PLANT SPECIES SPECIALIST ASSESSMENT FOR THE PROPOSED LAKENVLEI WETLAND REHABILITATION PROJECT

WSP Group Africa Pty (Ltd)

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

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Acronyms and Abbreviations

Abbreviation	Explanation
AIS	Alien Invasive Species
AOO	Area of Occupancy
BI	Biodiversity Importance
CA	Conservation Areas
CI	Conservation Importance
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EOO	Extent of Occurrence
FI	Functional Integrity
GGV	Goedgevonden Colliery
GLPE	Greater Lakenvlei Protected Environment
Ha	Hectare
MPTA	Mpumalanga Parks and Tourism Agency
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
SCC	Species of Conservation Concern
SEI	Site Ecological Importance
ToPS	Threatened or Protected Species
WUL	Water Use License

Details of the Expertise of the Specialist

Specialist Information	
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Qualifications	M.Sc. Resource Conservation Biology B.Sc. Hons. Ecology and Conservation Biology B.Sc. Zoology and Grassland Science
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 a decade 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 Lakenvlei Wetland Rehabilitation 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), on behalf of Glencore Operations South Africa (Pty) Ltd. (GOSA), to conduct the Plant Species Specialist Assessment for the proposed Lakenvlei Wetland Rehabilitation Project (hereafter referred to as the 'Project'), near Dullstroom in Mpumalanga 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.

1.2. Project Description

GOSA manages several coal mining operations including the Goedgevonden Colliery (GGV), which is existing opencast coal mining operation in the Emakhazeni Local Municipality, Nkangala District Municipality.

Wetland offsets were proposed as an offset for the impact associated with the loss of large wetland habitat at the GGV Mine. The GGV Water Use License (WUL) 24084063 of 19 April 2007 was issued on condition that wetland rehabilitation takes place as an offset for the wetland loss in GGV mining. The WUL required that the wetland offset be a ratio of 1: 2 (for every 1 hectare lost, 2 hectares must be rehabilitated). The direct wetland loss of 584 hectares at the GGV mine, resulted in a wetland offset target of 1 168 hectares. To find a wetland area this large to conserve and manage, GGV had

to look for sites beyond its catchment borders. The Lakenvlei wetland clusters 1-7 (within The Greater Lakenvlei Protected Environment [GLPE]) was identified as a suitable offset option.

The main objective of the GGV wetland offset strategy is to help improve the Present Ecological Status (PES) in all the wetland Clusters within the GLPE through rehabilitation and management initiatives. The proposed wetland rehabilitation work has been implemented in a phased approach. Phase 1 of the offset plan involved the installation of small dongerlock structures in Cluster 1 and 2 under the ambits of a GA (DWS Ref 27/2/2/B141/14/3). The small structures associated with Phase 1 did not require EA. This BAR\ Process is for the larger structures that will trigger NEMA Listed Activities, that require EA within Clusters 2-7 associated with Phase 2 of the wetland rehabilitation.

The activities that require EA, and are the focus of this specialist assessment, are those associated with placing infrastructure within a watercourse, the associated clearing of indigenous vegetation within the project footprint and infill and excavation activity that will take place within the watercourse/ wetland areas. Activities planned for each wetland cluster are listed in Table 1.

Table 1: Proposed rehabilitation interventions that require authorisation.

Location	Activity
Cluster 1	• Removal of 20.06 ha of alien vegetation
Cluster 2	• Install two double donga locks; • Clearing approximately 8.75 m^2 within the proposed structure footprints; and • Infill approx. 4.3 m^3 within wetland.
Cluster 3	• The formalisation of seven spillways; • Stabilise one headcut; • Install three double dongalock structures; • Infill approximately 5 628m^3 within wetland; • Indigenous vegetation clearance of approximately 879 m^2 within the proposed structure footprints; and • Remove 71.37 ha of alien vegetation.
Cluster 4	• Install 25 new dongalock structures; • Repair 36 existing rehabilitation structures; • Upgrade/formalise six road crossings; • Upgrade three spillways; • Construction footprint – 665 m^2 of structures within wetland and clearance of indigenous vegetation; • Infill – 87.33 m^3 within wetland; and • Removal of 6.35 ha of alien vegetation.
Cluster 5	• Install 23 new dongalock structures; • Existing Structure maintenance/ repair; • Upgrade two spillways; • Upgrade/formalise six road crossings; • Infill of 243.13 m^3 within wetland; and • Indigenous vegetation clearance of approximately 923.5 m^2
Cluster 6	• Installing one dongalock structure; • Repair one dam wall; • Upgrading two wetland road crossings; • Infill of 206.2 m^3 within wetland; and

	• Indigenous vegetation clearance of approximately 370 m^3.
Cluster 7	• Installing 16 new dongalock structures; • Repairing two spillways; • Installing two headcuts; • Formalising six farm tracks; • Infill of 969.8 m^3 within wetland; and • Removal of 945 m^2 of indigenous vegetation within the proposed structure footprints.
Totals	• The cumulative area of indigenous vegetation to be cleared – 3971.75 m^2 /0.39 ha; • Cumulative infill in the watercourse/wetland – 7192.56 m^3; and • Removal of approximately 97-78 ha of alien vegetation.

1.3. Location and Delimits of the Study Area

Lakenvlei is located approximately 10 km south of Dullstroom and 10 km north of Belfast in Mpumalanga Province, South Africa. The site has been officially declared the Greater Lakenvlei Protected Environment and comprises eight mapped wetland clusters, as shown in **Error! Reference source not found.**. The 'study area' defined for this assessment is shown in **Error! Reference source not found.**.

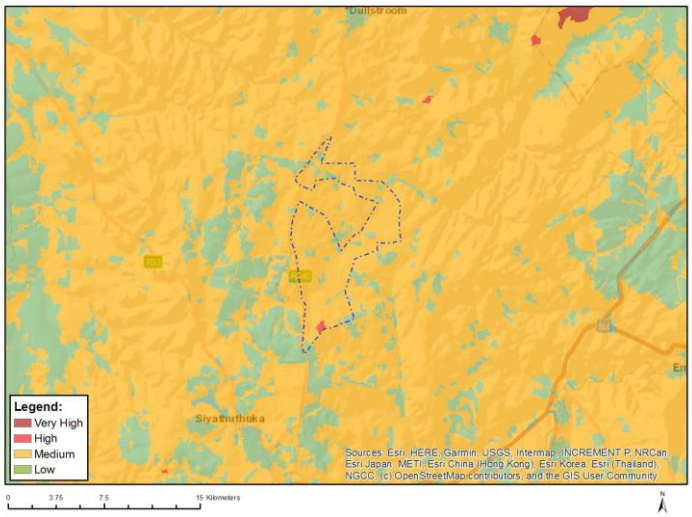
1.4. Results of the Environmental Screening Tool

According to the National Web Based Screening Tool, the Plant Species Theme for the proposed Project was rated 'High' sensitivity on account of the presence/potential presence of several threatened flora species. These species are listed below and discussed in more detail in Section 7.2.1 of this report:

- Sensitive species 1201;
- Sensitive species 1252;
- *Khadia carolinensis*;
- *Pearsonia hirsuta;*
- *Sensitive species 753;*
- Sensitive species 979;
- Asclepias dissona;
- *Aspidoglossum xanthosphaerum;*
- *Miraglossum davyi;*
- Sensitive species 971;
- Sensitive species 977;
- *Schizochilus cecilii subsp. culveri;*
- *Gnidia variabilis;*
- *Cymbopappus piliferus;*
- Sensitive species 1167;
- *Streptocarpus denticulatus;*
- *Streptocarpus latens;*
- Sensitive species 264;
- *Khadia alticola;*

- Sensitive species 41;
- Sensitive species 691;
- Sensitive species 998;
- Sensitive species 1219;
- Sensitive species 311;
- *Pachycarpus suaveolens;*
- Sensitive species 1086;
- Sensitive species 321; and
- *Hesperantha bulbifera*.

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).



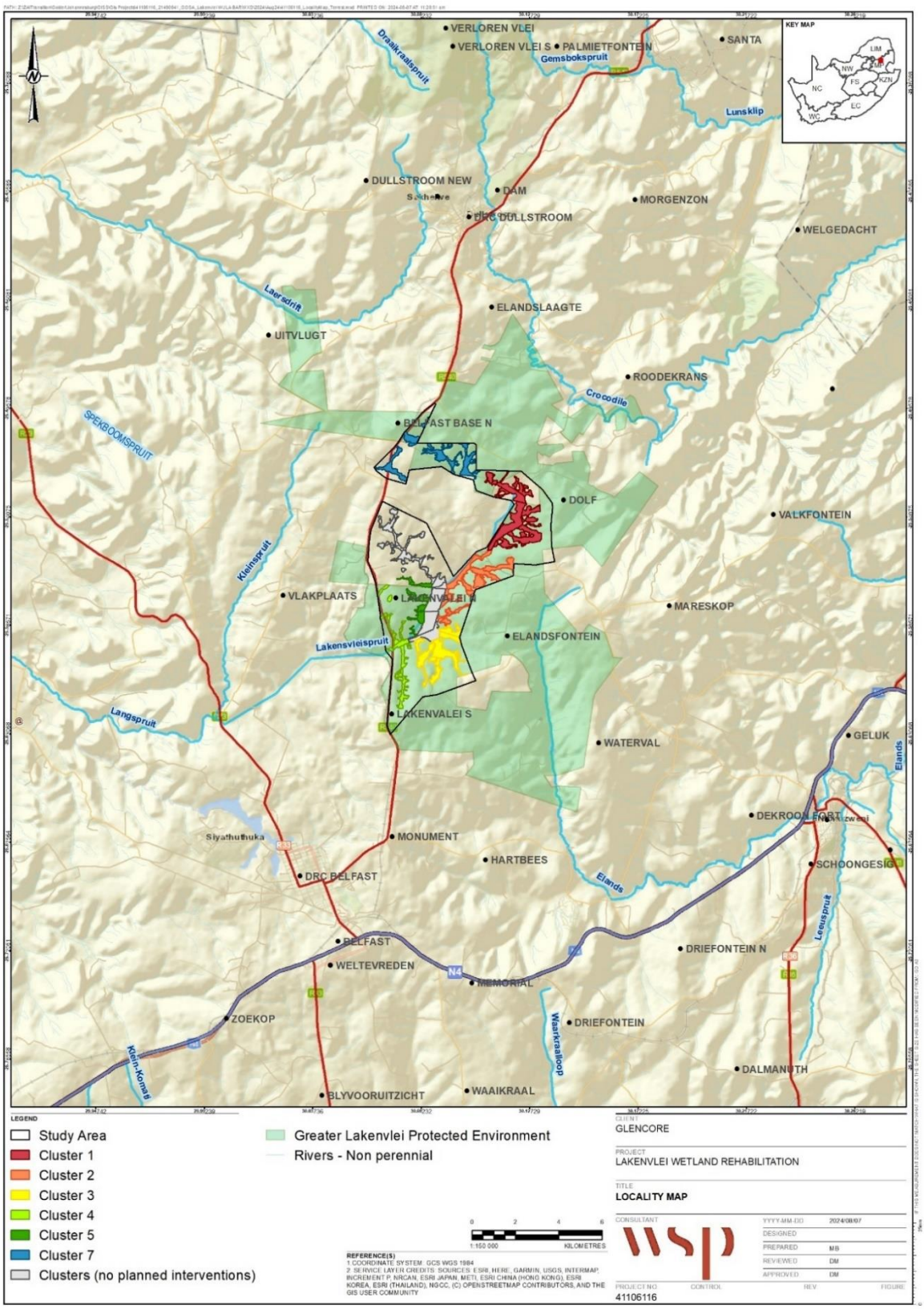


Figure 1: Map showing the regional location of the proposed Project.

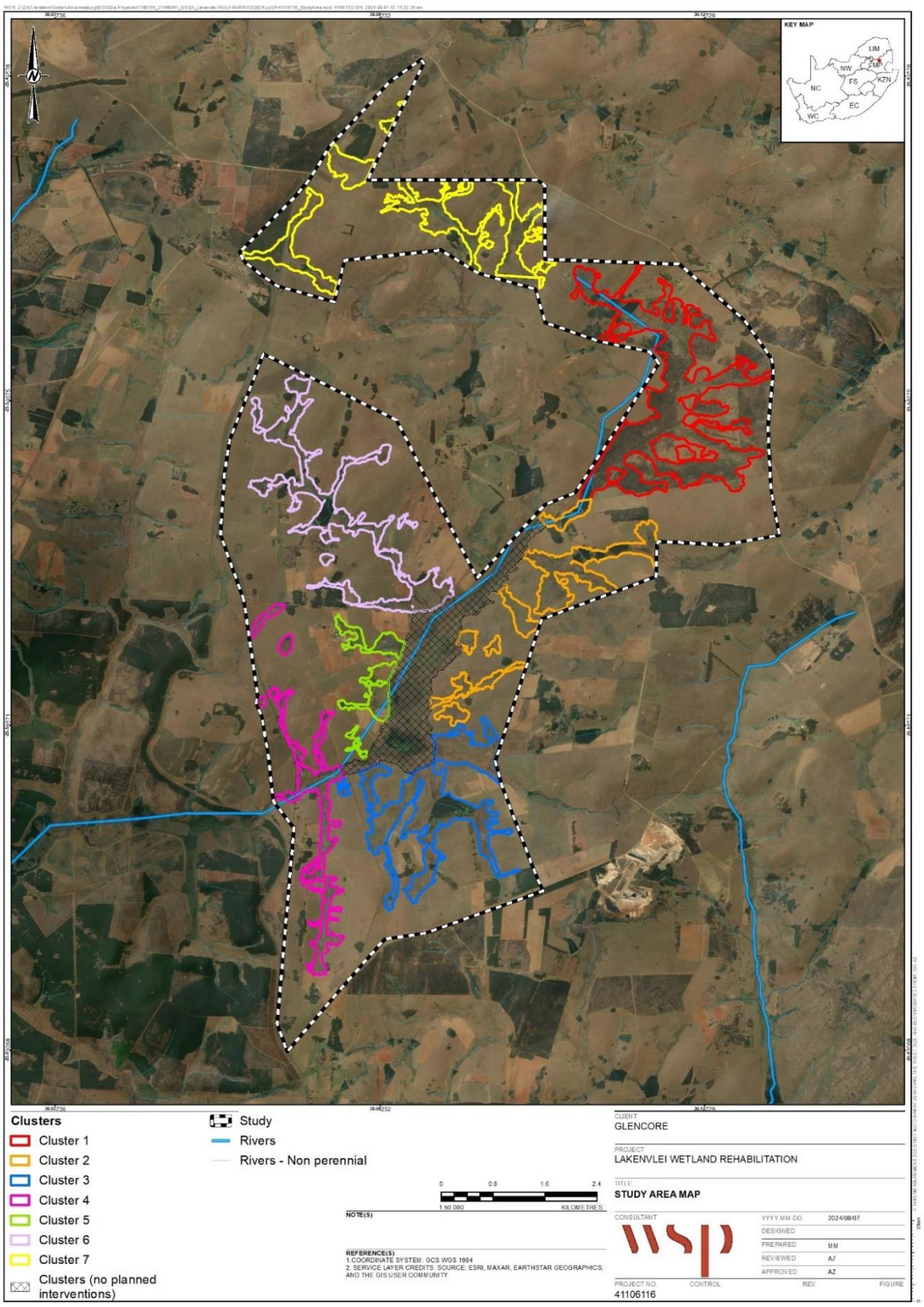


Figure 2: Aerial image showing the study area boundary and the surrounding landscape.

2. Relevant Legislation and Guidelines

Relevant international, national and provincial legislation, 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 (2011, and 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.
Mpumalanga Nature Conservation Act (Act No. 10 of 1998)	Amongst other provisions, the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) provides lists of specially protected and protected flora and fauna. Of particular relevance to this specialist study are species of game/wild animals and flora that are listed under: • Schedule 11 and 12: Protected and Specialist Protected Plants.
Other Relevant national and Provincial Policies, Plans and Guidelines	Other relevant policies, plans and guidelines that were considered during this study include: • Mpumalanga Biodiversity Sector Plan; • Species Environmental Assessment Guideline (SANBI, 2020); • National Protected Area Expansion Strategy (2018); and • Mpumalanga Protected Areas Expansion Strategy – 20 Year Plan.

3. Study Methodology

The methodology used for this study included a literature review component and a field programme. The tasks associated with these 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 in the study area and surrounding landscape, based on historic distribution ranges or recent records. Literature and data that were reviewed were obtained from a variety of online and literature sources, as discussed below:

3.1.1. Regional Ecosystems and Vegetation Types

General habitat descriptions relevant to the study area and the surrounding landscape were obtained from SANBI (2018) and 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 study area, was obtained from the SANBI's online Botanical Database of Southern Africa (BODATSA); and
- Lists of flora species of conservation concern (SCC) sourced from the Mpumalanga Parks and Tourism Agency (MPTA) for the 2530CA Quarter Degree Squares (QDS) and flora SCC highlighted by the online environmental sensitivity screening tool.

3.2. Field Programme

The field programme comprised one wet-season field survey, conducted on the 30th January to 2nd February 2024. 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 timed-meander search transects at representative sites in the main natural habitat units identified at a desktop level prior to the field survey. As proposed Project activities will take place within wetland areas, flora sampling focused primarily on wetland habitats;
- Twenty-one meander search transects were surveyed across the study area. Data collected during flora surveys included general habitat character and condition, flora species composition, evidence of disturbances, and presence of flora SCC and alien invasive species;
- Flora nomenclature is based on species names presented on SANBI's Red List of South African Plants website; and
- Vegetation structural classification was based on Edwards (1983).

3.3. Delineation and Mapping of Habitat Units

A composite approach was used to map habitat units in the study area. Recent landcover spatial data generated by GeoTerra Imagery was used as the base mapping layer, and this was augmented and refined using a combination of 1) data and observations obtained during the flora field survey, 2) existing Lakenvlei wetland delineations, and, 3) a desktop analysis of available satellite imagery.

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 Red Lists of threatened/near threatened flora species, and the Protected status of species, as per national and provincial legislation. These included:

- 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);
- Mpumalanga Nature Conservation Act (Act No. 10 of 1998); and
- Mpumalanga Red List of Threatened Flora.

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 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.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.

Site Ecological Importance	Interpretation in relation to proposed development 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 field survey was conducted over a four-day period in January/February 2024. The timing of the field survey coincided with mid/late wet-season. Sufficient rain had fallen prior to the site visit and vegetation was actively growing. Conditions at this time were therefore optimal to assess vegetation condition and flora species composition, and seasonality is not considered a limiting factor; and
- Notwithstanding 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 surveys.

5. Regional Description of Baseline Vegetation

The study area is located in the Grassland Biome, and according to SANBI's regional mapping of South Africa's vegetation types (2018), Steenkampsberg Montane Grassland is the dominant vegetation type (Figure 3). The region in which the study area is located is also referred to as the Lydenburg Centre of Plant Endemism.

The general characteristics of the Grassland Biome, Steenkampsberg Montane Grassland, and the Lydenburg Centre of Plant Endemism 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. Steenkampsberg Montane Grassland

Steenkampsberg Montane Grassland extends along the Steenkampsberg escarpment from the mountains north-west of Lydenburg, southwards to Dullstroom and Belfast and then eastwards towards Elandshoogte. This vegetation type occurs on mountain plateaus and slopes and is characterised by short grassland with a high forb/herb diversity.

Tree and Shrubs: *Leucosidea sericea, Searsia discolor, Rubus ludwigii* and *Lopholaena corifolia*.

Graminoides: *Tristachya leucothrix, Harpochloa falx, Andropogon shirensis* and *Monocymbium ceresiiforme.*

Herbs: *Acalypha wilmsii, Argyrolobium tuberosum, Helichrysum adenocarpum* and *Lobelia flaccida.*

Endemic Taxa: *Searsia tumulicola,* var. *meeuseana, Crotalaria monophylla, Indigofera hedyantha* var. *steenkampianus, Kniphofia rigidifolia, Streptocarpus latens, Gladiolus cataractarum, Gladiolus malvinus, Graderia linearifolia, Eucomis vandermerwei, Drimiopsis purpurea* and *Aloe challisii*.

5.3. Lydenburg Centre of Plant Endemism

The region in which the study area is located is known as the Lydenburg Centre of Plant Endemism. Thirty-three endemic flora and fauna species are known from this region, including several species of conservation concern, such as *inter alia;* Robust Golden Mole, Oribi, Blue Crane, Wattled Crane, Southern Bald Ibis, Yellow-breasted Pipit and Rudd's Lark, and flora species such as *Eucomis vandermerwei, Gladiolus cataractarum, Nerine gracilis* and *Watsonia cataractarum*.

5.4. Nationally Threatened Ecosystems

The Steenkampsberg Montane Grassland vegetation type is listed as Least Concern (SANBI, 2021) – see **Error! Reference source not found.**. It is noted that the study area is located in a demarcated ecosystem known as the Dullstroom Plateau Grasslands (MP4), which was previously listed as Endangered, under the NEMBA List of Threatened Ecosystems (2011).

Figure 3: Study area in relation to the SANBI (2018) vegetation types.

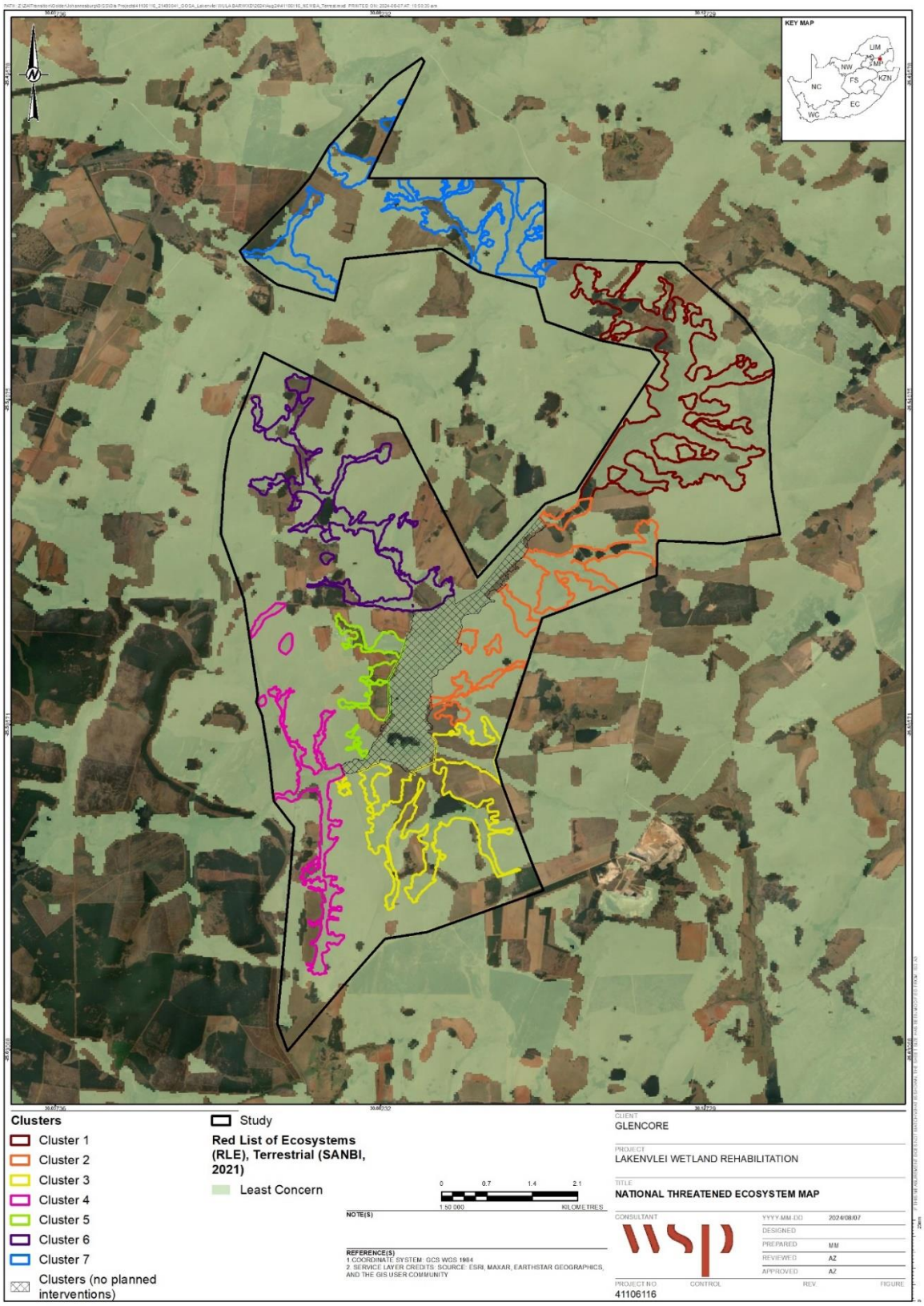


Figure 4: Study area in relation to delineations of the National Red List of Terrestrial Ecosystems.

6. Landscape Context and Existing Impacts on Flora

The following notes describe the landscape context and major existing impacts (anthropogenic activities and infrastructure) observed in the study area during the field survey:

- The study area, and well as the surrounding landscape, are mostly dominated by agricultural, conservation and recreational land uses, although a mining operation is present to the south of the study area. Landcover thus comprises a matrix of modified habitat patches and large tracts of natural habitat;
- Farming is the main land use within the study area. Large areas are under dryland crop cultivation, with maize a common crop type;
- Livestock farming with cattle was also observed in the study area. Cattle are grazed widely throughout grassland and wetland habitat in the study area;
- Several alien invasive tree stands and windrows are also present. These include stands dominated by wattle species (*Acacia dealbata* and *Acacia mearnsii*) and *Populus x canescens*, which are aggressive invaders and capable of spreading into undisturbed grassland and wetland habitats;
- Various forms of linear infrastructure ate present across the landscape, including tarred arterial roads (e.g., R540), formal gravel district roads, farm tracks, and farm- and game fences. Although these caused habitat fragmentation, the degree of overall natural habitat connectivity across the study area and its surrounds is considered high (refer to Section 8.1); and
- Other anthropogenic activities and infrastructure in the study area that have resulted in habitat loss and disturbance include *inter alia*, farm residences, rural dwellings and agriculture structures (e.g., poultry sheds, barns).

7. Vegetation and Flora Assessment

7.1. Habitat Units

Five primary habitat units were identified in the study area during the field survey. These include three natural habitat units, and two modified habitat units:

- Moist Grassland and Wetlands;
- Dry Mixed Grassland;
- Rocky Grassland;
- Cultivated Fields and Old Lands; and
- Alien Tree Plantations.

Habitat units are described, with accompanying photographs, in Section 7.1.1 through to Section 7.1.5. **Error! Reference source not found.Error! Reference source not found.**A habitat unit map for the study area is shown in Figure 5:

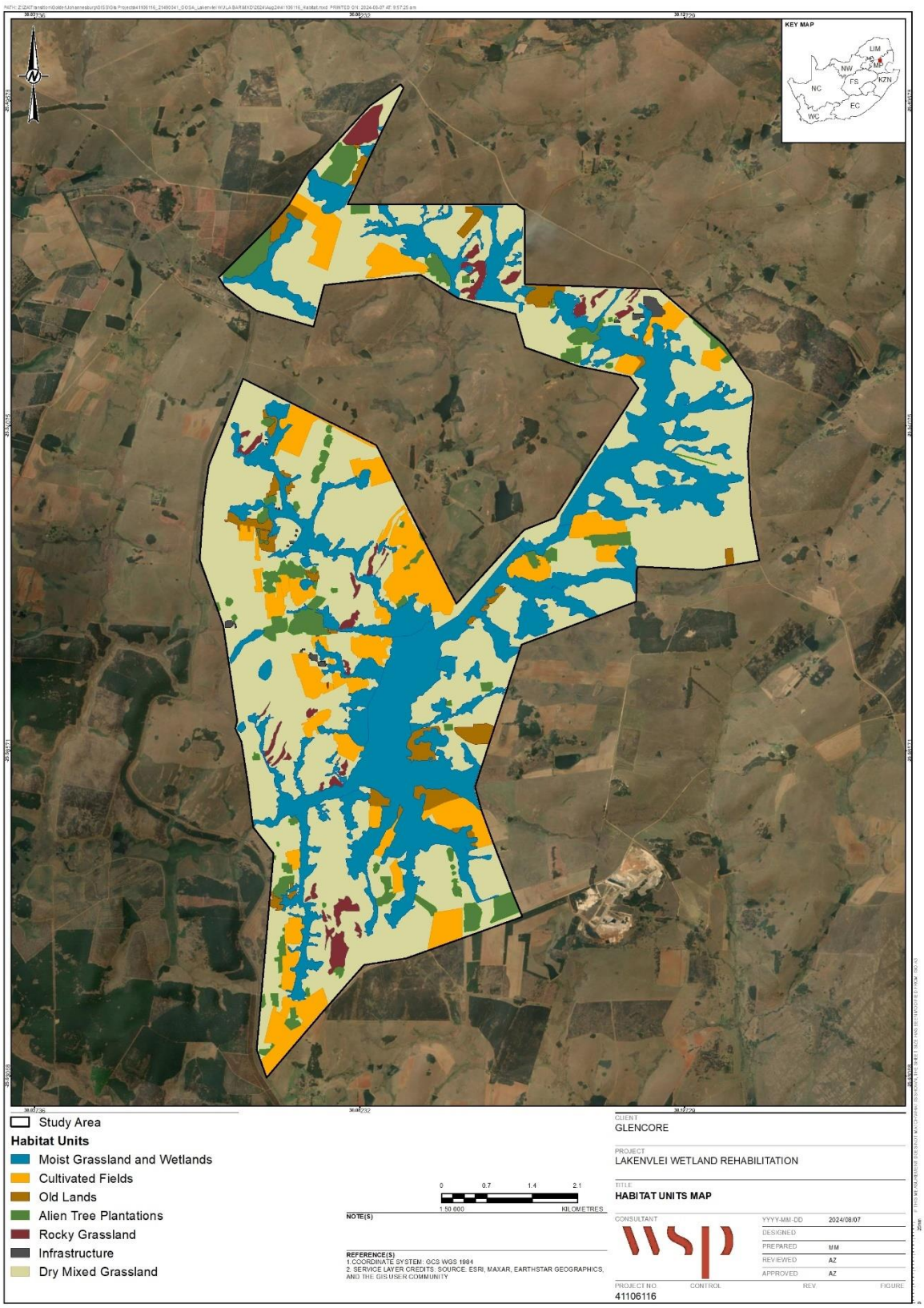


Figure 5: Habitat unit map of the study area.

7.1.1. *Moist Grassland and Wetlands*

The dominant feature of the study area are the extensive moist grassland and wetland areas associated with Lakensvleispruit. In previous work conducted in the study area, eight main wetland clusters were identified and delineated, and these are the focus of ongoing wetland rehabilitation efforts.

In line with Edwards (1983) structural classification system, vegetation structure within wetland habitat ranges from low (<0.5 m) to high (> 2 m) closed grassland, and compositionally, vegetation also varies. Temporary and seasonally moist areas are typically dominated by a mixture of grasses, sedges and various forb species (Figure 6), while the permanently moist, central wetland areas are typically dominated by tall robust species (Figure 7).

Common grass and sedge species characterising moist grassland and wetland areas include *Agrostis eriantha, Agrostis lachnantha, Andropogon appendiculatus, Arundinella nepalensis, Cyperus congesta, Cyperus denudatus, Eleocharis* species*, Eragrostis heteromera, Eragrostis plana, Holcus lanatus**, *Leersia hexandra, Paspalum dilatatum*,* and *Setaria sphacelata.* Common forbs recorded include *inter alia; Berkheya setifera, Centella asiatica, Helichrysum aureonitens, Helichrysum mundtii, Helichrysum nudifolium* var. *pilosellum, Pelargonium luridum, Scabiosa columbaria,* and *Senecio inornatus* (*indicates alien species).

In the permanently moist central wetland areas, the tall reed *Phragmites australis* and the bulrush *Typha capensis* are typically dominant and often form extensive, dense-monospecific stands (see Figure 7).

Listed alien invasive species recorded in this habitat unit include the tree *Populus x canescens*, and the herbaceous plants *Cirsium vulgare* and *Verbena bonariensis.* These are potentially aggressive invaders that are capable of spreading into undisturbed habitat fairly rapidly.

Several flora SCC were recorded in areas of moist grassland and wetland including, *Brunsvigia cf. radulosa, Eucomus autumnalis, Eucomus pallidiflora* subsp. *pole-evansii, Gladiolus papilio*, *Gunnera perpensa*, *Satyrium cristatum, Satyrium longicauda, Satyrium hallackii* subsp. *ocellatum* and *Zantedeschia* species. These are discussed in more detailed in Section 7.2.1.

For a list of flora species recorded during the field survey refer to Appendix C

Figure 6: Typical moist grassland/wetland habitat in the study area.

Figure 7: Dense Phragmites australis reedbeds characterise most of wetland Cluster 8 in the centre of the study area.

7.1.2. Dry Mixed Grassland

Dry Mixed Grassland is a broad habitat unit that characterises the drier areas of open grassland in the study area (Figure 8). Although localised disturbances typically associated with heavy grazing, are present, in general this habitat is relatively species rich and considered a primary vegetation community.

Structurally, vegetation comprises low closed grassland, as per Edwards (1983). In terms of composition, undisturbed areas of Dry Mixed Grassland are often dominated by *Themeda triandra* (Figure 9), with several other grass species also recorded including *Aristida junciformis, Alloteropsis semialata, Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Eragrostis racemosa, Trachypogon spicatus* and *Tristachya leucothrix.*

Commonly recorded forbs include *inter alia*; *Acalypha angustata, Acalypha punctata*, *Berkheya setifera, Haplocarpha scaposa, Hilliardiella aristata, Helichrysum rugulosum, Helichrysum callicomum Helichrysum nudifolium* var. *pilosellum*, *Hermannia transvaalensis, Hypoxis argentea, Hypoxis iridifolia, Ipomoea ommaneyi, Ledebouria ovatifolia, Pelargonium luridum* and *Richardia brasiliensis*.*

Woody species are not abundant in this habitat unit and typically comprise occasional, scattered small trees/shrubs with the following species such as *Searsia discolor, Diospyros lycioides* and *Seriphium plumosum* observed.

Listed alien invasive species recorded in this habitat unit include *Solanum elaeagnifolium* and *Verbena bonariensis.* Flora SCC recorded Dry Mixed Grassland include *Boophone disticha, Brunsvigia cf. radulosa, Eucomis autumnalis*, and various orchid, *Watsonia* and *Gladiolus* species. For a list of flora species recorded during the field survey refer to Appendix C

Figure 8: Typical Dry Mixed Grassland in the study area.

Figure 9: Themeda triandra dominated patch of Dry Mixed Grassland.

7.1.3. Rocky Grassland

In the study area, Rocky grassland habitat typically occurs as small- to medium-sized outcrops that are embedded within the broader grassland/wetland habitat matrix. In contrast to the other habitat units, these areas are characterised by protruding rock and often the presence of indigenous woody species.

Structurally, this habitat unit is defined as low open grassland, in line with Edwards (1983) structural classification, with woody vegetation generally growing in amongst rocks as scattered individual small trees and shrubs, or as discrete clusters of small trees and shrubs (Figure 10 and Figure 11).

In terms of composition, woody species recorded in this habitat unit include *Celtis africana, Diospyros lycioides, Leucosidea sericea*, *Kiggelaria africana, Lopholaena coriifolia, Otholobium wilmsii, Phymaspermum acerosum, Rabdosiella calycina* and *Searsia discolor.*

The herbaceous layer is characterised by various grasses such as *inter alia; Andropogon schirensis Alloteropsis semialata, Aristida aequiglumis, Digitaria argyrograpta, Eragrostis chloromelas, Eragrostis plana, Koeleria capensis, Melinis nerviglumis, Panicum natalense, Tristachya leucothrix* and *Tristachya rehmannii.*

Various forbs/herbs and shrublets were recorded in this unit including *inter alia*; *Berkheya seminivea Berkheya setifera, Crocosmia paniculata*, *Helichrysum callicomum, Helichrysum rugulosum and Psammotropha myriantha.* Ferns include *Pellaea calomelanos var. calomelanos* and *Selaginella dregei*.

Flora SCC recorded Dry Mixed Grassland include *Haemanthus humilis, Gladiolus* species and a *Zantedeschia* species. For a list of flora species recorded during the field survey refer to Appendix C.

Figure 10: Rocky grassland

Figure 11: Indigenous woody species occur in rocky habitat include Diospyros lycioides, Rabdosiella calycina and Searsia discolor.

7.1.4. Cultivated Fields and Old Lands

Cultivated fields and old lands are mostly present in the south of the study area. These areas comprise currently cultivated crop fields that are typically under maize production (Figure 12), managed grazing pastures, and old abandoned cultivated fields (old lands).

Cultivated fields and managed grazing pastures are subject to ongoing and regular anthropogenic disturbances, including ploughing, seeding and harvesting, or mowing and baling. Old lands refers to old cultivated fields that have been left fallow for several years, and as a consequence, they have naturally revegetated (i.e., regenerated) and are characterised by a secondary grass community that is typically species poor and dominated by hardy pioneer and early seral species. These are all considered modified habitats.

Figure 12: Cultivated field under maize production

7.1.5. Alien Tree Plantations

Several alien tree stands are present in the study area. Spatially, these generally occur as fairly well-defined and localised stands. Structurally, they are defined as closed woodland, as per Edwards (1983) – see Figure 13 and Figure 14.

Alien tree plantations are typically dominated by *Eucalyptus, Pinus* and *Acacia* (wattle) species although stands of *Populus x canescens* were also noted growing in riparian/wetland areas. Little indigenous vegetation is present in dense, well-established alien tree stands. No flora SCC were

recorded in alien tree plantations and none are likely to be present in these habitats. Accordingly, these areas have little- to no floristic importance or sensitivity.

Figure 13: Eucalyptus plantation.

Figure 14: Stand of Acacia dealbata.

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) and Mpumalanga Nature Conservation Act (Act No. 10 of 1998) are also included as flora species of conservation concern and discussed in this section.

Based on reviewed literature and data sources, 44 flora species that occur, or potentially occur in the study area are listed on the national and/or provincial Red Lists. These are listed in Table 4, along with the conservation statuses, habitat preferences and a probability of occurrence, based on habitat suitability. Red List flora species recorded in the study area during the field survey include *Eucomus pallidiflora* subsp. *pole-evansii* (Near Threatened) (Figure 15), *Eucomus autumnalis* (Declining, MP) (Figure 16), *Gunnera perpensa* (Declining, MP) (Figure 17) and *Protea cf. parvula* (Near Threatened) (Figure 18).

Several additional flora species that were recorded in the study area are listed as Protected at a provincial level, according to Mpumalanga Nature Conservation Act (Act No. 10 of 1998) (Table 5). These include, *inter alia; Agapanthus inapertus, Aloe ecklonis, Brunsvigia* cf. *radulosa, Boophone disticha* (Figure 19), *Gladiolus ecklonii, Gladiolus papilio, Haemanthus humilis, Hesperantha baurii* subsp. *baurii, Satyrium cristatum, Satyrium hallackii* subsp. *ocellatum, Satyrium longicauda* (Figure 20) and a *Zantedeschia* species. No flora species listed on the NEMBA ToPS (2007) List were recorded in the study area.

Refer to Figure 21 for a map showing the location of flora SCC recorded in the study area.

Figure 15: Eucomus pallidiflora subsp. pole-evansii (Near Threatened)

Figure 16: Eucomis autumnalis (Declining, MP)

Figure 17: Gunnera perpensa (Declining, MP)

Figure 18: Protea cf. parvula (Near Threatened)

Figure 19: Boophone disticha (Protected, MP)

Figure 20:Satyrium longicauda (Protected, MP)

Table 4: Regionally or provincially threatened and Near Threatened flora species that occur or potentially occurring in the study area.

Family	Scientific Name[#]	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Aizoaceae	*Khadia alticola*	Rare	Rare	-	This species favours high-altitude grasslands in shallow, sandy humus-rich soils in rocky areas (Victor, 2005). AOO is estimated at 9.40 km^2 (SANBI, 2020)	Probable – suitable habitat present.
Aizoaceae	*Khadia carolinensis*	Vulnerable	Vulnerable	-	Range-restricted species, occurring in Highveld grasslands between 1700 m. AOO is estimated at 28.34 km^2 (SANBI, 2020). Favours on well-drained sandy loam soils amongst rock outcrops, or along the edges of sandstone sheets (Lötter *et al*., 2007a)	Probable – suitable habitat present.
Amaryllidaceae	*Boophone disticha*	Least Concern	Least Concern	Protected	Widespread species favouring dry grassland and rocky areas (Williams, *et al.,* 2016a).	Recorded
Apocynaceae	*Asclepias dissona*	Critically Endangered (Possibly Extinct)	Critically Endangered (Possibly Extinct)	-	Last recorded in 1932. Favours damp grassland in the Carolina and Machadodorp region (von Staden, 2016).	Possible – suitable habitat present.
Apocynaceae	*Aspidoglossum xanthosphaerum*	Vulnerable	Vulnerable	-	Favours marshy habitats in montane grasslands around 1800 m. Only known from four locations, within an EOO of < 500 km^2 (Nickolas & Victor, 2006), and an AOO estimated at 15.90 km^2 (SANBI, 2020).	Possible – suitable habitat present.
Apocynaceae	*Miraglossum davyi*	Vulnerable	Vulnerable	-	Found on sloping grasslands in heavy black loam soils at high altitudes. Known from only five locations, with an EOO of <15 000km2 (Lötter et al., 2005) and a AOO estimated at 10.78 km^2 (SANBI, 2020).	Possible – suitable habitat present.
Apocynaceae	*Pachycarpus suaveolens*	Vulnerable	Vulnerable	-	Favours short, annually burnt grassland between 1400-2000 m. Known from eight locations with an EOO of 19 900 km^2 (Lötter et al., 2007b).	Possible – suitable habitat present.

Family	Scientific Name[#]	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Apocynaceae	*Riocreuxia aberrans*	Near Threatened	Near Threatened	-	Found in the cracks of rocks in exposed quartzite ridges in grassland habitats (Lötter *et al.* 2012).	Unlikely – limited suitable habitat present.
Asphodelaceae	*Aloe reitzii* var. *reitzii*	Near Threatened	Near Threatened	Protected	Restricted range species (EOO 4952-6488 km^2), known from more than 10 locations. Favours rocky slopes and granite outcrops in montane grassland (Mtshali, *et al.,* 2018).	Possible – suitable habitat present.
Asphodelaceae	*Kniphofia rigidifolia*	Least Concern	Rare	Protected	Among rocky outcrops on grassy plateaus.	Probable – suitable habitat present.
Asteraceae	*Callilepis leptophylla*	Least Concern	Declining	-	Widespread species (EOO 156 000 km^2) that occurs in rocky outcrops and hillslopes in grassland and savanna (Victor, 2016).	Probable – suitable habitat present.
Astercaeae	*Cymbopappus piliferus*	Vulnerable	Vulnerable	-	A restricted-range species, with an EOO of 1635 km^2. Known from six to seven locations and occurs in montane grassland where it favours rocky quartzitic ridges (von Staden & Lötter, 2016).	Possible – suitable habitat present.
Fabaceae	*Pearsonia hirsuta*	Vulnerable	Vulnerable	-	Known from four locations, from Dullstroom to Lydeburg. Favours low grassland habitat and occurs between rocks, in humus-rich sandy soils (Manyama, 2008).	Probable – suitable habitat present.
Gesneriaceae	*Streptocarpus denticulatus*	Vulnerable	Vulnerable		Known from five locations between Barbeton and Belfast. AOO estimated at 4.05 km^2. This species favours shaded and damp crevices on rocky outcrops in grassland habitat (Lötter, *et al*., 2005).	Possible – suitable habitat present
Gesneriaceae	*Streptocarpus latens*	Rare	Rare		A range-restricted species, with an EOO of <150 km^2. This species occurs at elevations of 2225 m	Possible – suitable

Family	Scientific Name[#]	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
					and favours mossy, moist rocky crevices from Dullstroom and Belfast and Steenkampsberg (Truter and Daniels, 2005).	habitat present
Gunneraceae	*Gunnera perpensa*	Least Concern	Declining	-	Widespread species, that favours moist grassland and wetland habitats in a range of ecosystems. Occurs from the coast to 2 400 m (Williams, *et al*., 2016).	Recorded
Hyacinthaceae	*Bowiea volubilis*	Vulnerable	Vulnerable	Protected	Found in open woodland and steep rocky hills in shady situations at low- and medium altitudes (Raimondo, *et al*., 2007)	Possible – suitable habitat present.
Hyacinthaceae	*Eucomis autumnalis*	Least Concern	Declining	Protected	Favours damp open places (Williams, *et al.,* 2016a).	Recorded
Hyacinthaceae	*Eucomis montana*	Least Concern	Declining	Protected	Widespread species (EOO 30 000km^2) that Favours rocky montane grassland in Mpumalanga and Swaziland (Williams, *et al*., 2016b).	Possible – suitable habitat present.
Hyacinthaceae	*Eucomis pallidiflora* subsp. *pole-evansii*	Near Threatened	Near Threatened	-	Restricted range species (AOO <1000 km^2), known from 18 locations. Favours wetland habitats, with standing water in grassland ecosystem (Lötter *et al.,* 2006a).	Recorded
Iridaceae	*Hesperantha bulbifera*	Rare	Rare	-	Species has a wide range but it is found in only localised sites and is rare. Favours rocky ledges along wet cliffs and damp places in the mist of waterfalls (von Staden, 2017).	Unlikely - limited habitat present.
Iridaceae	*Moraea robusta*	Least Concern	Rare	-	Favour montane grassland.	Probable – suitable habitat present.
Iridaceae	*Watsonia occulta*	Least Concern	Rare	Protected	Favours moist grassland habitats.	Probable – suitable habitat present.

Family	Scientific Name[#]	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Orchidaceae	*Centrostigma occultans*	Least Concern	Rare	Protected	Favours wetland habitats.	Probable – suitable habitat present.
Orchidaceae	*Eulophia parvilabris*	Least Concern	Rare	Protected	Favour moist slopes and flats in montane grassland habitat (Johnson *et al.,* 2015).	Probable – suitable habitat present.
Orchidaceae	*Schizochilus cecilii subsp. culveri*	Rare	Rare	Protected	This species has an estimated EOO of 1885 km^2, and is known from 9-11 scattered subpopulations located between Barberton and Mbabane. Prefers damp rock ledges on step grassy slopes (von Staden, et al., 2009).	Unlikely - limited suitable habitat present.
Proteaceae	*Protea parvula*	Near Threatened	Near Threatened	Protected	Species prefers rocky grassland habitats on acidic soils between 1300 to 2150 m (Rebelo, 2009).	Recorded
Rosaceae	*Prunus africana*	Vulnerable	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*., 2008)	Unlikely – no suitable habitat present.
Thymelaeceae	*Gnidia variabilis*	Vulnerable	Vulnerable	-	Known from only one location, with possible population at one other site. This species favours well-drained grassland between 900-1800 m (Lötter *et al*., 2006).	Possible – suitable habitat present.
-	Sensitive species 1086	Endangered	Endangered	Protected	This species is known from less than five locations within a EOO of 122 km^2. It is known from the Dullstroom area and favours wetland habitat between 1500-2000.	Probable – suitable habitat present.
-	Sensitive species 1167	Vulnerable	Vulnerable	Protected	Species has an EOO of 12 000 km^2, with small and fragmented subpopulations. This species occurs in rocky hillsides and is known from the Dullstroom area.	Probable – suitable habitat present
-	Sensitive species 1201	Vulnerable	Vulnerable	Protected	Range-restricted species (EOO 400 km^2 and AOO 1.9 km^2, SANBI, 2020) known from six locations.	Probable – suitable

Family	Scientific Name#	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
					Grows along dolerite outcrops in grassland habitats along the Mpumalanga escarpment at around 2000 masl.	habitat present
-	Sensitive species 1219	Vulnerable	Vulnerable	Protected	Occurs in seasonally moist, high-altitude montane grasslands between 1800-2300 m. AOO estimated at 3.89 km^2 (SANBI, 2020).	Possible – suitable habitat present.
-	Sensitive species 1252	Vulnerable	Vulnerable	Protected	Moist bushveld habitats, including wooded mountain kloofs. AOO estimated at 73.01 km^2 (SANBI, 2020).	Unlikely – limited suitable habitat present.
-	Sensitive species 264	Vulnerable	Vulnerable		Known from eight locations, this species has an EOO of 2726 km^2 and ranges is from Middelburg to Lydenburg. It occurs in sour montane grassland, on low pH quartzitic soils in amongst rocks. Typically favours north-facing slopes, between 2200-2500 m.	Possible – suitable habitat present.
-	Sensitive species 311	Rare	Rare		Known from ten locations along the Mpumalanga Drakenberg and in Ngome, KwaZulu-Natal. AOO estimated at 5 km^2 (SANBI, 2020). Inhabits quartzitic rocky outcrops in montane grassland between 1200-2200 m.	Unlikely – limited suitable habitat present.
-	Sensitive species 321	Rare	Rare	Protected	High altitude specialist that is known from fewer than 10 subpopulations. Favours montane and subalpine grassland on grassy, moist and stony slopes between 1600 and 3000 m. AOO estimated at 29.58 km^2 (SANBI, 2020).	Possible – suitable habitat present.
-	Sensitive species 41	Vulnerable	Vulnerable	Protected	Widespread but rare species, with a EEO of <19 940 km^2 and a AOO of <2000 km^2. Favours high altitude wetlands that remain damp throughout the year.	Probable – suitable habitat present.

Family	Scientific Name[#]	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
-	Sensitive species 691	Vulnerable	Near Threatened	-	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 753	Endangered	Endangered	Protected	This species occurs in scattered subpopulations along three streams in the Dullstroom-Lydenburg area. The EOO is estimated at 40 km^2, with an AOO of <10km^2). Population is estimated at between 500 to 1000 mature individuals. Sensitive species 753 favours moist sites associated with waterfalls, cliffs and steep rocky, south-facing slopes.	Unlikely – limited suitable habitat present.
-	Sensitive species 971	Vulnerable	Vulnerable	Protected	Sensitive species 971 is known from five locations in the vicinity of Sabie and Lydenburg. AOO estimated at 1.69 km^2 (SANBI, 2020). Favours seeps and depressions, among dolerite boulders in short, well-grazed grassland at 2000 m.	Probable – suitable habitat present.
-	Sensitive species 977	Vulnerable	Vulnerable	Protected	This species has an EOO of 234 km^2, and is known from only four locations. Habitat preferences include high-altitude montane grassland.	Probable – suitable habitat present.
-	Sensitive species 979	Vulnerable	-		Poorly understood species. Probably present at four locations in the Belfast and Dullstroom areas. Favours open, montane grassland at moist sites between 1700-1950 m.	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. AOO estimated at 30.81 km^2 (SANBI, 2020).	Unlikely – limited 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).

Source: List based on data from MPTA, BODATSA and Environmental Screening Report Output.

Figure 21: Location of flora species of conservation concern recorded during the field survey.

Table 5: Provincially protected species observed in the study area.

Family	Species Name	Mpumalanga Protected Status
Agapanthaceae	*Agapanthus inapertus*	Protected
Amaryllidaceae	*Boophone disticha*	Protected
Amaryllidaceae	*Brunsvigia* cf. *radulosa*	Protected
Amaryllidaceae	*Haemanthus humilis*	Protected
Araceae	*Zantedeschia* sp.	Protected
Asphodelaceae	*Aloe ecklonis*	Protected
Hyacinthaceae	*Eucomus autumnalis*	Protected
Iridaceae	*Gladiolus densiflorus*	Protected
Iridaceae	*Gladiolus ecklonii*	Protected
Iridaceae	*Gladiolus papilio*	Protected
Iridaceae	*Gladiolus pretoriensis*	Protected
Iridaceae	*Gladiolus* species (no flowers)	Protected
Iridaceae	*Hesperantha baurii* subsp. *baurii*	Protected
Orchidaceae	*Satyrium cristatum*	Protected
Orchidaceae	*Satyrium hallackii* subsp. *ocellatum*	Protected
Orchidaceae	*Satyrium longicauda*	Protected

7.2.2. Declared Alien Invasive Species

Based on the findings of the field survey, 11 NEMBA declared alien invasive plant species were recorded in the study area. These are listed in Table 6, along with their growth form and NEMBA Category.

Table 6: Declared alien invasive species recorded in the study area.

Scientific Name	Common Name	Growth Form	NEMBA Category
Acacia mearnsii	Black Wattle	Tree	2
Acacia dealbata	Silver Wattle	Tree	2
Cirsium vulgare	Spear Thistle	Herbaceous forb	1b
Datura stramonium	Large Thorn Apple	Herbaceous forb	1b
Eucalyptus species	Gum	Tree	1b or 2
Opuntia ficus-indica	Sweet Prickly Pear	Succulent Tree	1b
Pennisetum clandestinum	Kikuyu	Graminoid	1b
Populus x canescens	Gray Polar	Tree	2
Salix babylonica	Weeping Willow	Tree	-
Solanum elaeagnifolium	Potato Creeper	Herbaceous forb	1b
Verbena bonariensis	Wild Verbena	Herbaceous forb	1b

7.2.3. Flora of Medicinal Value

Eighteen flora species recorded in the study area 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 study area that have recognised medicinal value.

Scientific Name	Medicinal Use*
Agapanthus inapertus	Decoction used as an antenatal and post-natal medicine.
Alepidea setifera	Used to treat colds, chest complaints, asthma, influenza and abdominal cramps.
Asparagus laricinus	Used in the treatment of tuberculosis, kidney ailments and rheumatism.
Berula repanda	Used to treat toothache.
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.
Datura stramonium	Relieves asthma and acts to reduce pain. Weak infusions are used as an aphrodisiac.
Eucomus autumnalis	Bulb decoction used to treat lower back pain. Other treatments include, amongst others, urinary diseases, stomach aches and fevers.
Gunnera perpensa	Used to induce and augment labour, and assit with the expulsion of the placenta. Also used to treat stomach issues, rheumatic fever, swellings and menstrual pain.
Helichrysum species	Treats a variety of afflictions, including coughs, colds, fever, headaches and infections.
Hypoxis species	Infusions of the corm are used to treat dizziness, bladder disorders and insanity.

Scientific Name	Medicinal Use*
Pelargonium luridum	Taken orally to treat diarrhoea and dysentery.
Pellaea calomelanos	Used to treat boils and abscesses and for internal parasites
Rumex crispus	Used as a remedy for internal parasites, as well as vascular diseases and internal bleeding.
Salix mucronata	Willow tips are used to treat 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.
Hilliardiella aristata	Infusions taken to treat stomach ailments, rheumatism, dysentery and diabetes.
*Medicinal use, as per Van Wyk, *et al*. (2009).	

8. Key Ecological Attributes and Processes

8.1. Habitat Corridors, Resources and Refugia

The study area is large and characterised by extensive tracts of natural habitat, while the broader surrounding landscape is similarly characterised. Predicated on this landscape template, and notwithstanding the presence of linear infrastructure, such as roads, farm tracks and farm fences, and the presence of modified habitat (e.g., cultivated fields), it is noted that habitat connectivity across the landscape remains high. On-site grassland and wetland habitats provide a large and important network of dispersal corridors for biodiversity at the landscape-sale.

The proposed Project will not disrupt local habitat connectivity and the study area's role as an important landscape-scale ecological corridor. It may in fact, improve it.

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 in the study area.

8.2.1. Alien Invasive Species Colonisation

Several stands of alien invasive woody species – mostly *Eucalyptus, Pinus* or alien *Acacia* species (i.e., wattles, *Acacia dealbata* and *Acacia mearnsii*) are present in the study area. If not actively controlled, wattle trees in particular will continue to spread into adjacent natural habitat, where they will shade-out and competitively exclude many indigenous woody and herbaceous 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;
- A reduction in grass productivity; and
- Increased exposed soil surfaces and incidences of erosion.

The spread of alien invasive vegetation is therefore considered a significant driver of change in the study area and surrounding landscape, and one capable of negatively impacting SCC. The proposed Project may create temporary and localised sites where herbaceous alien invasive species could establish and this will need to be managed during Project implementation. It is noted that the

clearing of 97 ha of alien invasive trees that is part of the Project's proposed rehabilitation interventions will have a positive effect on the ecological integrity and hydrological functioning of wetland and dry grassland habitat across the study area.

8.2.2. 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 on vegetation and flora species. These include *inter alia*: removing moribund vegetation and enhancing plant primary productivity, stimulating germination / flowering of fire-adapted flora species (e.g., certain orchid species), and, controlling the encroachment of both alien and indigenous woody plant species and weeds into grassland and wetland habitats. Too frequent or intense wildfires can however, have negative consequences, such as the direct killing of flora species, including SCC, that are poorly adapted to fire. Hence, wildfires are considered an important driver of change in the study area. The proposed Project is not anticipated to affect local wildfire patterns.

8.2.3. 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), which can negatively affect local fauna communities. Excessive cattle grazing and trampling can also cause soil erosion and gulley formation, and modify and homogenise vegetation structure, which can potentially impact sensitive fauna species that have specific life-cycle habitat requirements.

Cattle grazing and trampling are considered important drivers of change in the study area. The proposed Project will not impact cattle grazing intensity and frequency across the study area.

9. General Sensitivity and Analysis of Site Ecological Importance

The National Web Based Screening Tool rated the Plant Species Theme for the study area as 'High' sensitivity, based on the confirmed or likely presence of several flora SCC (listed in Section 1.4).

The findings of this study confirm this sensitivity rating. Flora SCC were recorded in the study area during the field survey, and reviewed literature and datasets indicates that several flora SCC highlighted by the screening tool occur/probably occur in the study area (refer to Table 4).

The site-specific ecological importance (SEI) of identified habitat units in the study area were assessed for flora using the SANBI (2020) protocol (refer to Section 3.7 and Appendix B for the methodology). The results of the assessment for flora are presented in Table 8.

Figure 22 shows a map of the combined SEI ratings of habitat units in the study areas for Terrestrial Biodiversity, Animal Species and Plant Species. In the combined assessment, the SEI rating for Moist

Grassland and Wetlands is ‘Very High’ on account of the confirmed presence of a Critically Endangered fauna species.

Table 8: Site Ecological Importance of habitat unit in the study area

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Moist Grassland and Wetlands	HIGH: Highly likely occurrence of CR, EN, VU species or Extremely Rare or Critically Rare species	HIGH: Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality.	HIGH
Dry Mixed Grassland	HIGH: Highly likely occurrence of CR, EN, VU species.	HIGH: Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality.	HIGH
Rocky Grassland	HIGH: Highly likely occurrence of CR, EN, VU species.	HIGH: Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality.	HIGH

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
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
Old Lands	LOW: No confirmed populations of SCC. < 50% of receptor contains natural habitat.	LOW: Low habitat connectivity, but dispersal still possible across modified or degraded habitat. Several major past and current impacts.	LOW	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality.	LOW
Alien Tree Plantations	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 22: Map showing the combined Site Ecological Importance of the study area for Terrestrial Biodiversity, Animal Species and Plant Species.

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**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**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 23 below.

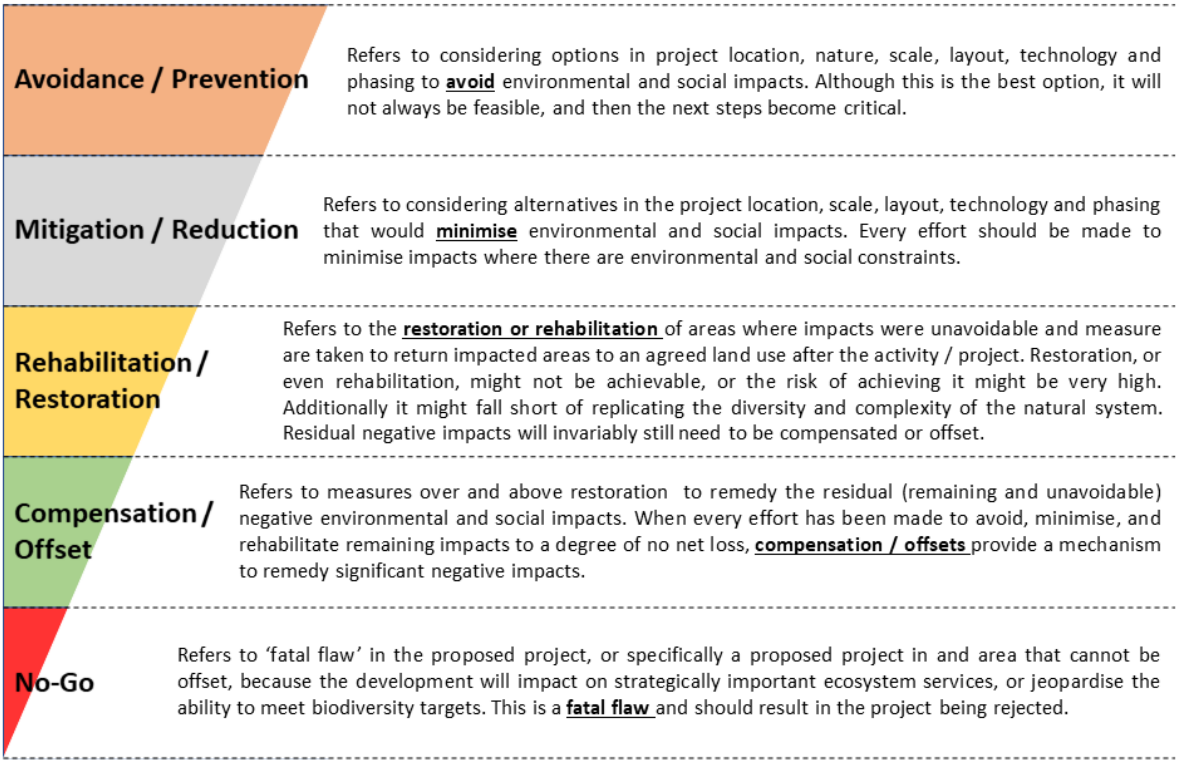


Figure 23: Mitigation Sequence/Hierarchy

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 10.

10.3. Assessment of Impacts on Terrestrial Flora

10.3.1. Construction Phase

10.3.1.1. Localised loss and disturbance of wetland habitat

Habitat loss and disturbance refers to the removal or modification of habitat to the extent that it loses important functionality. These impacts can negatively impact the viability of local terrestrial biodiversity.

Some of the proposed rehabilitation interventions will result in small-scale and localised losses and disturbances of wetland habitat at the intervention sites. It is anticipated that, in many cases, these disturbances will be temporary and that the disturbed areas will rapidly revegetate and recover. Over the long term, it is expected that the proposed rehabilitation interventions will improve wetland integrity at each site, and restore/improve the integrity and functioning of the whole wetland system. This will benefit biodiversity occurring in the study area, including, including flora SCC.

Across the seven wetland clusters where rehabilitation interventions are proposed, approximately 0.39 ha of natural vegetation will be cleared and/or disturbed. Figure 24 to Figure 30 show the location of proposed rehabilitation interventions across the seven wetland clusters.

The impact prior to mitigation is considered to be of high magnitude. Duration of impact will be medium-term, and will be local. Probability is rated high. This results in an impact of “medium” significance.

Considering that the proposed Project activities are rehabilitative in nature, mitigation is an intrinsic feature, and the application of additional mitigation measures can be taken to further minimise impact significance. With the application of the recommended additional measures, impact magnitude can be reduced to low, and it can be confined to the site scale. Duration can be reduced to short-term, and probability to medium. This results in an after-mitigation impact of “Low” significance.

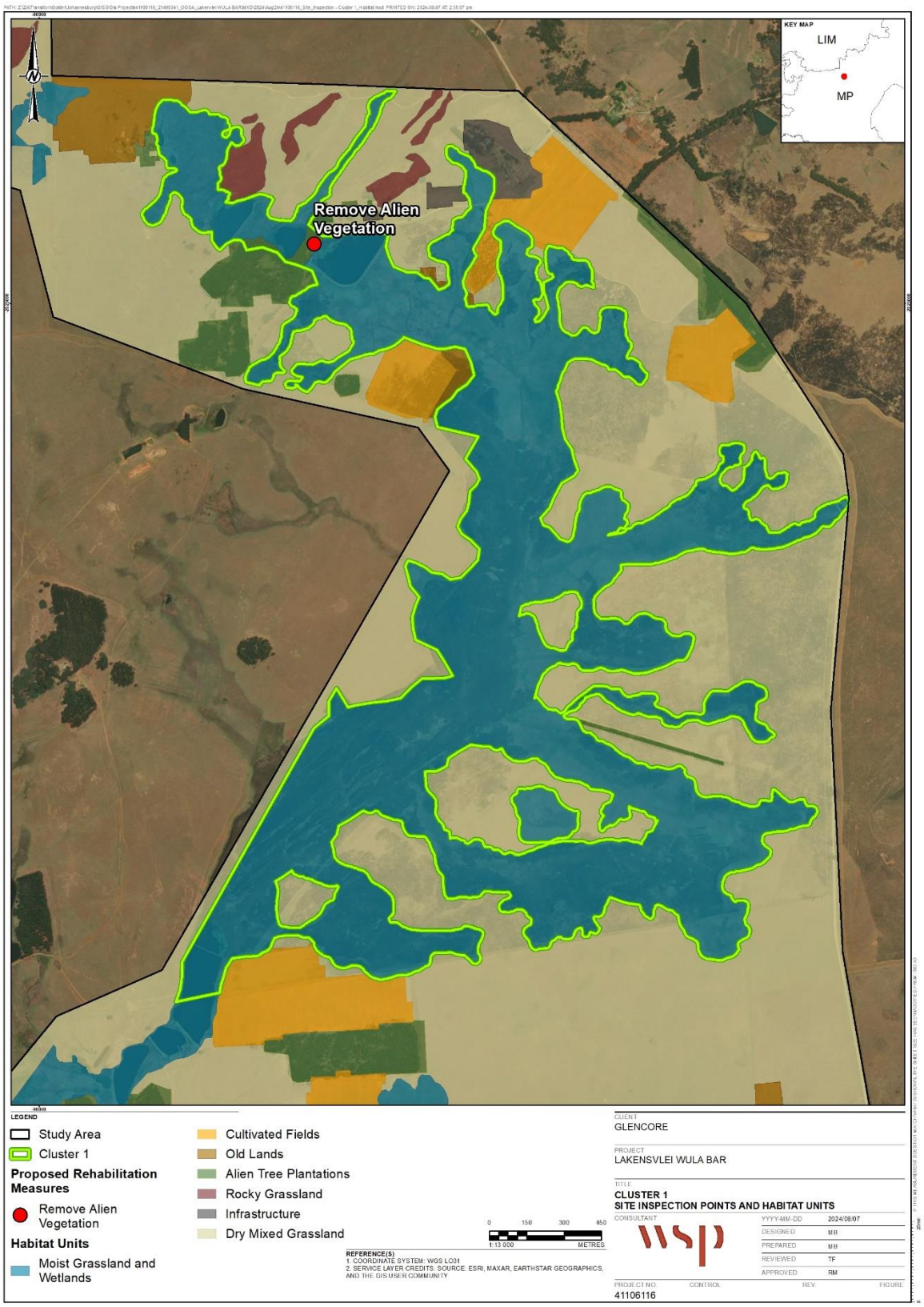


Figure 24: Cluster 1 - proposed wetland rehabilitation interventions.

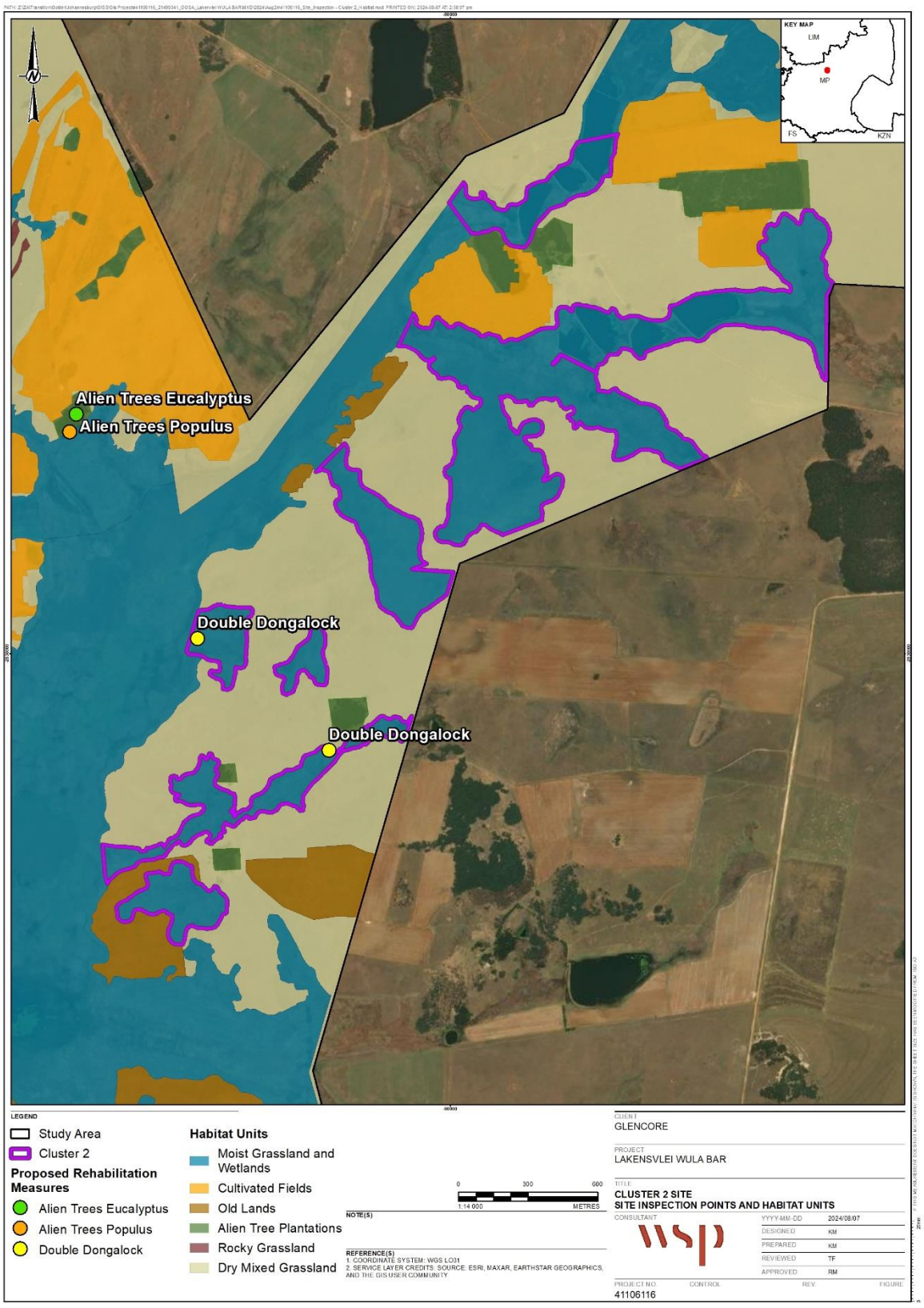


Figure 25: Cluster 2 - proposed wetland rehabilitation interventions.

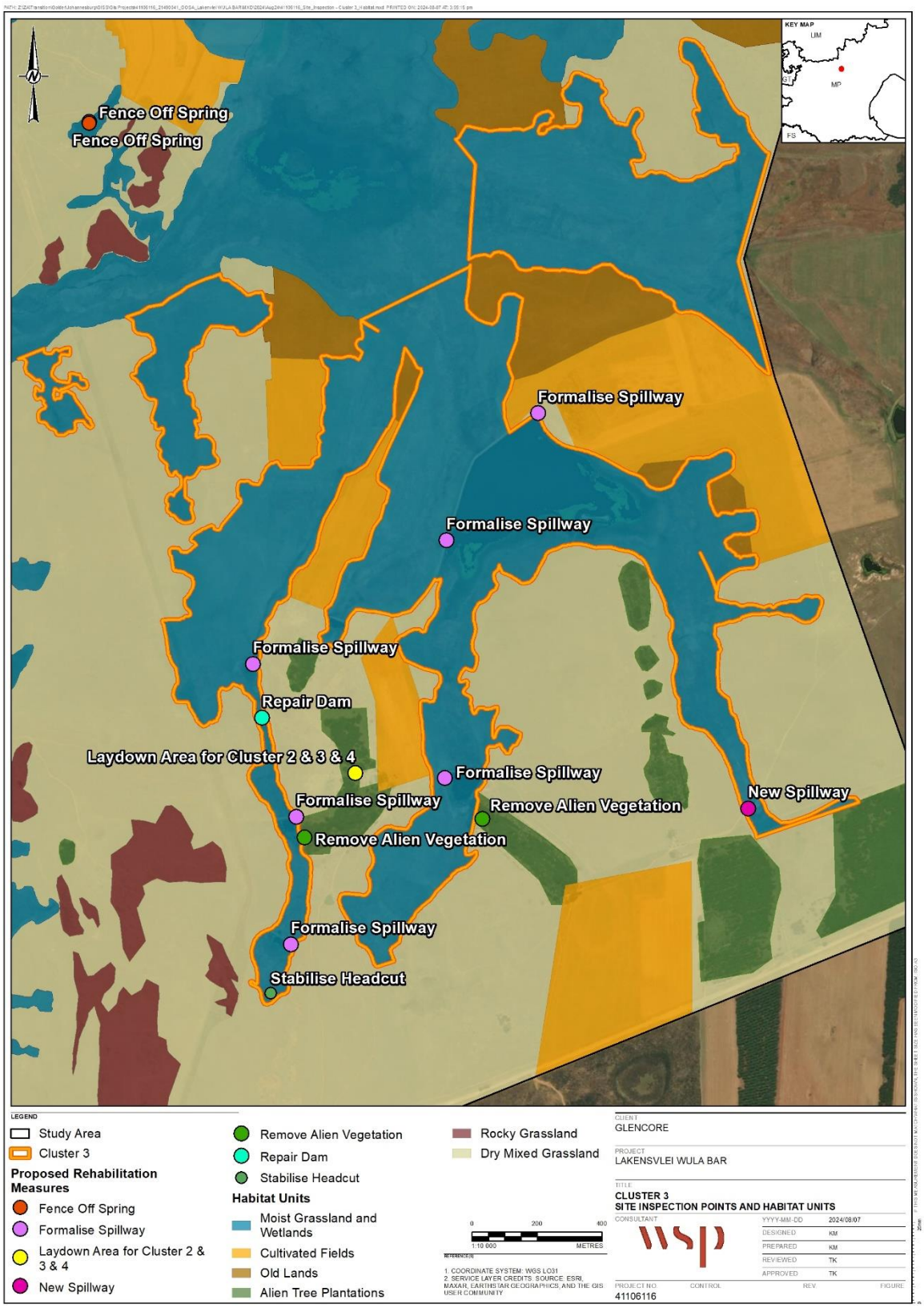


Figure 26: Cluster 3 - proposed wetland rehabilitation interventions.

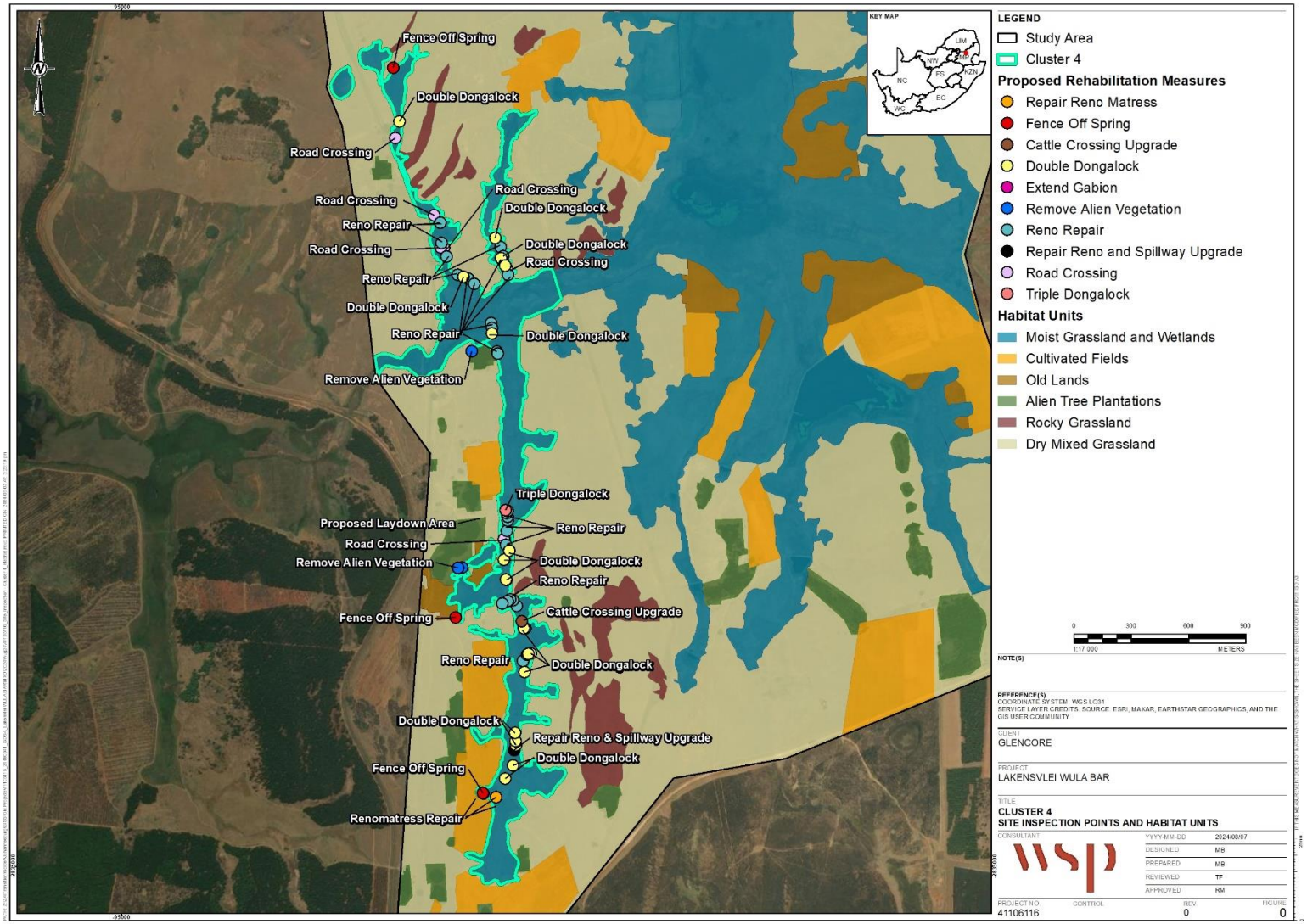


Figure 27: Cluster 4 - proposed wetland rehabilitation interventions

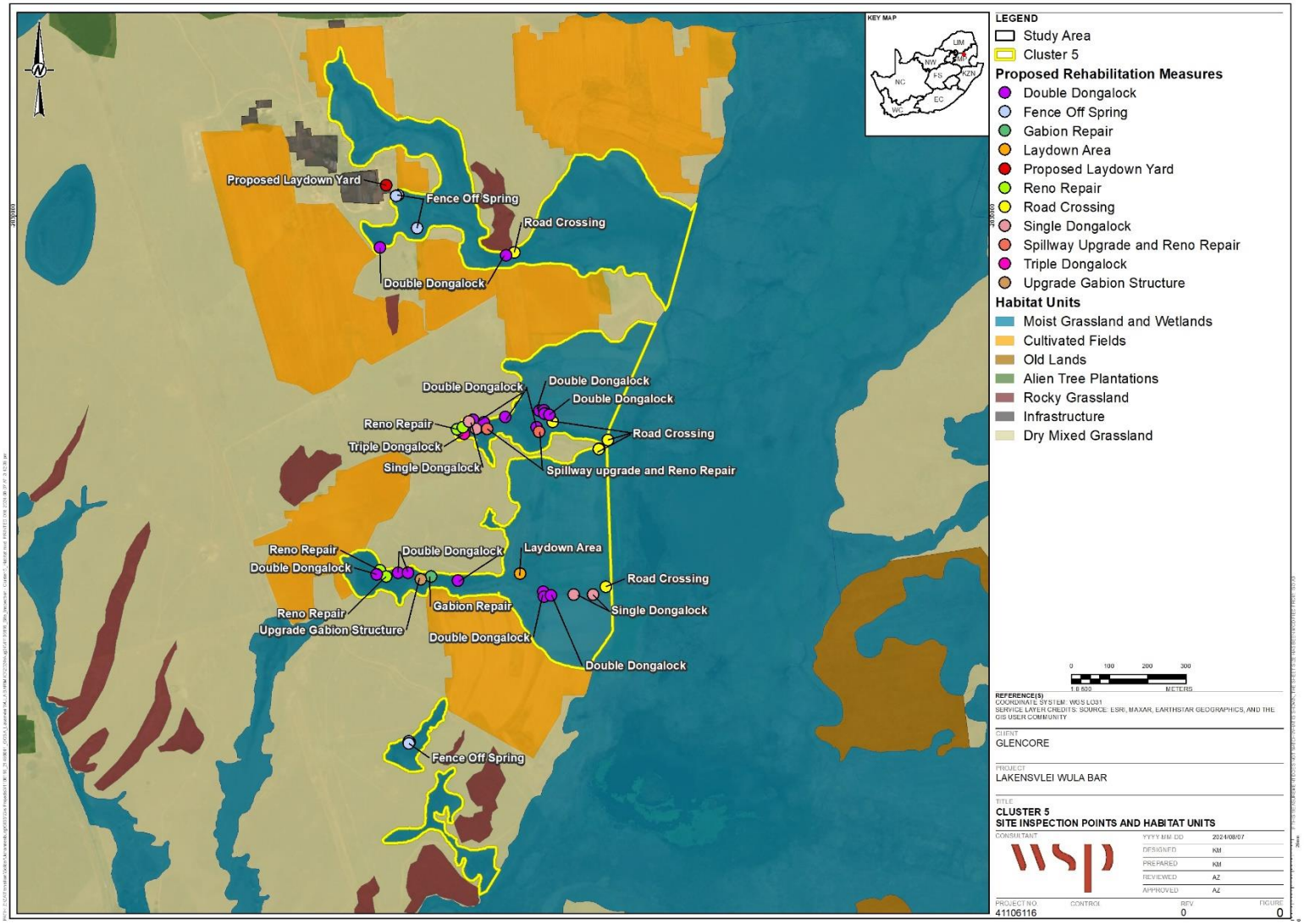


Figure 28: Cluster 5 - proposed wetland rehabilitation interventions

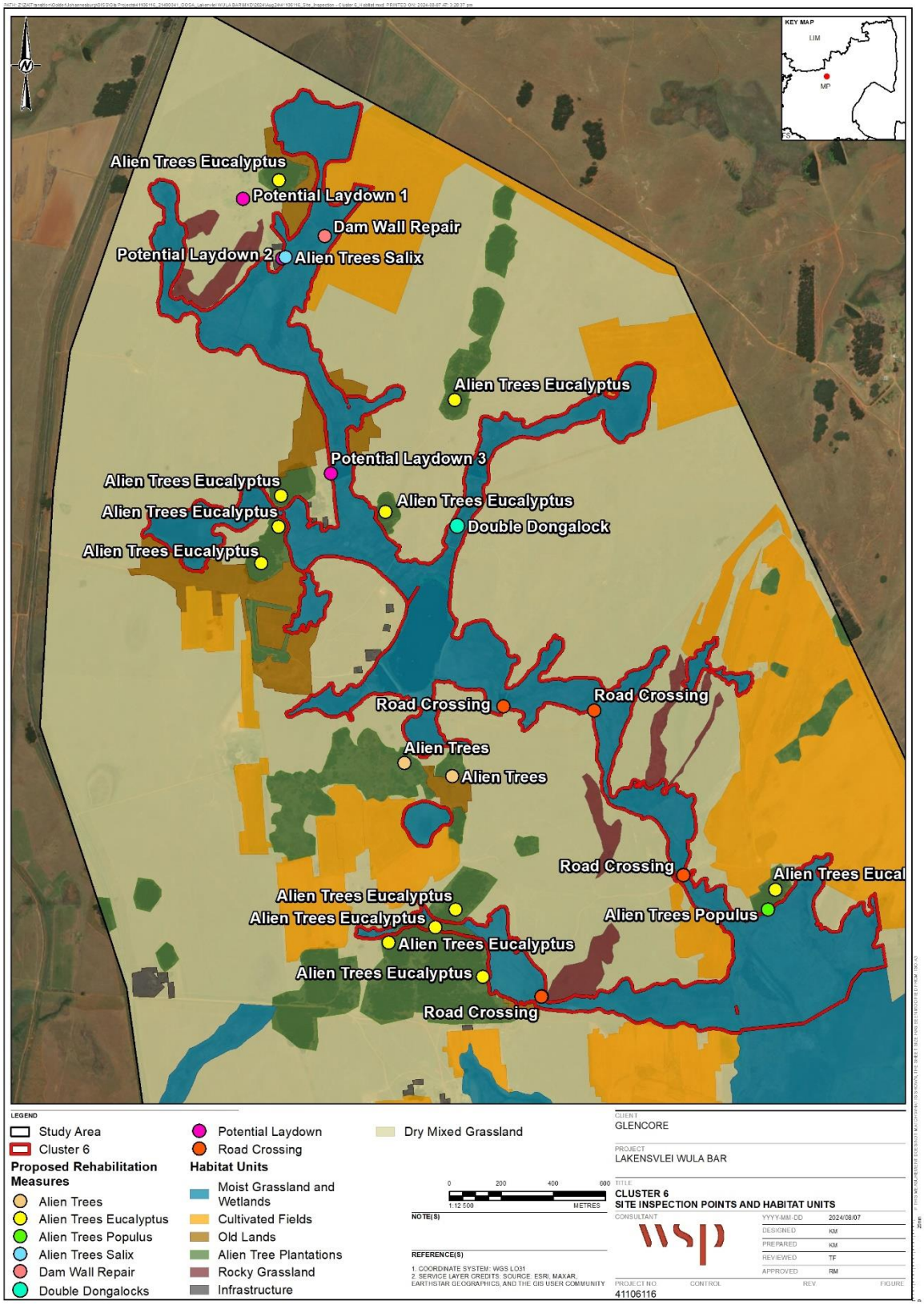


Figure 29: Cluster 6 - proposed wetland rehabilitation interventions

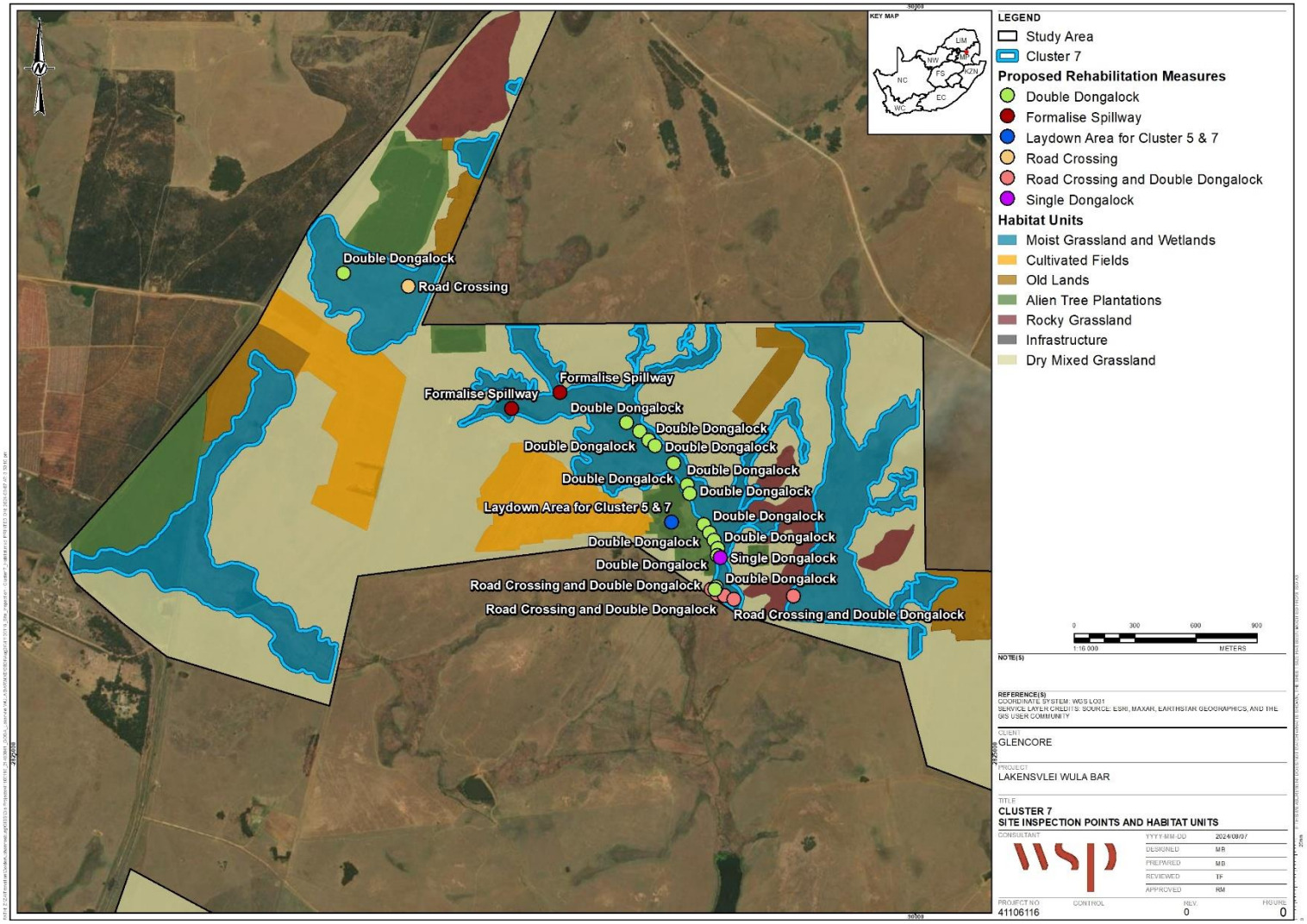


Figure 30: Cluster 7 - proposed wetland rehabilitation interventions

10.3.1.2. Loss of Flora Species of Conservation Concern

Several flora SCC were recorded in the study area during the field survey, and habitat suitability assessments indicate the several other SCC may be present on-site. It is thus possible that flora SCC may occur at the rehabilitation intervention sites, and potentially lost/damaged during vegetation clearing and earth works.

Before mitigation, impact magnitude is very high, while duration is immediate. It has a medium probability of occurrence. The spatial extent of the impact is at the local scale. Prior to mitigation, this impact is rated of "moderate" significance.

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 improbable. After mitigation, this impact is rated to be of "Very Low" significance.

10.3.1.3. Establishment and spread of alien invasive species

Habitat disturbances caused during the implementation of rehabilitation interventions may facilitate the establishment and spread of AIS, particularly herbaceous taxa. Alien plant infestations can spread exponentially, suppressing or replacing indigenous vegetation. This may impact ecological integrity and functioning and terrestrial biodiversity. Several NEMBA listed AIS have been recorded in the study area, and it is possible that these may colonise wetland sites that are disturbed during Project implementation.

Before mitigation, impact magnitude is high, while the duration is long term, and the impact has a medium 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 "Moderate" significance.

This impact is relatively easy to mitigate though the implementation of active AIS control. This impact can be reduced to a very 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 "Very Low" significance.

10.3.1.4. Active clearing of existing stands of alien invasive trees

One of the Project's proposed rehabilitation interventions is the clearing of approximately 97 ha of existing alien woody tree stands across the study area - refer to Figure 24 to Figure 30 for the location of sites proposed for alien tree clearing.

This proposed intervention will have a positive effect on the ecological integrity and hydrological functioning of wetland and dry grassland habitat across the study area, and this will benefit local flora SCC. The impact on flora SCC of actively clearing stands of alien invasive trees is therefore positive and rated "High" significance.

10.3.2. Operational Phase

10.3.2.1. Establishment and spread of alien invasive species

Potential AIS colonisation of disturbed sites may continue to be an impact of concern post implementation.

Before mitigation, impact magnitude is medium, while duration is long term and the impact has a low 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 “low” significance.

With the continued implementation of an active alien species control programme during the operational phase this impact can be reduced to a very 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 “Very Low” significance.

10.3.3. Decommissioning Phase

The proposed Project involves the implementation of various wetland rehabilitation interventions. No decommissioning phase impacts are anticipated.

Table 10: 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	Localised loss and disturbance of wetland habitat	Construction	Negative	High	4	2	3	3	4	**48**	**N2**	2	1	1	2	3	**18**	**N1**
					Significance	**N2 - Medium**							**N1 – Low**						
Impact 2:	Flora SCC	Loss of flora species of conservation concern	Construction	Negative	Low	5	2	3	1	3	**36**	**N2**	3	1	3	1	1	**8**	**N1**
					Significance	**N2 - Medium**							**N1 – Very Low**						
Impact 3:	Flora habitat	Establishment and spread of alien invasive species	Construction	Negative	High	4	2	3	4	3	**39**	**N2**	1	1	3	2	2	**14**	**N1**
					Significance	**N2 - Medium**							**N1 – Very Low**						
Impact 4	Flora habitat	Active clearing of existing stands alien invasive trees	Construction	Positive	High	3	3	1	4	3	**33**	**P2**	5	3	1	4	5	**65**	**P3**
						P2 - Medium							**P3 - High**						
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	3	2	3	4	2	**24**	**N1**	1	1	3	2	2	**14**	**N1**
					Significance	**N1 - Low**							**N1 – Very Low**						
DECOMISSIONING																			
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	Improved wetland integrity and functioning	All	Positive	High	4	3	1	4	5	**60**	**P2**	5	3	1	4	5	**65**	**P3**
					Significance	**P2 - Medium**							**P3 - High**						

10.3.4. Cumulative Impacts

10.3.4.1. Rehabilitation of wetland integrity and functioning

The proposed Project involves the implementation of wetland rehabilitation interventions across multiple sites in the study area. Collectively, over the long term these interventions will improve the ecological integrity and functioning of the wetland systems, which will have a positive impact of local flora SCC. The cumulative impact on flora SCC from the proposed Project is therefore **positive** and rated "High" significance.

11. Assessment of the No Go Alternative

If the proposed Project does not proceed, it is anticipated that the current condition and functional status quo of wetland habitat in the study area will persist into the future. Indeed, it is possible that the conditions at wetland areas that are subject to disturbances, such as channel erosion and alien invasive species colonisation, may deteriorate, which will negatively impact the suitability of habitat for terrestrial biodiversity.

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

Table 11: Recommended mitigation measures.

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
1. Construction phase							
1.1	Terrestrial Habitat	Localised loss and disturbance of wetland habitat	<u>Minimisation</u> • All rehabilitation intervention activities (e.g., earth moving and excavations), should be confined to the minimum footprint area required to implement the intervention successfully. No disturbances should be permitted outside of these footprints; • No heavy vehicles should travel beyond the designated works zone; and • At sites where earth works will take place, such as the removal of dam walls, additional measures should be implemented, as required, to stabilise the sites, prevent erosion and encourage revegetation.	Best Practice Guidelines for High-Elevation Wetland and Peatland Management in Southern Africa (*In Press*)	Minimisation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
1.2	Terrestrial Flora SCC	Loss of Flora Species of Conservation Concern	<u>Avoidance and Minimisation</u> • A pre-construction walkdown of the proposed intervention sites should be conducted by an ECO or specialist during the wet/growing season to identify any potentially impacted flora SCC and advise on appropriate avoidance and mitigation measures during construction.	N/A	Avoidance & Minimisation	During Construction Phase	Project Manager
1.2	Terrestrial Habitat	Establish and spread of alien invasive species	• As required, active AIS control should be conducted at intervention sites where AIS have established during the construction phase.	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Minimisation	During Construction Phase	Project Manager
2. Operational phase							
2.1	Terrestrial Habitat	Establish and spread of alien invasive species	• At sites where AIS are cleared as part of the proposed rehabilitation interventions, regular follow-up control should be implemented to	Guidelines for Monitoring, Control and Eradication	Minimisation	During Operational Phase	Facility Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			eradicate any emergent or coppice growth; and • As required, active AIS control should be conducted at all other rehabilitation intervention sites where AIS have established.	of AIS (DEA, 2015)			

13. Monitoring Measures

It is recommended that the existing biodiversity monitoring programmes currently conducted in the study area should continue. Moreover, it is also recommended that additional AIS monitoring should be conducted as discussed in Table 12 below.

Table 12: Recommended additional monitoring measures

Ref. No.	Category	Monitoring Method	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
1.1	Alien invasive species	• Annual on-site alien invasive species monitoring should be conducted at all rehabilitation intervention 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

14. Reasoned Opinion and Environmental Impact Statement

14.1. Summary of Main Findings

Five habitat units have been identified in the study area. These comprise both natural habitats and modified habitats. Modified habitats are of little conservation value and have floristic Site Ecological Importance ratings of 'Low' or 'Very Low'. The natural habitats have floristic Site Ecological Importance ratings of 'High'. These areas provide important habitat for flora SCC, and they also contribute to broader habitat connectivity, which is an important component of maintaining landscape-scale ecological processes and terrestrial biodiversity.

The DFFE Screening Tool rated the Plant Species Theme for the study area as 'High' sensitivity. Flora SCC were recorded in the study area during the field survey, and reviewed literature and datasets indicates that several SCC that were highlighted by the DFFE screening tool occur, or probably occur, in the study area. The findings of this study therefore confirm the 'High' sensitivity rating.

It is anticipated that proposed rehabilitation interventions may result in small-scale and localised disturbances to wetland habitat. It is contended however, that considering that the very purpose of the proposed interventions is to improve and restore wetland integrity and function, provided the mitigation measures outlined in this report are actively implemented, any habitat loss and disturbances caused during Project implementation are likely to be temporary, and will ameliorate over the short- to medium term. It is further noted that the proposed active clearing of 97 ha of alien trees that are currently established in the study area will significantly improve the ecological integrity and functioning of affected wetland and grassland habitats.

Overall, it is anticipated that on-site habitat integrity and function will be enhanced as a result of the proposed Project, and this will benefit flora SCC populations occurring in the study area.

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. Conversely, it is asserted that the proposed Project will actually improve habitat integrity and functioning in the study area, which will benefit local flora SCC populations. The proposed Project 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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Address: 58 Central Rd, Linden Ext., Johannesburg, 2195
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.

Publications

- Zinn, A.D., D.E., Burkepile and D.I. Thompson (In prep). Impacts of fire and herbivores on tree seedling establishment in a South African savanna.
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- Zinn, A.D., D. Ward and K. Kirkman (2007). Inducible defences in *Acacia sieberiana* in response to giraffe browsing. African Journal of Range and Forage Science, 24, 123-129.
- Zinn, A.D. (2007). Exploitation vs. Conservation: A Burgeoning Fifth Column. African Wildlife, 61, 9-11.
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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 List

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Achariaceae	*Kiggelaria africana*	Tree	Indigenous	LC	-	-			x	
Agapanthaceae	*Agapanthus inapertus*	Herb	Indigenous	LC	-	Protected	x			
Amaranthaceae	*Amaranthus hybridus**	Herb	Alien	NE	-	-				x
Amaranthaceae	*Chenopodium album**	Herb	Alien	NE	-	-				x
Amaranthaceae	*Kyphocarpa angustifolia*	Herb	Indigenous	LC	-	-		x	x	
Amaryllidaceae	*Boophone disticha*	Geophytic Herb	Indigenous	LC	-	Protected		x		
Amaryllidaceae	*Brunsvigia* cf. *radulosa*	Geophytic Herb	Indigenous	LC	-	Protected	x			
Amaryllidaceae	*Haemanthus humilis*	Geophyte	Indigenous	LC	-	Protected			x	
Anacardiaceae	*Searsia discolor*	Dwarf Shrub	Indigenous	LC	-	-		x		
Anacardiaceae	*Searsia pyroides* var. *gracilis*	Tree	Indigenous	LC	-	-			x	
Anacardiaceae	*Searsia tumulicola*	Tree	Indigenous	LC	-	-			x	
Anacardiaceae	*Searsia cf. zeyheri*	Tree	Indigenous	LC	-	-			x	
Apiaceae	*Alepidea setifera*	Herb	Indigenous	LC	-	-	x			
Apiaceae	*Berula repanda*	Herb	Indigenous	LC	-	-	x			
Apiaceae	*Centella asiatica**	Herb	Alien	NE	-	-	x			
Apocynaceae	*Pachycarpus* species	Herb	Indigenous	LC	-	-	x			

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Araceae	*Zantedeschia* sp. (no flowers)	Herb	Indigenous	-	-	Protected	x			
Araliaceae	*Hydrocotyle bonariensis*	Herb	Indigenous	LC	-	-	x			
Asparagaceae	*Asparagus laricinus*	Shrub	Indigenous	LC	-	-			x	
Asphodelaceae	*Aloe ecklonis*	Succulent	Indigenous	LC	-	Protected	x			
Asphodelaceae	*Trachyandra asperata*	Herb	Indigenous	LC	-	-		x		
Asteraceae	*Berkheya pinnatifida ingrata*	Herb	Indigenous	LC	-	-	x	x		
Asteraceae	*Berkheya seminivea*	Herb	Indigenous	LC	-	-			x	
Asteraceae	*Berkheya setifera*	Herb	Indigenous	LC	-	-	x	x	x	
Asteraceae	*Berkheya speciosa*	Herb	Indigenous	LC	-	-	x	x		
Asteraceae	*Cirsium vulgare**	Herb	Alien (NEMBA Category 1b)	NE	-	-	x			x
Asteraceae	*Conyza bonariensis**	Herb	Alien	NE	-	-		x		x
Asteraceae	*Conyza canadensis**	Herb	Alien	NE	-	-		x		x
Asteraceae	*Haplocarpha scaposa*	Herb	Indigenous	LC	-	-		x		
Asteraceae	*Helichrysum aureonitens*	Herb	Indigenous	LC	-	-	x	x		
Asteraceae	*Helichrysum callicomum*	Herb	Indigenous	LC	-	-		x	x	

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Asteraceae	*Helichrysum dasymallum*	Herb	Indigenous	LC	-	-	x			
Asteraceae	*Helichrysum mundtii*	Herb	Indigenous	LC	-	-	x			
Asteraceae	*Helichrysum nudifolium var. nudifolium*	Herb	Indigenous	LC	-	-		x		
Asteraceae	*Helichrysum nudifolium var. pilosellum*	Herb	Indigenous	LC	-	-	x	x		
Asteraceae	*Helichrysum oreophilum*	Herb	Indigenous	LC	-	-		x	x	
Asteraceae	*Helichrysum rugulosum*	Herb	Indigenous	LC	-	-		x	x	
Asteraceae	*Hilliardiella aristata*	Herb	Indigenous	LC	-	-		x		
Asteraceae	*Hypochaeris radicata**	Herb	Alien	NE	-	-	x	x		
Asteraceae	*Lopholaena coriifolia*	Shrub	Indigenous	LC	-	-			x	
Asteraceae	*Nidorella* species	Herb	Indigenous	LC	-	-	x			
Asteraceae	*Nidorella pinnata*	Herb	Indigenous	LC	-	-	x	x		
Asteraceae	*Nidorella hottentota*	Herb	Indigenous	LC	-	-		x		
Asteraceae	*Nidorella podocephala*	Herb	Indigenous	LC	-	-	x	x	x	
Asteraceae	*Phymaspermum acerosum*	Shrub	Indigenous	LC	-	-				

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Asteraceae	*Pseudognaphalium luteo-album**	Herb	Alien	NE	-	-	x			x
Asteraceae	*Senecio coronatus*	Herb	Indigenous	LC	-	-	x			
Asteraceae	*Senecio erubescens*	Herb	Indigenous	LC	-	-	x			
Asteraceae	*Senecio gerrardii*	Herb	Indigenous	LC	-	-	x			
Asteraceae	*Senecio inornatus*	Herb	Indigenous	LC	-	-	x	x		
Asteraceae	*Senecio polyodon*	Herb	Indigenous	LC	-	-		x		
Asteraceae	*Senecio venosus*	Herb	Indigenous	LC	-	-	x			
Asteraceae	*Taraxacum officinale**	Herb	Alien	NE	-	-				x
Campanulaceae	*Wahlenbergia undulata*	Herb	Indigenous	LC	-	-	x			
Commelinaceae	*Commelina africana* var. *krebsiana*	Herb	Indigenous	LC	-	-		x		
Convolvulaceae	*Ipomoea ommaneyi*	Herb	Indigenous	LC	-	-		x		
Crassulaceae	*Crassula vaginata*	Succulent	Indigenous	LC	-	-		x		
Cyatheaceae	*Alsophila dregei* (=*Cyathea dregei*)	Fern	Indigenous	LC	-	-	x			
Cyperaceae	*Afroscripoides* cf. *dioeca*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Carex rhodesiaca*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Cyperus congesta*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Cyperus denudatus*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Cyperus rotundus*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Eleocharis dregeana*	Graminoid	Indigenous	LC	-	-	x			

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Cyperaceae	*Eleocharis limosa*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Ficinia nodosa*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Fuirena pubescens*	Herb	Indigenous	LC	-	-	x			
Cyperaceae	*Isolepsis costata*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Isolepsis* species	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Kyllinga erecta*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Pycreus macranthus*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Pycreus nitidus*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Pycreus unioloides*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Schoenoplectus brachyceras*	Graminoid	Indigenous	LC	-	-	x			
Cyperaceae	*Schoenoplectus corymbosus*	Graminoid	Indigenous	LC	-	-	x			
Dipsacaceae	*Scabiosa columbaria*	Herb	Indigenous	LC	-	-	x	x		
Ebenaceae	*Diospyros lycioides*	Tree	Indigenous	LC	-	-		x	x	
Ericaceae	*Erica alopecurus*	Herb	Indigenous	LC	-	-	x			
Ericaceae	*Erica cf. cerinthoides*	Herb	Indigenous	LC	-	-	x		x	
Eriocaulaceae	*Eriocaulon dregei*	Graminoid	Indigenous	LC	-	-	x			
Euphorbiaceae	*Acalypha angustata*	Herb	Indigenous	LC	-	-		x		
Euphorbiaceae	*Acalypha punctata*	Herb	Indigenous	LC	-	-		x	x	
Fabaceae	*Acacia dealbata**	Tree	Alien (NEMBA	NE	-	-				x

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
			Category 2)							
Fabaceae	*Acacia mearnsii**	Tree	Alien (NEMBA Category 2)	NE	-	-				x
Fabaceae	*Indigofera hedyantha*	Herb	Indigenous	LC	-	-		x		
Fabaceae	*Otholobium wilmsii*	Shrub	Indigenous	LC	-	-	x			
Fabaceae	*Trifolium africanum*	Herb	Indigenous	LC	-	-	x			
Fabaceae	*Trifolium repens**	Herb	Alien	NE	-	-	x			
Gentianaceae	*Chironia palustris*	Herb	Indigenous	LC	-	-	x			
Gentianaceae	*Sebaea* cf. *aurea*	Herb	Indigenous	LC	-	-		x		
Geraniaceae	*Monsonia attenuata*	Herb	Indigenous	LC	-	-		x		
Geraniaceae	*Pelargonium luridum*	Herb	Indigenous	LC	-	-	x	x		
Gunneraceae	*Gunnera perpensa*	Herb	Indigenous	LC	Declining	-	x			
Hyacinthaceae	*Eucomus autumnalis*	Herb	Indigenous	LC	Declining	Protected	x	x		
Hyacinthaceae	*Eucomus pallidiflora* subsp. *pole-evansii*	Herb	Indigenous	NT	Near Threatened	Protected	x			
Hyacinthaceae	*Ledebouria cooperi*	Herb	Indigenous	LC	-	-	x	x		
Hyacinthaceae	*Ledebouria ovatifolia*	Herb	Indigenous	LC	-	-		x		
Hypericeae	*Hypericum* species	Herb	Indigenous	-	-	-		x		

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Hypoxidaceae	*Hypoxis argentea*	Herb	Indigenous	LC	-	-		x		
Hypoxidaceae	*Hypoxis hemerocallidea*	Herb	Indigenous	LC	-	-		x		
Hypoxidaceae	*Hypoxis iridifolia*	Herb	Indigenous	LC	-	-		x		
Iridaceae	*Babiana hypogaea*	Herb	Indigenous	LC	-	-		x		
Iridaceae	*Crocosmia paniculata*	Herb	Indigenous	LC	-	-			x	
Iridaceae	*Dierama cf. medium*	Herb	Indigenous	LC	-	-	x			
Iridaceae	*Gladiolus densiflorus*	Herb	Indigenous	LC	-	Protected	x			
Iridaceae	*Gladiolus ecklonii*	Herb	Indigenous	LC	-	Protected	x	x		
Iridaceae	*Gladiolus papilio*	Herb	Indigenous	LC	-	Protected	x			
Iridaceae	*Gladiolus pretoriensis*	Herb	Indigenous	LC	-	Protected	x			
Iridaceae	*Gladiolus* species (no flowers)	Herb	Indigenous	LC	-	Protected				
Iridaceae	*Hesperantha baurii* subsp. *baurii*	Herb	Indigenous	LC	-	Protected	x			
Juncaceae	*Juncus dregeanus*	Graminoid	Indigenous	LC	-	-	x			
Juncaceae	*Juncus effusus*	Graminoid	Indigenous	LC	-	-	x			
Juncaceae	*Juncus lomatophyllus*	Graminoid	Indigenous	LC	-	-	x			
Juncaceae	*Juncus oxycarpus*	Graminoid	Indigenous	LC	-	-	x			
Juncaceae	*Juncus oxymeris*	Graminoid	Indigenous	LC	-	-	x			
Juncaceae	*Juncus punctorius*	Graminoid	Indigenous	LC	-	-	x			
Lamiaceae	*Leonotis ocymifolia*	Shrub	Indigenous	LC	-	-			x	

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Lamiaceae	*Mentha aquatica*	Herb	Indigenous	LC	-	-	x			
Lamiaceae	*Pycnostachys reticulata*	Herb	Indigenous	LC	-	-	x			
Lamiaceae	*Rabdosiella calycina*	Shrub	Indigenous	LC	-	-			x	
Lentibulariaceae	*Utricularia* species	Herb	Indigenous	NE			x			
Lobeliaceae	*Lobelia flaccida*	Herb	Indigenous	LC	-	-		x		
Lobeliaceae	*Monopsis decipiens*	Herb	Indigenous	LC	-	-	x			
Malvaceae	*Hermannia transvaalensis*	Herb	Indigenous	LC	-	-		x		
Malvaceae	*Hibiscus trionum**	Herb	Alien	NE	-	-	x			
Menyanthaceae	*Nymphoides thunbergiana*	Herb	Indigenous	LC	-	-	x			
Molluginaceae	*Psammotropha myriantha*	Herb	Indigenous	LC	-	-			x	
Myrtaceae	*Eucalyptus* species*	Tree	Alien (NEMBA Category 2 or not listed)	NE	-	-				
Onagraceae	*Epilobium* cf. *tetragonum*	Shrub	Indigenous	NE	-	-	x			
Onagraceae	*Epilobium hirsutum*	Shrub	Indigenous	LC	-	-	x			
Ophioglossaceae	*Ophioglossum reticulatum*	Fern	Indigenous	LC	-	-	x			
Orchidaceae	*Satyrium cristatum*	Herb	Indigenous	LC	-	Protected	x			

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Orchidaceae	*Satyrium hallackii* subsp. *ocellatum*	Herb	Indigenous	LC	-	Protected	x			
Orchidaceae	*Satyrium longicauda*	Herb	Indigenous	LC	-	Protected	x			
Oxalidaceae	*Oxalis obliquifolia*	Herb	Indigenous	LC	-	-	x			
Pinaceae	*Pinus patula**	Tree	Alien	NE	-	-				x
Pinaceae	*Pinus pinaster**	Tree	Alien	NE	-	-				x
Plantaginaceae	*Plantago longissima*	Herb	Indigenous	LC	-	-	x			
Plantaginaceae	*Plantago major**	Herb	Alien	NE	-	-		x		
Plantaginaceae	*Veronica anagallis-aquatica*	Herb	Indigenous	-	-	-			x	
Poaceae	*Agrostis continuata*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Agrostis eriantha*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Agrostis lachnantha*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Alloteropsis semialata*	Graminoid	Indigenous	LC	-	-		x	x	
Poaceae	*Andropogon appendiculatus*	Graminoid	Indigenous	LC	-	-	x	x		
Poaceae	*Andropogon huillensis*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Andropogon schirensis*	Graminoid	Indigenous	LC	-	-			x	
Poaceae	*Aristida aequiglumis*	Graminoid	Indigenous	LC	-	-		x	x	
Poaceae	*Aristida junciformis*	Graminoid	Indigenous	LC	-	-	x	x	x	

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Poaceae	*Arundinella nepalensis*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Digitaria argyrograpta*	Graminoid	Indigenous	LC	-	-		x	x	
Poaceae	*Echinochloa jubata*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Eragrostis capensis*	Graminoid	Indigenous	LC	-	-		x		
Poaceae	*Eragrostis chloromelas*	Graminoid	Indigenous	LC	-	-		x	x	
Poaceae	*Eragrostis curvula*	Graminoid	Indigenous	LC	-	-	x		x	
Poaceae	*Eragrostis gummiflua*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Eragrostis heteromera*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Eragrostis plana*	Graminoid	Indigenous	LC	-	-	x	x	x	
Poaceae	*Eragrostis racemosa*	Graminoid	Indigenous	LC	-	-		x		
Poaceae	*Harpochloa falx*	Graminoid	Indigenous	LC	-	-		x	x	
Poaceae	*Helictotrichon turgidulum*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Holcus lanatus**	Graminoid	Alien	NE	-	-	x			
Poaceae	*Koeleria capensis*	Graminoid	Indigenous	LC	-	-			x	
Poaceae	*Leersia hexandra*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Melinis repens*	Graminoid	Indigenous	LC	-	-			x	
Poaceae	*Monocymbium ceresiiforme*	Graminoid	Indigenous	LC	-	-		x		
Poaceae	*Panicum natalense*	Graminoid	Indigenous	LC	-	-			x	
Poaceae	*Panicum schinzii*	Graminoid	Indigenous	LC	-	-	x			

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Poaceae	*Paspalum dilatatum**	Graminoid	Alien	NE	-	-	x		x	
Poaceae	*Paspalum distichum*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Paspalum notatum**	Graminoid	Alien	NE	-	-	x			
Poaceae	*Paspalum urvillei**	Graminoid	Alien	NE	-	-	x			
Poaceae	*Pennisetum clandestinum**	Graminoid	Alien (NEMBA Category 1b)	NE	-	-	x			x
Poaceae	*Pennisetum sphacelatum*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Pennisetum thunbergii*	Graminoid	Indigenous	LC	-	-		x		
Poaceae	*Phragmites australis*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Setaria incrassata*	Graminoid	Indigenous	LC	-	-		x		
Poaceae	*Setaria pallide-fusca*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Setaria sphacelata*	Graminoid	Indigenous	LC	-	-	x			
Poaceae	*Sporobolus africanus*	Graminoid	Indigenous	LC	-	-			x	
Poaceae	*Sporobolus pyramidalis*	Graminoid	Indigenous	LC	-	-				x
Poaceae	*Stiburus alopecuroides*	Graminoid	Indigenous	LC	-	-	x			

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Poaceae	*Themeda triandra*	Graminoid	Indigenous	LC	-	-	x	x		
Poaceae	*Trachypogon spicatus*	Graminoid	Indigenous	LC	-	-		x		
Poaceae	*Tristachya leucothrix*	Graminoid	Indigenous	LC	-	-		x	x	
Poaceae	*Tristachya rehmannii*	Graminoid	Indigenous	LC	-	-			x	
Poaceae	*Typha capensis*	Graminoid	Indigenous	LC	-	-	x			
Polygalaceae	*Polygala hottentotta*	Herb	Indigenous	LC	-	-	x			
Polygonaceae	*Persicaria decipiens*	Herb	Indigenous	LC	-	-	x			
Polygonaceae	*Persicaria lapathifolia**	Herb	Alien	NE	-	-	x			
Polygonaceae	*Rumex acetosella**	Herb	Alien	NE	-	-	x			
Polygonaceae	*Rumex crispus**	Herb	Alien	NE	-	-	x			
Proteaceae	*Protea parvula*	Dwarf Tree	Indigenous	NT	Near Threatened	Protected			x	
Pteridaceae	*Pellaea calomelanos* var. *calomelanos*	Fern	Indigenous	LC	-	-			x	
Ranunculaceae	*Ranunculus meyeri*	Herb	Indigenous	LC	-	-	x			
Ranunculaceae	*Ranunculus multifidus*	Herb	Indigenous	LC	-	-	x			
Rosaceae	*Cliffortia linearifolia*	Shrub	Indigenous	LC	-	-	x			
Rosaceae	*Rubus species*	Climber	Alien	NE	-	-			x	
Rubiaceae	*Anthospermum rigidum*	Herb	Indigenous	LC	-	-	x	x		

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
Rubiaceae	*Pygmaeothamnus zeyheri*	Dwarf Shrub	Indigenous	LC	-	-		x		
Rubiaceae	*Richardia brasiliensis**	Herb	Alien	NE	-	-		x		
Rubiaceae	*Vangueria pygmaea* (=*Pachystigma pygmaeum*)	Dwarf Tree	Indigenous	LC	-	-		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			
Scrophulariaceae	*Selago densiflora*	Herb	Indigenous	LC	-	-		x		
Solanaceae	*Datura stramonium**	Herb	Alien (NEMBA Category 1b)	NE	-	-				x
Solanaceae	*Solanum elaeagnifolium**	Herb	Alien (NEMBA Category 1b)	NE	-	-		x		
Ulmaceae	*Celtis africana*	Tree	Indigenous	LC	-	-			x	
Verbenaceae	*Verbena bonariensis**	Herb	Alien (NEMBA	NE	-	-	x	x		

Family	Species Name	Growth Form	Origin	Conservation Status			Habitat Units			
				National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Moist Grassland and Wetlands	Dry Mixed Grassland	Rocky Grassland	Modified Habitats (i.e., Cultivated Fields, Old Lands & Alien Tree Plantations)
			Category 1b)							
Verbenaceae	*Verbena rigida**	Herb	Alien	NE	-	-		x		
Vitaceae	*Cyphostemma woodii*	Succulent	Indigenous	LC	-	-			x	
Xyridaceae	*Xyris capensis*	Graminoid	Indigenous	LC	-	-	x			
*denotes alien/exotic taxa										
Red List Categories NT = Near Threatened LC = Least Concern NE = Not Evaluated										

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:	

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Plant Species	Relevant Section in Report
3.1.1 contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae;	Page 3 & Appendix A
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
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
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