Appendix J

BIODIVERSITY OFFSET STRATEGY

Dalmanutha Wind (Pty) Ltd.

DALMANUTHA WIND - BIODIVERSITY OFFSET REPORT

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Dalmanutha Wind (Pty) Ltd.

DALMANUTHA WIND - BIODIVERSITY OFFSET REPORT

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1 INTRODUCTION

Dalmanutha Wind (Pty) Ltd. is proposing the establishment of wind energy faciliies (WEF) and associated infrastructure at Dalmanutha, Mpumalanga (Figure 1-1). The development consists of three separate components, for which separate environmental authorisations are being sought:

- Dalmanutha Wind Energy Facility;
- Dalmanutha West Wind Energy Facility; and
- Dalmanutha 132kV Grid Connection and Common Collector Switching Station.

WSP was appointed to undertake the necessary ecological baseline surveys and impact assessment reports, in support of the environmental regulatory process required to authorise development related activities.

WSP was subsequently appointed to develop a Biodiversity Offset Report for the development as a whole, to address any significant residual impacts for which biodiversity offset via rehabilitation, restoration or additional conservation actions may be required. This report specifically addresses the requirement for a BOR for the Dalmanutha WEF only. Separate reports will be prepared for the West WEF and 132kV Grid Connection and Common Collector Switching Station applications.

1.1 TERMS OF REFERENCE

South Africa's draft National Biodiversity Offset Guideline was published for public consultation on 25 March 2022, which sets out the requirements for the development of a Biodiversity Offset Report (BOR) in support of an application for environmental authorisation (EA). This report was compiled based on the guidance set out in the draft guideline, and follows the requirements for preparation of the BOR set out in the guideline as follows:

'*Where the biodiversity offset site cannot be identified before the decision-making phase, Biodiversity Offset Reports must, as a minimum, specify the following':*

- That the mitigation hierarchy, including due consideration of project alternatives to avoid or minimise impacts, has been appropriately applied before considering biodiversity offsetting.
- The degree of risk that negative residual impacts cannot be offset (i.e. negative residual impacts on irreplaceable biodiversity and/or major constraints on finding suitable biodiversity offset sites to meet the offset requirements) and how the risk is to be addressed or mitigated.
- A measure of significant residual negative biodiversity impacts which must be offset. The applicable biodiversity offset ratios for impacted ecosystems.
- Any other considerations which are relevant to determining the size and characteristics of the biodiversity offset (for example, impacts on species of conservation concern with specific habitat requirements, impacts on ecological corridors and connectivity in the landscape, and impacts on important ecological infrastructure), and how the size of offset is to be adjusted to take these considerations into account.
- An explicit statement on the required size of the biodiversity offset to remedy the residual negative biodiversity impacts, applying the basic offset ratio and adjustments as appropriate
- The portfolio of candidate biodiversity offset sites, including the likelihood of each site's availability and feasibility.
- The required biodiversity outcomes on each of the candidate biodiversity offset sites identified in the Biodiversity Offset Report.

- The management measures that would need to be employed as part of the biodiversity offset for a defined period, for which the applicant would be responsible. Typically, this period is not less than 30 years, and is longer if the impacting activity, or activities, will last beyond 30 years.

1.2 PROJECT LOCATION AND EXTENT

The Project is composed of the Dalmanutha Wind Energy Facility (WEF), Dalmanutha West Wind Energy Facility, and the Dalmanutha 132kV Grid Connection and Common Collector Switching Station, and is situated near Belfast, within the Emakhazeni Local Municipality, in the Mpumalanga Province (Figure 1-1).

Two alternative options have been proposed for the Dalmanutha WEF;

- Alternative 1 consists of up to 70 turbines and associated infrastructure (Battery Energy Storage System (BESS), access roads etc).
- Alternative 2 consists of a combination of up to 44 turbines and solar PV (~160 ha), plus associated infrastructure (BESS, access roads etc).

These are described in full in the ESIA, and are shown on Figure 1-2 and Figure 1-3.

1.3 STUDY AREA

The study area for the Project was defined as follows:

- Local Study Area (LSA): The proposed development footprint plus all areas encompassed by the project site boundary, within which direct and indirect impacts on terrestrial and aquatic biodiversity receptors (i.e. direct habitat loss, fauna mortality) could occur;
- Regional Study Area (RSA): The quaternary catchments within which the proposed development is situated which is considered to be an ecologically appropriate area of analysis, within which indirect and/or induced impacts on biodiversity receptors (e.g. dust deposition, sensory disturbance, hydrological changes) could occur.

The LSA and RSA are shown on Figure 1-4.

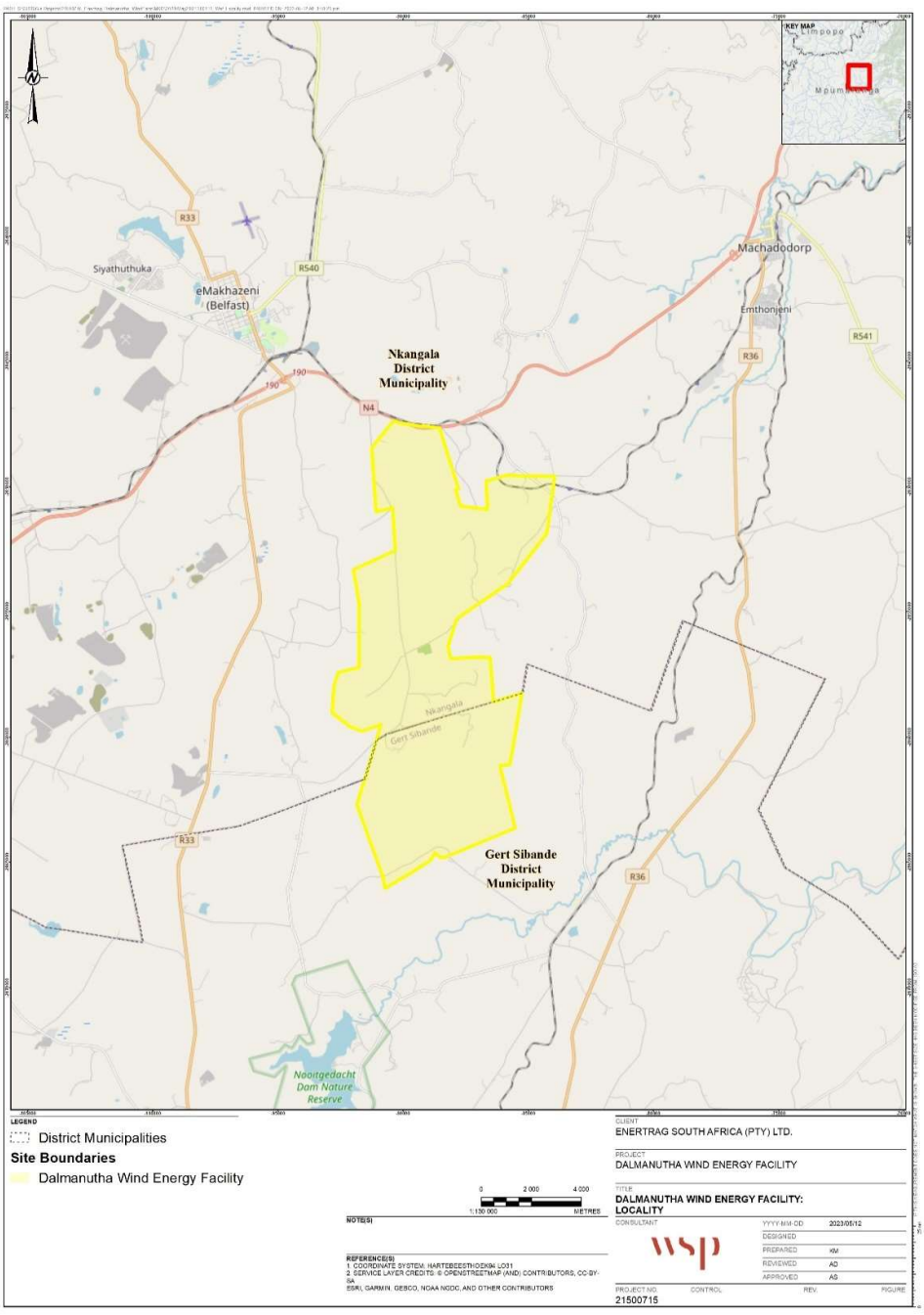

Figure 1-1 - Project locality

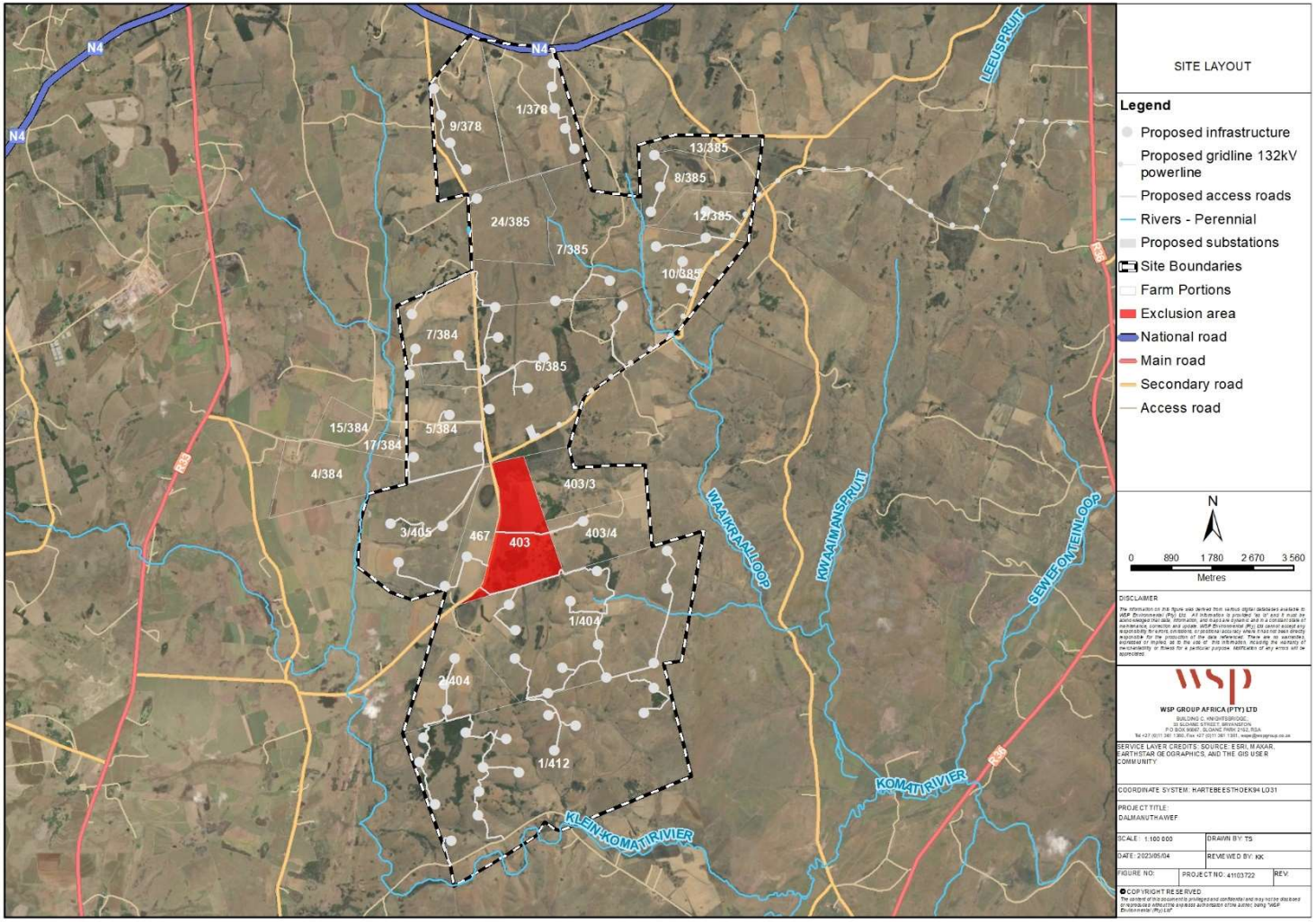

Figure 1-2 - Alternative 1

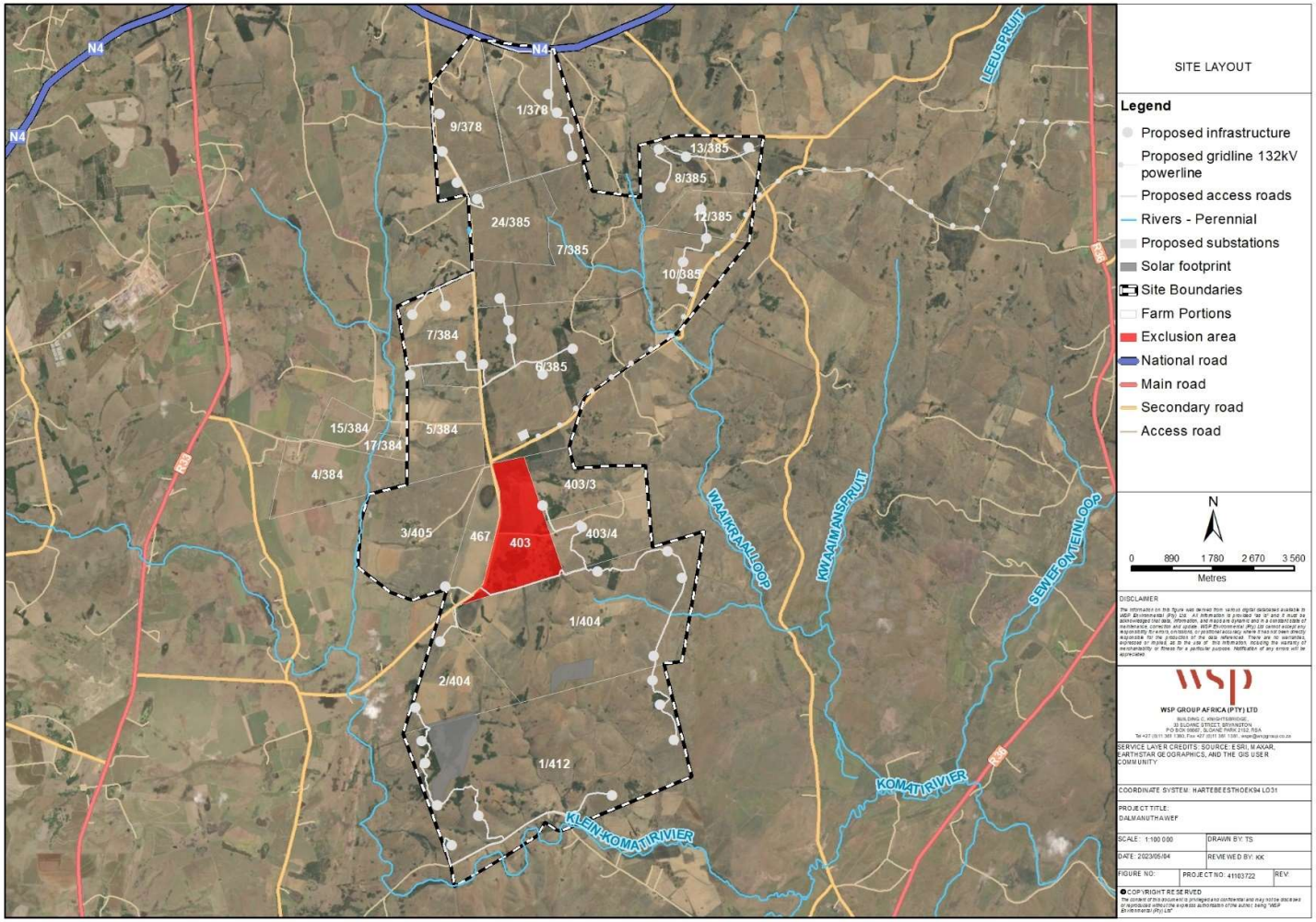

Figure 1-3 - Alternative 2

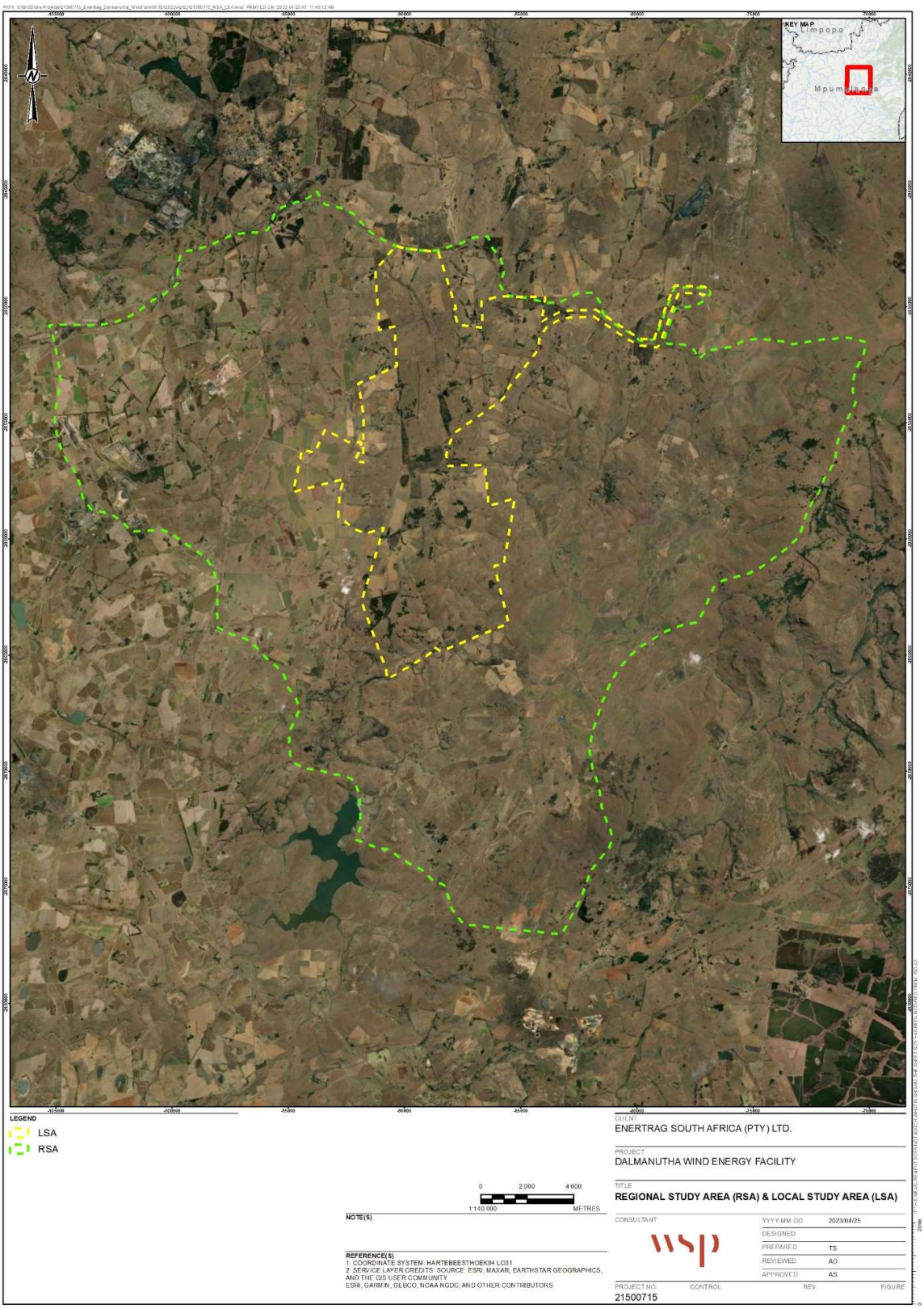

Figure 1-4 - Study Area

2 APPLICABLE LEGISLATION, POLICY AND STANDARDS

Applicable national and provincial legislation, associated regulations and policies that are pertinent to biodiversity, which were used to guide the EIA, include:

- National Environmental Management Act (NEMA) (Act No. 107 of 1998) including Section 24, concerning Procedures for the assessment and minimum criteria for reporting on identified themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA, when applying for environmental authorisation;
  - Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial biodiversity; and
  - Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity;
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA), specifically:
  - ToPS – National lists of critically endangered, endangered, vulnerable and protected species (2007;
  - National list of threatened terrestrial ecosystems for South Africa (2011) (NEMBA Threatened Ecosystems, 2011);
  - National list of alien and invasive species (2016);
- Environment Conservation Act (Act No. 73 of 1989), specifically the Lists of declared weeds and invader plants (CARA, 1983);
- National Water Act (Act No. 36 of 1998);
- Mpumalanga Nature Conservation Act (Act No. 10 of 1998);
- Mpumalanga Biodiversity Sector Plan (Lötter, 2015).
- National Protected Area Expansion Strategy (2016).

Recent, relevant South African national policies and guidance were also taken into consideration, in the development of the baseline description and impact assessment process, including:

- Draft National Biodiversity Offset Policy (2017);
- Draft National Biodiversity Offset Guideline (2022);
- Species Environmental Assessment Guideline (SANBI, 2020); and
- Wetland offsets: a best-practice guideline for South Africa (Macfarlane et al., 2014).

3 TERRESTRIAL BIODIVERSITY OVERVIEW

The local study area is situated in a landscape that is characterised by rolling high-altitude grassland interspersed by rocky outcrops, with extensive hillslope seep and valley bottom wetlands, and farmlands that are cultivated to varying degrees, but largely consist of secondary grasslands.

3.1 CONSERVATION CONTEXT

The regional study area coincides with the Steenkampsberg Important Bird Area (IBA) and Dullstroom Plateau Grasslands, which are considered to be of exceptional biodiversity value due to their support of bird species including Blue Crane, Wattle Crane, Grey Crowned Crane, Blue Korhaan, Southern Bald Ibis, Whitewinged Flufftail, Yellowbreasted Pipit and Rudd's Lark, mammals including Robust Golden Mole, Roughhaired Golden Mole, Cape Molerat, Oribi and Welwitch's Hairy Bat; one amphibian, *Bufo gariepensis nubicolus*; twenty plant species including *Eucomis vandermerwei, Gladiolus cataractarum Gladiolus malvinus, Nerine gracilis, Streptocarpus denticulatus* and *Watsonia occulta*; and two vegetation types including the Steenkampsberg Montane Grassland and Dry Afromontane Forest (MPTA, 2013). The RSA forms part of the Lydenburg Centre of Plant Endemism and also includes important sub-catchments; provides an escarpment corridor; contains important caves, pans and wetlands; and is considered important for grassland and forest processes (MPTA, 2013). These key features are further discussed in the sections that follow.

TERRESTRIAL CRITICAL BIODIVERSITY AREAS (CBAS) AND ECOLOGICAL SUPPORT AREAS (ESAS)

The LSA was compared to relevant available spatial biodiversity planning datasets, i.e. the Mpumalanga Biodiversity Sector Plan (2019) (Figure 3-1), in order to assess the local and regional biodiversity context of the site.

The Mpumalanga Biodiversity Sector Plan (MBSP) technical report (Lotter, 2015) defines five categories of conservation focus; protected areas, critical biodiversity areas (CBA), ecological support areas (ESA), other natural areas, and modified habitats. Definitions for each are listed below. These areas present risks to the Project in terms of impact, as well as opportunities for contribution to achieving provincially-set targets for biodiversity conservation, through focused biodiversity management planning and adherence to the mitigation hierarchy at EIA stage:

- **Protected Areas**: protected areas recognised in terms of the National Environmental Management Protected Areas Act, No. 57 of 2003, that are currently considered to meet biodiversity targets in the MBSP.
- **Critical Biodiversity Area**: areas (outside of Protected Areas) that are required to meet biodiversity targets for biodiversity pattern (species and ecosystems) and ecological processes. They should remain in a natural state that is maintained in good ecological condition.
- **Ecological Support Area**: play an important role in supporting the ecological functioning of critical biodiversity areas or for generating or delivering important ecosystem services. They support landscape connectivity and resilience to climate change adaptation. They need to be maintained in at least an ecologically functional state.
- **Other Natural Areas**: often retain much of their natural character and may contribute significantly to maintenance of viable species populations and natural ecosystem functioning, and may provide important

ecological infrastructure and ecosystem services. They are not, however, prioritized for immediate conservation action in the MBSP.

- **Modified**: often referred to as transformed, these areas have lost a significant proportion (or all) of their natural biodiversity and in which ecological processes have broken down (in some cases irretrievably), as a result of biodiversity-incompatible land-use practices such as ploughing, hardening of surfaces, mining, cultivation and the construction of houses or other built infrastructure.

Much of the LSA is mapped as CBAs and ESAs, which are largely aligned with grassland and wetland layers presented in the national landcover dataset (GTI, 2020) (Figure 3-2). These datasets are based on satellite imagery interpretation and as such the data may be aged, or require in-field verification.

The main outcome of the vegetation and flora baseline study which was conducted during the flowering season (late October 2022) is the vegetation map of the LSA (Figure 3-5), which defines the location and extent of natural and modified vegetation communities.

PRIORITY AREAS FOR PROTECTED AREA EXPANSION

The LSA coincides with areas that have been identified as Priority Focus Areas as part of the National Protected Area Expansion Strategy (2016) (Figure 3-3), which are aligned with the MBSP CBAs and ESAs (Figure 3-1).

PROTECTED AREAS

No nationally protected areas are situated within the LSA, with the closest feature listed on the National Protected Areas Register (DFFE, 2022) being the Nooitgedacht Dam Nature Reserve, which lies at the southern-most extent of the RSA.

The northern extent of the LSA overlaps with the Steenkampsberg Important Bird Area (IBA), which consists primarily of rolling high-altitude grassland interspersed with rocky outcrops, and encompasses the Lakenvlei wetland which hosts the critically endangered White-winged Flufftail (*Sarothrura ayersi*) (BirdLife International, 2022). The IBA also has importance due to its support of other threatened wetland birds including corncrake (*Crex crex*) and various crane species.

INDIGENOUS FORESTS

The most recent landcover dataset (GTI, 2020) for the LSA is shown in Figure 3-2. The LSA is characterised by secondary and some primary grasslands and hillslope seepage and valley bottom wetlands, interspersed by currently/previously cultivated areas and farmsteads. Woodland in the study area is largely restricted to plantations of typical alien species, including *Eucalyptus* sp., *Poplar* sp. and black wattle (*Acacia mearnsi*); however, a small area of indigenous forest gorge habitat was identified towards the centre of the LSA during field surveys (Hawkhead, 2023a).

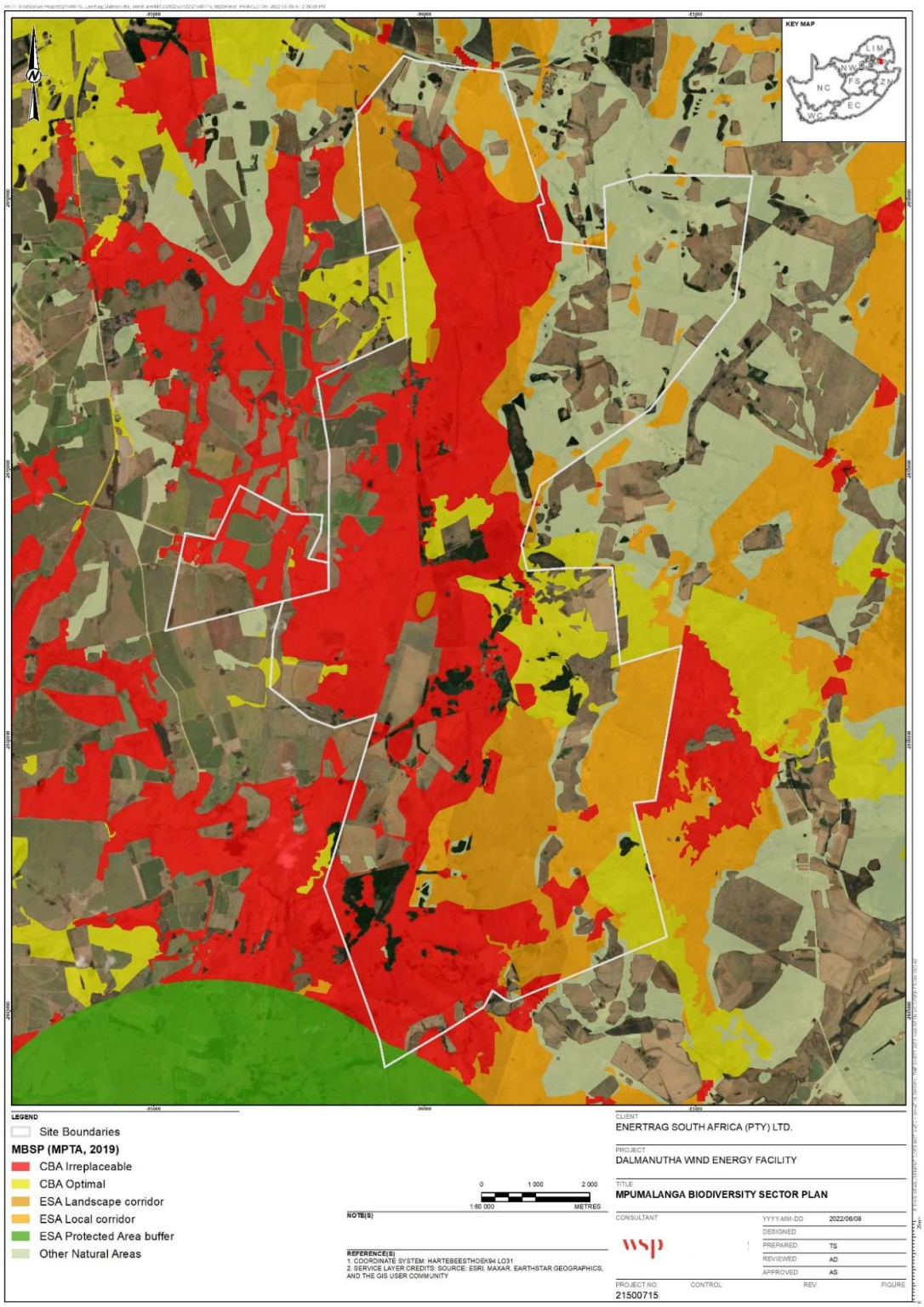

Figure 3-1 - Mpumalanga Biodiversity Sector Plan

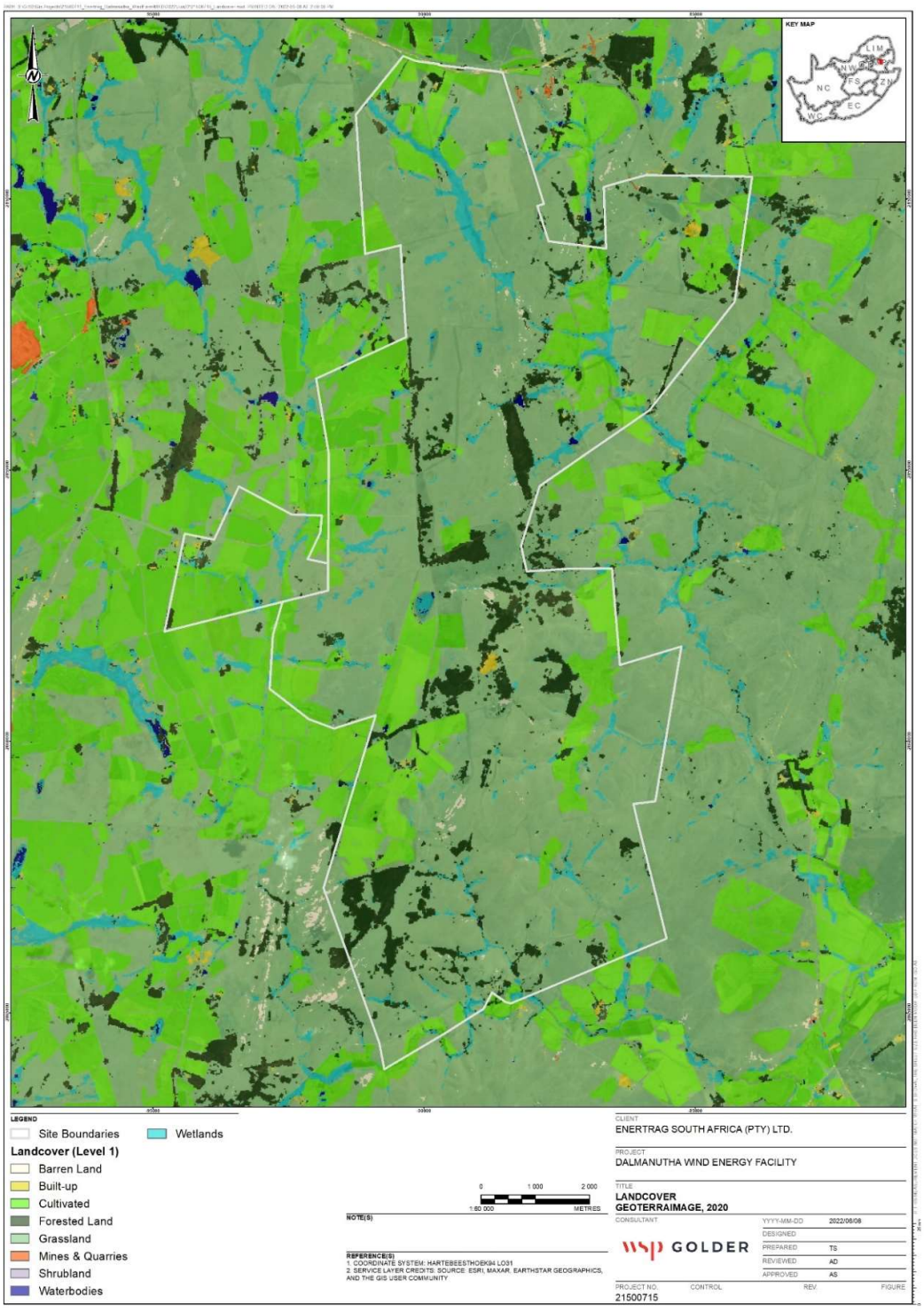

Figure 3-2 - Landcover dataset for LSA (GTI, 2020)

Figure 3-3 - LSA in relation to National Protected Area Expansion Strategy

3.2 VEGETATION AND FLORA

Three major vegetation types occur across the LSA; these include Eastern Highveld Grassland, Steenkampsberg Montane Grassland, and KaNgwane Montane Grassland (Figure 3-4).

Both Eastern Highveld Grassland and KaNgwane Montane Grassland were previously listed as Vulnerable (Government notice 1002/2011, in terms of section 52(1)(a) of NEMBA). However, the conservation status of both vegetation types have subsequently been revised to Endangered, as a result of high rates of habitat loss (Revised National List of Threatened Terrestrial Ecosystems, 2022).

Only a very small fraction of Eastern Highveld Grassland is conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and approximately 44% has been transformed, primarily by cultivation, forestry, mines, urbanisation and the building of dams. Similarly, Mucina and Rutherford (2011) indicate that only 0.4% of KaNgwane Montane Grassland is formally is conserved, with forestry and cultivation the main threats to this vegetation type.

Small portions of the north of the LSA also form part of the Dullstroom Plateau Grassland (MP4) ecosystem, which is listed as an Endangered ecosystem under the NEMBA (2011). This ecosystem comprises both the grassland and forest biomes and extends from Die Berg in the north to the town of Belfast in the south. It is delineated based on the presence of breeding and feeding habitat for cranes and Rudd's Lark. Thirty-three threatened and endemic flora and fauna species are known from the ecosystem. Other important ecosystem attributes include escarpment corridors, presence of important caves, pans and wetland and is important for grassland and forest processes

ECOLOGICAL IMPORTANCE OF VEGETATION COMMUNITIES IN THE LSA

The ecological importance of identified vegetation communities mapped in the LSA during baseline studies is summarised in Table 3-1. Natural vegetation communities mapped within the LSA are considered sensitive to development, and where these coincide with CBAs, and project infrastructure, offsets will typically be required according to the draft biodiversity offset guideline.

Table 3-1 – Ecological importance of mapped vegetation communities in LSA

Vegetation Community	Analysis
Cultivated Fields	A modified vegetation community, that has been heavily impacted by anthropogenic activity. Typically characterised by high-levels of ongoing disturbance and either denuded of vegetation (recently ploughed) and/or dominated by non-indigenous flora species. The ecological importance of this vegetation community is rated very low.
Alien Tree Plantations	A modified vegetation community, that is characterised by an almost complete dominance of alien invasive tree species. Little indigenous flora is present. It is noted that plantations do however, provide refuge habitat for sensitive fauna species. Notwithstanding this functional attribute, the ecological importance of the Alien Tree Plantations vegetation community is rated very low.
Dry Mixed Grassland	This is a large and variable vegetation community, that ranges from undisturbed to localised sites of disturbance and alien wattle colonisation. Dry mixed grassland constitutes important natural habitat for a variety of flora and fauna species, including many SCC. This community also play an important role in maintaining landscape connectivity, and in buffering rocky grassland and moist grassland/wetland habitats.

Vegetation Community	Analysis
	The conservation importance and functional integrity of this vegetation community are both rated high, resulting in a high biodiversity importance score. Receptor resilience is rated high-medium, resulting in an ecological importance rating of medium.
Disturbed Grassland	Disturbed grassland is a subclimax vegetation community that has regenerated following past disturbance. Habitat is stable and essentially retains the functional attributes of undisturbed grassland habitat. This community is rated as having a medium functional integrity, but low conservation importance. The biodiversity importance of disturbed grassland community is thus low. Receptor resilience is rated high, resulting in an ecological importance rating of low.
Rocky Grassland	Rocky grassland is a natural vegetation community, that is confined to ridge areas and localised sites embedded within the broader study area habitat matrix. The prominence of large rock outcrops and the presence of indigenous woody flora species, increases local-scale habitat heterogeneity and flora and fauna diversity. Several flora and fauna SCC have been recorded in this community, or have a high probability of occurrence. The functional integrity and conservation importance of the Rocky grassland are both rated high, resulting in a high biodiversity importance score. Receptor resilience is rated medium, and accordingly ecological importance is rated high.
Moist Grassland and Wetland	The Moist grassland and wetland community maintains several important ecological functions / traits, including its role in local hydrological patterns, providing linear and largely intact movement and dispersal corridors for fauna and flora, and promoting local-scale habitat heterogeneity. Moreover, several flora and fauna SCC have been recorded in this community, or have a high probability of occurrence. The functional integrity and conservation importance of the Moist grassland and wetland are both rated high, resulting in a high biodiversity importance score. Receptor resilience is rated medium, and accordingly ecological importance is rated high
Forested Gorge Habitat	In the context of the study area, this is a small, but unique community, that is characterised by well-developed indigenous forest, flanked by tall vegetated rocky cliffs. The complex topographical template supports numerous microhabitats, which significantly contribute to local-scale habitat heterogeneity and the flora and fauna diversity of the study area. Several flora SCC have a high probability of occurrence in this community. The functional integrity and conservation importance of this community are rated high. The biodiversity importance of disturbed grassland community is thus high. Receptor resilience is rated low, and accordingly ecological importance is rated very high (due to the very small extent of this community in the study area, it cannot be mapped at the scale presented in Figure 3-5).

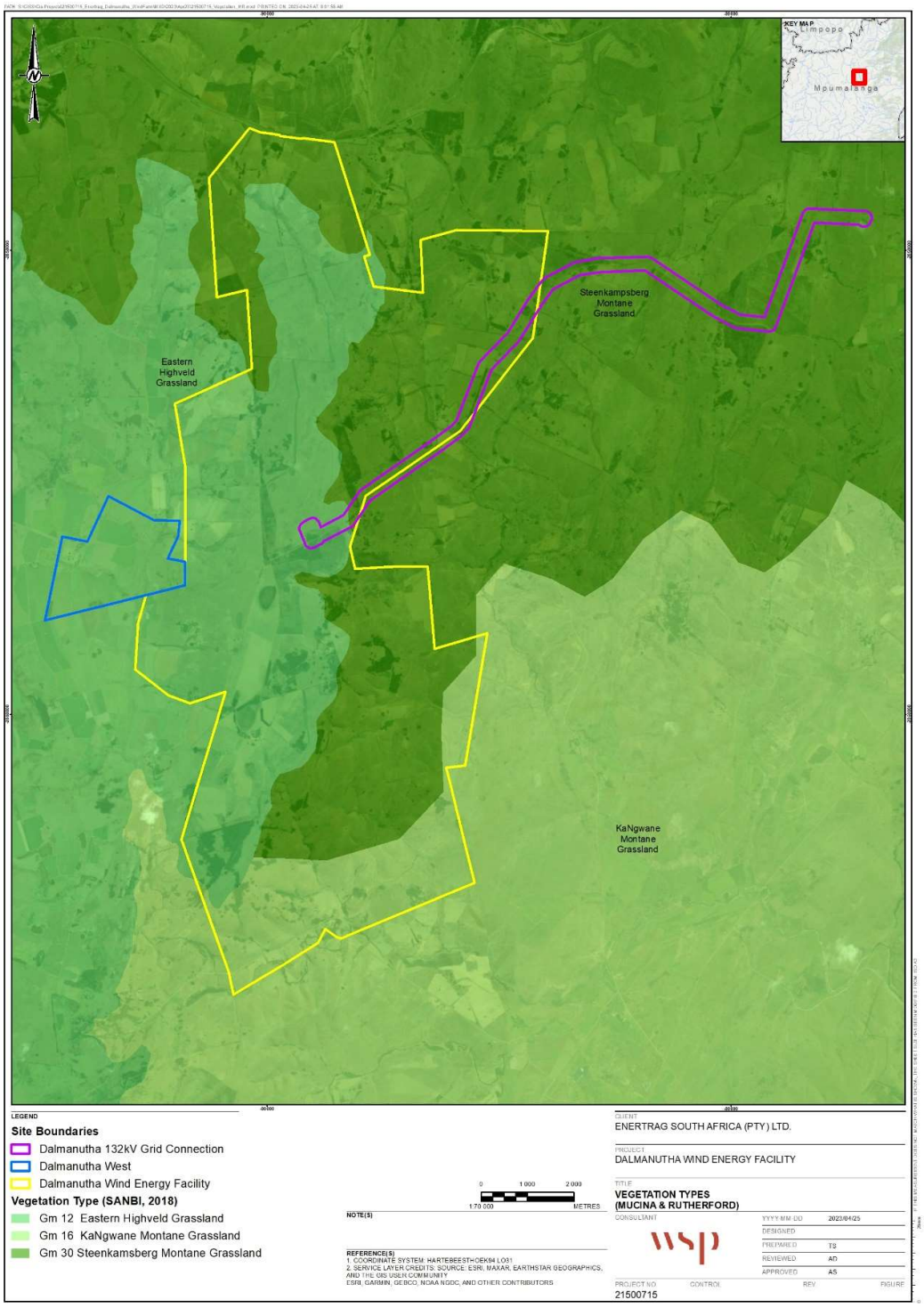

Figure 3-4 - Vegetation types

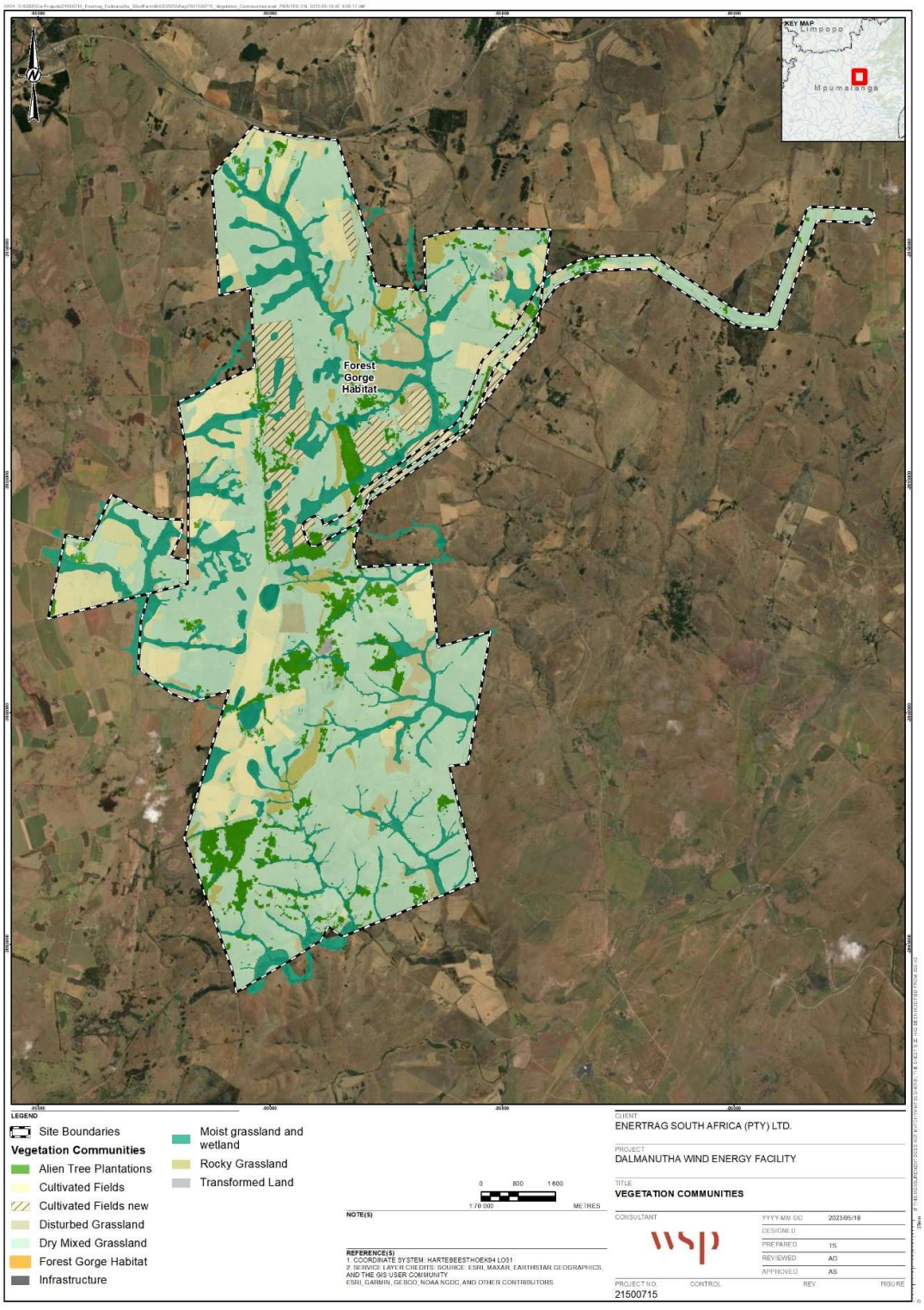

Figure 3-5 - Mapped vegetation communities

FLORA SPECIES OF CONSERVATION CONCERN

The National Web Based Screening Tool indicated that the majority of the LSA is considered to be of 'Medium sensitivity' in terms of the Plant Species Theme on account of the potential presence of at least 19 flora species of conservation concern (e.g. *Khadia carolinensis, Asclepias dissona, Miraglossum davyi*).

Based on reviewed botanical datasets and data collected in the study area during the field survey, up to 79 flora species of conservation concern (SCC) occur or potentially occur in the study area (Appendix A, Table A1-1).

Four national/provincial Red List species were recorded in the study area during the 2022 field survey:

- *Merwilla plumbea* is listed as Near Threatened on both the national and provincial Red Lists, as well as Vulnerable on the NEMBA ToPS List (2007), and was recorded along ridge and at isolated rocky outcrops in the south of the LSA;
- *Eucomis autumnalis* (Declining, MP) is fairly abundant in the study area and was recorded at several locations, including at disturbed locations. It is highly sought-after for medicinal use ;
- Ilex mitis var. mitis (Declining, MP) was recorded along the stream in the small patch of forest gorge habitat in the centre of the LSA. This species is highly unlikely to occur outside of this vegetation community; and
- *Protea parvula* (Near Threatened) was recorded at two locations in dry mixed grassland in the north of the LSA. It is likely to occur in grassland habitat throughout the study area.

In addition, four orchid species listed as Rare on the Mpumalanga Red List have been recorded in the north of study area by G. Lockwood. These include *Eulophia cooperi, Habenaria anguiceps, Habenaria humilior* and *Habenaria laevigata*.

In terms of flora listed as protected according to the Mpumalanga Nature Conservation Act (Act No. 10 of 1998), 12 protected taxa were recorded in the study area during the field survey, while an additional 28 protected orchid taxa have previously been recorded in the north of the LSA by G. Lockwood. These species are listed in Appendix A (Table A1-2), along with their habitat preferences.

3.3 FAUNA

Fauna species confirmed in the LSA during field surveys conducted during 2022, as well as fauna SCC confirmed/expected to occur, are summarised in the sections that follow. Full details of the methods used, and survey results, are available in the terrestrial fauna specialist assessments (Hawkhead, 2023) that accompany this EA application.

HERPETOFAUNA

Reptiles

Up to 84 reptile species have been documented the region in which the study area is located; of these, four were confirmed in the LSA during field studies - Puffadder (*Bitis arietans arietans*) Rinkhals (*Hemachatus haemachatus),* Spotted Grass Snake *(Psammophylax rhombeatus)* and Speckled Rock Skink *(Trachylepis punctatissima)* – all of which are common species with widespread distributions, and are not of conservation concern.

Reptile SCC with high potential to occur on site include Northern Dwarf Chameleon (*Bradypodion transvaalense*) which was previously recorded in the study area and could be present in the small patch of forested gorge habitat towards the centre of the LSA, Large-scaled Grass Lizard (*Chamaesaura macrolepis*) (Near Threatened, MP) and Breyer's Long-tailed Seps (*Tetradactylus breyeri*) (Vulnerable, MP) which are associated with rocky grassland habitat, and Many-spotted Snake (*Amplorhinus multimaculatus*) (Near Threatened, MP) which is considered likely to occur in wetlands and areas of riparian vegetation in the LSA.

Amphibians

Based on historic distribution ranges, up to 20 amphibian species are known from the region and potentially occur in the study area; six of which were confirmed during field surveys (Table 3-2), and all of which are common with widespread distributions (i.e. not of conservation concern).

Table 3-2 – Amphibian species recorded in LSA

Family	Scientific Name	Common Name
Bufonidae	*Bufo gutturalis*	Guttural Toad
Pipidae	*Xenopus laevis*	Common Platanna
Pyxicephalidae	*Stongylopus fasciatus*	Striped Stream Frog
Pyxicephalidae	*Amietia angolensis*	Common River Frog
Pyxicephalidae	*Amietia fusigula*	Cape River Frog
Pyxicephalidae	*Cacosternum boettgeri*	Boettger's Caco

Giant Bullfrog (*Pyxicephalus adspersus*) is the only amphibian of conservation concern potentially occurring in the study area. It inhabits seasonally shallow pans, wetland and rained-filled depressions in savanna and grassland ecosystems. These habitats are present in the LSA, and it is therefore probable that Giant Bullfrog are present.

BIRDS

Over two years of avifaunal monitoring conducted in the LSA, 244 bird species were recorded.

The South African Bird Atlas Project 2 (SABAP 2) reports an additional 75 species for the study area, albeit often at low reporting rates, or submitted as *ad hoc* accounts. These species include a number of Vulnerable, Near-threatened and/or near endemic species, the most notable of which include: Yellow-breasted Pipit *Anthus chloris* (0.5%), Verreaux's Eagle (0.9%), Abdim's Stork *Ciconia abdimii* (0.5%), Red-footed Falcon *Falco vespertinus* (1.4%) and Lesser Flamingo *Phoeniconaias minor* (0.5%).

Fifteen species recorded on the site are regionally Red Listed (Table 3-3). An additional two species are Regionally Least Concern, although listed Globally as Near Threatened: Blue Korhaan *Eupodotis caerulescens* and Forest Buzzard *Buteo trizonatus*.

Table 3-3 – Avifauna species of conservation concern recorded in LSA

Scientific Name	Common Name	Conservation Status
Wattled Crane	*Grus carunculata*	Critically Endangered
White-backed Vulture	*Gyps africanus*	Critically Endangered
Grey Crowned Crane	*Balearica regulorum*	Endangered
African Marsh Harrier	*Circus ranivorus*	Endangered
Cape Vulture	*Gyps coprotheres*	Endangered
Martial Eagle	*Polematus bellicosus*	Endangered
Black-rumped Buttonquail	*Turnix nanus*	Endangered
White-bellied Bustard	*Eupodotis senegalensis*	Vulnerable
Southern Bald Ibis	*Geronticus calvus*	Vulnerable
Denham's Bustard	*Neotis denhami*	Vulnerable
Crowned Eagle,	*Stephanoaetus coronatus*	Vulnerable
Lanner Falcon	*Falco biarmicus*	Vulnerable
Secretarybird	*Sagittarius serpentarius*	Vulnerable
Blue Crane	*Anthropoides paradiseus*	Near-Threatened
Pallid Harrier	*Circus macrourus*	Near-Threatened
Blue Korhaan	*Eupodotis caerulescens*	Least concern*
Forest Buzzard	*Buteo trizonatus*	Least concern*

* indicates species that are considered of conservation concern at the global level

Twenty-three of the recorded species or additional SABAP 2 records are either near endemic to South Africa, or endemic to South Africa, Lesotho and eSwatini.

Although not recorded during pre-construction monitoring surveys (since it requires specialised acoustic monitoring, and the bird's call has only recently become known and has not been made public), there is a potential that the Critically Endangered White-winged Flufftail (*Sarothrura ayresi*) is present in the LSA, based on the presence of potentially suitable wetland habitat, the outcome of consultation with BirdLife South Africa (BLSA) and anecdotal records (a stakeholder (Ms Burke pers comm) has stated that it is suspected to occur on her property in the area). In addition, Lockwood (pers comm) reports three records over 12 years of Yellow-breasted Pipit (*Anthus chloris*) which is considered regionally Vulnerable.

BATS

Seventeen bat species are expected to occur in the RSA (Volant, 2023), of which five are considered threatened at the national/global level; of these, a total of nine bat species from four families were detected during the pre-construction monitoring period, all of which are listed as Least Concern, with no endemic or range-restricted species encountered. Cape serotine (*Laephotis capensis*) was the most commonly recorded species across the monitoring area, accounting for the vast majority of recorded echolocation activity throughout the monitoring period; two roosts of this species within occupied houses were also confirmed within the LSA in the vicinity of Dalmanutha West WEF (Volant, 2023).

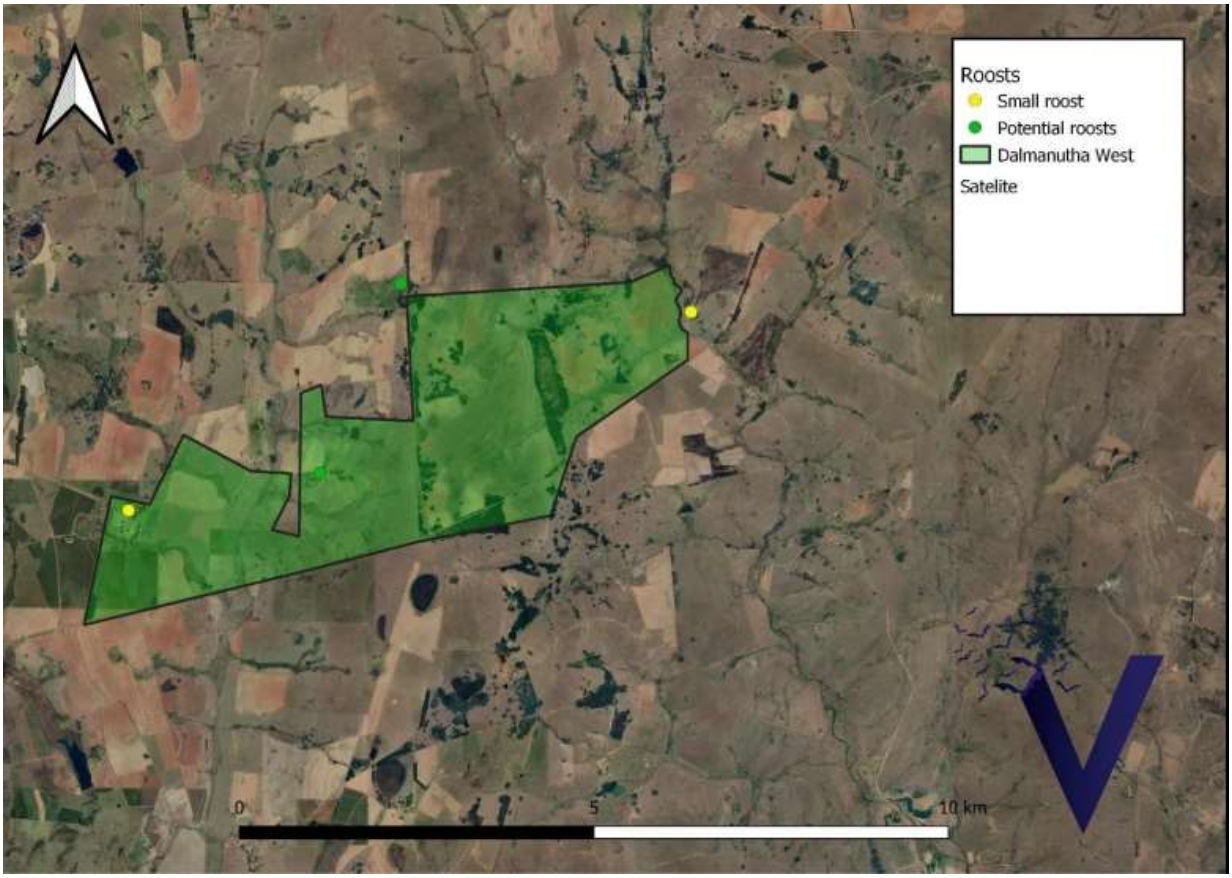

Figure 3-6 - Confirmed and potential bat roosts

OTHER MAMMALS

Twenty-eight other mammal species, ranging from small rodents to medium-sized antelope, were recorded in the study area during the field programme. Of these, five species of concern were confirmed in the LSA during field studies:

- National Mammal Red List (Child et al., 2016): Serval (Leptailurus serval), Mountain Reedbuck (*Redunca fulvorufula fulvorufula*) and Grey Rhebok (*Pelea capreolus*);

- Mpumalanga Nature Conservation Act: Steenbok (*Raphicerus campestris*) and Aardvark (*Orycteropus afer*); and
- NEMBA ToPS List (2007): Southern Reedbuck (*Redunca arundinum*).

Additional SCC that are likely to be present include Cape Clawless Otter (*Aonyx capensis*) and Spotted-necked Otter (*Hydrictis maculicollis*). These species favour riparian habitats, with permanent water and are thus likely to be found close to streams and farm dams in the study area.

4 AQUATIC BIODIVERSITY OVERVIEW

This section summarises the baseline aquatic biodiversity environment of the local and regional study areas. It draws upon existing studies, published information, local knowledge and data gathered during the wetland and aquatic baseline studies conducted during 2022.

The LSA falls within the upper reaches of the Inkomati Water Management Area, and the quaternary catchment X11D (Komati River). The catchment is situated within the Inkomati Water Management Area (WMA). The mean annual runoff (MAR) for the X11D catchment is 88 mm (WR2012). This catchment receives 744 mm rainfall per year and experiences 1,413 mm of evaporation annually. Numerous non-perennial rivers drain in an easterly direction into the perennial Waalkraalloop river and in a westerly and southerly direction into the perennial Klein Komati River.

The Komati River catchment is ecologically severely stressed due to the water demands imposed by Eskom and agriculture, with various abstraction weirs creating serious obstructions to fish migrations, and return flows from irrigation affecting downstream water quality as a result of input of chemicals such as pesticides, fertilizers and salts (MPTA). Alien invasive fish species that have been introduced into the numerous dams are also present in the rivers (MPTA, 2015). Nevertheless, the ecological status of some sections of the upper Komati River catchment (within which the LSA is situated) is still considered to be in a relatively good condition (MPTA, 2015).

4.1 CONSERVATION CONTEXT

The relative Aquatic Biodiversity theme sensitivity of the LSA is Very High, due to the presence of aquatic CBAs, wetlands, and freshwater ecosystem priority area quinary catchments (DFFE, 2022).

AQUATIC CRITICAL BIODIVERSITY AREAS (CBAS) AND ECOLOGICAL SUPPORT AREAS (ESAS)

According to the latest revision of the freshwater component of the provincial biodiversity sector plan (Mpumalanga Tourism and Parks Agency, 2019), the wetlands associated with the western half of the study area may be regarded as ESAs as part of the identified FEPA wetlands and wetland clusters. These areas and their surrounds are considered important FEPA sub-catchments. The Klein-Komati River and its tributaries are further classified as CBAs as the Klein-Komati River is classified as a FEPA river. One CBA wetland was also identified in the north-western portion of the study area. The eastern portion of the study area is dominated by Other Natural Areas, however, this excludes the southern portion of the study area, which once again forms part of the Klein-Komati River sub-catchment areas and are classified as ESAs

The MBSP freshwater assessment is partly based on remotely-sensed satellite imagery and landcover datasets, and thus some wetlands that were found to be present on site during field surveys are not represented in this dataset, particularly hillslope seeps which can be difficult to distinguish from grasslands based on satellite imagery alone. Similarly, some mapped features no longer support wetland habitat – generally due to land use changes (e.g. conversion to agriculture) that have taken place since the dataset was published.

STRATEGIC WATER SOURCE AREAS (SWSAS)

While the LSA is not located within any designated Strategic Water Source Areas (SWSA), it is located within the Komati River catchment approximately 18 km upstream of the Mpumalanga Drakensburg

Surface Water SWSA. The Komati River is an important water source within the Mpumalanga Drakensburg Surface Water SWSA.

FRESHWATER ECOSYSTEM PRIORITY AREA (FEPA) SUB-CATCHMENTS

As highlighted by the National Screening tool, the LSA interacts with FEPA quinary catchments and wetlands. The LSA coincides with three wetland vegetation groups: Mesic Highveld Grassland Group 4, Mesic Highveld Grassland Group 5 and Mesic Highveld Grassland Group 6. The western portion of the study area falls within the Klein-Komati River catchment, which is designated as a River FEPA and encompasses all of its associated sub-catchment areas. Four (4) designated wetland cluster areas are also associated with this area (Figure 4-1). According to Driver et al. (2011), wetland clusters are groups of wetlands embedded in a relatively natural landscape. This allows for important ecological processes such as migration of frogs and insects between wetlands.

NATIONAL WETLAND MAP 5 WETLANDS

The South African National Wetland Map version 5 (NWM5) portrays the most up-to-date spatial data for the extent and types of estuarine and inland aquatic (freshwater) ecosystems of South Africa (Van Deventer *et al.*, 2019). The proposed development footprint in relation to wetlands mapped as part of the National Wetland Map 5 project is illustrated on Figure 4-2. The extent of hillslope seep wetlands within the LSA is under-represented in this dataset, as evidenced by the wetland map produced subsequent to the completion of the wetland baseline assessments in support of the current application (see Figure 4-3).

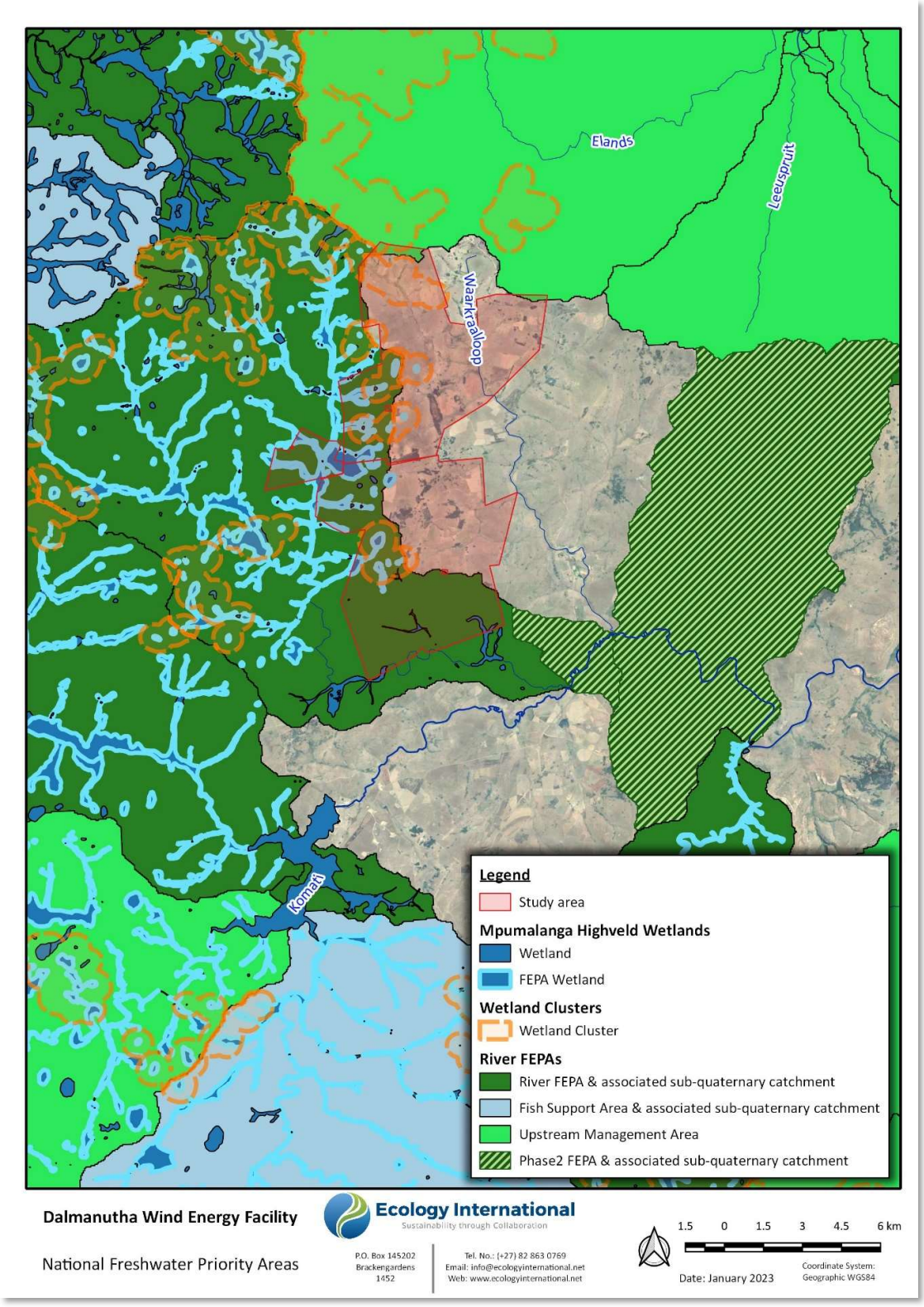

Figure 4-1 - FEPA wetlands and watercourses

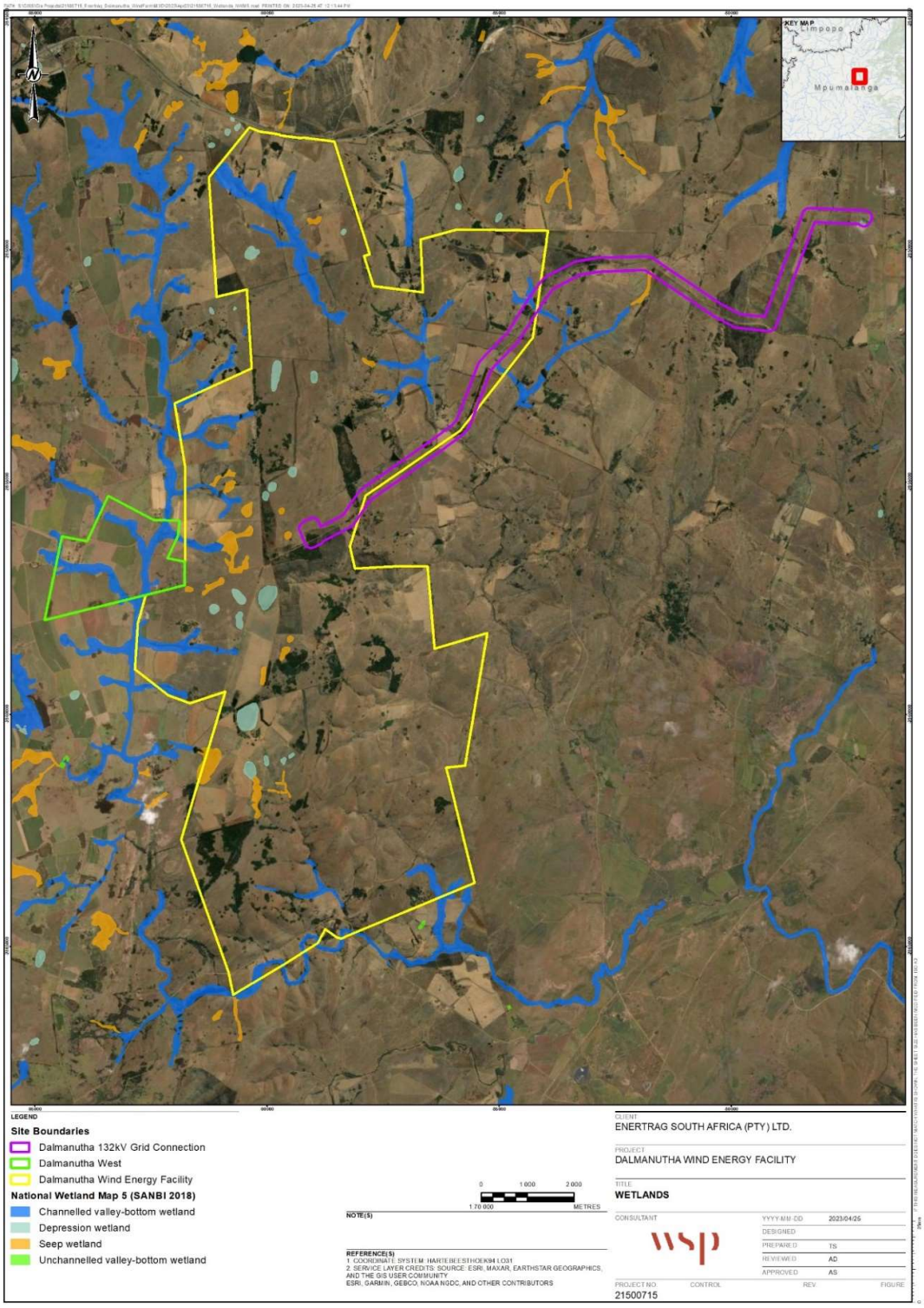

Figure 4-2 - National Wetland Map 5

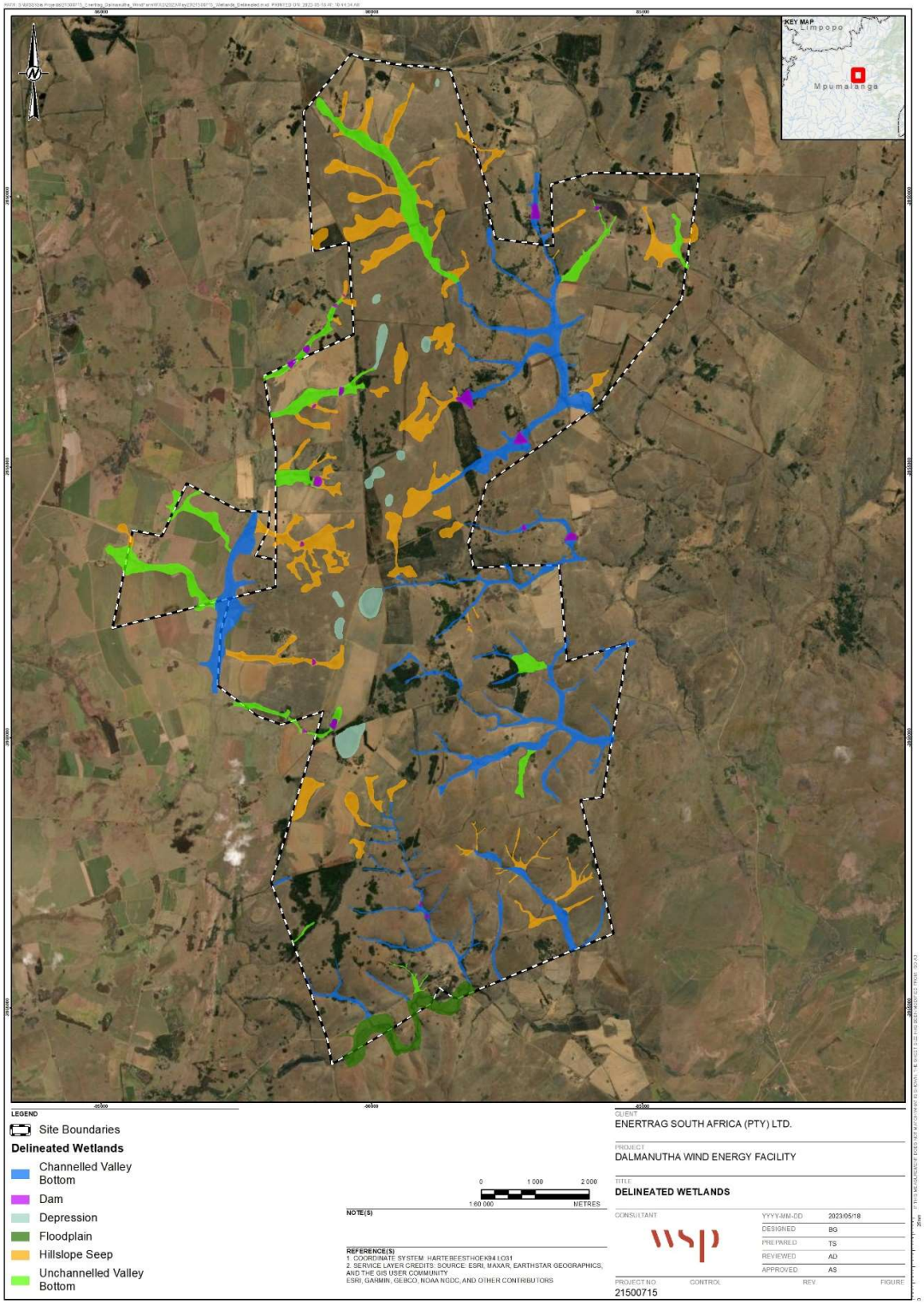

Figure 4-3 - Delineated wetlands within LSA

4.2 WETLAND ECOSYSTEMS

The LSA is dominated by mixed grassland and agricultural cultivation, with hillslope seeps and valley bottom wetlands occurring throughout. A number of depression wetlands occur in the central part of the LSA, and a floodplain is present in the southern extent.

Approximately 1,590 ha of wetland habitat has been mapped in the LSA. The wetlands within the LSA exist in a landscape that is characterised by agricultural activities – predominantly livestock grazing, with some intensive crop production. The bulk of the wetlands within the Project Area are in a Moderately Modified (PES C) (816 ha) to Largely Modified (PES D) (407 ha) condition, with 326 ha wetlands considered to be in Good (PES B) to Pristine (PES A/B) condition. In the south of the LSA, approximately 9 ha of channelled valley bottom wetlands are considered to be in a Seriously/Critically Modified state (PES E).

The EIS of the wetlands in the Project area varies, largely as a function of their size and ecological integrity, which affects their capacity to deliver biodiversity and water-related ecosystem services. The majority of wetlands in the LSA (approx. 742 ha) are considered to be of Moderately-Low to Moderate EIS; however, approximately 584 ha have Moderately High EIS, and 232 ha are of High to Very High EIS, largely due to their support of red listed birds, particularly Wattled Crane (*Bugeranus carunculatus*) and Grey-crowned Crane (*Balearica regulorum*).

The presence of large areas of moderately-largely modified wetlands in the LSA presents an opportunity for implementation of a wetland rehabilitation plan with the aim of improving wetland health to secure functional gains that can compensate (offset) any Project wetland losses.

4.3 RIPARIAN ECOSYSTEMS

The LSA is located within the revised Inkomati-Usuthu WMA, the major rivers of which include the Nwanedzi, Sabie, Crocodile (East), Komati and Usuthu rivers, and within the X11D quaternary catchment. The LSA is located upstream of the Komati River and is associated with the Klein-Komati River to the south and south-west. The Waarkraalloop (a tributary of the Klein-Komati) flows through and to the east of the LSA. Numerous wetlands and tributaries of these systems are also present.

ECOSTATUS

Based on the integration of results obtained during the 2022 baseline aquatic assessment for the watercourses associated with the proposed Dalmanutha WEF project (Figure 4-4), it was determined that integrated instream component of both the Waarkraalloop and the Klein-Komati Rivers and their tributaries, were predominantly moderately modified (Ecological category C). Further integration of the riparian element for each site (obtained through calculation of surrogate values from the IHI approach) suggests that, from the perspective of instream and riparian elements, these watercourses may be regarded as largely natural (Ecological Category B) to moderately modified (Ecological Category C). This is based on the largely intact structure of the riparian zones associated with each site where impacts were limited mostly to the encroachment of isolated stands of alien and invasive woody plant species, and in some places, impacts related to erosion and incision of the river banks. The Present Ecological States of both the Waarkraalloop and the Klein-Komati Rivers, thus meet the Target Ecological Category designated for the catchment by the Department of Water and Sanitation (Government Gazette No. 40531, 2016). However, any further deterioration in either the instream ecological integrity or the riparian habitat integrity, may result in a deviation from the designated Target Ecological Category for these watercourses.

Catchment	River	Site	Aquatic Macro-invertebrates	Fish	Integrated Instream Category	Riparian Vegetation	EcoStatus Category
Waarkraalloop	Unnamed Tributary	DWEF 1	C	B	C	A	B
	Unnamed Tributary	DWEF 5	C	B	B/C	A	B
	Waarkraalloop	DWEF 2	C	C	C	C	C
		DWEF 3	C	C	C	C	C
		DWEF 4	B	C	C	A/B	B
		DWEF 6	B/C	C	C	C	C
Klein_Komati	Unnamed Tributary	DWEF 7	C	C/D	C	C	C
		DWEF 8	C	C/D	C	A	B/C
	Unnamed Tributary	DWEF 11	B/C	C	C	C	C
	Unnamed Tributary	DWEF 12	C	A/B	B/C	A	B
	Klein-Komati	DWEF 9	C	C	C	A	C
		DWEF 10	C	C	C	C/D	C
		DWEF 13	C	C	C	C	C

Figure 4-4 - EcoStatus categories obtained during the 2022 aquatic specialist baseline assessment

SPECIES OF CONSERVATION CONCERN

Based on collection records for the study area, it was determined that several fish species of conservation concern were expected or confirmed to be present within the associated watercourses. These include the following species:

- *Chiloglanis emarginatus* (Phongola Suckermouth) – currently classified in terms of the IUCN Red List criteria at a global and regional (southern Africa) level as Vulnerable, and provincially as Near Threatened;
- *Labeobarbus nelspruitensis* (Incomati Chiselmouth) – currently classified in terms of the IUCN Red List criteria at a global and regional (southern Africa) level as well as at a provincial level as Near Threatened.
- *Enteromius anoplus: although the complex is classified as* Least Concern (Woodford, 2017), recent descriptions of new species from the complex render the IUCN Red List assessment obsolete. MTPA recognises three forms of this species complex as occurring in Mpumalanga, of which those occurring within the study area are likely to represent the Escarpment form which is considered to be Endangered at the provincial level.
- *Amphilius engelbrechti:* not yet assessed at a national or global level; however, MTPA recognises three forms of this species complex as occurring in Mpumalanga, of which those occurring within the study area are likely to represent the Mpumalanga form which is considered to be Vulnerable at the provincial level.

ECOLOGICAL IMPORTANCE AND SENSITIVITY

Both the mainstem Waarkraalloop and the mainstem Klein-Komati Rivers were assessed by the Department of Water and Sanitation (2014) in terms of Ecological Importance and Ecological Sensitivity from an aquatic perspective. Based on the condition of the various watercourses assessed and the results of the 2022 specialist aquatic baseline assessment, the values were adjusted where necessary to provide an updated assessment of the observed Ecological Importance and Sensitivity (Table 4-1).

According to the results of this assessment, the Waarkraalloop and its associated tributaries may be regarded as of 'High' Ecological Importance with a 'Very High' Ecological Sensitivity. Similarly, the Klein-Komati and its associated tributaries may also be regarded as of 'High' Ecological Importance with a 'Very High' Ecological Sensitivity.

Table 4-1 - Ecological Importance and Sensitivity for the reaches of the Waarkraalloop and the Klein-Komati associated with the LSA (Ecology International, 2023)

Ecological Importance	Description			
	Waarkraalloop		Klein-Komati	
	DWS (2014)	Adjusted	DWS (2014)	Adjusted
Fish representivity	High	High	Low	High
Fish rarity	High	High	High	High
Invertebrate representivity	High	Very high	Very High	Very high
Invertebrate rarity	Very High	Very high	Very High	Very high
Ecological Importance for riparian/wetland/instream (vertebrates excl. fish)	High	High	High	High
Riparian/Wetland natural vegetation importance	Low	Low	Low	Low
Habitat diversity class	Low	Moderate	Low	High
Instream migration link	High	High	Moderate	High
Riparian/Wetland zone migration link	High	High	High	High
Riparian/Wetland zone habitat integrity class	High	High	High	High
Instream habitat integrity class	High	High	High	High
Mean Ecological Importance Value	***High***	***High***	***High***	***High***
Ecological Sensitivity				

Fish physico-chem sensitivity	Very High	Very high	Very High	Very high
Fish flow sensitivity	Very High	Very high	Very High	Very high
Invertebrate physico-chem sensitivity	High	Very high	Very High	Very high
Invertebrate velocity preference	Very High	Very high	Very High	Very high
Riparian/Wetland/instream vertebrates sensitivity to water level/flow changes	High	High	High	High
Stream size sensitivity to modified flow/water level changes	High	High	High	High
Riparian/Wetland/instream vegetation intolerance to water level/flow changes	Low	Moderate	High	High
Mean Ecological Sensitivity Value	***Very High***	***Very High***	***Very High***	***Very High***

5 APPLICATION OF THE MITIGATION HIERARCHY

Biodiversity offsets are the final option in the mitigation hierarchy (Figure 5-1), once all other foregoing steps have been considered to their full extent. Environmental measures that have been incorporated in the Project design so that potential impacts can be avoided, are described in Section 5.1; and additional mitigation measures that have been prescribed in each of the biodiversity specialist reports are summarised in Section 5.2.

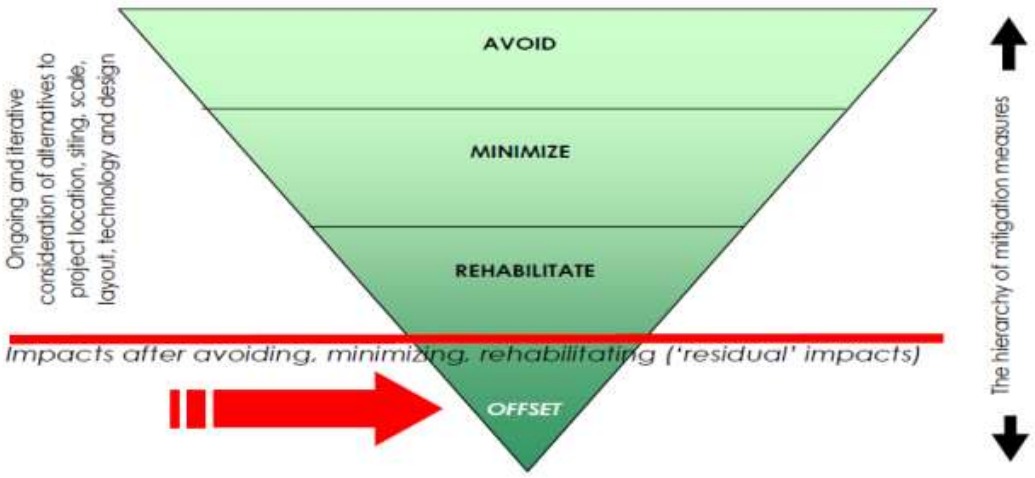

Figure 5-1 - The mitigation hierarchy (DFFE, 2022)

5.1 INCORPORATED ENVIRONMENTAL MEASURES

Given the sensitive nature of much of the LSA, a number of environmental mitigation measures were incorporated into the Project design to avoid and minimise potential effects to biodiversity. These include:

- A 100 m buffer was applied to all watercourses (wetlands and riparian systems) and all turbines, laydown and construction camps, and structures (batching plant, wind power factory and yard, on-site IPP substation and BESS) have been sited outside of this buffer area.
- Use will be made of existing access roads/tracks to the extent possible, to minimise the requirement for construction of new access roads.
- Low speed limits (20-40 kph) for all construction and operation vehicles will be clearly signposted and enforced.
- Internal roads will be designed and maintained so that natural drainage patterns and catchments are changed as little as possible.
- Appropriate sanitary facilities will be provided for the duration of the construction and operation and all wastes will be removed to an appropriate waste facility.

- Fuel/chemical storage and usage areas will be sited above any 1:100 year floodline/outside watercourse buffer zones, and limited to demarcated areas in laydown and construction camps, sealed and bunded, with storm water directed around these areas;
- All fuel/chemical/concrete storage areas will be on bunded hard stands to prevent any spills from infiltrating to the underlying soil;
- Grease and oil traps will be installed at refuelling facilities, workshops and fuel storage depots. Drip trays will be used in the plant and workshops.
- An alien and invasive species management procedure will be developed to:
  - Prevent the spread of invasive species and pathogens that may already be present in the surrounding environment;
  - Implement prompt and effective rehabilitation and revegetation (with desirable plant species) where applicable;
  - Implement of ongoing monitoring in Project-occupied land throughout the life of the Project to ensure early detection of new areas of weed and pathogen spread, identify previously unrecorded invasive species, pest and pathogens, and assess the efficacy of prescribed control measures; and
  - Provision of all construction contractors and other subcontractors with a copy of the invasive species management procedure, and specific invasive species, pest and pathogen management plans and secure their commitment to adhere to the measures outlined therein.

ALTERNATIVES

Due to the location of the Project in a sensitive area for biodiversity, and further to completion of two years of pre-construction avifauna monitoring and avifaunal sensitivity mapping, and discussions with BLSA and MTPA at scoping stage, two alternative options are now being considered for the Project:

- Alternative 1 consists of up to 70 turbines and associated infrastructure (Battery Energy Storage System (BESS), access roads etc).
- Alternative 2 consists of a combination of up to 44 turbines and solar PV (~160 ha), plus associated infrastructure (BESS, access roads etc).

Alternative 1 initially consisted of 77 turbines, but was reduced to 70 turbines in an effort to avoid potential negative impacts on biodiversity receptors.

Alternative 2 was developed in response to the confirmed presence of regionally Red-listed bird species that are susceptible to collision with turbines in the LSA, including Cape Vulture, Southern Bald Ibis, Blue Crane, and White-bellied Bustard, as well as the potential presence of White-winged Flufftail.

The reduction in the number of wind turbines from 70 to 44 for Alternative 2 is predicted to reduce (minimise) the likely impact on birds in terms of number of fatalities; however, fatalities are still predicted (WildSkies Ecological Services, 2023).

5.2 BIODIVERSITY MITIGATION MEASURES

The mitigation measures to minimise Project impacts on species and ecosystem receptors and rehabilitate impacted areas that have been prescribed in the various biodiversity specialist assessments are summarised as follows.

AVOIDANCE AND MINIMISATION MEASURES

All receptors

- The sensitive (No-Go) areas identified in the terrestrial and aquatic biodiversity specialist assessments should be adhered to.
- All temporary construction footprints, including, but not limited to, laydown areas, portable toilets, cement batching plants, wind tower factory etc., should only be located in areas of modified habitat (e.g., cultivated fields and alien tree plantations), and outside and above the 1:100 year floodline;
- Where feasible, permanent proposed Project infrastructure should be located on land that is already modified;
- All human activities associated with construction, operation and decommissioning should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment.
- Project access roads should be aligned with existing district and farm roads and tracks to the extent possible.
- All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.
- Care should be taken not to introduce or propagate alien plant species/weeds during construction.

Avifauna

- A pre-construction avifaunal walk down should be conducted to confirm final layout and identify any sensitivities that may arise between the conclusion of the EIA process and the construction phase.
- No internal medium voltage power lines should be overhead. All such cables should be buried, and follow road verges at all times. Only the 132kV grid connection power line should be above ground (this is assessed in a separate application).
- Any overhead conductors or earth wires should be fitted with an Eskom approved anti-bird collision line-marking device to make cables more visible to birds in flight and reduce the likelihood of collisions.
- The pole design of any overhead power line should be approved by an ornithologist in terms of the electrocution risk it may pose to large birds such as eagles and vultures.
- The combination of turbine hub height and rotor diameter must be optimised to maximise the lower blade tip height above ground. Raising the lower turbine blade tip height from a typical 30m above ground to 50m above ground will reduce collision risk for most species, as most flight is low over the ground.
- A post-construction site inspection must be conducted by an avifaunal specialist to confirm that all aspects have been appropriately handled and in particular that road and hard stand verges do not provide additional substrate for raptor prey species. It is essential that the new wind farm does not create favourable conditions for such mammals in high risk areas. We therefore recommend that within the first

year of operations a full assessment of this aspect be made by the ornithologist contracted for post-construction monitoring. If such conditions have been created, case-specific solutions will need to be developed and implemented by the wind farm.

- It is strongly recommended that rodenticides not be used at the newly established Operation and Maintenance (O&M) buildings or around auxiliary infrastructure on the project site. While pest control of this nature may be effective, even so-called “environmentally friendly” rodenticides are toxic and pose significant secondary poisoning risk to predatory avifauna, especially owls.
- A ‘Cape Vulture Food Management Programme’ must be implemented on site to ensure all dead livestock/wildlife on site are removed as soon as possible and made unavailable to vultures for feeding. This programme will reduce the amount of available vulture food on site and reduce vulture-turbine collision risk. This programme will require the deployment of a dedicated (i.e. no other tasks) and adequately resourced (transport, binoculars, GPS, cameras, training) team of staff to patrol the full site and immediate surrounds during all daylight hours. The co-operation of landowners will also be essential to ensure that reported carcasses are disposed of effectively. This programme must be operational by the time the first turbine blades are turning on site and should not wait for Commercial Operations Date (COD). A full detailed method statement for this programme must be designed by an ornithologist prior to COD, and included in the EMPr.
- The landowner agreements should ensure specifically that any vulture feeding sites be stopped from the start of wind farm construction and not used for the full lifespan of the wind farm. Landowners should also be sensitised to the need to cooperate with the above Cape Vulture Food Management Programme.
- Cape Vultures will have to be effectively deterred from roosting on overhead power lines on site. This will need to be achieved well before turbines are operational and maintained through the project lifespan. Eskom Bird Guards (perch deterrents) must be installed on all pylons at the two roost sites, with full coverage of steel cross members (not just above live phases as per Eskom standard). In addition, the team of staff employed to implement the Cape Vulture Food Management Programme described above should also be tasked with patrolling the relevant sections of power line early morning and late evenings to scare any perching vultures away. This should first be trialled by in collaboration with an avifaunal specialist to ensure that such actions don’t increase turbine collision risk in the short term by flushing vultures into turbines.
- An Observer-Led Turbine Shutdown on Demand (OLSDOD) programme must be implemented on site from COD. This is required in order to mitigate the risk of turbine collision for priority bird species. This programme must consist of a suitably qualified, trained, dedicated and resourced team of observers present on site for all daylight hours 365 days of the year. This team must be stationed at vantage points with full visible coverage of all turbine locations. The observers must detect incoming priority bird species, track their flights, judge when they enter a turbine proximity threshold, and alert the control room to shut down the relevant turbine/s until the risk has reduced. A full detailed method statement must be designed by an ornithologist prior to COD, and included in the EMPr. The effectiveness of this programme is highly dependent on hiring the correct staff and managing them appropriately. The project must pay careful attention to this aspect if it is to succeed.
- All turbines must have one of their blades painted according to a protocol currently under development by the South African Wind Energy Association (SAWEA) from the outset (i.e. prior to installation). Provision must be made by the developer for the resolution of any technical, warranty or supplier challenges that this may present.

- A bird fatality threshold and adaptive management plan must be designed by an ornithologist for the site prior to the Commercial Operation Date (COD) and included in the EMPr. This plan should identify most importantly the number of bird fatalities of priority species which will trigger a management response, appropriate responses, and time lines for such responses. Fatalities of priority bird species are usually rare events (but with very high consequence) and it is difficult to analyse trends or statistics related to these fatalities as they occur. It is therefore important to have a threshold policy in place proactively to assist adaptive management.
- Any residual impacts after all possible mitigation measures have been implemented will need to be mitigated off site. The facility will need to address other sources of mortality of priority species in a measurable way so as to compensate for residual effects on the facility itself. This will need to be detailed in a Biodiversity Action Plan.
- The "during construction" and "post-construction" monitoring programme outlined in the avifauna impact assessment (WildSkies, 2023) should be implemented according to the latest available version of the Best Practice Guidelines at the time. The findings from Operational Phase monitoring should inform the adaptive management programme to mitigate any impacts on avifauna to acceptable levels.
- The project must keep abreast of new developments in avifauna mitigation (e.g. blade illumination; radar technology; and acoustic deterrents) and implement if deemed necessary and reasonable as per the projects' adaptive management plan.

Bats

- A 200 m buffer to be implemented around sites that are considered to be of Medium Sensitivity to bats (i.e. water sources and potential foraging areas) as recommended by MacEwan (2022);
- A 500 m buffer to be implemented around confirmed bat roosts, within which no turbines should be located
- Adaptive mitigation during operational phase (i.e. application of additional/changed mitigation, further to the findings of operation phase monitoring of bat carcasses, and passive acoustic monitoring), which could include curtailment (as necessary).
- Use of minimal compulsory civil aviation lighting on turbines at night time
- Use of low-intensity, directional (downward) lights, that are non-UV emitting
- Higher cut-in speeds during times of peak activity (October to January), particularly during times of higher levels of bat activity (18:00 – 21:00).

Terrestrial plant species

- Vegetation clearing should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas;
- The footprints to be cleared should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas; and
- No heavy vehicles should travel beyond the marked works zone
- To promote grassland health, local farmers should be approached in order to investigate the potential of developing a co-ordinated grassland burning (wildfire) programme for the study area; and
- To prevent wetland desiccation, the wetland management and protection measures outlined in the wetland impact assessment for the proposed Project should be strictly implemented on site

- An Alien Invasive Species (AIS) Control and Eradication Plan must be developed for the Project, focussed on areas disturbed by construction, and wetland/riparian vegetation. It is recommended that the plan include:
    - A combined approach using both chemical and mechanical control methods; and
    - Periodic follow-up treatments, informed by regular monitoring.
- A wet/growing season field survey for flora SCC should then be conducted within the planned development footprints to determine the identify and number of potentially impacted flora SCC;
    - Wherever possible, infrastructure footprints should be re-aligned/re-positioned to avoid SCC locations;
    - Where re-alignment/re-positioning is not possible, permits should be obtained from the relevant authority to rescue and relocate impacted plants; and
    - A Flora SCC Rescue and Relocation Plan should be developed for the proposed Project to provide guidance on all aspects of SCC rescue and relocation.

Terrestrial animal species

- A Mountain Reedbuck surveying programme should be conducted to determine the population size and spatial use (i.e., territorial configuration) of the study area. These data should then be used to identify the need for any additional and adaptive conservation and management interventions for Mountain Reedbuck to be incorporated in the BMP/BAP;
- Limit the erection of fences or other linear artificial movement barriers to the minimum required to meet facility safety/security requirements.
- A suitably experienced Environmental Control Officer (ECO) should be on-site during vegetation clearing to monitor and manage any wildlife-human interactions;
    - In the event that millipedes are encountered during construction, the ECO should collect a suitable specimen and submit it to a millipede expert for identification. If it is found to be *Doratogonus furculifer*, construction activities at the relevant site should cease immediately, and the ECO should consult the millipede expert and the MPTA with respects to implementing a rescue and relocation managing programme for this species.
- As appropriate, barriers should be erected around construction trenches and excavations to prevent fauna being trapped in these features;
- Any fauna species trapped in construction areas should be safely and correctly relocated to an adjacent area of natural habitat;
- The handling, poisoning and killing of on-site fauna by contractors must be strictly prohibited;
- General noise abatement equipment should be fitted to construction machinery and vehicles;
- Dust suppression using water bowsers should be undertaken on all roads and other sites where dust entrainment occurs;
- The rules and regulations concerning fauna should be communicated to contractors through on-site signage and awareness training.

- An incidence register should be maintained throughout all phases of the Project detailing any fauna mortalities/injuries caused by on-site activities. The register should be used to identify additional biodiversity management requirements
- Project proponent must keep actively informed about new research in the field of vibration impacts on fauna and potential mitigation options;
- Based on the findings of new research in the field of vibration impacts on fauna and potential mitigation options, the biodiversity management plan for the proposed Project should be updated to include additional mitigation measures (as required) for on-site implementation.

Aquatic ecosystems (rivers and wetlands)

- A buffer zone of at least 100 m around wetlands must be clearly demarcated with semi-permanent fencing and maintained throughout the duration of the construction phase to enable construction workers to avoid the wetland areas outside the construction footprint, and minimise the risk of disturbance.
- A functional buffer of at least 63 m from the edge of the macro-channel of rivers and streams must be preserved for protection of the riverine ecosystem and maintenance of a functional riverine buffer zone.
    - No activities, roads or infrastructure (other than the absolute minimum necessary and approved road-crossings) are to be located within the final designated buffer zone area;
    - Indigenous vegetation cover within the designated buffer zone is to be maintained at a minimum of 80% to ensure that the buffer remains functional, and must be assessed annually;
    - Alien vegetation establishment within these buffer zone areas is to be strictly controlled through the development and implementation of a detailed alien management plan developed in accordance with legislative requirements.
- Some unavoidable wetland/river crossings will be utilised and will require upgrade, mitigation measures that will be applied at these crossings include:
    - A construction method statement for wetland road crossings must be developed by a wetland ecologist and environmental engineer, and implemented on site during construction;
    - Construction should be done in the dry season and completed by the wet season, so that appropriate water management systems are in place for stormwater management;
    - Design of infrastructure should be environmentally and structurally sound and should take into consideration any required restoration of the affected watercourses as well as the reach-scale movement needs of the expected fish assemblages and other migratory fauna;
    - Culvert designs should be such that no fragmentation of the affected systems occurs;
    - Where the gradient allows, culvert design must ensure that the base of the culverts are countersunk in line with the baseflows of the watercourse;
    - Should any sloped culverts be necessary, these should include the use of baffles or a roughened channel to ensure complex flow throughout culvert length (as opposed to laminar flow). Various options for inclusion of baffles are available, and final design selection would require engineering input and consideration of hydraulic roughness through the culvert;

- The number of culverts installed should be suitable for the gradient, width and flow profiles of the watercourses being crossed so as to avoid upstream inundation, erosion and incision, and alterations to the natural channel;
- Pipe culverts are to be avoided at all watercourse crossings to limit opportunities of flow confinement and channel incision of the wetland units, drainage lines and rivers. Piped culverts have the additional impact of limiting fish movement between reaches;
- Designs should account for high flow velocities, which may result in further scouring of the watercourse downgradient of the structure and as such, bed and bank protection downgradient of structures should be considered.

- Site clearing activities should take place at the end of the wet season to minimise the risk of erosion, incision and sedimentation of the associated watercourses, and as far as possible, all remaining construction activities should take place during the dry winter months to minimise impacts as a result of high flows and runoff from exposed soils and materials;
- Ensure a soil management programme is implemented and maintained to minimise the potential for erosion and sedimentation;
- All/any topsoil or building material stockpiles must be protected from erosion, stored on flat areas where runoff will be minimised, and be surrounded by bunds. Stockpiles must also only be stored for the minimum amount of time necessary;
- Erosion berms or suitable water attenuation measures should be installed on roadways and downstream of construction and infrastructure areas to prevent gully formation and siltation of the associated watercourses.
- All erosion noted within the construction/operation footprint should be remedied immediately and included as part of an ongoing rehabilitation plan;
- Only authorised personnel should be allowed within the construction area;
- No material may be dumped or stockpiled within or adjacent to the watercourses;
- No mixing of construction materials such as cement should be permitted within or adjacent to watercourses and no such mixing may occur on bare soils in the surrounding area

REHABILITATION MEASURES

- A rehabilitation/landscaping protocol should be developed and implemented on-site. The protocol should include the following provisions:
  - Stockpiling of topsoil from development footprints during site preparation;
  - Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment;
  - Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and
  - The location of sites requiring erosion prevention and rehabilitation should be identified through regular field inspections;

- Locally-occurring indigenous plant species should be used to revegetate all areas disturbed during construction;
- The re-vegetation programme shall take cognisance of the climatic and seasonal conditions but should generally be undertaken annually starting in spring and early summer.

- Active rehabilitation, re-sloping, and re-vegetation of disturbed riparian areas must take place immediately after construction;
- Active alien invasive species control should continue throughout the operational and decommissioning phase, as per the Project's AIS Control and Eradication Plan. Follow up control should be carried out for a five- year period following decommissioning.
- Develop a wetland rehabilitation and management plan for the remaining wetlands in the Study Area, to offset unavoidable losses of wetland habitat;
- Rehabilitation of wetlands disturbed during construction of wetland crossing upgrades should be implemented as soon as construction is completed.

6 RESIDUAL IMPACTS REQUIRING OFFSET

The LSA and Project infrastructure are situated in a high biodiversity value landscape, interacting with extensive areas of natural habitats, areas mapped as terrestrial and aquatic CBAs according to the MBSP, and an IBA, and supports numerous flora and fauna SCC. As a result, a number of residual impacts of moderate-high significance on species and ecosystem receptors have been identified in the various terrestrial and aquatic biodiversity specialist assessment reports. The full list of residual impacts is provided in Appendix B; significant residual impacts are summarised in Table 6-1.

Table 6-1 – Significant residual impact summary

Receptor	Impact	Alt. 1	Alt. 2
Construction			
Aquatic ecosystems (wetlands)	Loss of wetland habitat	Moderate	Moderate
Avifauna	Habitat destruction	Moderate	Moderate
Terrestrial animal species	Loss and disturbance of fauna habitat	Moderate	Moderate
Terrestrial plant species	Loss and disturbance of flora habitat	Moderate	Moderate
Operation			
Avifauna	Collision of birds with turbines causing mortality	High	High
Avifauna	Collision and electrocution of birds on OHPL	Low	Low
Cumulative			
Avifauna	Collision of birds with turbines causing mortality	High	High

Although significant residual impacts are predicted for both alternatives for the main Dalmanutha WEF, Alternative 2 is considered preferable based on the predicted reduction of the likely impact in terms of reduced risk of bird collisions with turbines causing mortality, and reduced direct loss of wetland habitat; nevertheless, loss of individuals of bird species of conservation concern remains an impact of high significance post-mitigation; and significantly more terrestrial habitat will be affected by Alternative 2 than Alternative 1.

7 TARGETS FOR OFFSET

Since direct loss of wetland and terrestrial habitats cannot be mitigated, these losses must be offset. The results of the application of wetland functional and ecosystem hectare equivalent calculations for wetland losses as a result of the proposed Project components using the revised SANBI and DWS offset guidelines (Macfarlane *et al.,* 2014) and guidance provided in the draft Biodiversity Offset Guidelines (DFFE, 2022) are presented in the following sections.

7.1 WETLAND HABITAT

Details of wetland loss per affected hydrogeomorphic (HGM) unit, hectare equivalents and ecosystem conservation targets are provided in Appendix C; summary figures for loss are provided in Table 7-1.

Between 1.45 and 1.95 ha of wetland habitat will be directly and permanently lost as a result of proposed road construction/improvements, depending on whether Alternative 1 or 2 is chosen, translating to a loss of between 0.85 and 1.32 hectare equivalents (ha-eq) of functional wetland habitat.

It is noted that these figures are likely to change once the final road layout has been determined. The required wetland offset will then be determined, and implemented via the Water Use License.

Table 7-1 – Predicted wetland losses to proposed project infrastructure

Project	Wetland type	Extent (ha)	Functional Hectare Equivalents	Ecosystem Conservation Target (habitat ha-eq)
Alt.1	Channelled valley bottom	0.73	0.43	5.14
	Unchannelled valley bottom	0.22	0.14	1.72
	Depression	0.15	0.13	1.6
	Hillslope seep	0.85	0.61	7.35
Subtotal		**1.95**	**1.32**	**15.81**
Alt.2	Channelled valley bottom	0.72	0.42	5.07
	Unchannelled valley bottom	0.42	0.23	2.81
	Floodplain	0.02	0.01	0.12
	Hillslope seep	0.29	0.18	2.22
Subtotal		**1.45**	**0.85**	**10.22**

The loss of wetland habitat translates to an estimated ecosystem conservation target of between 10.22 and 15.81 habitat ha-eq, based on a calculated ecosystem conservation ratio of 12 (Table 7-2).

Table 7-2 – Wetland ecosystem offset ratio determination (after Macfarlane et al., 2014)

Determining offset ratios	Ecosystem Status	Wetland Vegetation Group (or type based on local classification)	Mesic Highveld Grassland Group 4, 5 and 6; Eastern Highveld Grassland	
		Threat status of wetland	Threat status	EN
			Threat status Score	7.5
		Protection level of wetland	Protection level	Not Protected
			Protection level Score	2
			Ecosystem Status Muliplier	**15**
	Regional and National Conservation context	Priority of wetland as defined in Regional and National Conservation Plans	High Importance	1
			Regional & National Context Multiplier	**1.0**
	Local site attributes	Uniqueness and importance of biota present in the wetland	High biodiversity value	1
		Buffer zone integrity (within 500m of wetland)	Buffer compatability score	0.5
		Local connectivity	Good connectivity	0
			Local Context Multiplier	**0.8**
			Ecosystem Conservation Ratio	**12.00**

7.2 TERRESTRIAL HABITAT

Residual impacts on terrestrial habitat were defined as the extent of natural habitats supporting plant/fauna SCC that would be lost as a result of the proposed development options.

The basic and adjusted offset ratios for natural terrestrial habitats are set out in Table 7-3, based on the biodiversity offset ratios look-up table provided in the draft Biodiversity Offset Guideline. When the relevant habitats fall within a CBA1, the ratio is automatically set to 30:1, while the basic ratio for areas within CBA2 is adjusted by increasing it by a factor of 1.5. For other mapped categories, excluding 'heavily modified' and 'modified' areas (i.e. Ecological Support Areas - ESAs and Other Natural Areas - ONA) the basic ratio applies.

Table 7-3 – Basic and adjusted biodiversity offset ratios for terrestrial habitats

Criteria	Basic Ratio (DFFE, 2022)	CBA1	CBA2
Endangered ecosystems	10:1	30:1	15:1
Eastern Highveld Grassland (EN)	13:1	30:1	19.5:1
KaNgwane Montane Grassland (EN)	10:1	30:1	15:1
Steenkampsberg Montane Grassland (LC)	0	30:1	0

Mapped vegetation communities within the LSA that will be lost as a result of the proposed developments were ranked according to their occurrence in CBA1, CBA2, ESA and ONA areas mapped by the MBSP (Appendix C). Targets were then set for areas of natural habitat loss (i.e. loss of Disturbed Grassland, Dry Mixed Grassland, and Rocky Grassland) only. Loss of areas of Alien Tree Plantations, Cultivated Fields, Infrastructure and Transformed areas was not included in target setting, even if they occurred within areas mapped as CBA, since their loss is not considered a significant impact. In addition, loss of areas mapped as 'Moist Grassland and Wetland' in the terrestrial vegetation dataset were not included, since these areas are already accounted for in the wetland habitat targets.

The calculated targets for each vegetation group within the LSA, for each Project component, are summarised on Table 7-4. While it is clear that in its current incarnation, Alternative 2 would result in an increased area of natural habitat loss compared to Alternative 1, and as such would be subjected to a higher offset target; it is noted that there is much greater scope to optimise the layout of project components (particularly solar arrays, and BESS infrastructure) to reduce the amount of natural habitat loss within CBA1 and CBA2, which is expected to reduce the preliminary figures presented here. The layout optimisation will be done as part of the final layout design post environmental authorisation.

Table 7-4 – Terrestrial habitat offset targets

MBSP category and Vegetation Communities	Estimated extent of loss based on current design (ha)	Offset Target
Dalmanutha WEF, Alternative 1	**56.39**	**755.76**
CBA Irreplaceable	**23.89**	**716.80**
Eastern Highveld Grassland	17.31	519.42
KaNgwane Montane Grassland	5.77	173.12
Steenkampsberg Montane Grassland	0.81	24.26
CBA Optimal	**4.28**	**22.76**
Eastern Highveld Grassland	0.39	7.65
KaNgwane Montane Grassland	1.01	15.11
Steenkampsberg Montane Grassland	2.88	0.00
ESA Landscape corridor	**11.69**	**0.19**
Eastern Highveld Grassland	0.01	0.19
Steenkampsberg Montane Grassland	11.68	0.00
ESA Local corridor	**7.70**	**14.74**
Eastern Highveld Grassland	0.00	0.06
KaNgwane Montane Grassland	1.47	14.69
Steenkampsberg Montane Grassland	6.23	0.00
ESA Protected Area buffer	**0.10**	**0.99**
KaNgwane Montane Grassland	0.10	0.99
Other Natural Areas	**8.73**	**0.29**
Eastern Highveld Grassland	0.02	0.23
KaNgwane Montane Grassland	0.01	0.05
Steenkampsberg Montane Grassland	8.71	0.00

MBSP category and Vegetation Communities	Estimated extent of loss based on current design (ha)	Offset Target
Dalmanutha WEF, Alternative 2	**128.86**	**2088.51**
CBA Irreplaceable	**67.39**	**2021.74**
Eastern Highveld Grassland	61.13	1833.76
KaNgwane Montane Grassland	5.93	177.80
Steenkampsberg Montane Grassland	0.34	10.18
CBA Optimal	**6.23**	**29.69**
Eastern Highveld Grassland	0.32	6.26
KaNgwane Montane Grassland	1.56	23.43
Steenkampsberg Montane Grassland	4.35	0.00
ESA Landscape corridor	**39.89**	**11.64**
KaNgwane Montane Grassland	1.16	11.64
Steenkampsberg Montane Grassland	38.73	0.00
ESA Local corridor	**7.38**	**21.95**
KaNgwane Montane Grassland	2.20	21.95
Steenkampsberg Montane Grassland	5.19	0.00
ESA Protected Area buffer	**0.16**	**1.56**
KaNgwane Montane Grassland	0.16	1.56
Other Natural Areas	**7.80**	**1.93**
Eastern Highveld Grassland	0.08	0.99
KaNgwane Montane Grassland	0.09	0.94
Steenkampsberg Montane Grassland	7.63	0.00

7.3 BIRD SPECIES

The significance of the turbine collision risk of Alternative 1 for multiple Red Listed (including Critically Endangered & Endangered) species remains High post mitigation. While Alternative 2 is strongly preferred from an avifaunal perspective (since fewer turbines should cause fewer collision fatalities) it remains a large wind farm in a highly sensitive area from the avifauna perspective, and the impact significance remains High post mitigation.

In numerical terms, the fatalities estimate for each wind facility/alternative pre-mitigation is summarised in Table 7-5. Since the residual impacts remain high post mitigation, the fatalities estimates are used to contextualise the level of offset/compensation that may be needed, using the worst case scenario based on the precautionary principle.

Table 7-5 – Bird fatalities due to collision with wind turbines (WildSkies, 2023)

Project	Aspect	Impact
Alternative 1 (70 turbines)	Scenario 1: Rotor Swept Area of 30 m - 230m.	Approximately **18.46** fatalities could be recorded at the wind farm per year across the target bird species recorded flying on site prior to the application of mitigation measures. This includes most notably the following regionally Red Listed species fatalities: Cape Vulture – **10.20** birds/year; Southern Bald Ibis – 1.14 birds/year;

		Blue Crane – 0.72 birds/year; White-bellied Bustard – 0.26 birds/year
	Scenario 2: Rotor Swept Area of 50 m to 250 m.	A total of approximately **15.64** fatalities could be recorded at the wind farm per year across the target bird species recorded flying on site, prior to the application of mitigation measures. This includes the following regionally Red Listed species fatalities: Cape Vulture – **9.76** birds/year; Southern Bald Ibis – 0.44 birds/year; Blue Crane – 0.68 birds/year; White-bellied Bustard – 0.04 birds/year.
Alternative 2 (44 turbines)	Scenario 3: Rotor Swept Area of 30 m – 230 m	Approximately **11.60** fatalities could be recorded at the wind farm per year across the target bird species recorded flying on site prior to the application of mitigation measures. This includes the following regionally Red Listed species fatalities: Cape Vulture – **6.41** birds/year; Southern Bald Ibis – 0.71 birds/year; Blue Crane – 0.45 birds/year; White-bellied Bustard – 0.16 birds/year
	Scenario 4: Rotor Swept Area of 50 m to 250 m	A total of approximately **9.83** fatalities could be recorded at the wind farm per year across the target bird species recorded flying on site, prior to the application of mitigation measures. This includes the following regionally Red Listed species fatalities: Cape Vulture – **6.13** birds/year; Southern Bald Ibis – 0.28 birds/year; Blue Crane – 0.43 birds/year; White-bellied Bustard – 0.03 birds/year

These residual impacts will need to be mitigated off site, with an aim of achieving no net loss of affected bird species.

Since an area-based offset for affected bird species is not feasible, the Project will instead need to address other sources of mortality of priority species in a measurable way so as to compensate for the residual effects of the Dalmanutha WEF and West facilities itself. Proposed measures are set out in Section 8.1; the required measures will need to be agreed with the relevant authorities and conservation agencies, and detailed in a Biodiversity Action Plan thereafter.

Key to the compensation process will be ongoing operation phase monitoring so that the exact number of fatalities can be documented and compensated accordingly.

7.4 PREFERRED ALTERNATIVE

The preferred alternative for a Project from an offsetting perspective, is typically that which has the least residual impact, and as such requires the least effort in terms of offset. While Alternative 1 is preferable for ecological receptors including terrestrial habitats (Table 7-6) and aquatic ecosystems, and Alternative 2 currently incurs a greater extent of offset for grassland habitat within CBAs; the critical issue for the Project is the residual impact as a result of collision risk for priority bird species – as such, Alternative 2 is the preferred alternative from an offsetting perspective since the reduced residual impact on priority bird species is of paramount importance.

Table 7-6 – Preferred alternative based on reduced need for biodiversity offsetting

	Preferred Alternative

Ecological receptor	Alternative 1	Alternative 2
Wetland habitat	1.95 ha loss	1.45 ha loss - preferred
Terrestrial habitat	56.39 ha loss - preferred	128.86 ha loss – capacity to reduce
Avifauna	Approximately **18.46** fatalities per annum	Approximately **11.60** fatalities per annum - preferred

8 CANDIDATE OFFSET SITES

Wherever possible, a 'like-for-like' biodiversity offset is preferred so that residual negative impacts on affected biodiversity features are appropriately compensated – ensuring no net loss of that feature on a local or regional scale. In addition, the realities of securing offsets in the long-term depends heavily on securing appropriate areas from a land tenure and/or management perspective. For this reason, the selection of candidate offset sites focussed on nearby habitats within the LSA, where the Project Developer has established relationships with landowners and can capitalise on this for offset planning purposes.

The draft National Biodiversity Offset guideline (DFFE, 2022) requires that the below-listed principles – which are widely recognised in standard offset guidance (e.g. BBOP, 2009) – guide the selection of suitable candidate offset sites; these principles were also applied when identifying potentially suitable areas and required actions for offset:

- *Biodiversity offset sites should be selected for ecological equivalence (the "like-for-like" principle) or, where appropriate, there could be "trading-up" to select an area of relatively high or more urgent conservation priority.*
- *Selection should be guided as far as possible by existing biodiversity priority areas in the landscape (for example, the CBA and ESA network, Freshwater Ecosystem Priority Areas, and focus areas for protected area expansion) and/or areas identified as strategic from an ecological infrastructure perspective (such as Strategic Water Source Areas).*
- *Biodiversity offsets should strive to secure the best examples of the features which have been impacted and to improve connectivity in the landscape between protected and priority areas for biodiversity.*
- *The final selection can be influenced by the reasonable consideration of factors other than the biodiversity value of the different candidate sites, such as: ease of the management of the site by a relevant management authority; and threats to conservation due to conflicting land use rights, claims or land use classification*.

For biodiversity offsets in terrestrial ecosystems, rehabilitation and preferably restoration of areas in modified condition (i.e. no longer natural or near-natural) is seen as an integral part of the required management of the offset site. The guidelines state it is optimal for candidate biodiversity offset sites to be in a good ecological condition (natural or near-natural state), to minimise the additional burden of having to rehabilitate or restore an area (DFFE, 2022); however, some level of rehabilitation of natural habitats with a low level of disturbance is normally anticipated.

Wetland offsets, on the other hand, are often focussed in systems that are moderately modified, where the greatest potential for functional gain can be feasibly achieved via implementation of a wetland rehabilitation plan.

Candidate offset sites and required biodiversity outcomes for wetland and terrestrial habitat are therefore proposed to include:

- Unaffected wetland habitat within the study area:
    - The presence of extensive areas of modified wetland habitat within the LSA, representing each of the HGM units that will be lost, presents an opportunity for implementation of a wetland rehabilitation

programme within the LSA to compensate wetland loss, through securing functional gains via rehabilitation.

  - In targeted wetlands, the objective will be to increase the PES score/category through improvement of wetland health as a result of rehabilitation activities, thereby securing functional gains.
  - Both the ecosystem conservation target and functional ha-eq target will be easily achievable within the LSA.
  - It is envisaged that any necessary wetland offset will be secured via the necessary landowner agreement for the Water Use License that will be required for the implementation of rehabilitation structures/works in wetlands and watercourses. The wetland offset will therefore be done via the WULA process (separate to the EA process).
- Unaffected terrestrial habitat within the study area:
  - Grassland: areas of natural habitat (i.e. Disturbed Grassland, Dry Mixed Grassland, and Rocky Grassland) within the LSA; particularly those areas situated within CBA1/CBA2 areas, and adjacent to areas of loss; since landowners of areas where construction will take place are already engaged. The final areas and required extent of offset will be confirmed once the selected Alternative is finalised, final residual impacts quantified, and agreements with landowners secured.
  - Stewardship agreements with landowners and local communities – support conservation and enhancement of dry mixed, disturbed and rocky grasslands, and linked fauna species, through management and protection of high ecological importance natural grasslands in the LSA. Conservation servitudes may be utilised to give effect to landowner agreements.
  - Areas where landuse consists primarily of livestock grazing of open veld, if incorporated into protection-based offset areas, can potentially provide biodiversity support and demonstrate improved ecological integrity in the long-term, if targeted by suitable management plans e.g. grazing management plans, fire management.

The extent of suitable wetland and terrestrial habitat within the LSA (candidate offset sites) from which suitable offset sites can be selected, is depicted in Figure 8-1. The likelihood of each sites availability and feasibility will need to be established via engagement with landowners, and acceptability as offset for natural habitat loss agreed with relevant stakeholders (e.g. MTPA, EWT, BLSA). Offsite offsets may also be considered, depending on the feedback received through the engagement process.

8.1 OFFSITE ACTIONS FOR PRIORITY BIRD SPECIES

Since area-based offsets for residual impacts on affected bird species are not feasible, several offsite actions have been proposed in an effort to achieve no net loss of these species. These include:

- Partnering with the Dullstroom Bird of Prey and Rehabilitation Centre to rehabilitate injured birds.
- Donating 5000 Bird diverters to EWT to target high-risk powerlines every 10 years of the project.
- Support of ongoing bird research programmes, particularly for threatened (e.g. White-winged Flufftail) and endemic species, in partnership with universities, and conservation NGOs (e.g. BLSA, EWT).
- Support of improved management of current or potential protected areas that are important sites for the species of concern present within the LSA.

- Support of existing conservation programmes/sites, such as Middelpunt Wetland Trust Initiative, Verloren Valei Nature Reserve, African Crane Conservation and Threatened grasslands Species Programme.

It is noted that the finalised agreed offsite actions will be included in the Project BAP subject to determination of the final Project layout.

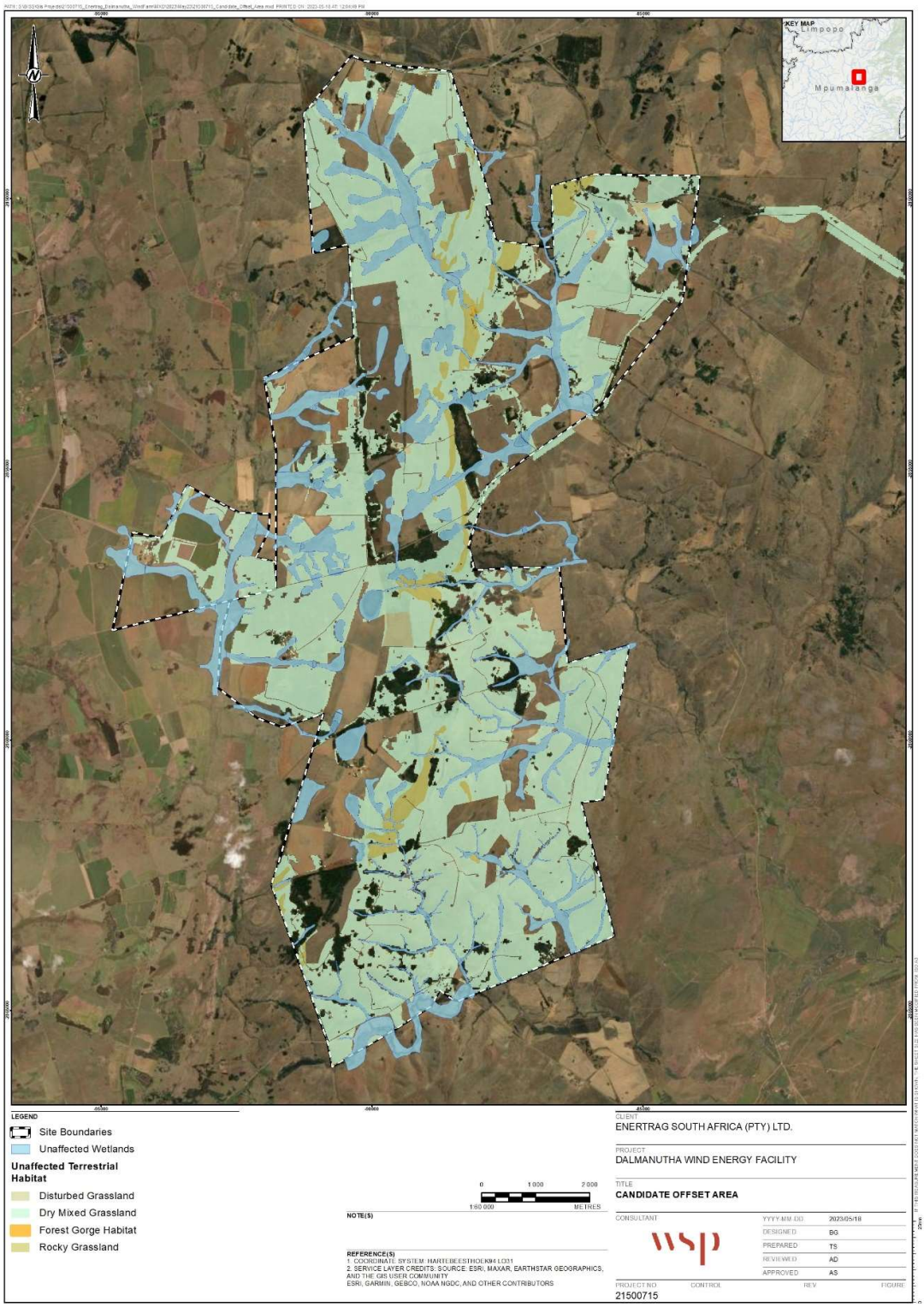

Figure 8-1 - Candidate offset areas - unaffected wetland and terrestrial habitat in LSA

8.2 CONCEPTUAL MANAGEMENT MEASURES AND PROGRAMME

The conceptual management measures that would need to be employed as part of the biodiversity offset, and programme for implementation, for which the Project developer would be responsible, are summarised in Table 8-1.

Table 8-1 – Conceptual offset management measures and programme for implementation

Management actions	Pre-construction	Construction	Operation
Develop conceptual wetland rehabilitation plan			
Apply for Water Use License for wetland rehabilitation			
Implement wetland rehabilitation plan once authorised			
Agree extent and location of offset sites with authorities			
Secure landowner agreements, including legal processes to register conservation servitudes			
Legal mechanism(s), in terms of which the biodiversity offset site would be secured			
Draft Biodiversity Offset Management Plan			
Public Participation			
Final Biodiversity Offset Management Plan			
Offset management activities, including offsite actions for priority bird species			
Biodiversity monitoring (fauna, operation phase avifauna monitoring) in operational area, and of offset sites			
Adaptive management			

9 RECOMMENDED CONDITIONS FOR ENVIRONMENTAL AUTHORISATION

The below-listed conditions are proposed for inclusion in the environmental authorisation, should the Project be authorised, based on the guidance provided in the draft National Biodiversity Offset Guideline:

- The Environmental Authorisation (EA) holder must select a biodiversity offset site(s) from the identified candidate portfolio that is sufficient to meet the targets for offset, to be confirmed based on the footprint of the final design (to be determined post EA).
- Only in situations that the proposed offset sites within the LSA are not feasible can the EA holder select a biodiversity offset site that is not identified in the Biodiversity Offset Report, but still meets the requirements for a biodiversity offset under the circumstances – in this situation, the guidance of the relevant conservation planning authority, i.e. MPTA, DFFE will be sought.
- A request for the declaration of the chosen biodiversity offset site as a protected area should be submitted to the Minister or an MEC. Other means of securing the biodiversity offset site (such as the registration of a conservation servitude) may be pursued if the Minister or MEC refuses to declare a protected area under the circumstances.
- A Biodiversity Offset Management Plan must be prepared for the biodiversity offset site, and incorporated into the EMPr or a Biodiversity Offset Implementation Agreement.
- A Biodiversity Action Plan (BAP) should be prepared for the Project, subsequent to the finalised layout, in consultation with the relevant authorities and conservation organisations.
- A Water Use License must be obtained for road crossings in wetlands, and the need for an offset investigated as part of the Water Use License Application (WULA) process.

10 REFERENCES

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Appendix A

FLORA SPECIES OF CONCERN

Table A1-1 List of flora species listed as nationally and provincially threatened or considered of conservation concern recorded and 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).	Probable – Suitable habitat present.
Aizoaceae	*Khadia carolinensis*	Vulnerable	Vulnerable	-	Range-restricted species, occurring in Highveld grasslands between 1700m. Favours on well-drained sandy loam soils amongst rock outcrops, or along the edges of sandstone sheets (Lötter, *et al.*, 2007)	Probable – Suitable habitat present.
Amaryllidaceae	*Crinum bulbispermum*	Least Concern	Declining	Protected	Wetland species, occurs along rivers and streams and near pans and depressions (Williams, *et al.*, 2016b)	Probable – Suitable habitat present.
Apocynaceae	*Asclepias dissona*	Critically Endangered (Possibly Extinct	Critically Endangered (Possibly Extinct	-	Species not recorded since 1932. Favours damp grassland. Habitat has been degraded and it is thought extinct (von Staden, 2016).	Unlikely – species is considered 'Possibly Extinct'.
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 000km^2.	Probable – 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.	Probable – Suitable habitat present.
Apocynaceae	*Riocreuxia aberrans*	Near Threatened	Near Threatened	-	Found in the cracks of rocks in exposed quartzite ridges in grassland habitats (Lötter et al. 2012).	Probable – Suitable habitat present.
Aquifoliaceae	*Ilex mitis var. mitis*	Least Concern	Declining	-	Found long rivers and streams in forest and thicket.	Recorded (2022 field survey)
Araceae	*Zantedeschia pentlandii*	Vulnerable	Vulnerable	Protected	Range-restricted species, with a EOO of 12 000 km^2. Favours rocky hillsides in Sekhukhuneland, as well as the Steenkampsberg Montane Grassland (Victor & Siebert, 2006).	Probable – Suitable habitat present.

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
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).	Probable – Suitable habitat present.
Asphodelaceae	*Kniphofia rigidifolia*	Least Concern	Rare	Protected	Among rocky outcrops on grassy plateaus.	Probable – Suitable habitat present.
Asphodelaceae	*Kniphofia typhoides*	Near Threatened	Near Threatened	Protected	Favours low-lying wetland habitats in *Themeda triandra* grassland on heavy black clay soils (von Staden & Victor, 2005).	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.
Asteraceae	*Cymbopappus piliferus*	Vulnerable	Vulnerable	-	Restricted range species (EOO 1635 km^2), known from six to seven locations. Prefers rocky quartzitic ridges in montane grassland (van Staden and Lötter, 2016)	Probable – Suitable habitat present.
Fabaceae	*Lessertia phillipsiana*	Data Deficient – Insufficient Information	Data Deficient	-	Widespread species, but very poorly known. Habitat preferences unknown, but thought to include rocky hills or plains (Von Staden, 2016).	Possible – Suitable habitat present.
Fabaceae	*Pearsonia hirsuta*	Vulnerable	Vulnerable	-	Known from four locations. Prefers humus-rich sandy soils and grows in patches between rocks (Manyama, 2008)	Probable – Suitable habitat present.
Gesneriaceae	*Streptocarpus denticulatus*	Vulnerable	Vulnerable	-	Range-restricted species, known from less than five locations. Favours damp, shady crevices with rocky overhangs in areas of rocky outcrops in grasslands (Lötter, *et al.*, 2005).	Probable – Suitable habitat present.
Gesneriaceae	*Streptocarpus latens*	Rare	Rare	-	Range-restricted species, with a EOO of <150 km^2. Favours moist, moss-covered rock crevices at around 2225 m (Truter & Daniels, 2005).	Probable – Suitable habitat present.
Gunneraceae	*Gunnera perpensa*	Least Concern	Declining	-	Widespread, but threatened species. Favours damp marshy areas and wetlands up to 2400 m.	Probable – Suitable habitat present.

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
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)	Unlikely. Subpopulation are not recorded around study area.
Hyacinthaceae	*Eucomis autumnalis*	Least Concern	Declining	Protected	Favours damp open places (Williams, *et al.,* 2016c)	Recorded (2022 field survey)
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*., 2016d).	Probable – 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).	Probable – Suitable habitat present.
Hyacinthaceae	*Merwilla plumbea*	Near Threatened	Near Threatened	Protected	Favours rocky grassland areas on steep well drained slopes between 300 – 2500 m (Williams, *et al.,* 2008).	Recorded (2022 field survey)
Iridaceae	*Gladiolus calcaratus*	Least Concern	Vulnerable	Protected	Known from 12 subpopulations with a EOO of 11 500 km^2. Prefers grassy slopes in deep soils or around the edges of wetlands (Goldblatt & Naidoo, 2005).	Probable – Suitable habitat present.
Iridaceae	*Hesperantha bulbifera*	Rare	Rare	-	Widespread but rare species that favours wet cliffs in the spray of waterfalls (Von Staden, 2017).	Probable – Suitable habitat present.
Iridaceae	*Moraea robusta*	Least Concern	Rare	-	Favour montane grassland.	Probable – Suitable habitat present.
Iridaceae	*Watsonia occulta*	Least Concern	Rare	-	Favours montane grassland.	Probable – Suitable habitat present.
Orchidaceae	*Centrostigma occultans*	Least Concern	Rare	-	Occurs in wetland and marshy habitats between 1250 and 1700 m in Mpumalanga and Limpopo Province (Zimbabwe Flora website).	Probable – Suitable habitat present.

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Orchidaceae	*Eulophia cooperi*	Least Concern	Rare	Protected	Widespread species. Found on rocky quartzite ridges between 1000 and 1800 m.	Recorded (pers. comms. G. Lockwood)
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	*Habenaria anguiceps*	Least Concern	Rare	Protected	Little information available on habitat preferences. Presumed to favour montane grassland habitat.	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria humilior*	Least Concern	Rare	Protected	Damp grassland habitat from 900-2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria laevigata*	Least Concern	Rare	Protected	Favour well-drained stony grassland habitat from 660 -2200 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Schizochilus cecilii* subsp. *culveri*	Rare	Rare	Protected	Grows on damp rocky ledges on steep grassland slopes. Known from 9-11 scattered subpopulations with an EOO of 1885km^2 (Von Staden, *et al.,* 2009).	Probable – 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 (2022 field survey)
Rosaceae	*Prunus africana*	Vulnerable	Vulnerable	-	Occurs in mistbelt and afromontane forest up to 2100 m (Williams *et al.,* 2008b).	Possible – Suitable habitat present.
Scrophulariaceae	*Jamesbrittenia macrantha*	Near Threatened	Near Threatened	-	A Sekhukhuneland endemic, known from 11 location and with a EOO of 1800 km^2. Favours grassy slopes with scattered woody plants on norite (Burrows, *et al.,* 2006).	Unlikely – recorded in the Sekhukhuneland.
Thymelaeaceae	*Gnidia variabilis*	Vulnerable	Vulnerable	-	This species is known from only one location in Mpumalanga. It is found in well-drained grassland, between 900 -1800 m (Lötter, *et al.,* 2006b).	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 998	Endangered	-	-	Favours forest margins, drainage lines and islands within wetlands. Also occurs on west and south facing mountain slopes.	Probable – Suitable habitat present.
-	Sensitive species 1219	Vulnerable	Vulnerable	Protected	Occurs in seasonally moist, high-altitude montane grasslands between 1800-2300 m.	Probable – Suitable habitat present.
-	Sensitive species 979	Vulnerable	-	-	Poorly known species. Likely present at four locations. Favours montane grassland in moist areas between 1700-1950 m.	Probable – Suitable habitat present.
-	Sensitive species 313	Endangered	-	Protected	Widespread, but exceptionally rare species. Population estimated at approximately 2500 individuals spread over 20 locations. Favours open grassland between 400 to 1800 m.	Probable – Suitable habitat present.
-	Sensitive Species 1252	Vulnerable	Vulnerable	Protected	Moist bushveld habitats, including wooded mountain kloofs.	Possible – Suitable habitat present.
-	Sensitive species 1086	Endangered	Endangered	Protected	Known from fewer than five locations, with an estimated EOO of 122 km^2. Occurs in wetlands and moist grassland between 1500 to 2000m.	Probable – Suitable habitat present.
-	Sensitive species 1201	Vulnerable	Vulnerable	Protected	Range-restricted species (EOO 400 km^2) known from six locations. Grows along dolerite outcrops in grassland habitats along the Mpumalanga escarpment at around 200 masl.	Possible – Suitable habitat present.
-	Sensitive species 41	Vulnerable	Vulnerable	Protected	Widespread bur 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.	Possible – Suitable habitat present.

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
-	Sensitive species 311	Rare	Rare	Protected	Known from ten sites in the Mpumalanga Drakensberg. Favours quartzitic rocky outcrops in montane grassland, between 1200-2200 masl.	Probable – Suitable habitat present.
-	Sensitive species 691	Vulnerable	Near Threatened	-	EOO is between 455 and 11 158 km^2, and though to occur at less than 10 locations. Prefers moist areas in undulating grassland.	Probable – 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.	Probable – Suitable habitat present.

Table A1-2: Flora species listed as Protected in Mpumalanga Province that have been recorded in the study area.

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Araceae	*Zantedeschia rehmannii*	Least Concern	-	-	Favours rocky grassland and bush margins (Manning, 2009)	Recorded (2022 field survey)
Amaryllidaceae	*Boophone disticha*	Least Concern	Least Concern	Protected	Widespread species favouring dry grassland and rocky areas (Williams, *et al.,* 2016a).	Recorded (2022 field survey) (**Error! Reference source not found.**)
Amaryllidaceae	*Cyrtanthus breviflorus*	Least Concern	-	Protected	Grassland and damp marshy habitats (Van Wyk and Malan, 1998)	Recorded (2022 field survey)
Amaryllidaceae	*Cyrtanthus contractus*	Least Concern	-	Protected	Occurs in areas of grassland (Pooley, 2005).	Recorded (2022 field survey)
Asphodelaceae	*Aloe arborescens*	Least Concern	-	Protected	Common and widespread species, that occurs in dense bush and exposed rocky ridges (van Wyk and Smith, 2014).	Recorded (2022 field survey)

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Asphodelaceae	*Aloe ecklonis*	Least Concern	-	Protected	Occurs in areas of grassland of the escarpment (van Wyk and Smith, 2014).	Recorded (2022 field survey)
Asphodelaceae	*Aloe cf. graciliflora*	Least Concern	-	Protected	Favours open grassland, often in rocky areas (van Wyk and Smith, 2014).	Recorded (2022 field survey)
Asphodelaceae	*Aloe verdoorniae*	Data Deficient - Taxonomy	-	Protected	Occurs in areas of grassland of the escarpment (van Wyk and Smith, 2014).	Recorded (2022 field survey)
Cyatheaceae	*Alsophila dregei*	Least Concern	-	Protected	Widespread species, found in thick scrub along mountain streams. (Crouch, *et al.,* 2011)	Recorded (2022 field survey)
Iridaceae	*Gladiolus longicollis subsp. platypetalus*	Least Concern	-	Protected	Common and widespread species in grassland habitats.	Recorded (2022 field survey)
Iridaceae	*Gladiolus woodii*	Least Concern	-	Protected	Common and widespread species in grassland habitats.	Recorded (2022 field survey)
Orchidaceae	*Brownleea parviflora*	Least Concern	-	Protected	Widespread species, favouring damp grassland and rocky sites from sea level to 1300 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Pterygodium dracomontanum (=Corycium dracomontanum)*	Least Concern	-	Protected	Widespread species, occurring in grasslands from sea level to 3000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disa aconitoides*	Least Concern	-	Protected	Favours damp grasslands from sea level to 2200 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disa baurii*	Least Concern	-	Protected	Widespread species, occurring in both damp to well-drained grasslands, from 150 to 2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Orchidaceae	*Disa chrysostachya*	Least Concern	-	Protected	Damp and marshy areas, from sea level to 2200 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disa cooperi*	Least Concern	-	Protected	Favours dry to damp grasslands, from 1450 to 2200 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disa versicolor*	Least Concern	-	Protected	A widespread species that favours dry to damp grasslands, from sea level to 2400 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disperis anthoceros*	Least Concern	-	Protected	Occurs in forested habitats in rocky areas and along streams, from 600 to 1800 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disperis micrantha*	Least Concern	-	Protected	Favours moist shaded locations among rocks, from 100 to 1800 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Disperis tysonii*	Least Concern	Least Concern	Protected	Damp grassy slopes on sandstone or quartzite, from 1200 to 2300 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Eulophia hians* var. *hians*	Least Concern	-	Protected	Widespread species. Occurs in grasslands, from sea level to 2200 m (Johnson *et al.,* 2015).	Recorded (2022 field survey & pers. comms. G. Lockwood)
Orchidaceae	*Eulophia hians* var. *nutans*	Least Concern	-	Protected	Widespread species. Occurs in grassland and marshy areas, from sea level to 1800 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Eulophia ovalis*	Least Concern	-	Protected	Widespread species. Occurs in open grassland (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Orchidaceae	*Habenaria dives*	Least Concern	-	Protected	Favours well-drained grassland habitat, between 15 -2300 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria dregeana*	Least Concern	-	Protected	Widespread species. Favours grassy slopes, between 300 - 2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria filicornis*	Least Concern	-	Protected	Common species, occurring in seasonally damp or marshy grasslands, between 400 -2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria galpinii*	Least Concern	-	Protected	Damp grasslands on rocky hillsides and along streams, between 900 -2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria nyikana*	Least Concern	-	Protected	Common species, occurring damp grasslands, between 600 - 1700 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria pseudociliosa*	Least Concern	-	Protected	Favours damp grasslands, from sea level to 1800 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Habenaria tysonii*	Least Concern	-	Protected	Favours damp rocky slopes in grasslands, from sea level to 2150 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Neobolusia tysonii*	Least Concern	Least Concern	Protected	Common species, found in moist montane grassland, from 350 to 2350 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Orthochilus foliosus*	Least Concern	-	Protected	Widespread species, found in sour grassland, from sea level to 2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)

Family	Scientific Name	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Orchidaceae	*Orthochilus leontoglossus*	Least Concern	-	Protected	Dry to moderately moist grassland, from sea level to 2200 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Orthochilus welwitschii*	Least Concern	-	Protected	Dry to marshy grassland, from 200 to 1800 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Satyrium cristatum var. longilabiatum*	Least Concern	-	Protected	Favours marshy grassland, from 1000 to 1000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Satyrium longicauda*	Least Concern	-	Protected	Favours moist grassland on peaty soils, from sea level to 2300 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Satyrium trinerve*	Least Concern	-	Protected	Widespread species, occurring in moist black soils, from sea level to 2300 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Orchidaceae	*Schizochilus zeyheri*	Least Concern	-	Protected	Common in moist grassland, from sea level to 2000 m (Johnson *et al.,* 2015).	Recorded (pers. comms. G. Lockwood)
Proteaceae	*Protea caffra*	Least Concern	-	Protected	Widespread species, favouring open wooded grassland.	Recorded (2022 field survey)

Appendix B

RESIDUAL IMPACTS

Receptor	Phase	Impact	Alternative 1	Alternative 2
Aquatic ecosystems (rivers and streams)	Construction	Clearing of vegetation and stripping of topsoils - causing erosion/sedimentation, altered runoff patterns	Low	Low
	Construction	Earthworks causing erosion/sedimentation, altered runoff patterns, potential fragmentation of watercourses	Low	Low
	Construction	Materials management - potential for pollution	Very low	Very low
	Construction	Construction of infrastructure - altered runoff patterns, biodiversity loss, fragmentation of watercourses	Low	Low
	Construction/operation	Movement of machinery - potential for pollution, AIS proliferation	Low	Low
	Operation	Physical presence of turbines - altered runoff patterns, loss of biodiversity, fragmentation of watercourses	Low	Low
	Operation	Materials management - potential for pollution	Very low	Very low
	Operation	Movement of machinery - potential for pollution, AIS proliferation	Very low	Very low
	Operation	Sterilisation of mining rights, maintenance of biodiversity	Positive	Positive
	Decommissioning	Physical presence of former turbines - altered runoff patterns, loss of biodiversity, fragmentation of watercourses	Low	Low
	Decommissioning	Movement of machinery - potential for pollution, AIS proliferation	Low	Low
Aquatic ecosystems (wetlands)	Construction	Loss of wetland habitat	Moderate	Moderate
	Construction	Interruption of wetland hydrology	Low	Low
	Construction	Wetland water quality deterioration	Very low	Very low
	Construction	Wetland soil erosion	Low	Low
	Construction/operation	Spread of AIS	Very low	Very low
Bats	Construction	Loss of foraging and roosting habitat	Very low	Very low
	Operation	Bat mortalities	Low	Low
	Operation	Artificial lighting - changes in foraging and roosting habitat	Low	Low
Avifauna	Construction	Habitat destruction	Moderate	Moderate
	Construction	Bird disturbance during construction activities	Low	Low
	Operation	Bird disturbance during operation activities	Low	Low
	Operation	Displacement of birds from site	Low	Low
	Operation	Collision of birds with turbines causing mortality	High	High
	Operation	Collision and electrocution of birds on OHPL	Low	Low
	Decommissioning	Bird disturbance during decommissioning activities	Low	Low
	Cumulative	Collision of birds with turbines causing mortality	High	High
	Cumulative	Collision and electrocution of birds on OHPL	n/a	n/a
Terrestrial animal species	Construction	Loss and disturbance of fauna habitat	Moderate	Moderate
	Construction	Fragmentation of habitat and disruption of fauna movement/dispersal	Low	Low
	Construction	Injury, mortality and disturbance of fauna	Low	Low
	Construction	Loss of fauna species of conservation concern	Low	Low
	Construction	Establishment and spread of alien invasive species resulting in degradation of fauna habitat.	Low	Low
	Operation	Injury and mortality of fauna, including SCC	Low	Low
	Operation	Establishment and spread of alien invasive species resulting in degradation of fauna habitat.	Low	Low
	Operation	Vibration from operating wind turbines	Low	Low
	Decommissioning	Establishment and spread of alien invasive species resulting in degradation of fauna habitat.	Low	Low
	Cumulative	Loss and disturbance of fauna habitat	Low	Low
Terrestrial plant species	Construction	Loss and disturbance of flora habitat	Moderate	Moderate
	Construction	Disruption of ecosystem processes due to Project infrastructure	Low	Low
	Construction	Establishment and spread of alien invasive species	Low	Low
	Construction	Loss of flora of conservation concern	Low	Low
	Construction	Increased incidences of soil erosion	Low	Low
	Operation	Establishment and spread of alien invasive species	Low	Low
	Decommissioning	Establishment and spread of alien invasive species resulting in degradation of fauna habitat.	Low	Low
	Decommissioning	Increased incidences of soil erosion	Low	Low
	Cumulative	Loss and disturbance of flora habitat	Low	Low

Appendix C

TARGETS FOR TERRESTRIAL HABITATS

Table C-1 – Terrestrial habitat targets

Project	Vegetation Type	MBSP Subcategory	Vegetation community	Area (ha)	Offset ratio	Target
Dalmanutha WEF, Alternative 1	Eastern Highveld Grassland	CBA Irreplaceable	Disturbed Grassland	0.26	30	7.77
Dalmanutha WEF, Alternative 1	Eastern Highveld Grassland	CBA Irreplaceable	Dry Mixed Grassland	16.69	30	500.79
Dalmanutha WEF, Alternative 1	Eastern Highveld Grassland	CBA Irreplaceable	Rocky Grassland	0.36	30	10.85
Dalmanutha WEF, Alternative 1	Eastern Highveld Grassland	CBA Optimal	Disturbed Grassland	0.06	19.5	1.13
Dalmanutha WEF, Alternative 1	Eastern Highveld Grassland	CBA Optimal	Dry Mixed Grassland	0.33	19.5	6.52
Dalmanutha WEF, Alternative 1	Eastern Highveld Grassland	ESA Landscape corridor	Rocky Grassland	0.01	13	0.19
Dalmanutha WEF, Alternative 1	Eastern Highveld Grassland	ESA Local corridor	Dry Mixed Grassland	0.00	13	0.06
Dalmanutha WEF, Alternative 1	Eastern Highveld Grassland	Other Natural Areas	Dry Mixed Grassland	0.02	13	0.23
Dalmanutha WEF, Alternative 1	KaNgwane Montane Grassland	CBA Irreplaceable	Dry Mixed Grassland	5.56	30	166.90
Dalmanutha WEF, Alternative 1	KaNgwane Montane Grassland	CBA Irreplaceable	Rocky Grassland	0.21	30	6.22
Dalmanutha WEF, Alternative 1	KaNgwane Montane Grassland	CBA Optimal	Dry Mixed Grassland	1.01	15	15.11
Dalmanutha WEF, Alternative 1	KaNgwane Montane Grassland	ESA Local corridor	Dry Mixed Grassland	1.47	10	14.69
Dalmanutha WEF, Alternative 1	KaNgwane Montane Grassland	ESA Protected Area buffer	Dry Mixed Grassland	0.10	10	0.99
Dalmanutha WEF, Alternative 1	KaNgwane Montane Grassland	Other Natural Areas	Dry Mixed Grassland	0.01	10	0.05
Dalmanutha WEF, Alternative 1	Steenkampsberg Montane Grassland	CBA Irreplaceable	Dry Mixed Grassland	0.81	30	24.26
Dalmanutha WEF, Alternative 1	Steenkampsberg Montane Grassland	CBA Optimal	Disturbed Grassland	0.00	0	0.00
Dalmanutha WEF, Alternative 1	Steenkampsberg Montane Grassland	CBA Optimal	Dry Mixed Grassland	2.87	0	0.00
Dalmanutha WEF, Alternative 1	Steenkampsberg Montane Grassland	ESA Landscape corridor	Dry Mixed Grassland	11.48	0	0.00
Dalmanutha WEF, Alternative 1	Steenkampsberg Montane Grassland	ESA Landscape corridor	Rocky Grassland	0.20	0	0.00
Dalmanutha WEF, Alternative 1	Steenkampsberg Montane Grassland	ESA Local corridor	Disturbed Grassland	0.01	0	0.00
Dalmanutha WEF, Alternative 1	Steenkampsberg Montane Grassland	ESA Local corridor	Dry Mixed Grassland	6.07	0	0.00
Dalmanutha WEF, Alternative 1	Steenkampsberg Montane Grassland	ESA Local corridor	Rocky Grassland	0.14	0	0.00
Dalmanutha WEF, Alternative 1	Steenkampsberg Montane Grassland	Other Natural Areas	Disturbed Grassland	0.17	0	0.00
Dalmanutha WEF, Alternative 1	Steenkampsberg Montane Grassland	Other Natural Areas	Dry Mixed Grassland	8.24	0	0.00
Dalmanutha WEF, Alternative 1	Steenkampsberg Montane Grassland	Other Natural Areas	Rocky Grassland	0.30	0	0.00

Project	Vegetation Type	MBSP Subcategory	Vegetation community	Area (ha)	Offset ratio	Target
Dalmanutha WEF, Alternative 2	Eastern Highveld Grassland	CBA Irreplaceable	Disturbed Grassland	0.08	30	2.31
Dalmanutha WEF, Alternative 2	Eastern Highveld Grassland	CBA Irreplaceable	Dry Mixed Grassland	56.27	30	1688.18
Dalmanutha WEF, Alternative 2	Eastern Highveld Grassland	CBA Irreplaceable	Rocky Grassland	4.78	30	143.27
Dalmanutha WEF, Alternative 2	Eastern Highveld Grassland	CBA Optimal	Disturbed Grassland	0.06	19.5	1.13
Dalmanutha WEF, Alternative 2	Eastern Highveld Grassland	CBA Optimal	Dry Mixed Grassland	0.26	19.5	5.12
Dalmanutha WEF, Alternative 2	Eastern Highveld Grassland	Other Natural Areas	Dry Mixed Grassland	0.08	13	0.99
Dalmanutha WEF, Alternative 2	KaNgwane Montane Grassland	CBA Irreplaceable	Disturbed Grassland	0.04	30	1.27
Dalmanutha WEF, Alternative 2	KaNgwane Montane Grassland	CBA Irreplaceable	Dry Mixed Grassland	5.61	30	168.43
Dalmanutha WEF, Alternative 2	KaNgwane Montane Grassland	CBA Irreplaceable	Rocky Grassland	0.27	30	8.09
Dalmanutha WEF, Alternative 2	KaNgwane Montane Grassland	CBA Optimal	Dry Mixed Grassland	1.56	15	23.43
Dalmanutha WEF, Alternative 2	KaNgwane Montane Grassland	ESA Landscape corridor	Disturbed Grassland	0.00	10	0.02
Dalmanutha WEF, Alternative 2	KaNgwane Montane Grassland	ESA Landscape corridor	Dry Mixed Grassland	1.16	10	11.62
Dalmanutha WEF, Alternative 2	KaNgwane Montane Grassland	ESA Local corridor	Dry Mixed Grassland	2.20	10	21.95
Dalmanutha WEF, Alternative 2	KaNgwane Montane Grassland	ESA Protected Area buffer	Dry Mixed Grassland	0.16	10	1.56
Dalmanutha WEF, Alternative 2	KaNgwane Montane Grassland	Other Natural Areas	Dry Mixed Grassland	0.09	10	0.94
Dalmanutha WEF, Alternative 2	Steenkampsberg Montane Grassland	CBA Irreplaceable	Dry Mixed Grassland	0.34	30	10.18
Dalmanutha WEF, Alternative 2	Steenkampsberg Montane Grassland	CBA Optimal	Dry Mixed Grassland	4.35	0	0.00
Dalmanutha WEF, Alternative 2	Steenkampsberg Montane Grassland	ESA Landscape corridor	Dry Mixed Grassland	38.44	0	0.00
Dalmanutha WEF, Alternative 2	Steenkampsberg Montane Grassland	ESA Landscape corridor	Rocky Grassland	0.28	0	0.00
Dalmanutha WEF, Alternative 2	Steenkampsberg Montane Grassland	ESA Local corridor	Dry Mixed Grassland	5.02	0	0.00
Dalmanutha WEF, Alternative 2	Steenkampsberg Montane Grassland	ESA Local corridor	Rocky Grassland	0.17	0	0.00
Dalmanutha WEF, Alternative 2	Steenkampsberg Montane Grassland	Other Natural Areas	Disturbed Grassland	0.16	0	0.00
Dalmanutha WEF, Alternative 2	Steenkampsberg Montane Grassland	Other Natural Areas	Dry Mixed Grassland	6.98	0	0.00
Dalmanutha WEF, Alternative 2	Steenkampsberg Montane Grassland	Other Natural Areas	Rocky Grassland	0.50	0	0.00

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