity Aspects

- Natural Dry Grassland is a natural habitat unit, with generally low levels of disturbance;
- Extensive intact tracts of grassland are present and provide important habitat for a variety of flora and fauna. These areas also act as important ecological corridors, increasing local habitat connectivity and facilitating various ecological processes such as, *inter alia*, flora and fauna movement and dispersal;
- Although not recorded in the LSA, one Red List flora species, namely *Khadia carolinensis* (Vulnerable) was recorded in this habitat unit in the broader RSA (recorded in the Normandien WEF Project site). Habitat suitability assessments also suggest that several additional Red List flora species may also be present in this habitat unit;
- Several provincially Protected flora taxa were recorded in areas of Natural Dry Grassland; and
- Natural Dry Grasslands are therefore considered to have floristic importance and sensitivity.

Figure 5: Typical Natural Dry Grassland.

Figure 6: Extensive tracts of intact Natural Dry Grassland are present on-site.

7.1.2. Rocky Shrubland

Rocky Shrubland characterises many of the rocky hillsides, slopes and valleys in the RSA. Vegetation structure is variable and strongly dependent on aspect. As per Edwards (1983) structural classification, tall- to high closed shrubland characterises the cooler and moister south-facing hillsides and ridges, as well as the deeper valley areas. A more open vegetation structure, approximating tall open shrubland, typically occurs on the drier north-facing hillsides and ridges.

Compositionally, *Leucosidea sericea* is the dominant woody species in this unit and is particularly prevalent on moist south-facing hillsides and in certain valleys, where it often forms dense, almost mono-specific stands. *Leucosidea sericea* is a common bush encroacher that typically increases in abundance in response to high levels of livestock grazing. This species is generally less abundant on north-facing slopes, with other woody taxa more evident, including *Diospyros lycioides* subsp. *lycioides, Euclea crispa, Searsia dentata, Searsia pallens* and *Searsia pyroides.*

Other less abundant woody species recorded in this unit include *inter alia*; *Buddleja salviifolia, Calpurnia aurea, Cussonia paniculata, Halleria lucida, Gymnosporia buxifolia, Kiggelaria africana, Myrsine africana, Protea roupelliae* and *Rhamnus prinoides.*

Common species recorded in the herbaceous layer include various grasses, such as *Digitaria eriantha Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Eragrostis racemosa* and *Sporobolus africanus,* as well as forbs, such as *inter alia*; *Acalypha angustata, Berkheya setifera, Hermannia transvaalensis* and *Hermannia depressa.*

Declared alien invasive species recorded in this unit include *Cotoneaster franchetii* and *Opuntia ficus-indica.* Both taxa are listed as NEMBA Category 1b alien invasive species. For a list of all flora species recorded in this habitat unit during the field programme refer to Appendix C.

Sensitivity Aspects

- Rocky Shrubland is a natural habitat unit, with generally low levels of disturbance;
- In the grassland dominated habitat matrix, this well-wooded and rocky habitat unit significantly increases landscape-scale habitat heterogeneity, and provides important corridor and refugia habitat for a variety of flora and fauna;
- No national Red List flora species were recorded in this habitat unit. However, habitat suitability assessments suggest that several flora SCC may be present; and

- This habitat unit therefore is considered to have floristic importance and sensitivity.

Figure 7 South-facing hillside, dominated by Leucosidea sericea.

Figure 8: Rocky Shrubland below a rocky ridge/cliff face.

7.1.3. Moist Grassland

This is a broad habitat unit that encompasses the range of drainage features across the RSA, including rivers and stream channels, as well as other wetland type habitats.

In typical moist grassland habitat, vegetation structure typically comprises low- to tall closed grassland. Along certain river/stream sections that are characterised by an increase in woody taxa, vegetation structure ranges from tall-open shrubland to short-closed woodland (*sensu*. Edwards, 1983).

Common graminoid species along recorded include various reed, grass and sedge species, such as *Agrostis eriantha, Andropogon appendiculatus, Aristida junciformis, Cyperus congesta, Eragrostis curvula, Eragrostis gummiflua, Eragrostis plana, Leersia hexandra, Miscanthus junceus, Panicum schinzii, Paspalum distichum, Paspalum dilatatum*, Phragmites australis, Scirpoides burkei, Setaria sphacelata, Themeda triandra* and *Typha capensis.* Common forbs recorded in this habitat unit include *inter alia*; *Centella asiatica, Commelina africana, Chironia palustris, Gunnera perpensa, Helichrysum aureonitens, Helichrysum mundtii, Oenothera roseus*, Rumex crispus** and *Trifolium repens*.*

Common woody species occurring along rivers and streams include *Leucosidea sericea* (which can be dominant), as well as *Salix mucronata, Searsia pyroides* and the alien's *Salix babylonica, Populus* x *canescens* and *Populus nigra* trees*.* For a list of flora species recorded in this habitat unit during the field programme refer to Appendix C.

Declared alien invasive species recorded in this unit include *inter alia*; *Cirsium vulgare*, *Populus* x *canescens, Solanum sisymbriifolium* and *Verbena bonariensis.* Apart from *Populus* x *canescens*, which is listed as NEMBA Category 2, these taxa are all listed as Category 1b alien invasive species.

Sensitivity Aspects

- Moist Grassland is a natural habitat unit, with varying levels of anthropogenic disturbance mostly associated with historic cultivation and alien species establishment;

- Moist Grassland and associated watercourses habitats (rivers and streams) play a crucial role in maintaining terrestrial biodiversity, ecological processes and the hydrological functioning (e.g., filtration and flood attenuation) of the landscape;
- These habitats significantly increase landscape-scale habitat connectivity and thus provide important ecological corridors;
- No national Red List species were recorded in this habitat unit; however, several provincially Protected flora species were recorded, and habitat suitability assessments also suggest that several flora SCC are likely to be present; and
- Moist Grassland and the associated watercourse habitats are therefore considered to have floristic importance and sensitivity.

Figure 9: Typical moist grassland habitat.

Figure 10: Broad open water body.

Figure 11: Rocky mountain stream, flanked by Leucosidea sericea trees.

Figure 12: Stream flanked by Salix mucronata trees and moist grassland.

7.1.4. Secondary Grassland

Secondary Grassland habitat characterises former cultivated fields that have been abandoned and left fallow, and over several years have regenerated to form a secondary, but indigenous grassland vegetation community (commonly termed 'old lands').

Like undisturbed Natural Dry Grasslands, vegetation structure is low closed grassland (Edwards, 1983). Common grasses include *Aristida congesta* var*. congesta, Cynodon dactylon*, *Eragrostis plana, Eragrostis chloromelas, Eragrostis curvula* and *Sporobolus africanus.*

Common forbs are present in areas of this habitat unit, and include, *inter alia*; *Acalypha angustata Selago densiflora, Helichrysum callicomum, Helichrysum rugulosum, Helichrysum nudifolium* var. *nudifolium, Hermannia transvaalensis, Hypochaeris radicata, Richardia brasiliensis* and *Solanum elaeagnifolium.* For a list of flora species recorded in this habitat unit during the field programme refer to Appendix C.

Sensitivity Aspects

- Secondary Grassland is a modified habitat unit. Many of these areas have however, been stable for a long period, and as a result, retain some of the functional attributes of adjacent natural grasslands. They therefore provide supporting/buffering habitat for adjacent areas of natural habitat;
- No national Red List flora species were recorded in this habitat unit. Considering their disturbed nature, it is considered unlikely that any flora SCC are present; and
- Secondary Grasslands in the study area have low floristic importance or sensitivity.

Figure 13: Secondary Grassland habitat associated with a former cultivated field.

7.1.5. Cultivated Fields and Grass Pastures

Cultivated Fields and Grass Pastures are typically present in low-lying bottomland areas that are characterised by deep, moist soils in RSA. Some however, were noted in flat, high-lying areas.

Both Cultivated Fields and Grass Pastures are subject to regular anthropogenic disturbance. Cultivated agricultural fields are regularly ploughed, planted with crop plants (e.g. maize) and harvested.

Grass pastures have been planted with palatable indigenous grasses species, such as *Chloris gayana, Digitaria eriantha* and *Eragrostis curvula*, and are regularly mown and baled to provide forage for livestock.

Sensitivity Aspects

- Cultivated Fields and Pastures are a modified habitat unit;
- These areas have been, or are currently, subject to regular and intense anthropogenic disturbances;
- No flora SCC were recorded in this habitat unit and none are considered likely to be present; and
- Cultivated Fields and Grass Pastures have no floristic importance or sensitivity.

Figure 14: Cultivated field under maize production.

Figure 15: Recently mown and baled grass pasture.

7.1.6. Alien Tree Stands

Stands of alien trees are not abundant or extensive in the RSA. Structurally, this habitat unit comprises closed woodland, as per Edwards (1983). Common alien tree species noted include *Eucalyptus* species and *Populus x canescens*. Little indigenous vegetation is present in well-established alien tree stands.

Sensitivity Aspects

- Alien tree stands are a modified habitat;
- No flora SCC were recorded in this habitat unit, and none are likely to be present; and
- Alien Tree Stands have no floristic importance or sensitivity.

Figure 16: Stand of Eucalyptus trees.

Figure 17: Populus x canescens trees.

7.2. Floristics Analysis

7.2.1. Flora Species of Conservation Concern

In line with the internationally endorsed IUCN Red List Categories and Criteria, the Red List of South African Plants recognises three categories of threatened species, namely Critically Endangered (CR), Endangered (EN) and Vulnerable (VU), and five 'other categories of conservation concern' that are recognised as having high conservation importance, namely Near Threatened (NT), Critically Rare, Rare, Declining, and Data Deficient – Insufficient Information (DDD).

As they are subject to national and/or provincial environmental legislation and require specific conservation management, flora species listed on the NEMBA ToPS List (2007) or under Schedule 6 of the Free State Free State Nature Conservation Ordinance 8 of 1969, are also included as flora species of conservation concern and discussed in this section.

7.2.1.1. Red List Flora Species

During the wet season field survey, one flora species listed as threatened on the Red List of South African Plants was recorded in the RSA, namely *Khadia carolinensis* (Vulnerable) (shown in Figure 18).

Khadia carolinensis was recorded at two locations in Natural Dry Grassland (habitat shown in Figure 19) in the Normandien WEF project site. *Khadia carolinensis* was not recorded in the LSA for this study (i.e. in the Groothoek WEF Project site); however, suitable habitat is present on-site, and it is therefore possible that *Khadia carolinensis* is present in the LSA.

Several *Khadia carolinensis* plants were recorded at both locations in the RSA. There was also no evidence of any current or direct anthropogenic threats to these locations. The local population of *Khadia carolinensis* therefore appears to be both large and stable. Figure 22 shows the two *Khadia carolinensis* locations in the Normandien WEF project site in the RSA, with a 200 m exclusion buffer area around each, as prescribed by SANBI (Driver, *et al*., 2009).

Khadia carolinensis is range-restricted and occurs in Highveld grasslands at around 1700 m (Lötter *et al*., 2007a). It occurs on well-drained sandy loam soils, amongst rock outcrops, or along the edges of sandstone sheets (Lötter *et al*., 2007a). The AOO is estimated at 28.34 km^2 (SANBI, 2020). Any impacts on *Khadia carolinensis* associated with the proposed Project should be avoided.

Based on reviewed literature and data sources, an additional 13 nationally threatened or Near Threatened flora species occur or potentially occur in the RSA/LSA. These are listed in Table 4, along with their conservation statuses, habitat preferences and a probability of occurrence, based on habitat suitability.

7.2.1.2. Flora Species List on the NEMBA ToPS List (2007)

No flora species listed on the NEMBA ToPS List (2007) were recorded in the RSA during the field programme. However, reviewed literature indicates that one species, *Merwilla plumbea* may be present. *Merwilla plumbea* is listed as Vulnerable on the NEMBA ToPS List (2007) and is also listed as Near Threatened on the national Red List.

7.2.1.3. Protected Flora Species

Several flora species listed as provincially Protected on the Schedule 6 of the Free State Free State Nature Conservation Ordinance 8 of 1969 were recorded during the field survey, including *inter alia* *Boophone disticha* (Figure 20) and *Eucomis humilis* (Figure 21). These are listed in Table 5, along with other provincially Protected flora species that potentially occur in the RSA/LSA, based on reviewed literature and datasets.

Figure 18: Khadia carolinensis (Vulnerable)

Figure 19: Habitat where Khadia carolinensis was recorded.

Figure 20: Boophone disticha (Protected, FS)

Figure 21: Eucomis humilis (Protected, FS)

Table 4: Nationally threatened and Near Threatened flora species that occur or potentially occur on-site

Family	Scientific Name[#]	National Red List Status	NEMBA ToPS List (2007)	Free State Conservation Status	Habitat Preferences	Probability of Occurrence in LSA
Aizoaceae	*Khadia carolinensis*	Vulnerable	-	-	Range-restricted species, occurring in Highveld grasslands between 1700m. AOO is estimated at 28.34 km2 (SANBI, 2020). Favours on well-drained sandy loam soils amongst rock outcrops, or along the edges of sandstone sheets (Lötter *et al*., 2007)	Probable - suitable habitat present. (Recorded – in RSA in the Normandien WEF Project site)
Aizoaceae	*Khadia alticola*	Rare	-	-	A high-altitude species (above 2000 m), that occurs in montane grassland in shallow, sandy humus -rich soil, as well as crevice's between rock plates (Victor, 2005)	Probable - suitable habitat in LSA.
Lauraceae	*Ocotea bullata*	Endangered	-	-	Species has a wide but disjunct distribution, with >53% reduction in range due to exploitation. Favours high evergreen Afromontane forest (Williams, *et al*., 2008a).	Unlikely – no suitable habitat present.
Fabaceae	*Lotononis amajubica*	Rare	-	-	Habitat specialist, favouring well-drained, high-altitude grassland between 1600-1800 m. Species can be locally very common (Lötter *et al*., 2013).	Probable – suitable habitat present.
Scrophulariaceae	*Zaluzianskya distans*	Rare	-	-	Widespread, but rare species. EOO is estimated at 25 286 km^2. Occurs in damp, partially shaded locations in rocks or montane scrub. Also found along wooded watercourses (van Staden, 2018).	Probable – suitable habitat present.
Rosaceae	*Prunus africana*	Vulnerable	-	-	Forest species, favouring *inter alia*, inland mistbelt and Afromontane forests up to 2100 m. Population estimated at 10 000 mature trees (Williams *et al*., 2022).	Unlikely – no suitable habitat present

Family	Scientific Name[#]	National Red List Status	NEMBA ToPS List (2007)	Free State Conservation Status	Habitat Preferences	Probability of Occurrence in LSA
Ranunculaceae	*Anemone fanninii*	Near Threatened	-	-	Heavily exploited, with an estimated population decline of 20%. Species occurs in high altitude grassland habitats (Williams *et al.*, 2024).	Possible – suitable habitat present.
Hyacinthaceae	*Eucomus bicolor*	Near Threatened	-	Protected	Heavily exploited species. Favours well-drained grassed mountain slopes, watercourses and rocky cliffs. Occurs at altitudes up to 2800 m (Williams, *et al.,* 2008b).	Probable – suitable habitat present.
Polygalaceae	*Polygala praticola*	Vulnerable	-	-	Species is known from five to ten locations, with an EOO of 19 466 km^2. Occurs in highly variable grasslands (Mtshali, *et al.*, 2016).	Probable – suitable habitat present.
Hyacinthaceae	*Merwilla plumbea*	Near Threatened	Vulnerable	Protected	Favours rocky grassland areas on steep well drained slopes between 300 – 2500 m (Williams, *et al.,* 2008c).	Probable – suitable habitat present.
-	Sensitive species 851	Vulnerable	-	-	EOO is between 455 and 11 158 km^2, and thought to occur at less than 10 locations, with an AOO estimated at 3.06 km^2 (SANBI, 2020). Prefers moist areas in undulating grassland.	Probable – suitable habitat present.
-	Sensitive species 1248	Vulnerable	-	-	Found in open woodland and steep rocky hills in shady situations at low- and medium altitudes. No EOO for this species is listed, but its AOO is estimated at 30.70 km^2 (SANBI, 2020).	Probable – suitable habitat present.
-	Sensitive species 998	Endangered	-	-	Favours forest margins, drainage lines and islands within wetlands. Also occurs on west and south facing mountain slopes.	Probable – suitable habitat present.
-	Sensitive species 1252	Vulnerable	-	Protected	Moist bushveld habitats, including wooded mountain kloofs. AOO estimated at 73.01 km^2 (SANBI, 2020).	Probable – suitable habitat present.

[#]The names of specific taxa that are regarded as being susceptible to overexploitation have been redacted and are not presented in this report. These species are referred to by their assigned 'sensitive species number', *a*s per the species assessment guidelines (SANBI, 2020).

Family	Scientific Name[#]	National Red List Status	NEMBA ToPS List (2007)	Free State Conservation Status	Habitat Preferences	Probability of Occurrence in LSA
Source: List based on data from BODATSA and Environmental Screening Report Output.						

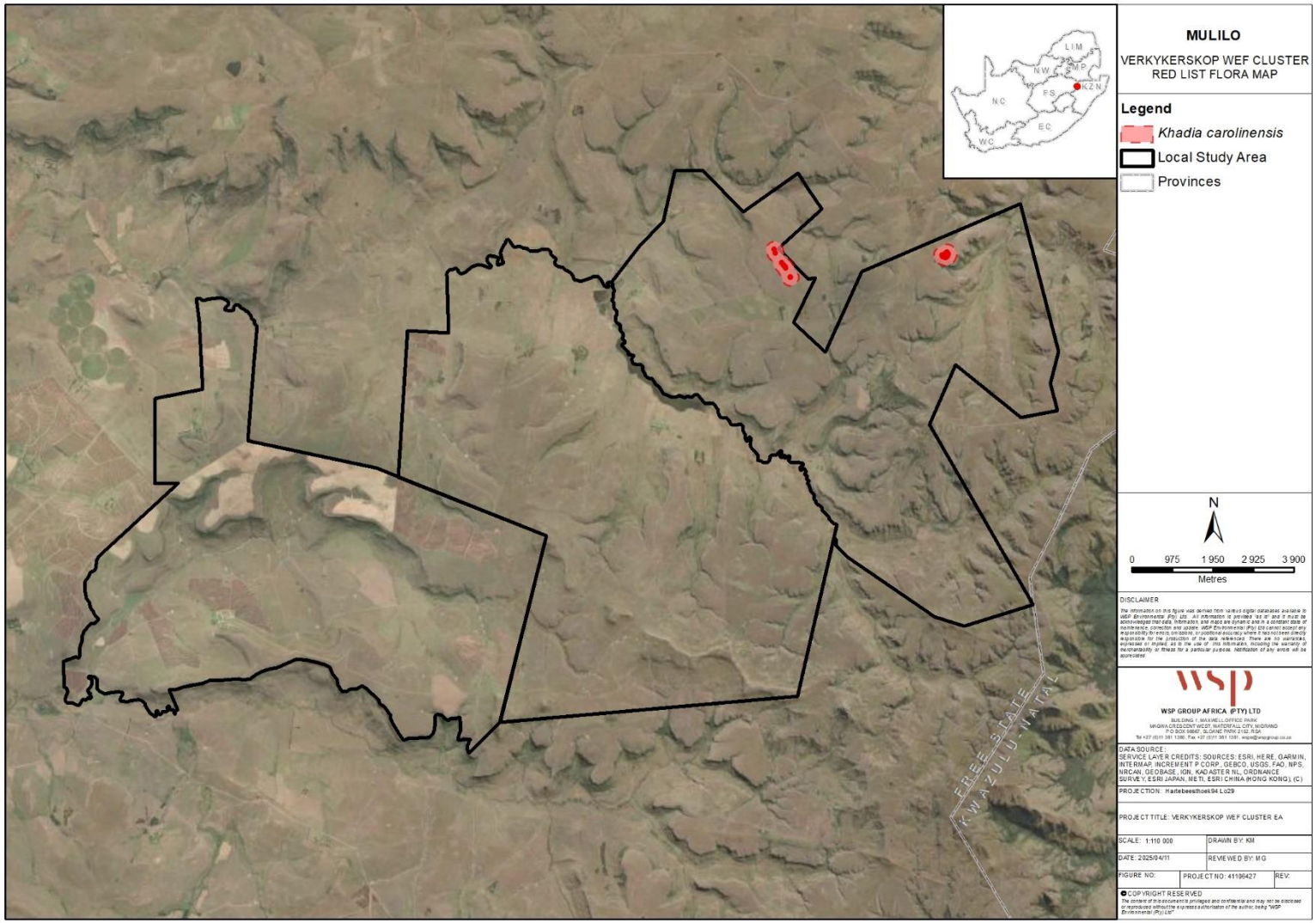


Figure 22: Location of the observed Khadia carolinensis populations in the Normandien WEF project site in the regional study area.

Table 5: Protected flora species recorded or potentially occurring in the RSA and LSA.

Family	Scientific Name	National Red List Status	Free State Conservation Status	2025 Field Record
Agapanthaceae	*Agapanthus cf. campanulatus*	Least Concern	Protected	Recorded
Amaryllidaceae	*Apodolirion buchananii*	Least Concern	Protected	
Amaryllidaceae	*Boophone disticha*	Least Concern	Protected	Recorded
Amaryllidaceae	*Brunsvigia radulosa*	Least Concern	Protected	Recorded
Amaryllidaceae	*Cyrtanthus breviflorus*	Least Concern	Protected	
Amaryllidaceae	*Crinum bulbispermum*	Least Concern	Protected	Recorded
Amaryllidaceae	*Haemanthus humilis* subsp. *hirsutus*	Least Concern	Protected	
Amaryllidaceae	*Nerine angustifolia*	Least Concern	Protected	Recorded
Apocynaceae	*Asclepias cucullata*	Least Concern	Protected	
Apocynaceae	*Asclepias macropus*	Least Concern	Protected	
Aquifoliaceae	*Ilex mitis var. mitis*	Least Concern	Protected	
Araceae	*Zantedeschia albomaculata*	Least Concern	Protected	Recorded
Araliaceae	*Cussonia paniculata*	Least Concern	Protected	Recorded
Asphodelaceae	*Kniphofia porphyrantha*	Least Concern	Protected	
Asphodelaceae	*Kniphofia cf. baurii*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum acutatum*	Least Concern	Protected	
Asteraceae	*Helichrysum adenocarpum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum albo-brunneum*	Least Concern	Protected	
Asteraceae	*Helichrysum appendiculatum*	Least Concern	Protected	
Asteraceae	*Helichrysum aureum* var. *monocephalum*	Least Concern	Protected	
Asteraceae	*Helichrysum argentissumum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum aureonitens*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum cephaloideum*	Least Concern	Protected	
Asteraceae	*Helichrysum callicomum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum chionosphaerum*	Least Concern	Protected	
Asteraceae	*Helichrysum confertifolium*	Least Concern	Protected	
Asteraceae	*Helichrysum cooperi*	Least Concern	Protected	
Asteraceae	*Helichrysum hypoleucum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum melanacme*	Least Concern	Protected	
Asteraceae	*Helichrysum miconiifolium*	Least Concern	Protected	
Asteraceae	*Helichrysum monticola*	Least Concern	Protected	

Family	Scientific Name	National Red List Status	Free State Conservation Status	2025 Field Record
Asteraceae	*Helichrysum mundtii*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum nudifolium* var. *nudifolium*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum opacum*	Least Concern	Protected	
Asteraceae	*Helichrysum oreophilum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum pallidum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum psilolepis*	Least Concern	Protected	
Asteraceae	*Helichrysum rugulosum*	Least Concern	Protected	Recorded
Asteraceae	*Helichrysum spiralepis*	Least Concern	Protected	
Asteraceae	*Helichrysum splendidum*	Least Concern	Protected	
Asteraceae	*Helichrysum subglomeratum*	Least Concern	Protected	
Asteraceae	*Helichrysum sutherlandii*	Least Concern	Protected	
Ericaceae	*Erica caffrorum*	Least Concern	Protected	
Ericaceae	*Erica caffrorum* var. *caffrorum*	Least Concern	Protected	
Ericaceae	*Erica cerinthoides* var. *cerinthoides*	Least Concern	Protected	
Ericaceae	*Erica oatesii* var. *oatesii*	Least Concern	Protected	
Ericaceae	*Erica paniculata*	Least Concern	Protected	
Hyacinthaceae	*Eucomis autumnalis*	Least Concern	Protected	Recorded
Hyacinthaceae	*Eucomis humilis*	Least Concern	Protected	Recorded
Iridaceae	*Dierama pictum*	Least Concern	Protected	
Iridaceae	*Gladiolus crassifolius*	Least Concern	Protected	
Iridaceae	*Gladiolus ecklonii*	Least Concern	Protected	
Iridaceae	*Gladiolus woodii*	Least Concern	Protected	
Iridaceae	*Gladiolus* species (no flowers)	Least Concern	Protected	Recorded
Iridaceae	*Hesperantha baurii* subsp. *baurii*	Least Concern	Protected	
Iridaceae	*Hesperantha coccinea*	Least Concern	Protected	
Iridaceae	*Watsonia confusa*	Least Concern	Protected	
Iridaceae	*Watsonia* species (no flowers)	Least Concern	Protected	Recorded
Orchidaceae	*Disa baurii*	Least Concern	Protected	
Orchidaceae	*Disa brevicornis*	Least Concern	Protected	
Orchidaceae	*Disa cooperi*	Least Concern	Protected	
Orchidaceae	*Disa versicolor*	Least Concern	Protected	Recorded
Orchidaceae	*Disperis fanniniae*	Least Concern	Protected	
Orchidaceae	*Eulophia hians* var. *hians*	Least Concern	Protected	
Orchidaceae	*Eulophia ovalis* var. *ovalis*	Least Concern	Protected	
Orchidaceae	*Habenaria dives*	Least Concern	Protected	
Orchidaceae	*Habenaria epipactidea*	Least Concern	Protected	
Orchidaceae	*Habenaria laevigata*	Least Concern	Protected	

Family	Scientific Name	National Red List Status	Free State Conservation Status	2025 Field Record
Orchidaceae	*Holothrix incurva*	Least Concern	Protected	
Orchidaceae	*Pterygodium dracomontanum*	Least Concern	Protected	
Orchidaceae	*Pterygodium nigrescens*	Least Concern	Protected	
Orchidaceae	*Satyrium cristatum* var. *longilabiatum*	Least Concern	Protected	
Orchidaceae	*Satyrium longicauda* var. *longicauda*	Least Concern	Protected	
Proteaceae	*Protea roupelliae*	Least Concern	Protected	Recorded

7.2.2. Declared Alien Invasive Species

Seventeen NEMBA declared alien invasive plant species were recorded in the RSA during the field programme. These are listed in Table 6, along with their growth form and NEMBA Category.

Table 6: Declared alien invasive species recorded during the field survey.

Scientific Name	Common Name	Growth Form	NEMBA Category
Acacia mearnsii	Black Wattle	Tree	2
Acacia dealbata	Silber Wattle	Tree	2
Cirsium vulgare	Spear Thistle	Herbaceous forb	1b
Datura stramonium	Common Thorn Apple	Herbaceous forb	1b
Eucalyptus camaldulensis	Gum	Tree	1b or 2
Morus alba	White Mulberry	Tree	3
Opuntia ficus-indica	Sweet Prickly Pear	Succulent Tree	1b
Pennisetum clandestinum	Kikuyu	Graminoid	1b
Pinus patula	Patula pine	Tree	2
Populus x canescens	Grey Poplar	Tree	2
Pyracantha angustifolia	Yellow Fire-thorn	Tree	1b
Solanum elaeagnifolium	Potato Creeper	Herbaceous forb	1b
Solanum sisymbriifolium	Wild Tomato	Herbaceous forb	1b
Verbena brasiliensis	Brazilian Verbena	Herbaceous forb	1b
Verbena bonariensis	Wild Verbena	Herbaceous forb	1b
Verbena rigida	Veined Verbena	Herbaceous forb	1b
Xanthium spinosum	Spiny Cocklebur	Herbaceous forb	1b

7.2.3. Flora of Medicinal Value

Twenty-five flora species recorded in the RSA have recognised medicinal value. These are listed in Table 7, accompanied by a description of their purported use, as per Van Wyk *et al*., (2009).

Table 7: Flora species recorded in the RSA that have recognised medicinal value.

Scientific Name	Medicinal Use*
Asparagus laricinus	Used in the treatment of tuberculosis, kidney ailments and rheumatism.
Agapanthus cf. campanulatus	Oral decoction that is used as a post-natal medicine.
Boophone disticha	Bulbs scales are used to treat boils and septic wounds, as well as alleviate pains.
Centella asiatica	Used to treat a variety of infirmities including leprosy, wounds, cancer, fever and syphilis.
Crinum bulbispermum	Used to treat colds and flu.
Datura stramonium	Relieves asthma and acts to reduce pain. Weak infusions are used as an aphrodisiac.
Dicoma anomala	Treats a variety of aliments including fever, stomach issues, high blood pressure and cancer.
Helichrysum species	Treats a variety of afflictions, including coughs, colds, fever, headaches and infections.
Hilliardiella aristata	Infusions taken to treat stomach ailments, rheumatism, dysentery and diabetes.

Scientific Name	Medicinal Use*
Hypoxis species	Infusions of the corm are used to treat dizziness, bladder disorders and insanity.
Eucomis species	Used to treat lower back pain, fractures, urinary diseases, stomach aches, colic, syphilis, and to facilitate childbirth.
Gunnera perpensa	Used to induce labour and as an antenatal medication to tone the uterus.
Heteromorpha arborescens	Used as a remedy for tuberculosis, abdominal pains, colic and to treat mental disorders.
Mentha longifolia	Treats various respiratory ailments including coughs, colds and asthma.
Melianthus comosus	Leaf decoctions are used to treat septic wounds, sores, bruises, back ache and rheumatic joints.
Leonotis ocymifolia	Smoked for the relief of epilepsy, while leaves and roots are used to treat snake bites and other stings.
Pelargonium luridum	Taken orally to treat diarrhoea and dysentery.
Pellaea calomelanos var. calomelanos	Used to treat boils and abscesses and for internal parasites
Pentanisia prunelloides	Decoctions are used to treat burns, swellings, sore joints and rheumatism.
Rhoicissus tridentata	Root or tuber infusions are used as enemas.
Rumex crispus	Used as a remedy for internal parasites, as well as vascular diseases and internal bleeding.
Salix mucronata	Used as a remedy for rheumatism and fever.
Scabiosa columbaria	Used to treat colic and heartburn.
Typha capensis	Decoctions used to treat venereal disease, as well as diarrhoea, dysentery and enhance male libido.
Xysmalobium undulatum	Remedy for diarrhoea and colic.
*Medicinal use, as per Van Wyk, *et al*. (2009).	

8. Key Ecological Attributes and Processes

8.1. Habitat Corridors, Resources and Refugia

The LSA and broader RSA comprise extensive tracts of intact natural habitat, occurring on a highly varied topography that is characterised by low hills and mountains, are bisected by numerous drainage features. Areas of modified habitat (mostly Cultivated Fields) are present, but these are mostly confined to low-lying areas and some small upland sites.

Prominent linear infrastructure noted during the field programme included gravel district roads, farms roads and tracks, powerlines, as well as numerous farm fences. Although these linear features have caused some degree of habitat fragmentation, overall habitat connectivity remains very high across the landscape due to the extensive areas of undisturbed natural habitat.

The Rocky Shrubland habitat unit is characterized by acute altitudinal changes, exposed rocks, and indigenous woody vegetation, which in the general grassland-dominated habitat matrix, significantly increases habitat heterogeneity and provides diverse micro-habitats and refugia for flora and fauna.

Amongst other impacts, the proposed Project will impact local habitat connectivity through habitat loss and fragmentation, and this may affect various ecological processes, such as *inter alia*, wildfire patterns, fauna movement and foraging, and flora propagule dispersal.

8.2. Dynamic Ecological Processes and Drivers of Change

The following notes summarise the key ecological processes and drivers of change that are present in the landscape and their possible influence on the character of terrestrial vegetation and flora.

8.2.1. Wildfire – Grassland Burning

Fire is a natural, albeit often human initiated, disturbance agent in grassland ecosystems. Mesic Highveld Grasslands are considered fire-prone and fire-dependent landscapes, and fire is essential to the maintenance of biodiversity patterns and ecological processes (SANBI, 2013). Wildfires have several key ecological effects with respects to terrestrial biodiversity, including:

- Removal of moribund vegetation and increasing plant productivity and palatability, which improves grazing for wild herbivores, and stimulates germination / flowering of fire-adapted flora species (e.g., certain orchid species);
- Controls the encroachment of both alien and indigenous woody plant species and weeds; and
- Increases overall habitat heterogeneity by creating a structural mosaic of tall- and short grassland and closed- and open wooded areas.

Notwithstanding the positive ecological benefits of fire, wildfires that are too frequent, or too intense, can have negative consequences for flora and fauna populations. These include the killing of fauna species (typically slow-moving taxa, or taxa trapped by fences), and the homogenisation of on-site habitat, which can limit the availability of key adaptive resources.

Fire is considered an important driver of change. It is anticipated that the proposed Project may result in altered wildfire patterns due to increased habitat fragmentation. It is also possible that the number of accidental fires initiated from shorting/faulty electrical infrastructure associated with the proposed Project may increase. Changes in local fire may impact vegetation productivity, which may affect the local fauna and flora diversity community, including SCC.

8.2.2. Herbivory - Livestock Grazing and Trampling

High levels of grazing (overgrazing) and trampling by herbivores is a common cause of dryland degradation (Scholes, 2009). Overgrazing occurs when herbivores (both wildlife and domestic) are kept at excessive stocking rates and/or are able to concentrate their grazing to a limited foraging area, without suitable rest periods. A common degradation syndrome that is linked to overgrazing, at least in part, is a change in plant species composition. In grassland habitats, this typically manifests as a reduction in palatable grass species and a reduction in grassland productivity (Scholes, 2009). Excessive cattle grazing and trampling can also cause soil erosion and gulley formation and modify and homogenise vegetation structure.

Livestock grazing and trampling are considered important drivers of change. However, it is unlikely to that proposed Project activities will alter livestock grazing patterns.

8.2.3. Alien Invasive Species Colonisation

Several alien invasive plant species were recorded on-site during the field programme. These have the potential to spread into areas of natural habitat, where they may competitively exclude many indigenous species. This will have several deleterious impacts on the integrity and function of these habitats, such as *inter alia*:

- A loss of natural habitat and floristic diversity, with the resulting habitat patches unable to support diverse flora and fauna communities;
- A reduction in grass productivity for grazing herbivores, and
- Increased exposed soil surfaces and incidences of erosion.

The spread of alien invasive vegetation is therefore considered a significant driver of change, and one capable of negatively impacting terrestrial biodiversity. The proposed Project will create disturbed sites where alien invasive species could establish and this will need to be managed.

9. General Sensitivity and Analysis of Site Ecological Importance

The DFFE National Web Based Screening Tool rated the Plant Species Theme for the LSA as 'Medium' sensitivity, based on the potential presence of several flora SCC (listed in Section 1.4).

One Red List flora species was observed in Natural Dry Grassland in the RSA during the field programme, *viz. Khadia carolinensis* (Vulnerable), and habitat suitability assessments indicate that other flora SCC, including some of the taxa highlighted by the screening tool, may occur on-site. The findings of this study therefore indicate that the sensitivity for the Plant Species Theme is 'High'.

The ecological importance (SEI) of identified habitat units were assessed using the SANBI (2020) protocol (refer to Section 3.7 and Appendix B for the methodology). The results of the assessment are presented in Table 8 and shown in Figure 23.

Table 8: Site Ecological Importance of habitat units

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Natural Dry Grassland	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species (=*Khadia carolinensis*, VU A3c) >50% of receptor contains natural habitat to support SCC.	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as a functional ecological corridor. Limited road network between intact habitat patches. Only minor current negative ecological impacts (livestock grazing), with no signs of major disturbance.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Rocky Shrubland	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species. >50% of receptor contains natural habitat to support SCC.	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as a functional ecological corridor. Only minor current negative ecological impacts (livestock grazing), with no signs of major disturbance.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	HIGH
Moist Grassland	MEDIUM: Confirmed or highly likely occurrence of CR, EN, VU species.	VERY HIGH: Very large (>100 ha) intact area for any conservation status of ecosystem type.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species	HIGH

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
	>50% of receptor contains natural habitat to support SCC.	High habitat connectivity serving as a functional ecological corridor. Only minor current negative ecological impacts (livestock grazing).		composition and functionality	
Secondary Grassland	LOW: No confirmed populations of SCC. < 50% of receptor contains natural habitat.	LOW: Good habitat connectivity, with potentially functional ecological corridors and a regularly used road network. BUT, Several major past impacts (=ploughing).	LOW	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality	LOW
Cultivated Fields	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Alien Tree Stands	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW

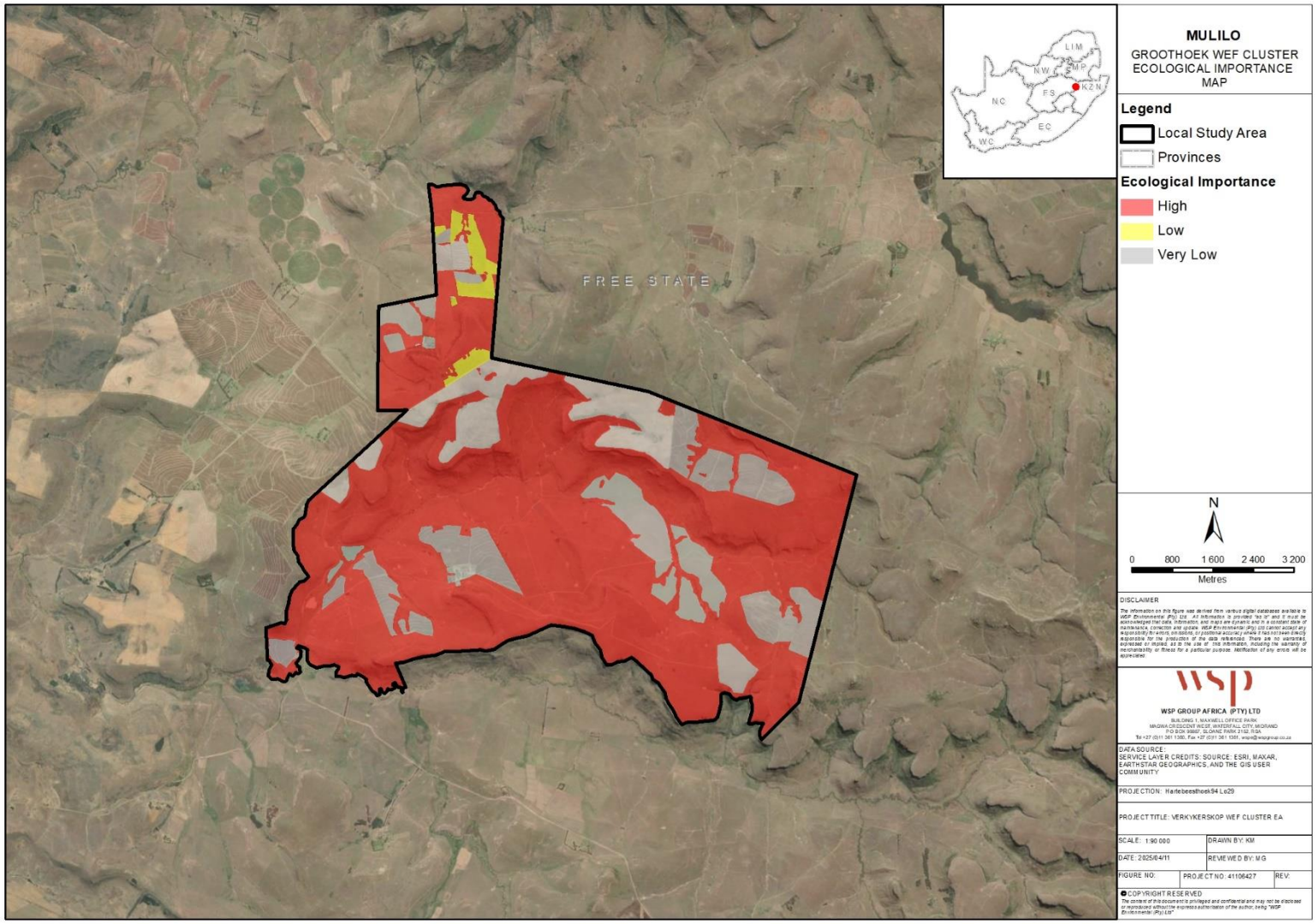


Figure 23: Site Ecological Importance of the local study area.

10. Impact Assessment

10.1. Impact Assessment Methodology

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3] as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e., residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] presented in Table 9.

Table 9: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action

[1] Impacts that arise directly from activities that form an integral part of the Project.
[2] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[3] Secondary or induced impacts caused by a change in the Project environment.
[4] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects
[5] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Medium**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Medium**	**High**	**Very High**

10.2. Impact Mitigation

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then

considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in Figure 24 below.

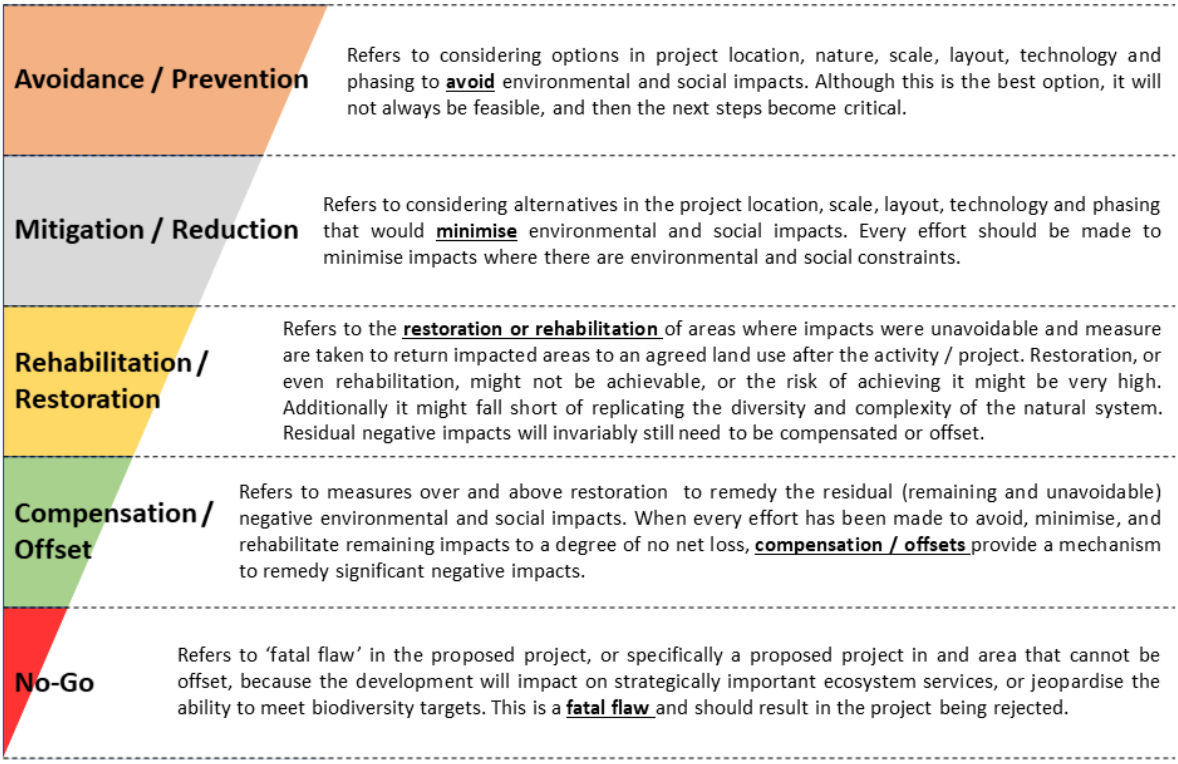


Figure 24: Mitigation Sequence/Hierarchy

A discussion on assessed impacts for each phase (i.e., Construction Operational and Decommissioning) of the proposed Project is provided in the sections below, along with an analysis of anticipated cumulative impact in Section 10.3.4. A summary table presented in Table 11.

This impact assessment section should be read in conjunction with the impact assessments presented in the Animal Species Specialist Assessment and Terrestrial Biodiversity Specialist Assessment reports.

10.3. Assessment of Impacts on Terrestrial Flora

10.3.1. Construction Phase

10.3.1.1. Direct loss and disturbance of natural habitat

Habitat loss refers to the removal or complete degradation of natural habitat. In terrestrial ecosystems, this primarily occurs through vegetation clearing and bulk earth works during construction. Habitat disturbance refers to the modification of habitat to the extent that it loses important functionality. These impacts can negatively impact the viability of flora occurring in the study area, including SCC. The proposed Project will result in the clearing of natural vegetation for infrastructure development.

Based on the placement of currently mapped proposed turbine, road and supporting infrastructure, it is anticipated that at least 99.61 ha of natural habitat is likely to be directly impacted by construction activities, with Table 10 presenting the approximate extent of habitat loss and disturbance for each habitat unit. The current proposed Project layout in relation to the identified habitat units is shown in Figure 25.

The impact prior to further mitigation is considered to be of high magnitude. Duration of impact will be permanent, and habitat within and potentially adjacent to the development footprints (local) will be impacted. Probability is rated definite. This results in an impact of "high" significance.

Several management/mitigation measures can be taken to minimise impact significance, including: where possible repositioning turbines and internal roads to areas of modified habitat to avoid directly impacting natural habitat; in areas of natural habitat, in-field micro-siting of turbine and road footprints to already disturbed sites; minimising disturbance footprints to the absolute necessary for construction and operational purposes; and, rehabilitating all disturbed areas after construction.

With the application of these, and other recommended mitigation measures, impact magnitude can be reduced to medium, and it can be confined to the site scale. Duration can be reduced to the long-term, and probability to medium. This results in an after-mitigation impact of "Medium" significance.

Table 10: Indicative extent of possible impacts on the identified habitat units, based on the proposed Project layout.

Habitat Unit	Approx. Extent in Local Study Area (Ha)	Approx. Extent of Habitat Loss & Disturbance (Ha)
Natural Dry Grassland	4489.38	88.62
Rocky Shrubland	306.70	0.65
Moist Grassland	1096.54	10.34
Secondary Grassland	135.8	2.72
Cultivated Fields and Grass Pastures	1905.45	53.30
Alien Tree Stands	0.0	0.0

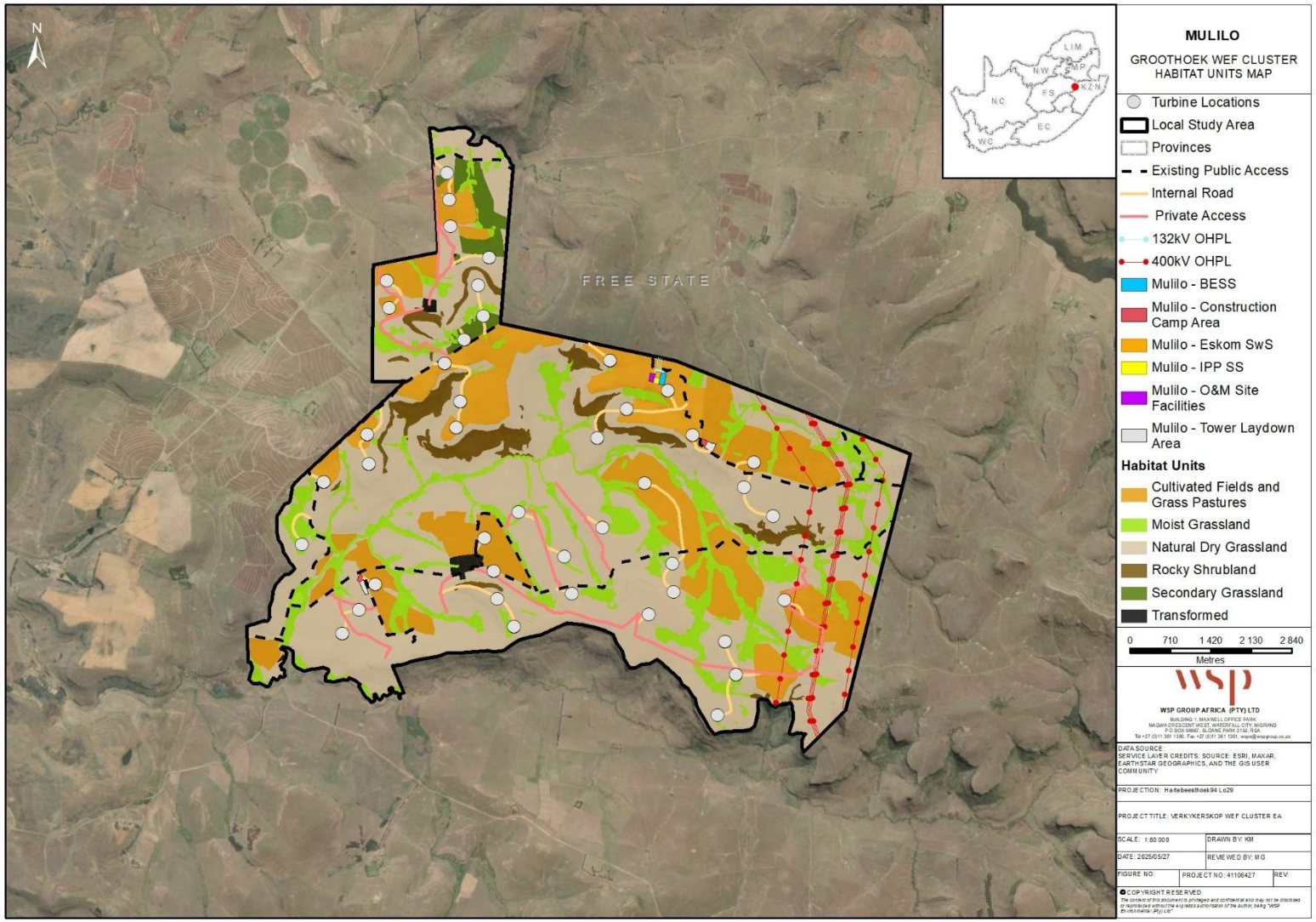


Figure 25: Habitat units and the currently proposed infrastructure layout (also shown is the existing Eskom overhead powerline).

10.3.1.2. Fragmentation reducing natural habitat connectivity and integrity

Habitat fragmentation is caused when vegetation clearing and/or the development of infrastructure (e.g., roads and fences) result in the partitioning of habitat into smaller, discontinuous patches. This leads to altered habitat configuration that typically manifests as an increase in patch number and isolation, yet a decrease in overall patch size. These alterations change the ecological properties of remaining patches (edge effects) and can affect various ecological processes (e.g. fire patterns) and metapopulation dynamics, such as flora pollination and propagule dispersal. This can, in turn, affect flora species richness and population stability.

The proposed access and internal road network is mostly aligned with existing farm roads. However, existing road upgrades coupled with the cutting of the proposed new access roads is likely to cause some fragmentation of natural habitat, and this will reduce habitat connectivity, which may have negative ecological impacts including *inter alia*, increased edge-effect disturbances and altered wildfire patterns.

Prior to mitigation, this impact has a very magnitude, permanently affecting natural habitat within and potentially adjacent to the development footprint (local). It is also considered to have a medium probability, resulting in an impact of "Medium" significance.

Various mitigation measures can be implemented to habitat fragmentation, including: aligning access roads with existing access roads and farm tracks; in-field micro-siting of new roads to already disturbed sites; minimising the clearance footprint to the minimum area required for construction and operational purposes; and, rehabilitating all disturbed footprints.

With these measures, impact magnitude can be reduced to medium. Duration can be reduced to the long-term, and probability to low, but spatial scale will remain local. This results in a residual impact of "Low" significance.

10.3.1.3. Loss of flora species of conservation concern

Khadia carolinensis (Vulnerable) was recorded at two locations in Natural Dry Grassland in the Normandien WEF project site in the RSA during the field programme. Although *Khadia carolinensis* was not recorded in the LSA for this study, habitat suitability assessments indicate that it probable that this species, along with other Red List flora species, may be present on-site. It is also noted that several provincially Protected flora species were also recorded during the field survey. It is therefore possible that flora SCC will be present in the proposed infrastructure footprints, and potentially directly lost/damaged during construction phase vegetation clearing and earth works.

Before mitigation, the loss of flora SCC has a very high magnitude. Duration is immediate and it has a very high probability of occurrence. The spatial extent of the impact is at the local scale. Prior to mitigation, this impact is rated of "medium" significance.

This impact can be effectively mitigated through the successful of mitigation measures, including *inter alia*:

- Conducting additional walkdown surveys of proposed infrastructure footprints to identify and further delineate locations of Red List flora and provincially protected flora species;

- Re-siting proposed infrastructure outside a 200 m buffer around the *Khadia carolinensis* locations, as well as any other locations of Red List recorded on-site, as prescribed by SANBI (2020); and
- Rescuing and relocating provincially protected flora species occurring within proposed infrastructure footprints to adjacent areas of suitable habitat.

With the application of mitigation, this impact can be reduced to a medium magnitude, while duration will remain of immediate. Spatial extent will be reduced to the site only, but probability will be reduced to low. After mitigation, this impact is rated to be of "Low" significance.

10.3.1.4. Establishment and spread of alien invasive species

Seventeen NEMBA listed AIS have been recorded during the field survey. Habitat disturbances caused by vegetation clearing and earth works during construction can facilitate the establishment and spread of these AIS. Alien plant infestations can spread exponentially, suppressing or replacing indigenous vegetation. This may impact ecological integrity and functioning and terrestrial biodiversity, which may impact flora SCC.

Before mitigation, impact magnitude is high, while the duration is long term, and the impact has a high probability of occurrence. The spatial extent of AIS spread is local. Prior to mitigation, the establishment and spread of AIS is rated an impact of "medium" significance.

This impact is relatively easy to mitigate though the implementation of an AIS control programme during the construction phase. This impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only and the probability of the impact occurring as predicted would be reduced to low. After mitigation, this impact is rated to be of "Low" significance.

10.3.2. Operational Phase

10.3.2.1. Establishment and spread of alien invasive species

The potential establishment and spread of AIS will continue to be an impact of concern during the operational phase.

Before mitigation, impact magnitude is high, while duration is long-term and the impact has a medium probability of occurring as predicted. The spatial extent of alien invasive species spread is local. Prior to mitigation, the establishment and spread of alien invasive species is rated an impact of "medium" significance.

With the continued implementation of an active alien species control programme during the operational phase this impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only and probability at low. After mitigation, this impact is rated to be of "Low" significance.

10.3.3. Decommissioning Phase

10.3.3.1. Establishment and spread of alien invasive species

As Project infrastructure is dismantled and removed from site during the decommissioning phase, the associated disturbances are likely to facilitate additional alien invasive species colonisation and spread from disturbed sites.

Before mitigation, impact magnitude is high, while duration is long-term and the impact has a high probability of occurring as predicted. The spatial extent of alien invasive species spread is local. Prior to mitigation, the establishment and spread of alien invasive species is rated an impact of "moderate" significance.

With the continued implementation of an active alien species control programme during decommissioning and for a defined period thereafter, this impact can be reduced to a low magnitude, with a short-term duration. Spatial extent will be reduced to the site only and the probability of the impact occurring would be low. After mitigation, this impact is rated to be of "Low" significance.

Table 11: Impact assessment scoring for terrestrial flora species.

CONSTRUCTION																		
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**	**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
Impact 1:	Flora habitat	Direct loss and disturbance of natural habitat	Construction	Negative	Low	4	2	3	5	5	**70**	**N3**	3	1	3	4	3	**33**	**N2**
					Significance	**N3 - High**							**N2 - Medium**						
Impact 2:	Flora habitat	Fragmentation reducing natural habitat connectivity and integrity	Construction	Negative	Low	4	2	3	5	3	**42**	**N2**	3	2	3	4	2	**24**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						
Impact 3:	Flora SCC	Loss of flora of conservation concern	Construction	Negative	High	5	2	5	1	4	**52**	**N2**	3	1	3	1	3	**24**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						
Impact 4:	Flora habitat	Establishment and spread of alien invasive species	Construction	Negative	High	4	2	3	4	4	**52**	**N2**	2	1	3	2	2	**16**	**N1**
						N2 - Medium							**N1 - Low**						
OPERATIONAL																			
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**		**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	
Impact 1:	Flora habitat	Establishment and spread of alien invasive species	Operational	Negative	High	4	2	3	4	3	**39**	**N2**	2	1	3	2	2	**16**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						
DECOMISSIONING																			
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**		**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	
Impact 1:	Flora habitat	Establishment and spread of alien invasive species	Decommissioning	Negative	High	4	2	3	4	4	**52**	**N2**	2	1	3	2	2	**16**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						
CUMULATIVE																			
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**		**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	
Impact 1:	Flora habitat & SCC	Cumulative loss of flora SCC due to natural habitat loss, disturbance and fragmentation	Construction	Negative	Moderate	4	3	3	5	5	**75**	**N3**	2	3	3	4	2	**24**	**N1**
					Significance	**N3 - High**							**N1 - Low**						

10.3.4. Cumulative Impacts

Cumulative impacts refer to the successive, incremental, and/or combined effects of a project, activity, or action when considered alongside other existing, planned, or reasonably foreseeable developments. The assessment and management of cumulative impacts focus on those impacts that are scientifically significant or of concern to affected receptors.

Cumulative impacts are evaluated within the project's area of influence, which includes:

- Areas directly impacted by the proposed Project;
- Surrounding regions influenced by other existing and planned projects; and
- Broader geographic and temporal scales where unplanned but predictable impacts may emerge.

The cumulative impact assessment provides a foundation for understanding the broader ecological context of the Verkykerskop WEF cluster in general and the Groothoek WEF Project in particular. It evaluates the additive effects of the proposed Project in conjunction with other renewable energy developments within the region with the goal of proposing actionable measures to mitigate cumulative impacts where feasible.

Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed WEF. While one project may not have a significant negative impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

Several WEF in the surrounding area were considered for the cumulative impact assessment. Those within a 50 km radius of the Verkykerskop WEF cluster are listed in Table 12 and shown in Figure 26.

Table 12: WEF Projects within 50 km of the Verkykerskop WEF Cluster.

Project Name	Applicant	Status	Reference Number	Distance Away (km)
Newcastle Gas Engine Power Plant (NGEPP), Newcastle, KwaZulu-Natal Province.	Newcastle Energy (Pty) Ltd	Refused	14/12/16/3/3/2/2074	36
Proposed Upgrade of Karbochem boilers and electricity project in Newcastle	Distributed Energy Generation (Pty) Ltd	In process	14/12/16/3/3/1/1164	37
Proposed Upgrade of Karbochem boilers and electricity project in Newcastle - Amendment	Distributed Energy Generation (Pty) Ltd	Approved	14/12/16/3/3/1/1164/AM1	37

Project Name	Applicant	Status	Reference Number	Distance Away (km)
Proposed Newcastle solar energy facility near Newcastle, KwaZulu-Natal Province	Building Energy (Pty) Ltd	Refused	14/12/16/3/3/1/1225	38
Proposed Newcastle WEF 2 and associated grid infrastructure near Newcastle, KwaZulu-Natal Province	Mulilo Newcastle Wind Power 2 (Pty) Ltd	Refused	14-12-16-3-3-2-2213	34
Proposed Mulilo Newcastle WEF and associated grid infrastructure near Newcastle, KwaZulu-Natal Province	Mulilo Newcastle Wind Power (Pty) Ltd	Approved	14-12-16-3-3-2-2457	40
Proposed Mulilo Newcastle WEF 2 and associated grid infrastructure near Newcastle, KwaZulu-Natal Province	Mulilo Newcastle Wind Power 2 (Pty) Ltd	Approved	14-12-16-3-3-2-2458	43

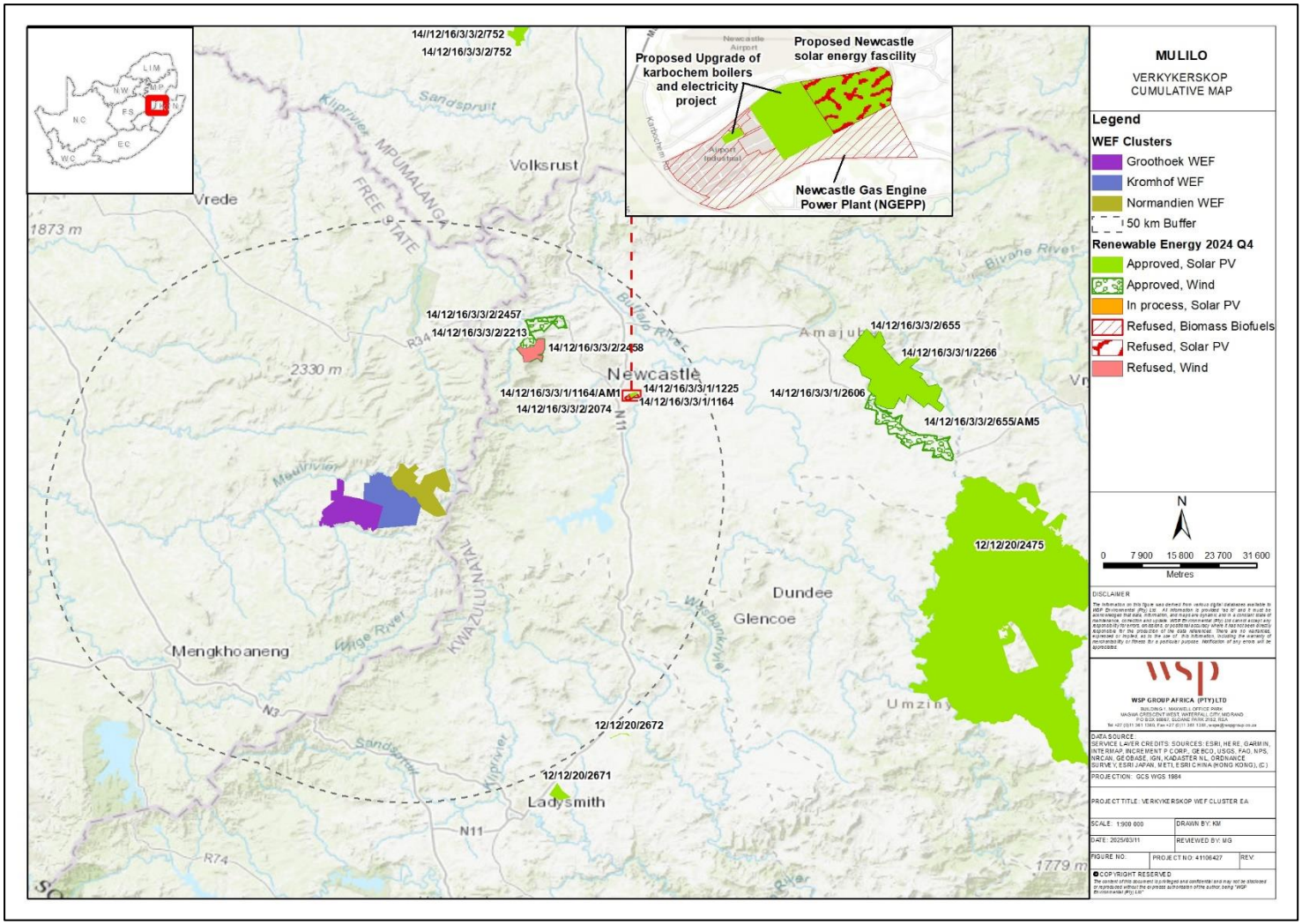


Figure 26: Map showing WEF Projects within a 50 km radius of the Verkykerskop WEF Cluster.

10.3.4.1. *Cumulative loss of flora SCC due to natural habitat loss, disturbance and fragmentation.*

Collectively, the various projects associated with the Verkykerskop WEF cluster, as well as the additional projects within a 50 km radius (listed in Table 12), will cause direct habitat loss, disturbance and fragmentation through vegetation clearing that is greater in extent than that of a single project, and this is a cumulative impact of concern with respects to the conservation of local populations of flora SCC.

Prior to any form of mitigation, the cumulative impact on flora SCC from vegetation clearing is rated 'high'. The proposed Project's contribution to cumulative impacts can be minimised by strictly implementing the required mitigation measures and addressing any significant residual impacts via additional conservation actions. The cumulative impacts on terrestrial flora SCC can therefore be reduced to 'Low' significance.

11. Assessment of the No Go Alternative

If the proposed Project does not proceed, it is expected that the existing/current agricultural land use practices (i.e., crop cultivation, cattle, and sheep farming) will continue across the LSA. Consequently, the condition and character of on-site natural habitat, along with current flora SCC, will likely remain unchanged.

12. Mitigation Measures

The following section presents the proposed impact management actions to avoid, minimise and/or manage the potential impacts/risks which were assessed in the preceding section.

As with the assessment of potential impacts/risks, the impact management actions have been arranged according to the following main Project phases:

- Construction (incl. Pre-Construction);
- Operational; and
- Decommissioning

For each impact management action, the following information is provided:

- Category: The category within which the potential impact/risk occurs;
- Potential impact/risk: Identified potential impact/risk resulting from the pre-construction, construction, operation, and decommissioning of the proposed Project;
- Description: Description of the possible impact management action;
- Prescribed standards or practices: Prescribed environmental standards or practices with which the impact management action must comply. Note that only key standards or practices have been listed;
- Mitigation type: The type of mitigation measure. This includes the following:
    - Avoidance;
    - Minimisation;
    - Rehabilitation or restoration;
    - Offsetting;

- Time period: The time period when the impact management actions must be implemented; and
- Responsible persons: The persons who will be responsible for the implementation of the impact management actions.

Table 13**Error! Reference source not found.** presents a summary of the proposed impact mitigation actions during the pre-construction, construction, operational, and decommissioning phases of the proposed Project.

Table 13: Recommended mitigation measures.

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
1. Pre-Construction and Construction Phase							
1.1	Terrestrial Flora	Direct loss and disturbance of flora habitat	<u>Avoidance</u> • As far as possible proposed permanent Project infrastructure (e.g., wind turbines, access roads) should be located in areas of modified habitat (i.e., Cultivated Fields); • All temporary construction footprints, (e.g., construction camps, laydown areas), should <u>only</u> be located in areas of modified habitat; • A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed sites and other relevant management measures. <u>Minimisation</u>	N/A	Avoidance, Minimisation and Rehabilitation	During Pre-Construction and Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			• All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these footprints; • The footprints to be cleared of vegetation should be clearly demarcated, prior to construction, to prevent unnecessary clearing outside of these areas; • No heavy vehicles should travel beyond the marked/demarked work zones; • Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. <u>Rehabilitation</u> A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction activities. The protocol should include: • The correct stockpiling of topsoil that was cleared from development footprints during site preparation;				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			• The correct contouring of the post-construction landform to limit potential erosion; • Compacted soils should be ripped and loosened to facilitate vegetation establishment; • Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and • Active revegetation should be conducted using grass species that are indigenous, locally-occurring and perennial.				
1.2	Terrestrial Flora	Fragmentation reducing natural habitat connectivity and integrity	<u>Avoidance and Minimisation</u> See mitigation measures for *Direct loss and disturbance of natural habitat*, and • Proposed access roads should be aligned, as far as possible, with existing farm	N/A	Avoidance, Minimisation and Rehabilitation	During Pre-Construction and Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			roads and tracks, and wherever possible micro-sited to already disturbed sites. <u>Rehabilitation</u> See rehabilitation measures for *Direct loss and disturbance of natural habitat*				
1.3	Terrestrial Flora SCC	Loss of Flora Species of Conservation Concern	<u>Avoidance and Minimisation</u> • Additional walkdown surveys of the proposed development footprints should be conducted during the wet/growing season to determine the identity and number of potentially impacted flora SCC; • Data from the walkdown surveys should then be used to inform: ○ Additional micro-siting requirements for proposed Project infrastructure, including avoiding a 200 m bugger around Red List species locations, as prescribed by SANBI; and.	SANBI (2020) Guidelines	Avoidance & Minimisation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			○ The scope of a Flora SCC Management Plan with respects to: ▪ Management and monitoring of-site Red List flora species populations; and ▪ Procedure for rescuing and relocating provincial Protected flora species occurring within infrastructure footprints.				
1.4	Terrestrial Flora	Establish and spread of alien invasive species	An AIS control and eradication plan must be developed for the Project that focuses on controlling and eradicating AIS occurring at sites disturbed by proposed Project activities. The plan must include: • Identification of AIS management units • Prioritisation of sites and species requiring control; • Targets and indicators of success; • Scheduling of AIS control;	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			• Species-specific control methods, using a combined approach of both chemical and mechanical control methods; and • Provision for follow-up treatments, as informed by regular AIS monitoring.				
2. Operational Phase							
2.1	Terrestrial Biodiversity	Establish and spread of alien invasive species	• Active alien invasive species control should continue throughout the operational phase, as per the approved AIS control and eradication programme.	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	During Operational Phase	Facility Manager
3. Decommissioning Phase							
3.1	Terrestrial Biodiversity	Establish and spread of alien invasive species	• Active alien invasive species control should continue during the decommissioning phase and annual follow up control should be carried out for a five- year period following decommissioning.	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	Annually during decommissioning and annually for a five-year period after decommissioning	Facility Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
3.2	Terrestrial Biodiversity	General habitat restoration	• To limit the potential for AIS encroachment, soil erosion and dust generation, all Project footprints and sites that were disturbed during decommissioning, should be actively rehabilitated using local-occurring perennial indigenous flora species.	N/A	Rehabilitation	During the Decommissioning Phase	Facility Manager

13. Monitoring Measures

The following section presents the proposed monitoring actions for monitoring and reporting on the implementation of the impact mitigation actions presented in the preceding Section **Error! Reference source not found.**.

The content of this section is largely based on the monitoring requirements outlined in Appendix 4 of the EIA Regulations, 2014.

For each monitoring action, the following information is provided:

- Category: The category within which the potential impact and/or risk occurs
- Potential impact/risk: Identified potential impact/risk resulting from the pre-construction, construction, operation, and closure of the proposed Project
- Method for monitoring : The method for monitoring the implementation of the recommended mitigation measures
- Time period: The time period over which the monitoring actions must be implemented
- Frequency of monitoring: The frequency of monitoring the implementation of the recommended mitigation measures
- Mechanism for monitoring compliance: The mechanism for monitoring compliance with the impact management actions
- Responsible persons: The persons who will be responsible for the implementation of the monitoring actions

As with the impact management actions, the proposed monitoring actions have been arranged according to the following project phases:

- Pre-construction;
- Construction;
- Operational; and
- Decommissioning

Table 14 presents a summary of the proposed monitoring actions during the construction, operational and decommissioning phases.

Table 14: Recommended monitoring measures

Ref. No.	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
1. Construction and Operational phase						

1.1	Alien invasive species	• Annual on-site alien invasive species monitoring should be conducted. Monitoring should focus on:
		  ○ All sites disturbed during the construction phase;
		  ○ Wetland areas adjacent to construction sites; and
		• Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control.
			Wet/growing season	Annual	Annual Monitoring Report	Project Manager

2. Decommissioning phase						
2.1	Alien invasive species	• Alien invasive species monitoring should be conducted on an annual basis during decommissioning and annually for a five-year period following decommissioning. Monitoring should focus on: ○ All sites disturbed during decommissioning;	Wet/growing season	Annually during decommissioning and for a five-year period after decommissioning	Annual Monitoring Report	Facility Manager

Ref. No.	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
		○ Watercourses adjacent to development sites; and • Monitoring should assess species type and density, and these data should inform the scope of ongoing alien invasive species control.				

14. Reasoned Opinion and Environmental Impact Statement

14.1. Summary of Main Findings

The LSA and the broader RSA are characterised by large intact tracts of natural habitat, comprising Natural Dry Grassland, Moist Grassland and Rocky Shrubland. These habitats comprise important flora habitat.

One threatened flora species on the national Red List was recorded in the RSA during the field survey, namely *Khadia carolinensis* (Vulnerable). This species was recorded in the Normandien WEF site, but it was not recorded in the LSA for this specialist study (i.e. the Groothoek WEF site). However, there is suitable habitat *Khadia carolinensis* present on-site, and it is therefore possible that *Khadia carolinensis* is indeed present in the LSA. Habitat suitability assessments also suggest that a number of other Red List taxa may be present on-site. It is therefore possible that flora SCC may be negatively impacted by proposed Project activities, such as vegetation clearing and earth works.

The National Web Based Screening Tool rated the Plant Species Theme for the Project site as 'Medium' sensitivity. The findings of this study indicate that patches of undisturbed natural habitat have a High sensitivity rating.

Several potential negative impacts on flora species have been identified and assessed for the proposed Project for both pre- and post-mitigation scenarios. The successful implementation of the recommended mitigation measures presented in this report can effectively manage the identified impacts. It is recommended that all mitigation and management measures should be incorporated into the proposed Project's environmental management plan (EMP).

14.2. Conditions to be Included in the Environmental Authorisation

No additional conditions are recommended for inclusion in the proposed Project's environmental authorisation.

14.3. Specialist Opinion

In accordance with the outcomes of the impact assessment, and taking cognisance of the baseline conditions presented herein, as well as the impact management measures, the proposed Project is not deemed to present significant negative ecological issues or impacts on terrestrial plant species, and it should thus be authorised.

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This report has been compiled by Andrew Zinn (Hawkhead Consulting).

Andrew Zinn (*Pr.Sci.Nat*.)

Appendix A: Curriculum Vitae – Andrew Zinn

Hawkhead Consulting

Curriculum Vitae of Andrew Zinn (Pr.Sci.Nat.)

Details

Andrew David Zinn
Terrestrial Ecologist
B.Sc. (Hons.), M.Sc., Pr.Sci.Nat.

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South Africa
Date of birth: 14 July 1982
Nationality: South African

Profile

I am an ecologist with an M.Sc. Degree in Resource Conservation Biology and 15 years of experience working in biodiversity consulting and ecological research. I am registered with the South African Council of Natural Scientific Professions as a Professional Natural Scientist. I currently work as an independent consulting ecologist, with Hawkhead Consulting. During my career I have worked on projects in remote areas in several African countries including South Africa, Botswana, Democratic Republic of the Congo, Ethiopia, Ghana, Mozambique, Tanzania and Zambia. I have also previously worked in the United Kingdom and the United Arab Emirates.

Education and Qualifications

- University of the Witwatersrand, M.Sc. Resource Conservation Biology (2013).
- University of KwaZulu-Natal, BSc. Hons. Ecology and Conservation Biology (2005).
- University of KwaZulu-Natal, BSc. Zoology and Grassland Science (2004).
- Bryanston High School, Johannesburg. Matric Exemption. (2000).

Affiliations

- Member of the South African Council of Natural Scientific Professions – Professional Natural Scientist (400687/15).
- Member of the South African Wildlife Management Association.
- Member of the South African Association of Botanists.

Work Experience

1. **Independent Ecologist**

Hawkhead Consulting, South Africa
September 2020 – Present

Consulting ecologist focusing on terrestrial ecology. I specialise in conducting baseline flora and fauna surveys, ecological impact assessments, and developing mitigation and management programmes for projects and operations in various industry sectors. Core services and responsibilities include, amongst others:

- Biodiversity study design and implementation;
- Biodiversity baseline and impact assessment reporting;
- Mitigation measure design and application;
- Vegetation surveys and vegetation community mapping;
- Fauna surveys for mammals, birds, reptiles and amphibians;
- Development of biodiversity management plans;
- Development of rehabilitation and revegetation plans; and
- Alien invasive species control and eradication plans.

2. Ecologist

Golder Associates Africa, South Africa
June 2011 – September 2020

Ecologist responsible for the management and implementation of baseline biodiversity studies and ecological impact assessments for development projects in the mining, power generation, transport, land development and industrial development sectors throughout sub-Saharan Africa. Role responsibilities included project management, technical review, biodiversity study design and implementation, flora and fauna surveys, biodiversity baseline and impact assessment reporting, development of biodiversity management plans, rehabilitation plans and alien invasive species control and eradication plans. These studies were conducted to satisfy national environmental regulations and/or international financing requirements, including the International Finance Corporation's (IFC) Performance Standard 6 (PS6)

3. Independent Ecologist

Subcontracted to KPMG, United Arab Emirates
March – April 2011

Subcontracted to KPMG as a subject matter expert (ecology) on the internal audit of Sir Bani Yas Island's Conservation Department (United Arab Emirates). The audit focused on evaluating the efficacy of the island's various conservation practices, including game management, feed provisioning, carnivore breeding and monitoring, veterinary care and vegetation maintenance.

4. Environmental Consultant

WSP Environment and Energy, South Africa
August 2008 – March 2011

Environmental consultant, responsible for a range of environmental projects and services including managing environmental authorisation processes (BAs and EIAs), facilitating stakeholder engagement processes,
conducting compliance audits, developing environmental management programmes and conducting specialist ecological studies.

5. Research Technician

Yale University, Kruger National Park, South Africa
October 2007 – May 2008

Research technician on the Savanna Convergence Experiment (SCE). The SCE project was a long-term cross-continental study that investigated the role of mega-herbivores in fire-grazing interactions and their influence on vegetation dynamics. Responsible for collecting and analysing vegetation composition and productivity data, as well as herbivore distribution data.

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Appendix B: Methodology Supplement

Rating criteria for Conservation Importance, Functional Integrity and Receptor Resilience and the scoring matrices, as per (SANBI, 2020).

The ecological sensitivity of habitats in the study area was determined using the protocol for evaluating site ecological importance (SEI) as published in SANBI's Species Assessment Guideline (SANBI, 2020). SEI is considered to be a function of the biodiversity importance (BI) of a receptor and its resilience to impacts (receptor resilience, RR), as per:

SEI = BI + RR.

Biodiversity importance is a function of conservation importance (CI) and the functional integrity (FI) of the receptor, as per:

BI = CI + FI

- **Conservation Importance** is defined as "the importance of a site for supporting biodiversity features of conservation concern present, e.g., populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), Rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystems types, through predominantly natural processes" (SANBI, 2020).
- **Functional Integrity** is defined as "A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts" (SANBI, 2020).
- **Receptor Resilience** is defined as "the intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention" (SANBI, 2020).

Table 1: Conservation Importance (CI) criteria.

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

Table 2: Functional Integrity (FI) criteria.

Functional Integrity (FI)	Fulfilling Criteria
Very High	• Very large (>100 ha) intact area for any conservation status of ecosystem type or >5a ha for CR ecosystem type; • High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches; • No or minimal current negative ecological impacts with no signs of major disturbance (e.g., ploughing)
High	• Large (>5 ha but < 100 ha) intact area for any conservation status ecosystem types; • Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches; and • Only minor current negative ecological impacts (e.g., few livestock utilising area) with no signs of major past disturbance (e.g., ploughing) and good rehabilitation potential.
Medium	• Medium (>5ha but< 20 ha) semi-intact area for any conservation status ecosystem type or >20 ha for VU ecosystem type; • Only narrow corridors of good connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches; • Mostly minor current negative ecological impacts with some major impacts (e.g., established population of alien invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	• Small (> 1 ha but <5ha) area; • Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential; and • Several minor and major current negative ecological impacts.
Very Low	• Very small (<1 ha) area; • No habitat connectivity except for flying species or flora with wind-dispersed seeds; • Several major current negative ecological impacts.

BI = CI + FI

Biodiversity Importance (BI) Rating Matrix

Biodiversity Importance (BI)		Conservation Importance				
		Very High	**High**	**Medium**	**Low**	**Very Low**
Functional Integrity	**Very High**	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

Table 3: Receptor Resilience criteria (RR)

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

SEI = BI + RR

Site Ecological Importance (SEI) Rating Matrix

Site Ecological Importance		Biodiversity Importance				
		Very High	**High**	**Medium**	**Low**	**Very Low**
Receptor Resilience	**Very Low**	Very High	Very High	High	Medium	Low
	Low	Very High	Very High	High	Medium	Very Low
	Medium	Very High	High	Medium	Low	Very Low
	High	High	Medium	Low	Very Low	Very Low
	Very High	Medium	Low	Very Low	Very Low	Very Low

Table 4: Guidelines for interpreting SEI in the context of the proposed development activities.

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

Appendix C: Flora species recorded in the study area during the field survey.

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
				National Red List Status	NEMBA ToPS List (2007)	Free State Conservation Status	Natural Dry Grassland	Rocky Shrubland	Moist Grassland	Secondary Grassland	Other Modified (Cultivated Fields & Alien Tree Stands)
Achariaceae	*Kiggelaria africana*	Tree	Indigenous	LC				x			
Agapanthaceae	*Agapanthus cf. campanulatus*	Herb	Indigenous	LC		Protected		x			
Agavaceae	*Chlorophytum cooperi*	Herb	Indigenous	LC			x				
Aizoaceae	*Delosperma lavisiae*	Succulent	Indigenous	LC				x			
Aizoaceae	*Khadia carolinensis*	Succulent	Indigenous	VU			x				
Amaranthaceae	*Amaranthus hybridus**	Herb	Alien	NE							x
Amaranthaceae	*Chenopodium album**	Herb	Alien	NE							x
Amaryllidaceae	*Boophone disticha*	Geophytic Herb	Indigenous	LC		Protected	x				
Amaryllidaceae	*Brunsvigia cf. radulosa*	Geophytic Herb	Indigenous	LC		Protected	x		x		
Amaryllidaceae	*Brunsvigia radulosa*	Geophytic Herb	Indigenous	LC			x				
Amaryllidaceae	*Crinum bulbispermum*	Geophytic Herb	Indigenous	LC		Protected			x		
Amaryllidaceae	*Nerine angustifolia*	Geophyte	Indigenous	LC		Protected			x		
Anacardiaceae	*Searsia dentata*	Shrub	Indigenous	LC			x	x			
Anacardiaceae	*Searsia discolor*	Dwarf Shrub	Indigenous	LC			x	x			
Anacardiaceae	*Searsia pallens*	Tree	Indigenous	LC				x			
Anacardiaceae	*Searsia pyroides*	Tree	Indigenous	LC			x	x			
Anacardiaceae	*Searsia tumulicola*	Tree	Indigenous	LC			x				
Apiaceae	*Centella asiatica**	Herb	Alien	NE			x		x		
Apiaceae	*Heteromorpha arborescens* var. *abyssinica*	Tree	Indigenous	LC			x	x			
Apocynaceae	*Aristea torulosa*	Herb	Indigenous	LC			x	x			
Apocynaceae	*Gomphocarpus fruticosus*	Shrub	Indigenous	LC			x		x		
Apocynaceae	*Xysmalobium undulatum*	Herb	Indigenous	LC					x		
Araceae	*Zantedeschia albomaculata*	Herb	Indigenous	LC		Protected			x		
Araliaceae	*Cussonia paniculata*	Tree	Indigenous	LC		Protected		x			
Asparagaceae	*Asparagus laricinus*	Shrub	Indigenous	LC			x	x			

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
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Asparagaceae	*Asparagus virgatus*	Shrub	Indigenous	LC				x			
Asphodelaceae	*Kniphofia cf. baurii*	Herb	Indigenous	LC		Protected			x		
Asteraceae	*Berkheya onopordifolia*	Herb	Indigenous	LC			x	x	x	x	
Asteraceae	*Berkheya pinnatifida ingrata*	Herb	Indigenous	LC			x	x	x		
Asteraceae	*Berkheya radula*	Herb	Indigenous	LC			x		x		
Asteraceae	*Berkheya setifera*	Herb	Indigenous	LC			x	x			
Asteraceae	*Bidens bipinnata**	Herb	Alien	NE			x	x			x
Asteraceae	*Bidens pilosa**	Herb	Alien	NE			x		x		x
Asteraceae	*Brachylaena cf. rotundata*	Tree	Indigenous	LC				x			
Asteraceae	*Cirsium vulgare**	Herb	Alien (NEMBA Category 1b)	NE			x		x		x
Asteraceae	*Conyza canadensis**	Herb	Alien	NE			x				x
Asteraceae	*Cosmos bipinnatus**	Herb	Alien	NE					x		x
Asteraceae	*Dicoma anomala*	Herb	Indigenous	LC			x	x			
Asteraceae	*Felicia filifolia*	Shrub	Indigenous	LC			x	x			
Asteraceae	*Gazania krebsiana*	Herb	Indigenous	LC			x				
Asteraceae	*Gerbera* species (no flowers)	Herb	Indigenous	LC			x				
Asteraceae	*Haplocarpha lyrata*	Herb	Indigenous	LC			x		x		
Asteraceae	*Haplocarpha scaposa*	Herb	Indigenous	LC			x	x	x	x	
Asteraceae	*Helichrysum adenocarpum*	Herb	Indigenous	LC		Protected	x				
Asteraceae	*Helichrysum argentissimum*	Herb	Indigenous	LC		Protected	x				
Asteraceae	*Helichrysum aureonitens*	Herb	Indigenous	LC		Protected	x	x	x		
Asteraceae	*Helichrysum callicomum*	Herb	Indigenous	LC		Protected	x	x	x	x	
Asteraceae	*Helichrysum hypoleucum*	Herb	Indigenous	LC		Protected	x				
Asteraceae	*Helichrysum mundtii*	Herb	Indigenous	LC		Protected			x		
Asteraceae	*Helichrysum nudifolium* var. *nudifolium*	Herb	Indigenous	LC		Protected	x			x	

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Asteraceae	*Helichrysum nudifolium* var. *pilosellum*	Herb	Indigenous	LC		Protected	x	x			
Asteraceae	*Helichrysum oreophilum*	Herb	Indigenous	LC		Protected	x	x			
Asteraceae	*Helichrysum pallidum*	Herb	Indigenous	LC		Protected		x			
Asteraceae	*Helichrysum rugulosum*	Herb	Indigenous	LC		Protected	x	x	x		
Asteraceae	*Helichrysum splendidum*	Herb	Indigenous	LC			x	x			
Asteraceae	*Hilliardiella aristata*	Herb	Indigenous	LC			x	x		x	
Asteraceae	*Hilliardiella elaeagnoides*	Herb	Indigenous	LC			x	x	x		
Asteraceae	*Hypochaeris radicata**	Herb	Alien	NE			x		x	x	x
Asteraceae	*Nidorella pinnata*	Herb	Indigenous	LC			x		x		
Asteraceae	*Nidorella podocephala*	Herb	Indigenous	LC			x	x	x		
Asteraceae	*Nidorella anomala*	Herb	Indigenous	LC			x	x			
Asteraceae	*Osteospermum moniliferum*	Shrub	Indigenous	LC			x				
Asteraceae	*Schistostephium crataegifolium*	Herb	Indigenous	LC				x			
Asteraceae	*Schkuhria pinnata**	Herb	Alien	NE			x	x	x		x
Asteraceae	*Senecio consanguineus*	Herb	Indigenous	LC			x		x	x	
Asteraceae	*Senecio coronatus*	Herb	Indigenous	LC			x	x			
Asteraceae	*Senecio erubescens*	Herb	Indigenous	LC			x			x	
Asteraceae	*Senecio inornatus*	Herb	Indigenous	LC			x		x		
Asteraceae	*Senecio isatidioides*	Herb	Indigenous	LC					x		
Asteraceae	*Senecio venosus*	Herb	Indigenous	LC				x	x		
Asteraceae	*Seriphium plumosum*	Shrub	Indigenous	LC			x	x	x	x	
Asteraceae	*Sonchus dregeanus*	Herb	Alien	NE			x				
Asteraceae	*Tagetes minuta**	Herb	Alien	NE			x				x
Asteraceae	*Xanthium spinosum*	Herb	Alien (NEMBA Category 1b)	NE							x

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Cactaceae	*Opuntia ficus-indica**	Succulent	Alien (NEMBA Category 1b)	NE				x			
Campanulaceae	*Wahlenbergia undulata*	Herb	Indigenous	LC					x	x	
Celastraceae	*Gymnosporia buxifolia*	Tree	Indigenous	LC				x			
Convolvulaceae	*Ipomoea ommaneyi*	Herb	Indigenous	LC				x			
Crassulaceae	*Crassula dependens*	Succulent	Indigenous	-			x	x			
Crassulaceae	*Crassula setulosa*	Succulent	Indigenous	LC				x			
Crassulaceae	*Crassula vaginata*	Succulent	Indigenous	LC			x				
Cyperaceae	*Cyperus congesta*	Graminoid	Indigenous	LC					x		
Cyperaceae	*Cyperus esculentus**	Graminoid	Alien	NE					x		
Cyperaceae	*Cyperus fastigiatus*	Graminoid	Indigenous	-					x		
Cyperaceae	*Cyperus marginatus*	Graminoid	Indigenous	-					x		
Cyperaceae	*Cyperus rupestris*	Graminoid	Indigenous	LC			x	x			
Cyperaceae	*Eleocharis limosa*	Graminoid	Indigenous	LC					x		
Cyperaceae	*Kyllinga erecta*	Graminoid	Indigenous	LC			x		x		
Cyperaceae	*Pycreus mundii*	Graminoid	Indigenous	LC					x		
Cyperaceae	*Scirpoides burkei*	Graminoid	Indigenous	LC					x		
Dipsacaceae	*Scabiosa columbaria*	Herb	Indigenous	LC			x	x			
Dryopteridaceae	*Dryopteris cf. pentheri*	Fern	Indigenous	LC			x				
Ebenaceae	*Diospyros austro-africana*	Tree	Indigenous	LC			x	x			
Ebenaceae	*Diospyros lycioides* subsp. *lycioides*	Tree	Indigenous	LC			x	x			
Ebenaceae	*Euclea crispa*	Tree	Indigenous	LC			x	x			
Euphorbiaceae	*Acalypha angustata*	Herb	Indigenous	LC			x	x		x	
Euphorbiaceae	*Clutia pulchella*	Shrub	Indigenous	LC				x			
Fabaceae	*Acacia dealbata**	Tree	Alien (NEMBA Category 2)	NE							x
Fabaceae	*Acacia mearnsii**	Tree	Alien (NEMBA Category 2)	NE							x
Fabaceae	*Calpurnia aurea*	Tree	Indigenous	LC				x			
Fabaceae	*Commelina africana*	Herb	Indigenous	LC			x	x	x		

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Fabaceae	*Indigofera hedyantha*	Herb	Indigenous	LC				x			
Fabaceae	*Indigofera obscura*	Herb	Indigenous	LC				x			
Fabaceae	*Sphenostylis* species	Herb	Indigenous	LC			x				
Fabaceae	*Trifolium africanum*	Herb	Indigenous	LC			x				
Fabaceae	*Trifolium repens**	Herb	Alien	NE					x		x
Fabaceae	*Vigna vexillata*	Herb	Indigenous	LC			x				
Gentianaceae	*Chironia palustris*	Herb	Indigenous	LC					x		
Gentianaceae	*Sebaea leiostyla*	Herb	Indigenous	LC			x	x			
Gentianaceae	*Sebaea grandis*	Herb	Indigenous	LC			x		x		
Geraniaceae	*Geranium schlechteri*	Herb	Indigenous	LC				x			
Geraniaceae	*Monsonia attenuata*	Herb	Indigenous	LC			x				
Geraniaceae	*Pelargonium luridum*	Herb	Indigenous	LC			x				
Gunneraceae	*Gunnera perpensa*	Herb	Indigenous	LC					x		
Hyacinthaceae	*Eucomis autumnalis*	Geophytic herb	Indigenous	LC		Protected			x		
Hyacinthaceae	*Eucomis humilis*	Geophytic herb	Indigenous	LC		Protected		x			
Hyacinthaceae	*Ledebouria cooperi*	Herb	Indigenous	LC			x				
Hyacinthaceae	*Ledebouria ovatifolia*	Herb	Indigenous	LC				x			
Hyacinthaceae	*Ledebouria revoluta*	Herb	Indigenous	LC			x				
Hypoxidaceae	*Hypoxis acuminata*	Herb	Indigenous	LC			x				
Hypoxidaceae	*Hypoxis argentea*	Herb	Indigenous	LC			x				
Hypoxidaceae	*Hypoxis costata*	Herb	Indigenous	LC			x				
Hypoxidaceae	*Hypoxis galpinii*	Herb	Indigenous	LC			x				
Iridaceae	*Gladiolus* species (no flowers)	Geophytic herb	Indigenous	LC		Protected	x	x	x		
Iridaceae	*Hesperantha coccinea*	Herb	Indigenous	LC					x		
Iridaceae	*Watsonia* species (no flowers)	Herb	Indigenous	-		Protected	x		x		
Lamiaceae	*Leonotis glabrata*	Herb	Indigenous	LC				x			
Lamiaceae	*Leonotis ocymifolia*	Shrub	Indigenous	LC				x			
Lamiaceae	*Mentha longifolia*	Herb	Indigenous	LC					x		
Lamiaceae	*Plectranthus fruticosus*	Shrub	Indigenous	LC				x			
Lamiaceae	*Rabdosiella calycina*	Shrub	Indigenous	LC				x			
Lamiaceae	*Salvia runcinata*	Herb	Indigenous	LC				x			

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Lobeliaceae	*Lobelia erinus*	Herb	Indigenous	LC					x	x	
Lobeliaceae	*Lobelia flaccida*	Herb	Indigenous	LC			x	x	x		
Lobeliaceae	*Monopsis decipiens*	Herb	Indigenous	LC			x		x		
Malvaceae	*Hermannia depressa*	Herb	Indigenous	LC			x	x	x		
Malvaceae	*Hermannia transvaalensis*	Herb	Indigenous	LC			x	x		x	
Malvaceae	*Hibiscus trionum**	Herb	Alien	LC			x		x		
Malvaceae	*Malva parviflora**	Herb	Alien	NE							x
Melianthaceae	*Melianthus comosus*	Shrub	Indigenous	LC				x			
Menispermaceae	*Stephania abyssinica*	Climber	Indigenous	LC				x			
Molluginaceae	*Psammotropha mucronata*	Dwarf Herb	Indigenous	LC			x				
Moraceae	*Morus alba*	Tree	Alien (NEMBA Category 3)	NE							x
Myrsinaceae	*Myrsine africana*	Shrub	Indigenous	LC				x			
Myrtaceae	*Eucalyptus* camaldulensis*	Tree	Alien (NEMBA Category 2 or not listed)	NE							x
Myrtaceae	*Eucalyptus cf. sideroxylon**	Tree	Alien	NE							x
Onagraceae	*Oenothera indecora**	Herb	Alien	NE			x				
Onagraceae	*Oenothera rosea**	Herb	Alien	NE			x		x		
Orchidaceae	*Disa versicolor*	Geophytic Herb	Indigenous	LC		Protected			x		
Orobanchaceae	*Striga elegans*	Herb	Indigenous	LC			x	x			
Oxalidaceae	*Oxalis corniculata**	Herb	Alien	NE			x		x		
Oxalidaceae	*Oxalis obliquifolia*	Herb	Indigenous	LC			x	x	x	x	
Pinaceae	*Pinus patula**	Tree	Alien (NEMBA Category 2)	NE							x
Plantaginaceae	*Plantago lanceolata**	Herb	Alien	NE			x		x		
Plantaginaceae	*Plantago major**	Herb	Alien	NE			x	x	x		
Poaceae	*Agrostis eriantha*	Graminoid	Indigenous	LC					x		
Poaceae	*Agrostis lachnantha*	Graminoid	Indigenous	LC					x		
Poaceae	*Alloteropsis semialata*	Graminoid	Indigenous	LC			x				

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Poaceae	*Andropogon appendiculatus*	Graminoid	Indigenous	LC			x	x	x		
Poaceae	*Andropogon eucomus*	Graminoid	Indigenous	LC					x		
Poaceae	*Andropogon schirensis*	Graminoid	Indigenous	LC			x	x			
Poaceae	*Aristida bipartita*	Graminoid	Indigenous	LC			x		x		
Poaceae	*Aristida congesta* subsp. *barbicollis*	Graminoid	Indigenous	LC			x	x	x		
Poaceae	*Aristida congesta* subsp. *congesta*	Graminoid	Indigenous	LC			x			x	
Poaceae	*Aristida junciformis*	Graminoid	Indigenous	LC			x		x	x	
Poaceae	*Aristida transvaalensis*	Graminoid	Indigenous	LC				x			
Poaceae	*Bromus catharticus**	Graminoid	Alien	NE			x		x		x
Poaceae	*Chloris virgata*	Graminoid	Indigenous	LC					x		
Poaceae	*Cymbopogon caesius*	Graminoid	Indigenous	LC			x		x		
Poaceae	*Cymbopogon pospischilii*	Graminoid	Indigenous	LC			x	x	x		
Poaceae	*Cynodon dactylon*	Graminoid	Indigenous	LC			x		x		
Poaceae	*Digitaria brazzae*	Graminoid	Indigenous	LC			x	x			
Poaceae	*Digitaria eriantha*	Graminoid	Indigenous	LC			x	x	x		
Poaceae	*Digitaria sanguinalis*	Graminoid	Indigenous	LC					x		
Poaceae	*Echinochloa* species	Graminoid	Indigenous	LC					x		
Poaceae	*Eleusine coracana*	Graminoid	Indigenous	LC							x
Poaceae	*Elionurus muticus*	Graminoid	Indigenous	LC			x		x		
Poaceae	*Eragrostis capensis*	Graminoid	Indigenous	LC			x		x		
Poaceae	*Eragrostis* cf. *heteromera*	Graminoid	Indigenous	LC					x		
Poaceae	*Eragrostis chloromelas*	Graminoid	Indigenous	LC			x	x	x	x	
Poaceae	*Eragrostis cilianensis*	Graminoid	Indigenous	LC			x				
Poaceae	*Eragrostis curvula*	Graminoid	Indigenous	LC			x	x	x	x	
Poaceae	*Eragrostis gummiflua*	Graminoid	Indigenous	LC			x		x		
Poaceae	*Eragrostis plana*	Graminoid	Indigenous	LC			x	x	x	x	
Poaceae	*Eragrostis racemosa*	Graminoid	Indigenous	LC				x	x		
Poaceae	*Eragrostis* species	Graminoid	Indigenous	LC			x			x	
Poaceae	*Harpochloa falx*	Graminoid	Indigenous	LC			x		x		

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Poaceae	*Helictotrichon turgidulum*	Graminoid	Indigenous	LC			x			x	
Poaceae	*Heteropogon contortus*	Graminoid	Indigenous	LC			x				
Poaceae	*Hyparrhenia dregeana*	Graminoid	Indigenous	LC			x	x	x	x	
Poaceae	*Hyparrhenia hirta*	Graminoid	Indigenous	LC			x	x			
Poaceae	*Imperata cylindrica*	Graminoid	Indigenous	LC					x		
Poaceae	*Koeleria capensis*	Graminoid	Indigenous	LC			x				
Poaceae	*Leersia hexandra*	Graminoid	Indigenous	LC					x		
Poaceae	*Melinis nerviglumis*	Graminoid	Indigenous	LC			x	x			
Poaceae	*Melinis repens*	Graminoid	Indigenous	LC				x			x
Poaceae	*Microchloa caffra*	Graminoid	Indigenous	LC			x				
Poaceae	*Miscanthus junceus*	Graminoid	Indigenous	LC					x		
Poaceae	*Monocymbium ceresiiforme*	Graminoid	Indigenous	LC			x		x		
Poaceae	*Panicum natalense*	Graminoid	Indigenous	LC				x			
Poaceae	*Panicum schinzii*	Graminoid	Indigenous	LC					x		
Poaceae	*Paspalum dilatatum**	Graminoid	Alien	NE			x	x	x		
Poaceae	*Paspalum distichum*	Graminoid	Indigenous	LC					x		
Poaceae	*Paspalum notatum**	Graminoid	Alien	NE					x		
Poaceae	*Pennisetum clandestinum**	Graminoid	Alien (NEMBA Category 1b)	NE							x
Poaceae	*Pennisetum sphacelatum*	Graminoid	Indigenous	LC					x		
Poaceae	*Pennisetum thunbergii*	Graminoid	Indigenous	LC					x		
Poaceae	*Phragmites australis*	Graminoid	Indigenous	LC					x		
Poaceae	*Setaria pallide-fusca*	Graminoid	Indigenous	LC			x		x		
Poaceae	*Setaria* species	Graminoid	Indigenous	LC					x		
Poaceae	*Setaria sphacelata*	Graminoid	Indigenous	LC			x		x	x	
Poaceae	*Sporobolus africanus*	Graminoid	Indigenous	LC			x	x	x	x	x
Poaceae	*Themeda triandra*	Graminoid	Indigenous	LC			x	x	x	x	
Poaceae	*Trichoneura grandiglumis*	Graminoid	Indigenous	LC			x	x		x	
Poaceae	*Tristachya leucothrix*	Graminoid	Indigenous	LC			x	x	x		

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Polygonaceae	*Persicaria lapathifolia**	Herb	Alien	NE					x		
Polygonaceae	*Persicaria* species	Herb	Indigenous	LC					x		x
Polygonaceae	*Rumex acetosella**	Herb	Alien	NE			x		x		
Polygonaceae	*Rumex crispus**	Herb	Alien	NE					x		
Potamogetonaceae	*Potamogeton richardii*	Herb	Indigenous	LC					x		
Proteaceae	*Protea roupelliae*	Tree	Indigenous	LC			x	x			
Pteridaceae	*Cheilanthes hirta*	Fern	Indigenous	LC				x			
Pteridaceae	*Pellaea calomelanos* var. *calomelanos*	Fern	Indigenous	LC			x	x			
Ranunculaceae	*Clematis brachiata*	Herb	Indigenous	LC				x			
Ranunculaceae	*Ranunculus multifidus*	Herb	Indigenous	LC					x		
Rhamnaceae	*Rhamnus prinoides*	Tree	Indigenous	LC			x	x			
Rosaceae	*Cliffortia linearifolia*	Shrub	Indigenous	LC					x		
Rosaceae	*Cotoneaster franchetii**	Tree	Alien (NEMBA Category 1b)	NE				x			
Rosaceae	*Leucosidea sericea*	Tree	Indigenous	LC			x	x	x		
Rosaceae	*Prunus persica**	Tree	Alien	NE							x
Rosaceae	*Pyracantha angustifolia*	Tree	Alien (NEMBA Category 1b)	NE			x				
Rosaceae	*Rubus ludwigii*	Shrub	Indigenous	LC			x				
Rubiaceae	*Pentanisia prunelloides*	Shrub	Indigenous	LC			x				
Rubiaceae	*Richardia brasiliensis**	Herb	Alien	NE			x	x	x	x	
Ruscaceae	*Eriospermum* species	Herb	Indigenous	LC			x		x		
Salicaceae	*Populus cf. niger**	Tree	Alien	NE					x		
Salicaceae	*Populus x canescens**	Tree	Alien (NEMBA Category 2)	NE					x		x
Salicaceae	*Salix babylonica**	Tree	Alien	NE					x		
Salicaceae	*Salix mucronata*	Tree	Indigenous	LC					x		
Santalaceae	*Osyris lanceolata*	Tree	Indigenous	LC				x			
Scrophulariaceae	*Buddleja saligna*	Tree	Indigenous	LC				x			

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Scrophulariaceae	*Buddleja salviifolia*	Tree	Indigenous	LC				x			
Scrophulariaceae	*Chaenostoma floribundum*	Herb	Indigenous	LC			x	x			
Scrophulariaceae	*Chaenostoma hispidum*	Herb	Indigenous	LC			x	x			
Scrophulariaceae	*Chaenostoma species*	Herb	Indigenous	LC				x			
Scrophulariaceae	*Jamesbrittenia aurantiaca*	Herb	Indigenous	LC			x				
Scrophulariaceae	*Limosella* sp.	Herb	Indigenous	LC					x		
Scrophulariaceae	*Nemesia fruticans*	Herb	Indigenous	LC					x		
Scrophulariaceae	*Phygelius aequalis*	Shrub	Indigenous	LC					x		
Scrophulariaceae	*Selago densiflora*	Herb	Indigenous	LC			x	x	x	x	
Scrophulariaceae	*Selago flanaganii*	Herb	Indigenous	LC							
Scrophulariaceae	*Zaluzianskya elongata*	Herb	Indigenous	LC				x			
Solanaceae	*Datura stramonium**	Herb	Alien (NEMBA Category 1b)	NE							x
Solanaceae	*Solanum elaeagnifolium**	Herb	Alien (NEMBA Category 1b)	NE			x			x	
Solanaceae	*Solanum lichtensteinii*	Herb	Indigenous	LC			x	x		x	
Solanaceae	*Solanum sisymbriifolium**	Herb	Alien (NEMBA Category 1b)	NE							x
Stilbaceae	*Halleria lucida*	Tree	Indigenous	LC				x			
Typhaceae	*Typha capensis*	Graminoid	Indigenous	LC					x		
Verbenaceae	*Verbena bonariensis**	Herb	Alien (NEMBA Category 1b)	NE			x		x		x
Verbenaceae	*Verbena brasiliensis**	Herb	Alien (NEMBA Category 1b)	NE			x		x	x	x
Verbenaceae	*Verbena rigida**	Herb	Alien (NEMBA Category 1b)	NE			x				

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units				
				National Red List Status	NEMBA ToPS List (2007)	Free State Conservation Status	Natural Dry Grassland	Rocky Shrubland	Moist Grassland	Secondary Grassland	Other Modified (Cultivated Fields & Alien Tree Stands)
Vitaceae	*Rhoicissus tridentata*	Climbing Shrub	Indigenous	LC			x	x			
Red List Categories NE = Not Evaluated LC = Least Concern VU = Vulnerable											
*Indicates alien species											

Appendix D: Compliance with Plant Species Protocol.

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Plant Species	Relevant Section in Report
The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline7; and must;	
2.2.1 identify the SCC which were found, observed or are likely to occur within the study area;	Section 7.2.1
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 facility, immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3);	Section 7.2.1
2.2.3 identify the distribution, location, viability and provide a detailed description of population size of the SCC, identified within the study area;	Section 7.2.1
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;	Section 10.3
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;	Section 7.2.1
2.2.6 determine the potential impact of the proposed development on the habitat of the SCC located within the study area;	Section 10.3
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;	Section 7.2.1
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;	Section 8
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;	Section 8 & Section 10.3
2.2.10 determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC;	N/A
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 species10; or roosting and breeding or foraging areas used by migratory species where these species show significant congregations, occurring in the vicinity	Section 7.2.1
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	Section 9
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	Page 3 & Appendix A

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Plant Species	Relevant Section in Report
registration number of the specialist preparing the assessment including a curriculum vitae;	
3.1.2 a signed statement of independence by the specialist;	Page 3
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;	Section 3.2 & Section 4
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;	Section 3 & Section 10.1
3.1.5 a description of the mean density of observations/number of sample sites per unit area and the site inspection observations;	Section 3.2 & Appendix B
3.1.6 a description of the assumptions made and any uncertainties or gaps in knowledge or data;	Section 4
3.1.7 details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported;	Section 7.2.1
3.1.8 the online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the study area;	iNaturalist – Andrew Zinn profile
3.1.9 the location of areas not suitable for development and to be avoided during construction where relevant;	N/A
3.1.10 a discussion on the cumulative impacts;	Section 10.3.4
3.1.11 impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Section 12 & Section 13
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;	Section 14
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;	N/A
3.2 A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	EAP to incorporate