Appendix H.13

ANIMAL THEME ASSESSMENT

Igolide Wind (Pty) Ltd

ANIMAL SPECIES SPECIALIST ASSESSMENT

Igolide Wind Energy Facility, Fochville, Gauteng Province

OCTOBER 2023

CONFIDENTIAL

Igolide Wind (Pty) Ltd

ANIMAL SPECIES SPECIALIST ASSESSMENT

Igolide Wind Energy Facility, Fochville, Gauteng Province

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WSP

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

Phone: +27 11 361 1300

WSP.com

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DETAILS OF THE SPECIALIST

Specialist Information	
Name:	Aisling Dower
Phone number:	+27 11 254 4802
Email:	aisling.dower@wsp.com
SACNASP Registration Number	114477/15
Curriculum vitae:	See Appendix B

DECLARATION OF INDEPENDENCE BY THE SPECIALIST

I, Aisling Dower declare that I –

- Act as the independent specialist for the undertaking of a specialist section for the proposed project.
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Do not have nor will have a vested interest in the proposed activity proceeding;
- Have not, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan, or document.

Aisling Dower, Pr.Sci.Nat. 114477/15

EXECUTIVE SUMMARY

ENERTRAG South Africa (Pty) Ltd is proposing the development of the Igolide Wind Energy Facility which will be operated under a Special Purpose Vehicle (SPV), namely, Igolide Wind (Pty) Ltd (a private special purpose company to be incorporated). This report summarises the results of the investigation of mammal, reptile and amphibian populations, as well as invertebrate SCC communities that occur or potentially occurring in the broader study area and describes how they may be impacted by development activities in the proposed Project site. The site sensitivity relative to the animal species theme was rated as medium by the National Web based Environmental Screening Tool; the findings of the field surveys supported the ascribed sensitivity, since potentially suitable habitat for some of the flagged species are present, and the Endangered species Southern mountain reedbuck is known to occur. While several potential impacts on fauna communities were identified as a result of the proposed development, the low residual impact significance (i.e. after mitigation), and low sensitivity rating for many of the habitats means the project could go ahead without major constraints, provided the mitigation measures and management actions proposed to conserve any protected fauna that occur in the study area are applied.

Contact name Aisling Dower

Contact details 079 465 0504 | Aisling.Dower@wsp.com

1 INTRODUCTION

ENERTRAG South Africa (Pty) Ltd is proposing the development of the Igolide Wind Energy Facility (WEF; *hereafter the Project*), which will be operated under a Special Purpose Vehicle (SPV), namely, Igolide Wind (Pty) Ltd (a private special purpose company to be incorporated). Scoping and Environmental Impact Assessment processes are required for the proposed development of the Project.

WSP Group Africa (Pty) Ltd (WSP) was appointed by ENERTRAG to undertake the Terrestrial Animal Species (fauna) Specialist Assessment, in support of the scoping, baseline and impact assessment phases of the environmental regulatory process required to authorise development-related activities.

1.1 SCOPE AND PURPOSES OF THE REPORT.

The fauna of the Project area was surveyed during January 2021 (Ekotrust, 2023 – also attached in Appendix A); however, the report detailing the findings was a combined terrestrial ecology report and was not split into the separate animal and plant species assessments required by the NEMA protocols for the specialist assessment and minimum report content requirements for impacts on animal/plant species for activities requiring environmental authorisation, since the work had been commissioned prior to the gazetting of the protocols.

The findings of the Ekotrust study were used to inform this animal species specialist assessment report, which addresses the requirements of the protocol, and describes the baseline terrestrial animal species within areas that will be impacted by the proposed Project.

The Ekotrust study focused on terrestrial mammals (excluding bats), as well as terrestrial invertebrate species of conservation concern (SCC). It is noted that separate avifauna and bat specialist studies have been conducted for the proposed Project, and are submitted separately in support of the current EA application.

1.2 PROJECT DESCRIPTION.

The project is located approximately 6 km northeast of Fochville, within the Merafong City Local Municipality in the Gauteng Province of South Africa. The site location (centre point) is at 26° 27’ 2.44” S; 27° 30’ 58.82” E. The proposed Project will be developed within a project area of approximately 680 hectares (ha) (Figure 1-1). Within this project area, the extent of the Project footprint will be approximately 50 hectares (ha). The WEF will comprise of the following (full project description is given by the client):

- Ten wind turbine generators (WTGs) with a maximum capacity of up to 100 MW.
- Turbines with a hub height of up to 200 m, a rotor diameter of up to 200 m and tip height of up to 300 m.
- Foundation: Approximately 25 m diameter x 3 m deep. Volume to be excavated will be approximately 2 200 m^3, in sandy soils due to access requirements and safe slope stability requirements.
- Turbine hardstand areas of approximately 1 ha per turbine. Hardstand does not require concrete.
- A 33/132 kV on-site IPP substation, including the Battery Energy Storage System (BESS), with a total footprint of up to 2.5 ha. The on-site IPP substation will consist of a high voltage substation

yard to allow for multiple (up to 132 kV) feeder bays and transformers, control building, telecommunication infrastructure, and other substation components, as required. A 500m buffer around the on-site IPP substation has been identified to ensure flexibility in routing the powerline.

- The BESS storage capacity will be up to 100 MW/400 megawatt-hour (MWh) with up to four hours of storage.
- Medium voltage collector system will comprise cables up to and including 33 kV connecting the turbines to the on-site IPP substation and will be laid underground except where a technical assessment suggests that overhead lines are required.
- Access and internal roads with a width of 8 - 10 m will provide access to each turbine, the BESS, on-site substation, step-down substation and laydown area. The width will increase up to 20 m for turning circle/bypass areas to allow for larger component transport. Existing access roads will be used where possible to minimise impact. Where required, the width of the existing roads will be widened to ensure the passage of vehicles.
- Temporary construction camp of up to 1 ha.
- A temporary laydown area of 2 - 3 ha is envisaged.
    - The Operation and Maintenance (O&M) building footprint is to be located near the on-site substation and will not exceed 0.5 ha. Typical areas include: Operations building – 20 m x 10 m = 200 m^2; Workshop and stores area – of ~300 m^2; and Refuse area for temporary waste storage and conservancy tanks to service ablution facility.
- The cement batching plant will have a footprint of 1 ha.
- Supporting infrastructure includes fencing, lighting, lightning protection, telecommunication infrastructure, stormwater channels, water pipelines, offices, gatehouse and security building.
- Grid (separate EA): A single or double circuit 132 kV overhead powerline and 132 kV switching station with a footprint of 1.5 ha (adjacent to the on-site IPP substation) to feed the electricity generated by the proposed WEF into Eskom's Midas Main Transmission Substation via a 11 km overhead line.

1.3 RESULTS OF THE ENVIRONMENTAL SCREENING TOOL

According to the National Web Based Screening Tool, the overall Animal Species Theme for the study area was rated 'Medium' sensitivity due to the potential presence of several species of conservation concern (SCC) (Table 1-1).

Table 1-1 – Animal species flagged by the national web-based screening tool.

Group	Species name	Conservation status
Mammals	• Maquassie musk shrew (*Crocidura maquassiensis*) • Spotted-necked otter (*Hydrictis maculicollis*)	Vulnerable
Insects - Lepidoptera	• *Lepidochrysops praeterita* • *Lepidochrysops procera*	Endangered Rare (habitat specialist)

Insects - Orthoptera	• *Clonia uvarovi*	Vulnerable

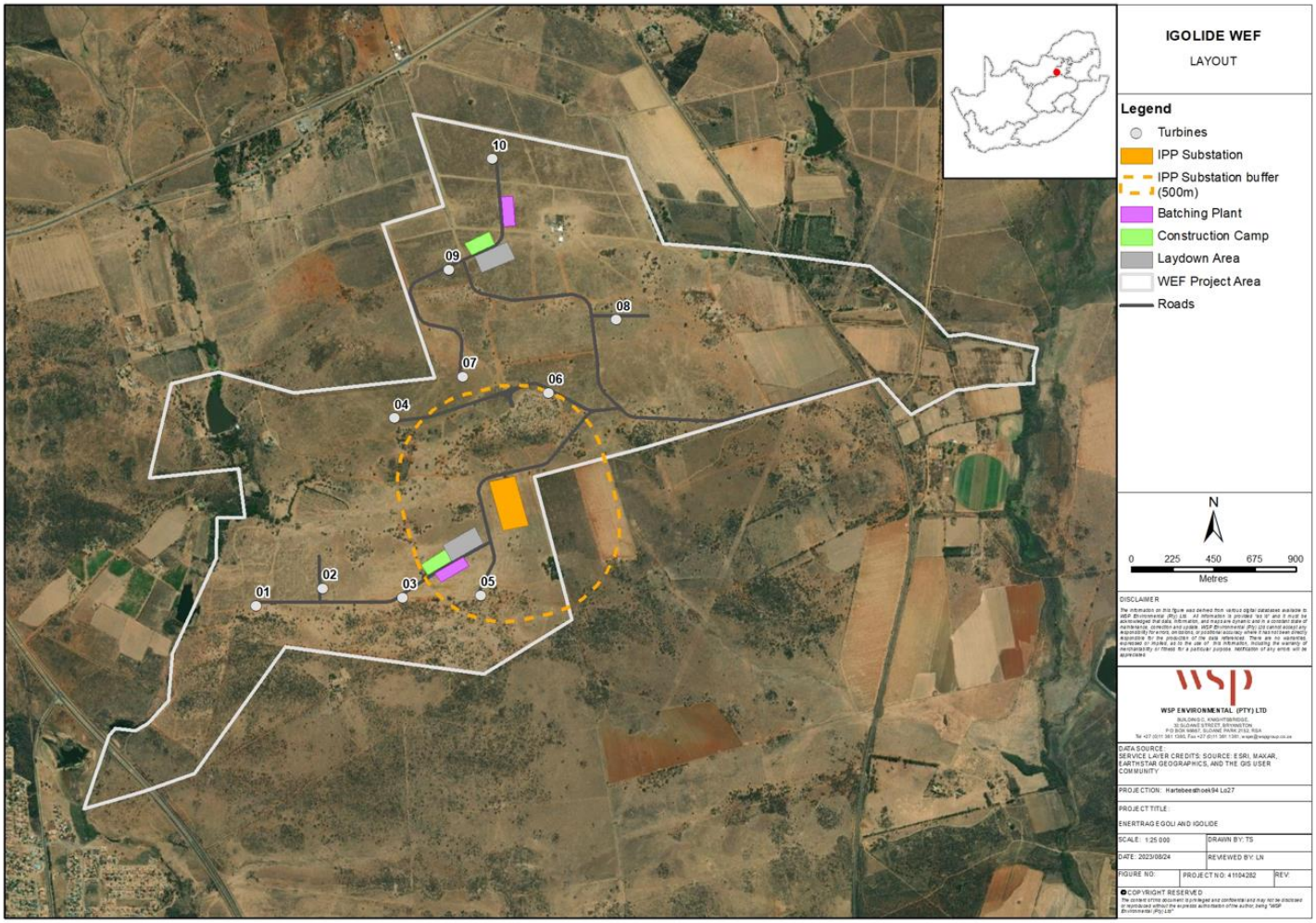

Figure 1-1 The Igolide WEF site with proposed roads and location of 10 turbines indicated (01- 10). Orange rectangle = on-site IPP substation/BESS; Grey rectangles = Laydown/ ancillary areas 1 & 2.

2 RELEVANT LEGISLATION AND GUIDELINES

The principal relevant national and provincial legislation associated guidelines and policies that are relevant to the environmental and biodiversity are listed below. Other relevant Policies, Plans and Guidelines are detailed in Ekotrust (2023) Appendix A.

National Environmental Management Act, 1998 (Act No 107 of 1998) – Section 24 (1)(a) and (b) states that "the potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment must be considered, investigated and assessed before their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity

National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (ToPS list) (NEMBA 2007c) – NEMBA also deals with endangered, threatened and otherwise controlled species, under the ToPS Regulations (Threatened or Protected Species Regulations). A ToPS permit is required for any activities involving a ToPS listed species.

Gauteng conservation bill, 2014 – some of the objectives of this act is (a) to provide for the management and conservation of biodiversity, indigenous wild animals, plants, aquatic biota, invertebrates and their associated habitats in the Province; (b) to provide for the management and control of alien species in the Province; (c) to secure ecologically sustainable development and responsible use of natural resources in the Province;

Gauteng Conservation Plan – this bioregional plan serves as the basis for biodiversity inputs into land use planning processes in the province and the primary informant for the biodiversity component of the Basic Assessment and Environmental Impact Assessment (EIA) processes. The C-Plan provides a map of biodiversity priorities (identified as Critical Biodiversity Areas and Ecological Support Areas). The Critical Biodiversity Areas are comprised of key areas that are required to meet national biodiversity pattern and process targets. Ecological Support Areas are areas required to prevent the degradation of Critical Biodiversity Areas and Protected Areas (GDARD, 2014).

3 STUDY METHODOLOGY

This Animal Species Specialist Assessment report summarises the results of the investigation of mammal, reptile, amphibian and invertebrate SCC that occur or potentially occur in the broader study area conducted by Ekotrust, and describes how they may be impacted by development activities in the proposed Project site.

The approach and methodology applied to conduct the baseline surveys and impact assessment are detailed in the Ekotrust (2023) report (Appendix A).

3.1 ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

The following assumptions, limitations or uncertainties were identified regarding the evaluation of the impacts of the proposed Igolide project on the Terrestrial Animal Species Specialist Assessment study:

- Field surveys were undertaken in January 2021 after the region had received good rains, thus the assessment was conducted during the wet season and as such was favourable for the detection of most fauna species, particularly herpetofauna and some invertebrates which are typically difficult to detect during the dry season when many species become cryptic or aestivate.
- Faunal lists were sourced from literature and the website of the Animal Demography Unit of the University of Cape Town, and the landowner was consulted regarding sightings of mammals on the property.
- The faunal survey was limited to daytime visual assessments via indirect sighting methods whilst traversing the site. Rare and threatened animal species are generally uncommon and/or localised and the once-off survey may fail to locate such species.
- No aerial census, road census or trapping surveys (either camera trapping or by way of Sherman traps) were conducted for fauna, since these methods generally provide an underrepresentation of the full faunal diversity within the limited timeframe available.

4 REGIONAL CONTEXT

4.1 VEGETATION COMMUNITIES/FAUNA HABITATS

The site falls in the Grassland Biome, across two Bioregions, i.e., the northern section of the site falls in the Central Bushveld Bioregion, while the remainder of the site falls in the Mesic Highveld Grassland Bioregion. The site does not fall within any Centre of Plant Endemism according to Van Wyk and Smith (2001).

The broad scale vegetation types associated with the Project are Rand Highveld Grassland (Gm 11), where most of the Project infrastructure are located and Gauteng Shale Mountain Bushveld (SVcb 10) which covers the northern parts of the Project.

Based on species composition, nine natural habitats (plant communities) were distinguished, described and mapped on the Igolide site (Figure 4-1). A further five man-made units were also distinguished (Figure 4-1). Full descriptions of the mapped plant communities and broad scale vegetation types mentioned above are outlined in the terrestrial impact assessment (Ekotrust, 2023) (Appendix A).

The plant communities as they relate to provision of habitat for fauna SCC confirmed/potentially present are summarised in Table 4-1

Table 4-1 – Site Ecological Importance (SEI) of mapped vegetation communities and fauna SCC confirmed/potentially occurring.

Mapped vegetation communities	SEI (Ekotrust, 2023)	Fauna SCC with potential/confirmed to occur
1. *Trachypogon spicatus* grassland	Low	-
2. *Melinis repens - Selaginella dregei* rocky grassland	Medium	Southern mountain reedbuck (*Redunca fulvorufula fulvorufula*) - confirmed
3. *Cymbopogon caesius - Elionurus muticus* rocky grassland	Low	Southern mountain reedbuck (*Redunca fulvorufula fulvorufula*) - confirmed
4. *Hyparrhenia hirta - Eragrostis chloromelas* grassland	Low	-
5. *Eragrostis plana - Trisetopsis imberbis* wetlands/floodplains	Medium	Maquassie Musk Shrew (*Crocidura maquassiensis*) - Low potential
6. *Vachellia karroo - Ehretia rigida* rocky bushveld	Low	*Clonia uvarovi* (Orthoptera) - Low potential
7. *Salix babylonica - Phragmites australis* riverine vegetation	Medium	Spotted-necked otter (*Hydrictis maculicollis*) - moderate potential
8. *Hyparrhenia tamba* floodplains	Low	Maquassie Musk Shrew (*Crocidura maquassiensis*) - Low potential

Mapped vegetation communities	SEI (Ekotrust, 2023)	Fauna SCC with potential/confirmed to occur
9. *Eragrostis tef - Tagetes minuta* abandoned cropland	Low	-
10. Planted pasture (*Digitaria eriantha*)	Low	-
11. *Eucalyptus camaldulensis* plantations (degraded)	Low	-
12. Hedges (*Robinia sp., Pyracantha sp., Cedrus sp., Searsia pyroides*)	Low	-
13. Dams	n/a	-
14. Habitation/infrastructure	n/a	-

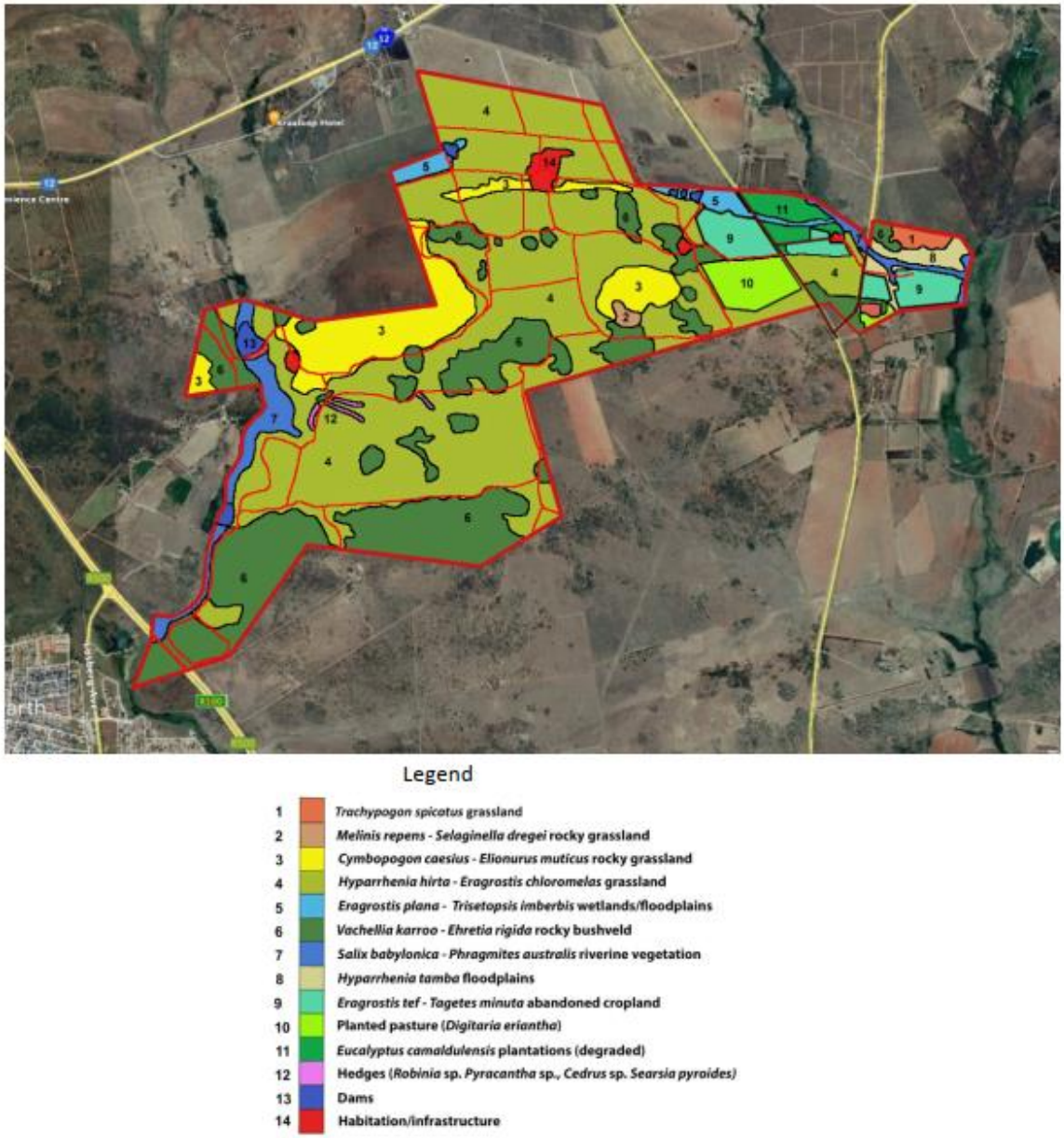

Figure 4-1 – Vegetation/habitat map of the Igolide site.

4.2 CONSERVATION CONTEXT

The information in this section is directly paraphrased from terrestrial impact assessment (Ekotrust, 2023) (Appendix A), and summarised here for ease of reference.

4.2.1. National Environmental Management: Protected Areas Act (Act No. 10 of 2003)

The study site is not located in a protected area.

4.2.2. National Protected Areas Expansion Strategy (NPAES)

The wider study area lies within an area mapped as part of the NPAES (2018). Only one of the turbines (Turbine 04) is located in close proximity to the boundary of the area demarcated by the

NPAES (Figure 4-2); however, this could be microsited to miss the NPAES entirely although it will still be in an ESA.

4.2.3. National list of ecosystems that are threatened and in need of protection

The site is located in the Gauteng Shale Mountain Bushveld and Rand Highveld Grassland (Mucina & Rutherford 2006, SANBI 2006-2018) vegetation types, that are classified as “Least Concern” and “Vulnerable” respectively (NEMA 2011, Skowno et al. 2019).

4.2.4. Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Other Natural Areas (ONAs)

Critical Biodiversity Areas (CBAs) are areas required to meet biodiversity targets for ecosystems, species or ecological processes. CBAs are regarded as areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species. The two levels of CBA are:

- CBA 1 (CBA irreplaceable): Areas that are irreplaceable for meeting biodiversity targets. There are no other options for conserving the ecosystems, species or ecological processes in these areas (SANBI 2018).
- CBA 2 (CBA optimal): Areas that are the best option for meeting biodiversity targets, in the smallest area, while avoiding conflict with other land uses.

The main reasons provided for the mapping of the CBAs (GDARD, 2011), were:

- Orange list plant habitat;
- Red list invertebrate habitat;
- Primary vegetation.

The CBA map in Figure 4-3 indicates the presence of a CBA2 (Important area) on the rocky grassland habitats (Habitat 2 and Habitat 3, Figure 4-1) and parts of the rocky bushveld (Habitat 6) as well as grassland on the plains (Habitat 4). Turbine 04 lies on the boundary of a CBA (and NPAES) and could be microsited eastwards to avoid the CBA, although it will still remain in an ESA.

The ESAs in Figure 4-3 cover parts of the rocky grassland (Habitat 3), some of the rocky bushveld (Habitat 6) and wetlands/floodplains (Habitat 5). The ESAs also cover areas of abandoned cropland (Habitat 9) and planted pasture (Habitat 10) (Figure 4-1). Turbines 05, 07 and 08 lie in ESAs but outside the NPAES and their locations could be reconsidered.

4.2.5. Ecological processes, functioning and drivers

Ecological processes include primary production, decomposition, nutrient cycling and fluxes of nutrients and energy. These processes will be altered by the clearing of the vegetation at the footprint of the WEF infrastructure. The impact is expected to be fairly small in relation to the adjacent landscape where no change to the ecological processes is anticipated.

The relatively small footprint of the infrastructure will not hinder pollination by airborne pollinators. Migration of ground-dwelling organisms will be temporarily hindered locally at the construction sites, but ecological connectivity should not be disrupted during the operational phase. Overall, it is unlikely that the project will contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions. The infrastructure will not cause any additional impediment to ecological corridors and habitat fragmentation should not be an issue. The disturbance caused during construction will create

conditions favourable for invasion by alien species. Since, the level of alien infestation at the site was moderate to high, an alien invasive plant species monitoring and control programme needs to be initiated to control invasions.

Fire is considered an important driver of vegetation dynamics in the Grassland and Savanna Biomes and can occur when the fuel load is high. To avoid damage to the infrastructure, fire will have to be suppressed. If the grass layer is regularly mowed/brush cut, it should prevent grasses from becoming moribund in the absence of fire although mowing or brush cutting would reduce seed set. Should fire be suppressed on site this could have long-term effects on the vegetation dynamics.

Grasslands have evolved under the grazing pressure from large ungulates. Mesic Highveld Grasslands are reasonably well adapted to grazing pressure under low to moderate stocking rates with adequate rest periods. The WEF development will still allow livestock or wildlife grazing.

4.2.6. Indigenous forests

No indigenous forests occur on the site.

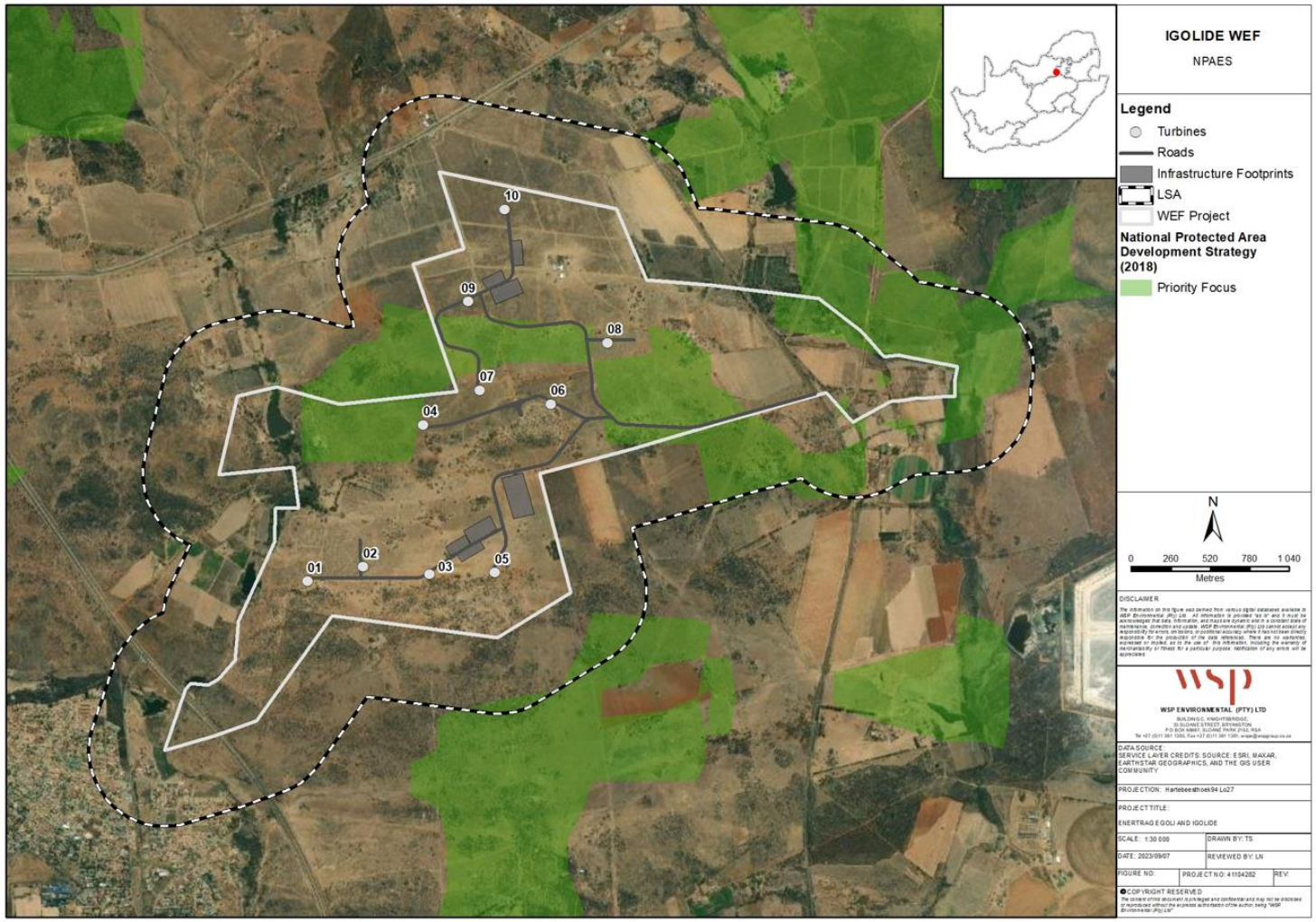

Figure 4-2 – NPAES map of the Igolide WEF site (NPAES 2018). Turbine 04 lies in the NPAES.)

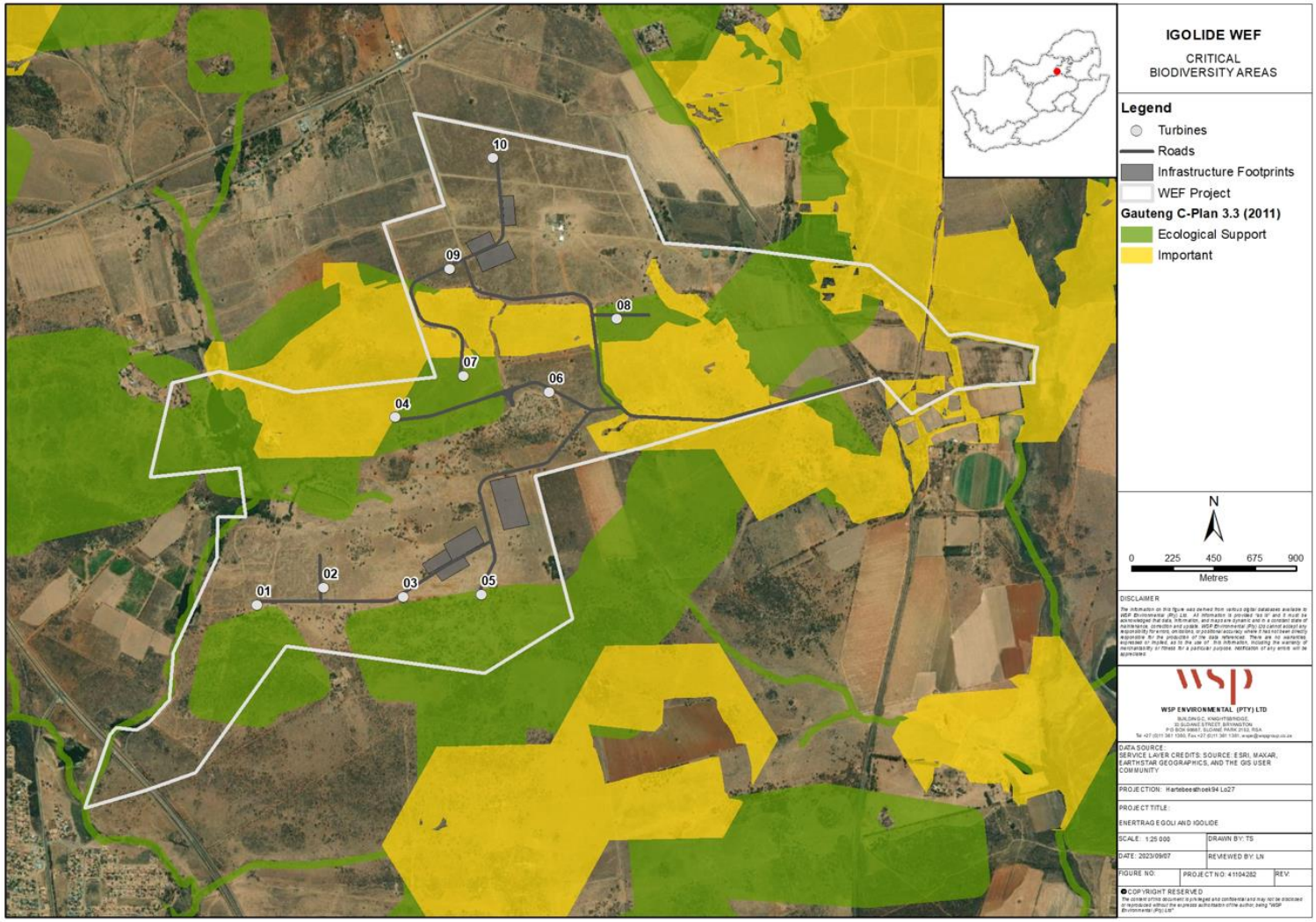

Figure 4-3 – Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Other Natural Areas (ONAs) of the Igolide site and environs (biodiversityadvisor.sanbi.org).

5 ANIMAL SPECIES BASELINE CHARACTERISATION

5.1 MAMMALS

The site falls within the distribution range of 85 terrestrial mammal species (Ekotrust, 2023); although it is important to note that this list was drawn from a far larger area than that occupied by the site and includes several game farms. It is important to note that a game farm exists within the study area, therefore some of the species discussed in the sections below were likely introduced.

5.1.1. IUCN threatened mammal species

Five IUCN threatened mammal species were listed for the environs of the Igolide site on the website of the Animal Demography Unit, University of Cape Town. None of these species were flagged by the Screening Tool report for the project area. The threatened category include species that are Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).:

Scientific name	Common name	IUCN status	Recorded on site or Confirmed by landowner (X)
Redunca fulvorufula	Mountain reedbuck	EN	X
Acinonyx jubatus	Cheetah	VU	-
Panthera pardus	Leopard	VU	-
Cloeotis percivali	Percival's short-eared trident bat	EN	-
Mystromys albicaudatus	African white-tailed rat	VU	-
Atelerix frontalis	Southern African Hedgehog	NT	-
Leptailurus serval	Serval	NT	-
Aonyx capensis	African clawless otter	NT	-
Miniopterus schreibersii	Schreibers's long-fingered bat	NT	-
Pipistrellus rusticus	Rusty pipistrelle	NT	-
Hydrictis maculicollis	Spotted-necked otter	VU	-

The full list of animal species that were either sighted during the Ekotrust surveys, or confirmed by the landowner, is provided in Appendix C of the Ekotrust (2023) report (Appendix A). The key animal SCC confirmed or with potential to occur on the site are summarised as follows:

Southern Mountain reedbuck

The southern mountain reedbuck is listed as Endangered A2b (Taylor et al. 2016) due to large population declines in all protected areas for which long-term count data are available. However, the

species has been extensively reintroduced into parts of its former range (Taylor et al. 2016). A large portion of the Igolide site is currently a game farm and the species could have been introduced. It is important to note that because of their specialised habitat requirements, the distribution of the mountain reedbuck is patchy and discontinuous and that they are found only where there is suitable habitat. They favour grass-covered ridges and hillsides in broken, rocky country or high-altitude grasslands. They are dependent on steep slopes, a well-developed grass layer and some scattered woody cover to evade predators.

According to Rowe-Rowe (1983) the mountain reedbuck favours slopes with a gradient of 20° or more. In regions where cover is locally more abundant in lower valleys than on upper slopes and ridges, it often prefers the lower slopes. They avoid the open conditions with no cover associated with the summits of mountainous areas as well as dense woody cover (Mason 1977; Oliver et al. 1978; Skinner & Chimimba 2005). They also occur in dry hilly areas (such as the Nama-Karoo), utilising steep slopes and the bases of hills for grazing. The extent of available slopes for predator evasion is regarded as an indicator of the quality of their territory (Dunbar & Roberts 1992).

Note: The Screening Tool did not list the Southern mountain reedbuck for the site and it is considered likely that it was introduced on site; nevertheless its presence on site and its status of "Endangered" should be taken into account when developing the Igolide site.

The Screening Tool also highlighted the presence of following two mammal species in the region. Neither were recorded on site during the survey, although they may occur in the region:

Spotted-necked otter

Potentially suitable habitat for the Spotted-necked otter (dams, rivers, permanent water bodies) is available on site. Although widespread, it is restricted to areas of permanent fresh water offering good shoreline cover and an abundant prey base. Overall, the population may be declining as river habitat is lost to development and infestations of alien species in riparian areas, and riverside vegetation degradation from overgrazing. The main interventions revolve around riparian protection. Thus, rivers should be carefully managed to increase flow and reduce turbidity, and development on banks should be restricted. The Igolide development will avoid all rivers and wetlands.

Maquassie musk shrew

This species is classified as Vulnerable (Taylor et al. 2016). It depends on wetlands as suitable habitat in savanna and grassland. Although it has a wide inferred extent of occurrence, it appears to be patchily distributed. The main threats to shrews are the loss or degradation of moist, productive areas such as wetlands and rank grasslands within suitable habitat. *Crocidura maquassiensis* has not been reported from Gauteng or North West Province post-1999 and thus there is a low probability for it to occur on site.

5.1.2. Provincially protected mammal species (GDARD, 1983)

Nine of the ten terrestrial mammal species listed as Schedule 2 Protected Game in Gauteng were recorded on site (with the exception of hippopotamus). The following nine species were recorded on the Igolide site:

- *Alcelaphus buselaphus caama* (Red hartebeest)
- *Connochaetes gnou* (Black wildebeest)
- *Kobus ellipsiprymnus ellipsiprymnus* (Waterbuck)
- *Oryx gazella* (Gemsbok)

- *Raphicerus campestris* (Steenbok)
- *Redunca fulvorufula* (Mountain reedbuck)
- *Taurotragus oryx* (Cape eland)
- *Giraffa giraffa giraffa* (Giraffe)
- *Lepus saxatilis* (Scrub hare)

Three of the mammal species listed in the ADU database for the region are Schedule 4 Protected Wild Animals; however, none of these were recorded on site (or are considered likely to occur):

- *Acinonyx jubatus* (Cheetah)
- *Panthera leo* (Lion)
- *Panthera pardus* (Leopard)

Three species are listed as Schedule 8 Problem Animals (all were recorded on site):

- *Canis mesomelas* (Black-backed jackal)
- *Chlorocebus pygerythrus pygerythrus* (Vervet monkey)
- *Caracal caracal* (Caracal)

5.1.3. Nationally Threatened or Protected Species: ToPS

According to ToPS legislation (NEMBA 2007c), three mammal species with potential to occur in the area are listed as Vulnerable and five species are Protected (Appendix C of Ekotrust (2023) report).

Vulnerable:

- *Panthera leo* (Lion)
- *Panthera pardus* (Leopard)
- *Acinonyx jubatus* (Cheetah)

Protected:

- *Atelerix frontalis* (Southern African hedgehog)
- *Aonyx capensis* (African Clawless otter)
- *Connochaetes gnou* (Black wildebeest)
- *Leptailurus serval* (Serval)
- *Hydrictis maculicollis* (Spotted-necked otter)

5.2 REPTILES

Forty-four (44) reptile species are listed for the region (Ekotrust 2023). The list includes one IUCN threatened (Vulnerable) species, i.e. Crocodylus niloticus, for the region, although this species is not present on site. Provincially protected reptile species include 26 Schedule 2 Protected Game, and 17 Schedule 5 snakes. The python *Python natalensis* is the only protected reptile species according to the ToPS list (NEMBA 2007c) with potential to occur on site; however, its occurrence is considered unlikely given the cultivated nature of surrounding lands and limited prey opportunities.

5.3 FROGS

Sixteen species were listed for the region and the Giant Bull Frog *Pyxicephalus adspersusis* listed as Near Threatened and is also on the ToPS list as a protected species (NEMBA 2007c). No

seasonally wet pans that would constitute suitable breeding habitat for Giant Bullfrog occur in the project area. None of the sixteen species were confirmed on site during the survey (Ekotrust, 2023). However, common species such as common river frog (*Amietia delalandii*) are likely present in suitable habitat (e.g. riparian habitat, wetlands, dams).

5.4 INVERTEBRATES

LEPIDOPTERA

The two Lepidopteran species (*Lepidochrysops praeterita* and *Lepidochrysops procera*) listed by the Screening Tool are unlikely to occur on site because their host plant (*Ocimum obovatum*) was not recorded on site.

ODONATA

Fifty-three species of Odonata were listed for the region, all of which have a status of Least Concern according to the IUCN classification.

SCORPIONS

Four scorpion species are listed for the region and two are listed as ToPS species (NEMBA 2007c). Although no scorpion species were confirmed on site during the survey, it is possible that they occur in suitable habitat (e.g. rocky grassland)

SPIDERS

All baboon spiders are provincially protected; one of which *Harpactira hamiltoni* is a ToPS protected species (NEMBA 2007c). Although none of the species were confirmed on site during the survey, undisturbed areas of *Vachellia karroo - Ehretia rigida* rocky bushveld mapped in the study area could constitute potentially suitable habitat. This habitat will be avoided by the turbines.

OTHER INSECTS

According to the RSA Red List, *Clonia uvarovi* is rated as Vulnerable. While tall savanna woodland was not recorded on site, *Vachellia karroo - Ehretia rigida* rocky bushveld may be marginally suitable for the species. However, its habitat will not be affected by the turbines.

6 ASSESSMENT OF SITE ECOLOGICAL IMPORTANCE FOR ANIMAL SPECIES

An assessment of the sensitivity of the mapped plant communities, based on ecological integrity and protected species support, is presented in Section 10 of the Ekotrust (2023) report (Appendix A). An assessment of site ecological importance for animal species, based on their associations with mapped habitat units in the study area, is shown on Table 6-1.

Rocky grassland and bushland were assessed as medium importance due to their support of southern mountain reedbuck and potentially *Clonia uvarovi*; while wetlands, rivers and floodplain habitats are important landscape corridors for fauna movement, as well as providing habitat for southern mountain reedbuck on site, and potentially spotted-necked otter and Maquassie shrew at the regional level.

Habitats 9 – 12 are transformed habitats (cropland, planted pasture, plantations and wind breaks) and all have a very low sensitivity rating.

The site options for the on-site IPP substation and BESS facility and the ancillary areas are shown in (**Figure 1-1**). The WEF infrastructure is currently located predominantly in Habitat 4 (Grassland) and all rocky hills, rocky outcrops (sheets) and drainage lines are avoided. Habitat 4 (*Hyparrhenia hirta - Eragrostis chloromelas* grassland) has been assessed as having medium SEI for fauna species – primarily on the basis of the support of southern mountain reedbuck, which occurs in the study area. However, since southern mountain reedbuck was probably reintroduced to the game farm within the study area, the magnitude of the potential project impacts (habitat loss, sensory disturbance) is reduced.

Buffers are applicable to the development along the watercourses. A buffer zone of 32 m is usually applied to drainage lines; this should be cross-referenced with the bat and aquatic specialist studies, and the widest recommended buffer zone applied.

CITES listed species were not considered as being of conservation concern because none of them qualify as SCC according to the SANBI definition (SANBI 2020). No ToPS listed species or endemic species were recorded on site.

Table 6-1 – SEI for animal SCC confirmed/potentially occurring in the study area

Plant community/Habitat unit		Plant community sensitivity (Ekotrust, 2022)	Conservation importance	Functional integrity	Biodiversity importance	Receptor resilience	Fauna SEI
1	*Trachypogon spicatus* grassland	Low	Medium – confirmed population of IUCN EN* species (Southern mountain reedbuck)	Low: Small isolated patches with limited connectivity, although migrations between adjacent areas possible. Minor current negative ecological impacts.	Low	Medium – southern mountain reedbuck has a moderate likelihood of return to the site, once construction phase disturbances have ceased.	Low
2	*Melinis repens - Selaginella dregei* rocky grassland	Medium			Low		Low
3	*Cymbopogon caesius - Elionurus muticus* rocky grassland	Low		Medium: larger areas with good connectivity	Medium		Medium
4	*Hyparrhenia hirta - Eragrostis chloromelas* grassland	Low			Medium		Medium
5	*Eragrostis plana - Trisetopsis imberbis* wetlands/floodplains	Medium	Medium - > 50% contains natural habitat with potential to support SCC eg the Vulnerable (Taylor et al, 2016) Maquassie shrew (*Crocidura*	Medium: small patches, although with good connectivity	Medium	Medium – should it be present, Maquassie shrew has a moderate likelihood of return to the site post-impact	Medium

Plant community/Habitat unit		Plant community sensitivity (Ekotrust, 2022)	Conservation importance	Functional integrity	Biodiversity importance	Receptor resilience	Fauna SEI
			maquassiensis)				
6	*Vachellia karroo* - *Ehretia rigida* rocky bushveld	Low	Medium - > 50% contains natural habitat with potential to support SCC e.g. – *Clonia uvarovi* , southern mountain reedbuck	Medium: larger areas with good connectivity	*Medium*	Medium – if present, likely to remain at the site despite WEF presence	Medium
7	*Salix babylonica* - *Phragmites australis* riverine vegetation	Medium	Medium - > 50% contains natural habitat with potential to support SCC e.g. Spotted-necked otter (*Hydrictis maculicollis*)	Medium: small area with good connectivity – forming natural corridor, with alien trees on banks	Medium	Medium – if present, otter have a moderate likelihood of remaining/returning to the site post-disturbance	Medium
8	*Hyparrhenia tamba* floodplains	Low	Medium - > 50% contains natural habitat with potential to support SCC e.g. (*C. maquassiensis*)	Medium: small area with good connectivity	Medium	Medium – should it be present, Maquassie shrew has a moderate likelihood of return to the site post-impact	Medium
9	Eragrostis tef - *Tagetes minuta* abandoned cropland	Low	Low	Low: isolated patches with limited connectivity, although migrations	Low	Very high/not applicable	Very low

Plant community/Habitat unit		Plant community sensitivity (Ekotrust, 2022)	Conservation importance	Functional integrity	Biodiversity importance	Receptor resilience	Fauna SEI
				between adjacent areas possible.			
10	Planted pasture (*Digitaria eriantha*)	Low	Very low – no natural habitat remaining	Very low	Very low	Very high/not applicable	Very low
11	*Eucalyptus camaldulensis* plantations (degraded)	Low	Very low – no natural habitat remaining	Low: isolated patches with limited connectivity, although migrations between adjacent areas possible.	Very low	Very high/not applicable	Very low
12	Hedges (*Robinia sp.*, *Pyracantha sp.*, *Cedrus sp.*, *Searsia pyroides*)	Low	Very low – no natural habitat remaining	Low: isolated patches with limited connectivity, although migrations between adjacent areas possible.	Very low	Very high/not applicable	Very low

* listed under IUCN Criterion A only

7 IMPACT ASSESSMENT

The assessment of project impacts as they relate to animal species, summarised from Ekotrust (2023), is presented in the sections that follow. Additional discussion on fauna habitat loss is provided in Section 8.1, based on the updated findings of the SEI for animal species.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects were reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct, indirect, secondary as well as cumulative impacts. For a detailed impact assessment methodology, see section 13 of the Ekotrust (2023) report (Appendix A)

7.1 ASSESSMENT OF IMPACTS ON TERRESTRIAL FAUNA

DIRECT IMPACTS DURING THE CONSTRUCTION PHASE

Loss of faunal habitat

Clearance of the vegetation due to new access roads, upgrading of existing tracks, construction site, substation, turbines and crane pads will be accompanied by loss of Habitat 4 (*Hyparrhenia hirta - Eragrostis chloromelas* grassland), which has been assessed as having medium SEI for fauna species – primarily on the basis of the support of southern mountain reedbuck, which occurs in the study area. However, since southern mountain reedbuck was probably reintroduced to the game farm within the study area, the magnitude of the potential project impact is reduced

Although suitable habitat for spotted-necked otter is available on site, it is unlikely that they would be affected by the development since their habitats (rivers, dams) will be avoided by the development; similarly, potentially suitable habitat for *Clonia uvarovi* will be avoided by the turbines as proposed.

Before mitigation, the impact magnitude is considered medium, whilst the duration is long term, with a high probability of occurrence. The spatial extent is site only. Prior to mitigation, the loss of fauna habitat is rated an impact of “moderate” significance. With mitigation, the probability can be reduced to probable, and the impact magnitude can also be reduced to low. The residual impact will be of ‘low’ significance (Table 7-1).

Direct faunal mortalities during construction activities

Faunal mortalities may be caused by construction at the footprint of the infrastructure, construction vehicles or other operational activities and by electrical fences, should they be erected around the construction site and substation.

In particular, slow-moving/ground-dwelling species might be prone to these mortalities. When animals ingest waste material or become ensnared in wires, fatalities might occur. Larger more mobile fauna such as antelope and larger predators will most likely move away from areas of high activity during the construction phase. Smaller and less-mobile animals are not as capable of moving away and may seek shelter down burrows and other shelter sites. None of the SCC listed in the Screening Tool were encountered on site and generally the protected species listed for the region occur at a low density and thus it is unlikely that they would be directly encountered by people at the Igolide WEF.

The impact prior to mitigation is considered to be of low magnitude,and will impact affected fauna for a short term. The spatial extent is site only. It is also considered to be probable, resulting in an impact of “low” significance. With mitigation, magnitude is reduced to very low, and probability of the impact can be reduced to low. The impact significance will remain “low” (Table 7-1).

Increased dust deposition

Increased dust deposition may discourage herbivores from grazing or browsing. The increased dust levels will be temporary, lasting for the duration of the construction phase.

Before mitigation, the impact magnitude is moderate, while duration is short term with low probability of occurrence. The spatial extent is site only. Prior to mitigation, the increased dust deposition impact is rated an impact of “low” significance. With mitigation, the probability can be reduced to low, and the impact magnitude can also be reduced to low. The impact significance will be “very low” (Table 7-1).

Increased human activity, noise and light levels.

Construction activities will increase human presence, noise and light levels at the site. These activities may affect animal behaviour. Increased noise and light levels associated with the construction phase are temporary.

The impact prior to mitigation is considered to be of medium magnitude and will impact affected fauna for a short term. The spatial scale is site only. The impact is considered to belikely , resulting in an impact of “low” significance. With mitigation, magnitude can be reduced to low, and probability of the impact can be reduced to low. The impact significance will be reduced to “very low”, (Table 7-1).

Impacts of roads

Roads are referred to under several impacts, but a summary is provided in this section. Even in natural regions roads are intrusive and destructive and cause a disturbance. Their construction destroys the vegetation, leads to compaction of the soil and loss of habitat for small animals. Roads can create barriers for small animals, cutting off dispersal routes and fragmenting habitats. Animals crossing or moving along roads can also become easy targets for predators. Compacted roads also impact on the movement of subterranean and burrowing animals. Dust kicked up by vehicles coat the roadside plants making them less attractive to animals. Poorly planned roads often result in water erosion problems and busy roads affect the movement of especially shy animals. Some destruction of the vegetation adjacent to the footprint will also inevitably occur when preparing the sites. Unnecessary clearing of vegetation beyond the footprint of the development can however, largely be avoided.

The impact prior to mitigation is considered to be of high magnitude and will impact affected fauna for the long term. The spatial scale is site only. The impact is considered to be highly probable, resulting in an impact of “moderate” significance. With mitigation, magnitude can be reduced to low, and probability of the impact can be reduced to probable, resulting in a residual impact of ‘low’ significance (Table 7-1).

INDIRECT IMPACTS DURING THE CONSTRUCTION PHASE

Changes in animal behaviour

The increased human presence and/or construction operations will increase noise levels as well as light levels at night. The increased human presence, elevated noise and light levels, loss of animal habitat and compaction of soils may alter the behavioural patterns of some animals. Some of these changes may favour certain species and negatively affect others and consequently change the composition of the animal communities. Species with small territories will be negatively affected as well as species that live in the soil.

Research elsewhere showed that the response of animals to wind energy facilities was highly species-specific and could range from avoidance to a positive reaction. The response was apparently also depended on the level of predation, with no impact noted where predation pressure was low. Wind farms affect large terrestrial mammals mainly through an increase in human activity within the wind farm area. During the construction phase, the mobile large-mammal carnivores and ungulates may temporarily avoid the site, but when construction ceases and human presence decreases, these animals generally acclimate to the wind energy infrastructure. The impact on burrowing fauna may be higher, since these animals are usually sensitive to soil tremors and disturbances, and consequently they will likely move away from construction areas. It is anticipated that the impact of the Igolide site on the fauna would mostly be temporary, i.e. during the construction phase.

Before mitigation, the impact magnitude is medium, while duration is medium term and probable probability of occurrence. The spatial extent is site only. Prior to mitigation, changes in animal behaviour is rated an impact of “low” significance. With mitigation, the probability can be reduced to low, and the impact magnitude can also be reduced to low. The impact significance will be “very low”, (Table 7-1).

OPERATIONAL PHASE IMPACTS

Direct faunal mortalities

Faunal mortalities may be caused by maintenance vehicles or other maintenance activities, electric fences and ingestion of waste material. In particular slow-moving species might be prone to road mortalities. Fatalities might also arise when animals become ensnared in wires or in electric fences. Bird collisions with the wind turbine blades will be addressed by the avifaunal and bat specialists.

Although activity at the site is likely to be relatively low during operation, some impact on fauna may still occur as a result of personnel present on site as well as the operation of maintenance vehicles. Direct interactions between the turbines and terrestrial fauna (excluding avifauna and bats) are likely to be low. Major risk factors during operation are likely to be from vehicle collisions with fauna.

The impact prior to mitigation is considered to be of low magnitude and will impact affected fauna for a long term. The spatial scale is site only. The impact is considered to be probable, resulting in an impact of “moderate” significance. With mitigation, magnitude is not expected to change but probability of the impact can be reduced to low. The impact significance will be reduced to “low” (Table 7-1).

Increased light and noise levels and changes in animal behaviour.

The loss of vegetation cover, compacting of soils, increased noise levels and the increased human presence will alter animal behavioural patterns by making certain areas unavailable and making roads difficult to traverse, Some animal species will be more affected than others. These species might undergo a reduction in their population size.

According to Todd & Skowno (2014), small mammals, reptiles and amphibians are not likely to move away from the turbines on account of the noise as these animals do not rely on sound to forage and rely largely on plant cover and other avoidance measures to avoid predators. Although frogs communicate with their calls, the pitch of the noise generated by the turbines is not likely to be similar to that of the frogs and a significant impact is unlikely. Fauna which rely heavily on hearing for foraging or predator avoidance are potentially worst affected by the noise. This would include species that rely extensively on hearing for prey detection or predator avoidance. However, it is difficult to predict the impact on these species without entering into a high degree of speculation as there has been little research on this topic and hence there is no baseline in terms of known impacts due to turbine noise on fauna, especially within the South African context.

However, noise due to turbines at the site will be variable and related to wind direction and operating conditions among other factors. As most fauna are adaptable with regards to noise, it is likely that any affected fauna would adapt to the local conditions and it is not likely that there would be any ecosystem-level or trophic impacts due to turbine noise. According to Todd & Skowno (2014), the possibility that predators such as jackal and caracal would prey more heavily on livestock or wildlife as a result of turbine noise, is not a likely scenario.

Before mitigation, the impact magnitude is medium, while duration is also expected to be medium term and probable probability of occurrence. The spatial extent is site only. Prior to mitigation, the impact is rated an impact of “moderate” significance. With mitigation, the probability can be reduced to low, and the impact magnitude can also be reduced to low. The impact significance will be “low” (Table 7-1).

DECOMMISSIONING PHASE IMPACTS

Direct impacts during the decommissioning phase

Faunal mortalities

Faunal mortalities may be caused by vehicles or other decommissioning activities and waste. In particular slow-moving species, might be prone to road mortalities. When animals ingest waste material or become ensnared in it fatalities might also occur.

Before mitigation, the impact magnitude is low, while duration is also expected to be immediate and with probable occurrence. The spatial extent is site only. Prior to mitigation, faunal mortalities impact is rated an impact of “low” significance. With mitigation, the probability can be reduced to low, and the impact magnitude can also be reduced to very low. The impact significance will be “very low” (Table 7-1).

Increased dust deposition

Increased dust deposition may harm physiological processes of plants and a reduction in the photosynthetic capacity of the plants may occur. The dust layer on the vegetation may also

discourage herbivores from grazing or browsing the dust covered vegetation. The increased dust levels will be temporary.

The impact prior to mitigation is considered to be of low magnitude and will impact affected fauna for a short term. The spatial scale is site only. The impact is considered to be probable, resulting in an impact of “low” significance. With mitigation, magnitude is not expected to very low and probability of the impact can be reduced to low. The impact significance will be reduced to “very low” (Table 7-1).

Table 7-1 below shows a summarised impact rating table for the Construction, Operational and Decommissioning phases, after Ekotrust (2023).

Table 7-1 - Impact rating table for the Construction, Operational and Decommissioning Phases

CONSTRUCTION																		
Impact number	**Aspect**	**Description**	**Stage**	**Character**	**Difficult/feasible**	**Pre-Mitigation**							**Post-Mitigation**					
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**	**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
Impact 1:	Fauna habitat	Loss of faunal habitat	Construction	Negative	Feasible	3	1	3	4	4	**44**	**N3**	2	1	3	4	3	**30**	**N2**
					Significance	**N3 - Moderate**							**N2 - Low**						
Impact 2:	Fauna species	Direct faunal mortalities due to construction and increased traffic	Construction	Negative	Feasible	2	1	4	2	3	**27**	**P2**	1	1	4	2	2	**16**	**P2**
					Significance	**P2 - Low**							**P2 - Low**						
Impact 3:	Fauna habitat and Fauna species	Increased dust deposition	Construction	Negative	Feasible	2	1	1	2	3	**18**	**N2**	2	1	1	2	2	**12**	**N1**
					Significance	**N2 - Low**							**N1 - Very Low**						
Impact 4:	Fauna species	Increased human activity, noise and light levels.	Construction	Negative	Feasible	3	1	1	2	3	**21**	**N2**	2	1	1	2	2	**12**	**N1**
					Significance	**N2 - Low**							**N1 - Very Low**						
Impact 5:	Fauna habitat and Fauna species	Impacts of roads	Construction	Negative	Feasible	4	1	3	4	4	**48**	**N3**	2	1	3	4	3	**30**	**N2**
					Significance	**N3 - Moderate**							**N2 - Low**						
OPERATIONAL																		
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Difficult/feasible**	**Pre-Mitigation**							**Post-Mitigation**					
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**		**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	
Impact 1:	Fauna species	Direct faunal mortalities	Operational	Negative	Feasible	3	1	4	4	3	**36**	**N3**	2	1	4	4	2	**22**	**N2**
					Significance	**N3 - Moderate**							**N2 - Low**						
Impact 2:	Fauna species	Increased light and noise levels and changes in animal behaviour.	Operational	Negative	Feasible	3	1	3	4	3	**33**	**N3**	2	1	1	4	2	**16**	**N2**
					Significance	**N3 - Moderate**							**N2 - Low**						
DECOMISSIONING																		
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Difficult/feasible**	**Pre-Mitigation**							**Post-Mitigation**					
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**		**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	
Impact 1:	Fauna species	Faunal mortalities	Decommissioning	Negative	Feasible	2	1	4	1	3	**24**	**N2**	1	1	4	1	2	**14**	**N1**
					Significance	**N2 - Low**							**N1 - Very Low**						
Impact 2:	Fauna habitat and Fauna species	Increased dust deposition	Decommissioning	Negative	Feasible	2	1	1	2	3	**18**	**N2**	1	1	1	2	2	**10**	**N1**
					Significance	**N2 - Low**							**N1 - Very Low**						

8 MITIGATION MEASURES

The following section presents the proposed impact management actions to avoid, minimise and/or manage the potential impacts/risks assessed Section 8 of this report.

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

- Construction, incl. Pre-Construction;
- Operational; and
- Decommissioning.

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

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

Table 8-1 below presents a summary of the required impact mitigation measures during the construction, operational, and decommissioning phases of the proposed Project.

Table 8-1 - Summary of the proposed impact mitigation actions during the construction, operational, and decommissioning phases of the proposed Project

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
1. Pre-construction phase							
1.1	Terrestrial Fauna - Habitats	Loss of fauna habitat	Avoidance Areas of undisturbed natural habitat should be avoided as far as practically possible: A walkthrough would be needed prior to construction to ensure that sensitive species and/or habitats are avoided and to inform permitting. Should the results of the walkthrough indicate that sensitive species and/or habitats are not fully avoided, further micrositing of the infrastructure should be undertaken through an amendment process post-authorisation. Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns. This includes awareness as to remaining within demarcated construction areas, no littering, handling of pollution and chemical spills, avoiding fire hazards and minimising wildlife interactions. Ensure that all temporary use areas e.g. laydown areas and construction camp, are located in areas of low sensitivity. Permits should be obtained for the destruction or removal of provincially specially protected or protected species.	N/A	Avoidance	Prior to Construction Phase.	Project Manager
2. Construction phase							

2.1	Terrestrial fauna – Habitats	Loss of fauna habitat	Minimisation Footprints of the turbines, crane pads, roads, construction and substation locations should be clearly demarcated. Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided; and All vehicles are to remain on demarcated roads and no driving through the veld should be allowed.	N/A	Minimisation	During and after Construction Phase	Project Manager
2.2	Terrestrial fauna	Direct faunal mortalities due to construction and increased traffic.	Minimisation and Avoidance Speed limits (e.g. 40 km/h or appropriate limit) should be set on all roads on site. Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days, should have an escape ramp to allow any fauna that fall in to escape. Should electrical fences be erected it must be done according to the norms and standards of the Nature Conservation Authorities in Gauteng. Access to the site should be strictly regulated to reduce the opportunities for collusions. As per Mitigation Actions for Impact 2.1: Loss of fauna habitat.	N/A	Minimisation and Rehabilitation	During and after Construction Phase	Project Manager
2.3	Terrestrial fauna – habitat.	Increased dust deposition	Excessive dust must be reduced by spraying water onto the soil.	N/A	Avoidance and Minimisation	During Construction Phase	Project Manager

2.4	Terrestrial fauna	Increased human activity, noise and light levels.	Avoidance and Minimisation The SANS standards should be adhered to in terms of noise levels. No major construction should be done at night. If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals.	N/A	Avoidance and Minimisation	During Construction Phase	Project Manager
2.5	Terrestrial fauna	Impacts of roads	Avoidance and Minimisation Wherever possible, existing roads/tracks should be used. Roads should not have steep curbs. Avoid driving in wet clay soils after rain also as it may result in deep tracks that damage the road surface and lead to other users bypassing such areas, thereby forming new tracks alongside the original ones.	N/A	Avoidance and Minimisation	During Construction Phase	Project Manager
2.6	Terrestrial fauna	Changes in animal behaviour	Avoidance and Minimisation Development should avoid rocky outcrops and wetlands. If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. Soil compaction should be kept to a minimum by restricting driving to designated roads. The mitigation measures as indicated by the noise specialist must be adhered to.	N/A	Avoidance and Minimisation	During Construction Phase	Project Manager
3. Operational phase							

3.1	Terrestrial Fauna	Direct faunal mortalities	Avoidance and Minimisation Access to the site should be strictly controlled. Maintenance crew should undergo environmental training, by way of an induction course, to increase their awareness of environmental concerns. All vehicles at the site should adhere to a low speed limit (of e.g. 40 km/h (or whatever is appropriate) and slow-moving fauna on roads should be moved off the road.	N/A	Avoidance and Minimisation	During Operational Phase	Facility Manager
3.2	Terrestrial Fauna - Habitats	Increased light and noise levels and changes in animal behaviour	Avoidance and Minimisation See mitigation measures for Impact 2.4 and 2.6 Increased light and noise levels and changes in animal behaviour;	Guidelines for Monitoring, Control and Eradication of AIS (DEA, 2015)	Avoidance and Minimisation	During Operational Phase	Facility Manager
4. Decommissioning phase							
4.1	Terrestrial Fauna	Faunal mortalities	Avoidance and Minimisation See mitigation measures for Impact 3.1: Direct faunal mortalities; and Proper waste management procedures should be in place and no material should be left on site in order to prevent instances of ensnarement or ingestion of foreign material.	N/A	Avoidance and Minimisation	During Decommissioning Phase	Facility Manager
4.2	Terrestrial Fauna - Habitats	Increased dust deposition	Minimisation Excessive dust must be reduced by spraying water onto the soil.	N/A	Minimisation	During Decommissioning, and five-years post-decommissioning.	Facility Manager

9 CUMULATIVE IMPACTS

The assessment of the Project's potential contribution to cumulative impacts as they relate to animal species, summarised from the terrestrial impact assessment (Ekotrust, 2023), is presented in the sections that follow.

The existing and proposed developments within 30 km from the site that were taken into consideration for cumulative impacts include the renewable energy project linked with Sibanye Gold Limited. The cumulative assessment however does not consider the grid as it is still to be determined.

Loss of fauna habitat

Vegetation loss, habitat destruction and possibly loss of SCC and protected species, can occur when considering all developments. The habitat destruction will lead to changes in the physical features of the habitat, with concomitant changes in ecological processes. Vegetation loss will also constitute the loss of animal habitat. The contribution of the Igolide project (residual impact of fauna habitat loss) to the cumulative impact will likely be small.

Compromising integrity of CBA, ESA and NPAES

According to the mapping of CBAs in Gauteng, one of the turbines (WTG04) is located on the boundary of the CBA and NPAES and could be microsited to avoid the CBA and NPAES. Development within a CBA should not be allowed as such development may result in biodiversity loss and therefore compromise the integrity of the CBA.

Since ESAs have been assigned a 'Very High' sensitivity in the Screening Tool, the micro-siting or repositioning of those turbines within ESAs should be considered. The on-site substation/BESS as well as Ancillary area 1 and 2 avoid CBAs and ESAs. Thus, the contribution of Igolide to the cumulative impact will likely be small. It is assumed that authorisation would only be granted to projects that have similarly avoided CBAs and NPAES.

Reduced ability to meet conservation obligations & targets

The loss of unprotected vegetation types on a cumulative basis from the area may impact the countries' ability to meet its conservation targets. The 'Vulnerable' Rand Highveld Grassland is a large national vegetation type but only 1.8% is currently conserved, with a conservation target of 24%. However, the direct physical impact of the Igolide WEF on the vegetation type will be small in extent (estimated at 50 ha by Enertrag) and the Igolide site is not located in a protected area, although it does fall within the protected area expansion strategy (NPAES). No Special Conservation Zone occurs in the region (GDARDE 2011).

With the full application of the mitigation hierarchy (i.e. compensation for significant residual impacts on undisturbed areas of Vulnerable vegetation communities, the Igolide project's contribution to cumulative impacts in this regard, would be reduced.

Loss of landscape connectivity and disruption of broad-scale ecological processes

The presence of the facility and the associated transformation of intact vegetation could pose a threat to the connectivity of the landscape. For fauna, the disruption is largely due to the hardened

surfaces of the facility which also create open areas. Subterranean species that have to emerge from the soil to crossroads will be most affected.

The severity of these impacts for faunal species is likely to be relatively low as the roads required for operation are likely to still be of a natural surface such as gravel and would experience low traffic volumes. Because of the relatively small footprint of the wind turbines, the facility is unlikely to disrupt pollination and dispersal processes that could cause spatial fragmentation of plant populations. The facility would still allow grazing by wildlife and livestock to continue. Fire would need to be controlled and this could affect the vegetation dynamics.

In the long-term the facility is not likely to create significant local or regional population-level impact on fauna.

10 BIODIVERSITY MANAGEMENT PLAN

The proposed Biodiversity Management Plan (BMP) for the implementation of the recommended mitigation measures (Ekotrust, 2023), is summarised in Table 10-1 below.

Table 10-1 - Biodiversity Action Plan

Impact	Mitigation / Management Objectives	Mitigation / Management actions	Monitoring		
			Methodology	Frequency	Responsibility
IMPACTS ON TERRESTRIAL BIODIVERSITY AND SPECIES					
Pre-Construction PHASE					
Potential impact on terrestrial biodiversity and species as a result of the proposed WEF	Avoid or minimise impacts on terrestrial biodiversity and species on site regarding the placement of the infrastructure. Avoiding ridges, rocky sheets and drainage lines will reduce the chances of loss of protected species and SCC (Screening Tool).	A walkthrough would be needed prior to construction to ensure that sensitive species and/or habitats are avoided and to inform permitting. Should the results of the walkthrough indicate that sensitive species and/or habitats are not fully avoided, further micrositing of the infrastructure should be undertaken through an amendment process post-authorisation.	Ensure that this is taken into consideration during the planning and design phase.	During design cycle and before construction commences.	Project Developer and Appointed Ecological Specialist
CONSTRUCTION PHASE					

Loss of vegetation/habitat	Confine vegetation clearance to footprint and minimise disturbance of adjacent areas.	Demarcate all infrastructure sites clearly to avoid unnecessary clearance of the vegetation. Permits have to be obtained for the removal of Gauteng protected species within the footprint of the development.	Ensure that mitigation measures are enforced	Daily	The Environmental Control Officer (ECO) should monitor and report any incidents to the Holder of the EA
Impact on animal species	Avoid or minimise impacts that could potentially affect animal behaviour	Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns. Holes and trenches should not be left open for long periods of time. These should be regularly inspected for the presence of trapped animals. Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the site. Speed limit (of e.g. 40 km/h) should be strictly adhered to.	Ensure compliance with these mitigation measures	Daily	The ECO should monitor and report to the Holder of the EA.
Increased dust levels	Avoid or minimise increased dust levels.	Dust control measures should be implemented.	Ensure that dust control measures are in place.	Daily	The ECO should monitor and report to the Holder of the EA.
Alien species invasion	Avoid invasion by alien species	Implement a monitoring program for the early detection of alien invasive plant species.	Ensure implementation of a control programme	Daily	The ECO should monitor and report to the Holder of the EA

Run-off and erosion control	Avoid negative effects of run-off and water erosion by applying appropriate mitigation measures	All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area. Road maintenance procedures should be in place. Vegetation clearance and soil compaction should be minimized.	Ensure compliance with these mitigation measures	Weekly	The ECO should monitor and report to the Holder of the EA
OPERATIONAL PHASE					
Impact on animal species	Avoid or minimise impacts that could potentially affect animal behaviour	Proper waste management procedures should be put in place. If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals.	Ensure compliance with these mitigation measures.	Monthly	The ECO should monitor and report to the Holder of the EA.
Alien species invasion	Avoid invasion by alien species.	Implement a monitoring program for the early detection of alien invasive plant species and employ a control program to combat declared alien invasive plant species.	Ensure implementation of a control programme to combat alien invasive plants.	Every three months	The ECO should monitor and report to the Holder of the EA
Run-off and erosion control	Avoid negative effects of run-off and water erosion by applying appropriate mitigation measures	All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area. Road maintenance procedures should be in place. Vegetation clearance and soil compaction should be minimized,	Ensure compliance with these mitigation measures.	Weekly	The ECO should monitor and report to the Holder of the EA.
DECOMMISSIONING PHASE					

Loss of vegetation/habitat	Minimise disturbance and clearance of vegetation.	Unnecessary clearance of natural vegetation should be avoided.	Ensure that mitigation measures are enforced	Monthly	The ECO should monitor and report to the Holder of the EA.
Impact on animal behaviour	Avoid or minimise impacts that could potentially affect animal behaviour.	Proper waste management procedures should be put in place.	Ensure compliance with these mitigation measures.	Monthly	The ECO should monitor and report to the Holder of the EA.
Alien species invasion	Avoid invasion by alien species.	Implement a monitoring program for the early detection of alien invasive plant species and employ a control program to combat declared alien invasive plant species	Ensure implementation of a control programme to combat alien invasive plants.	Every three months	The ECO should monitor and report to the Holder of the EA

11 ENVIRONMENTAL IMPACT STATEMENT

11.1 SUMMARY OF THE KEY FINDINGS AND CONSIDERATIONS OF THE TERRESTRIAL ANIMAL SPECIES SPECIALIST ASSESSMENT

Fauna

- Note: bird and bat components – see avifaunal report.
- Screening Tool: None of the animal species highlighted by the Screening Tool were encountered on site.
- Threatened animal species: The key faunal issue is the presence of the endangered mountain reedbuck, which could possibly have been re-introduced to the game farm. The mountain reedbuck was not listed by the Screening Tool.
- Overall sensitivity of animal species theme: This is rated as medium by the Screening Tool. Excluding the avifaunal component, we would suggest a Low - Medium sensitivity. If the suggested mitigation measures are followed, the threatened animal species should not be negatively affected by the WEF.

Conservation

- Vulnerable ecosystem: The Rand Highveld Grassland vegetation type is listed as “Vulnerable” and covers a large portion of the site. Seven of the ten turbines are situated in this vegetation type.
- Protected Areas: The study area is not located in a protected area and the closest protected area, Abe Bailey Provincial Nature Reserve, is approximate 20 km to the northwest of the site.
- .National Protected Areas Expansion Strategy (NPAES): The study site is part of the NPAES (NPAES 2018) and all turbines are located outside the NPAES.
- Critical Biodiversity Areas (CBAs): CBA2s (Important area) are present on the site (GDARDE 2011, C-Plan V3.3) and development within the CBAs should best be avoided. All turbines fall outside the CBA2s.
- Ecological Support Areas (ESAs): Turbines WTG04, WTG07 and WTG08 lie in ESAs. The extent of the development is relatively small and will not have a negative impact on the functionality of the broader ESA. Thus no additional loss of ecological connectivity in relation to the broader landscape is likely.
- Other Natural Areas (ONAs): Seven of the ten turbines are situated in ONAs.
- Freshwater Ecosystem Priority Area (FEPA): Two rivers cross the site with some wetlands delineated along the rivers. The development will avoid the rivers and wetlands. FEPAs were not highlighted by the Screening Tool.
- Terrestrial Biodiversity Theme: Although portions of the site qualify as CBA2s and ESAs and parts have been included in the NPAES, a substantial portion of the site has been identified as ONAs (even when in the Vulnerable vegetation type). The development has been largely contained in the ONAs. In the Screening Tool the Terrestrial Biodiversity Theme allocated a Very High sensitivity to the entire site. Although we agree that the current site clearly includes areas of very high sensitivity (CBA, ESAs and NPAES), it also includes a substantial portion that has not been demarcated as very high sensitivity, thus ONA. According to the land use guidelines supplied by SANBI (2021), split zoning should be used, where feasible, to demarcate sensitive areas, where CBAs occur across part of a property.

Ecological processes, function and drivers

- Overall, it is unlikely that the development will contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions.
- The disturbance caused by the construction of the WEF will create conditions favourable for invasion by alien species.
- Fire is an important driver of vegetation dynamics in the Grassland Biome and can occur when the fuel load is high. To avoid damage to the infrastructure, fire will have to be suppressed. If the grass layer is regularly mowed/brush cut, it should prevent grasses from becoming moribund in the absence of fire although mowing or brushcutting would reduce seed set.
- Grasslands have evolved under the grazing pressure from large ungulates. Mesic Highveld Grasslands are reasonably well adapted to grazing pressure under low to moderate stocking rates with adequate rest periods. The WEF development will still allow livestock or wildlife grazing.

11.1.1. Preferred infrastructure locations

Access route

- The access road is currently from an unnamed road to the east. The access road follows existing farm tracks more or less to the centre of the site. Although the road does cross a CBA2 (Important area) and ESAs it is acceptable because it follows an existing farm road.

Turbines

- Turbines 04, 07 and 08 lie in ESAs and where possible the number of turbines should be limited within the ESA..
- All other turbines are situated in ONAs.

Ancillary areas (On-site IPP substation, batching plant, construction camp, laydown):

- These ancillary areas fall in a Least Concern ecosystem and outside of CBA2s, ESAs and NPAES.

Roads

- The road network within CBAs (only CBA2s are present on site) and ESAs should be minimised.
- Wherever possible, existing roads should be used.
- The construction of a road should be done in the most environmentally sensitive manner possible.
- A suitably qualified person should plan, design and supervise the proper construction of roads to minimize the impact on the environment.
- Roads should be provided with run-off structures to reduce the risk of erosion.
- Proper road maintenance procedures should be in place.

11.2 SPECIALIST OPINION

The low residual impact significance (after mitigation), means the project could proceed without major constraints, provided the recommended mitigation measures and management actions proposed to conserve protected fauna on the site are applied.

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Appendix A

EKOTRUST (2023). TERRESTRIAL BIODIVERSITY AND SPECIES: SPECIALIST ASSESSMENT

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED DEVELOPMENT OF THE IGOLIDE WIND ENERGY FACILITY LOCATED NEAR FOCHVILLE, GAUTENG

TERRESTRIAL BIODIVERSITY AND SPECIES: SPECIALIST ASSESSMENT

Report prepared for:	*Report prepared by:*
WSP Group Africa	Ekotrust cc
Contact person: Ashlea Strong/Jashmika Maharaj	7 St George Street
Tel. +27 011 361 1392	Lionviham,
Mobile: 082 786 7819 / 081 401 8337	Somerset West, 7130
E-mail: Ashlea.Strong@wsp.com	South Africa

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EXECUTIVE SUMMARY

Background

Igolide Wind (Pty) Ltd proposes to develop the Igolide Wind Energy Facility (WEF) (up to 100 MW) and its associated infrastructure near Fochville in Gauteng.

This report has been prepared in terms of the Environmental Impact Assessment (EIA) Regulations under the National Environmental Management Act (Act No. 107 of 1998) (NEMA 2014, 2017) and the gazetted '*Procedures for the assessment and minimum criteria for reporting on identified environmental themes* (Government Gazette 43110, No. 320, 20 March 2020 (NEMA 2020a). Note that this protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations.

*Note: This specialist assessment was commissioned on **25 October 2020** (between ENERTRAG and Ekotrust) prior to the gazetting of the 'Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species' and the 'Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species' (GG 43855 / GN R1150, 30 October 2020)* (NEMA 2020b). *We refer to the following in the gazetted procedures published on 30 October 2020: **"The requirements of these protocols will apply from the date of publication, except where the applicant provides proof to the competent authority that the specialist assessment affected by these protocols had been commissioned by the date of publication of these protocols in the Government Gazette, in which case Appendix 6 of the Environmental impact Assessment Regulations, 2014, as amended, will apply to such applications."***

Location, topography, climate, geology and soils

The Igolide site covers an area of 680 ha and is located northeast of Fochville on portions 14, 20 and RE/22 of the farm Kraalkop 147 IQ and portions 8, 57, 65 and 66 of the farm Leeuwpoort 356 IQ. The area falls within the West Rand District Municipality and the Merafong City Local Municipality in the province of Gauteng. The homestead on site is located at 26° 27' 04.2" S; 27° 30' 21.7" E. The site is characterised by grassland on the sloping plains and low hills, with bushveld patches on the rocky plains and koppies (ridges). The altitude ranges from 1500 m at the lowest point in the west up to approximately 1640 m at the highest point on the hill in the central part of the site. The site is drained from north to south on the western boundary by the Kraalkopspruit and its tributaries and by a stream in the east.

The mean annual rainfall in the region ranges from 613 mm at Fochville to 652 mm at the farm Leeuwpoort. The rainy season at Carltonville is predominantly from October to April when about 92% of the annual rainfall occurs. The mean annual temperature for Carltonville is 16.3°C with the extreme maximum and minimum temperatures 37.1°C and -9.5°C respectively.

Most of the site is underlain by andesite (Vh) while the northern part of the site consists of shale and hornfels (Vt). A small section in the southeast is underlain by shale and quartzite (Vs). The site covers two land types *viz.* the Ba and Fb Land Types.

Vegetation and flora

The site falls in the Grassland Biome, but in two Bioregions, i.e. the northern section the site falls in the Central Bushveld Bioregion, while most of the site falls in the Mesic Highveld Grassland Bioregion. The site does not fall within any Centre of Plant Endemism. The site occurs in two vegetation types. i.e. the 'Vulnerable' Rand Highveld Grassland and the 'Least Concern' Gauteng Shale Mountain Bushveld.

Based on species composition, nine natural habitats (plant communities) as well as five man-made units were distinguished, described and mapped on the Igolide site. The Species of Conservation Concern (SCC) listed for the

region in the NewPosa database are *Khadia beswickii* (VU) and *Adromischus umbraticola* subsp*. umbraticola* (NT). These two species were not recorded on the Igolide site. Thirteen plant species are listed as protected in the region according to the GDARD (1983, 2014a). *Gladiolus permeabilis* was the only Schedule 11 protected species recorded on site (GDARD 1983). Two rare plant species could potentially occur on the Igolide site according to data provided by GDARDE (2011, C-Plan). They are *Cineraria austrotransvaalensis* and *Gnaphalium nelsonii*, both with a Near Threatened status. Neither species is listed in the NewPosa species list for the region or were recorded on site during the site survey.

No threatened or protected (ToPS) species (National Environmental Management: Biodiversity Act (Act No. 10 of 2004) is listed for the study area and none were found at the site. None of the thirteen CITES listed species were recorded during the site survey. No nationally protected tree species is listed for the site and none were recorded during the site visit. Eight endemic species are listed for the Rand Highveld Grassland, but none were recorded on the Igolide site.

Alien invasive plant species

Forty-nine alien plant species were recorded on the Igolide site of which 21 are currently declared alien invasive species and 27 naturalised alien species (Appendic B). Another 46 alien species are listed by NewPosa for the region.

Fauna

Note: Bird and bat checklists will be provided and discussed in the avifaunal and bat specialist assessments.

Mammals

The site falls within the distribution range of 85 terrestrial mammal species. Five IUCN threatened mammal species were listed for the environs of the Igolide site with the endangered Mountain reedbuck *Redunca fulvorufula* recorded on site. However, a large portion of the Igolide site at the time of the survey was a game farm and the species could have been introduced. The Screening Tool highlighted the Spotted-necked Otter *Hydrictis maculicollis* and the Maquassie Musk Shrew *Crocidura maquassiensis* for the region. Neither of them were recorded on site during the survey although they may occur in the region. The property (a game farm) has game-proof fencing and nine Schedule 2 Protected Game (GDARD 1983) and three Schedule 8 Problem Animals have been recorded on the Igolide site. The three Schedule 4 Protected Wild Animals (mammals) listed in the ADU database were not recorded on site. According to ToPS legislation (NEMBA 2007c), three mammal species are listed as Vulnerable and five species are Protected. The only ToPS-listed species recorded on site was the black wildebeest (*Connochaetes gnou)*.

Reptiles and frogs

Forty-four reptile species are listed for the region. The list includes one IUCN threatened (Vulnerable) species, i.e. *Crocodylus niloticus* for the region. Provincially protected reptile species include 26 Schedule 2 Protected Game and 17 Schedule 5 snakes. The python *Python natalensis* is the only protected reptile species according to the ToPS list (NEMBA 2007c). The Giant Bull Frog *Pyxicephalus adspersus* is listed as Near Threatened and is also on the ToPS list as a protected species. However, all wetlands as well as a buffer (as specified by the aquatic specialist) around the wetland should be avoided by the development.

Invertebrates

Two Lepidopteran species listed by the Screening Tool are unlikely to occur on site because their host plant was not recorded on site. According to the RSA Red List, *Clonia uvarovi* (Orthoptera) is rated as Vulnerable. It inhabits tall woodland savanna, a habitat that is not present on site. Where the habitat on site has been decribed as bushveld it may be marginally suitable for the species. Other invertebrates are listed in Appendix C.

Conservation

The study site is part of the NPAES (NPAES 2018). All turbines are located outside the NPAES. The site is located in

the Gauteng Shale Mountain Bushveld and Rand Highveld Grassland that are classified as "Least Concern" and "Vulnerable" respectively.

Habitat sensitivity

A sensitivity model was applied to the **vegetation data** for each of the 13 habitats (plant communities) on site. Habitats 2, 5 and 7 (rocky outcrops, wetlands and watercourses respectively) were rated as of medium sensitivity and the remainder as low sensitivity. The proposed substation is not located in any sensitive habitat or CBA and could be used as the preferred site for the substation and BESS facility. The WEF infrastructure is currently located mostly in Habitat 4 (grassland) and all rocky hills, rocky outcrops (sheets) and drainage lines are avoided. The ten turbines are located in a habitat with a low vegetation sensitivity rating according to the model applied (Figure 7, Habitat 4).

Buffers are applicable to the development along the watercourses. A buffer zone of 32 m is usually applied to drainage lines, but the bat and aquatic specialists may apply wider buffer zones along these habitats. It is recommended that the buffer zones specified in the aquatic report are used as guideline.

Screening Tool

The Screening Tool rated the sensitivity of the Plant Species Theme as medium and four species were highlighted as being of concern. None of the SCC highlighted by the Screening Tool were recorded on site.

The Screening Tool rated the sensitivity of the Animal Species Theme as medium. Eight animal species were highlighted by the Screening Tool for the region and include three bird species (refer to avifaunal specialist report), three invertebrate species and two mammal species. The 'Vulnerable' Maquassie Musk Shrew *Crocidura maquassiensis* and the Spotted-necked Otter *Hydrictis maculicollis* were not recorded on site. The two Lepidopteran species in the region (*Lepidochrysops praeterita* and *L. procera*) were not recorded and their host plant (*Ocimum obovatum*) was not encountered during the site survey. None of the Lepidopteran species highlighted by the Screening Tool are listed on the ADU database for the region. According to the RSA Red List, *Clonia uvarovi* (Orthoptera) is rated as Vulnerable. It inhabits tall woodland savanna (http://speciesstatus.sanbi.org /assessment/last-assessment/4333/), and no tall woodland savanna is present on site. Where the habitat on site has been decribed as bushveld it may be marginally suitable for the species.

The Screening Tool rated the sensitivity of the Relative Terrestrial Biodiversity Theme as very high based on the presence of CBAs, ESAs, NPAES and a vulnerable ecosystem. The study area is not located in a protected area. The study site is part of the NPAES (NPAES 2018). CBAs and ESAs are present on the site (CPlanV33_1110_ge 2017) and development within the CBAs should best be avoided. Turbines WTG04, WTG07 and WTG08 lie in ESAs and their positions may be reconsidered.

The Freshwater Ecosystem Priority Areas (FEPAs) or water catchments are priority areas for conserving freshwater ecosystems and supporting sustainable use of water resources and upstream management areas. The FEPAs were not flagged by the Screening Tool.

Environmental Impact Assessment

The key issue is that a sizeable portion of the site falls within a 'Vulnerable' national vegetation type, i.e. the Rand Highveld Grassland and a sizeable proportion of the proposed infrastructure (seven turbines) is located in this vegetation type.

The direct, indirect and cumulative impacts of the proposed development on the Terrestrial Biodiversity and Species were assessed based on the knowledge gained during the site visit and literature review. Each of the impacts is briefly described in Chapters 12 & 13 in terms of the nature; proposed mitigation measures; and the significance of

the impact without and with the mitigation measures applied. In this section the issues, risks and impacts associated with the project from a Terrestrial Biodiversity and Species viewpoint is presented. The methodology follows the guidelines provided by WSP.

Potential impacts identified during construction, operational and decommissioning phases

- Loss of vegetation/habitat
- The potential loss of threatened, protected, CITES listed and/or endemic plants/animals
- Loss of faunal habitat
- Direct faunal mortalities due to construction and increased traffic
- Increased dust deposition
- Increased human activity, noise and light levels
- Establishment of alien vegetation
- Increased water run-off and erosion
- Changes in animal behaviour
- Impact of road construction

Cumulative impacts

- Vegetation loss and habitat destruction
- Compromising integrity of CBAs, ESAs and NPAES
- Reduced ability to meet conservation obligations & targets
- Loss of landscape connectivity and disruption of broad-scale ecological processes

Legislative and permit requirements

GDARDE is the regulatory authority in Gauteng for the issuing of permits for fauna, flora, hunting and CITES. The most important permit requirement is the permit that needs to be obtained for the removal of plant species protected in Gauteng. Legislative requirements also relate to the combatting of alien invasive species. Other aspects are summarised in Chapter 14.

Key environmental mitigation and management actions proposed

The impacts and their mitigation are presented in Chapters 12 & 13, whereas the management objectives and actions as well as monitoring relating to the impacts and their mitigation are discussed in the Environmental Management Programme (see Chapter 15).

Final specialist statement and authorisation recommendation

A brief summary of the most important considerations is provided below:

Vegetation and flora:

- **Vegetation types:** The Rand Highveld Grassland vegetation type is listed as “Vulnerable”, while the Gauteng Shale Mountain Bushveld vegetation type is listed as “Least Concern".
- **Screening tool:** None of the SCC highlighted by the Screening Tool were recorded on site.
- **Threatened plant species:** No IUCN threatened or red listed plant species were encountered during the field survey.
- **Near Threatened plant species**: Two near threatened species, *Gnaphalium nelsonii* and *Cineraria austrotransvaalensis*, could potentially occur on site according to the Gauteng C-plan.
- **Protected plant species:** No CITES listed species, ToPS species or protected tree species were recorded on site.
- **Provincially protected species:** Only one provincially protected species with a Least Concern status, was recorded on site, i.e. *Gladiolus permeabilis* (Iridaceae).

- **Habitats:** Ten of the 13 habitats/vegetation units had a low vegetation sensitivity rating with three habitats/vegetation units rated as of medium sensitivity (streams, wetlands and rocky outcrops).
- **Statement**: Because none of the SCC highlighted by the Screening Tool were found on site, we suggest that the Plant Species Theme's site sensitivity is rated as **Low.**

Fauna (excluding the bird and bat components):

- **Threatened animal species:** The key faunal issue is the presence of the endangered mountain reedbuck. However, a large portion of the Igolide site at the time of the survey was a game farm and the species could have been introduced.
- **Screening tool:** None of the SCC highlighted by the Screening Tool were recorded on site.
- **Overall sensitivity of animal species theme:** This is rated as medium by the Screening Tool. Excluding the avifaunal component, we would suggest a **Low** - **Medium** sensitivity. If the suggested mitigation measures are followed the threatened animal species should not be negatively affected by the WEF.

Conservation:

- **Protected Areas:** The study area is not located in a protected area.
- **Vulnerable ecosystem:** The Rand Highveld Grassland vegetation type is listed as "Vulnerable" and covers a large portion of the site. Seven of the ten turbines are situated in this vegetation type.
- **National Protected Areas Expansion Strategy (NPAES):** The study site is part of the NPAES (NPAES 2018) and all turbines are located outside the NPAES.
- **Critical Biodiversity Areas (CBAs):** CBAs are present on the site (CPlanV33_1110_ge 2011) and development within the CBAs should best be avoided.
- **Ecological Support Areas (ESAs):** Turbines WTG04, WTG07 and WTG08 lie in ESAs and their positions may be reconsidered. The extent of the development is relatively small and will not have a negative impact on the functionality of the broader ESA. Thus no additional loss of ecological connectivity in relation to the broader landscape is likely.
- **Other Natural Areas (ONAs):** Seven of the 10 turbines are fully situated in ONAs.
- **Freshwater Ecosystem Priority Area (FEPA):** Two rivers cross the site with some wetlands delineated along the rivers. The development will avoid the wetlands. FEPAs were not highlighted by the Screening Tool.
- **Terrestrial Biodiversity Theme:** Although portions of the site qualify as CBAs and ESAs and parts have been included in the NPAES, a substantial portion of the site has been identified as ONAs (even when in the Vulnerable vegetation type). The development has been largely contained in the ONAs. In the Screening Tool the Terrestrial Biodiversity Theme allocated a Very High sensitivity to the entire site, which appears to disregard the portion of the site that does not qualify as CBA, ESA or NPAES and is ONA.

Ecological processes, function and drivers:

- Overall, it is unlikely that the development will contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions.
- The disturbance caused by the construction of the WEF will create conditions favourable for invasion by alien species.
- Fire is an important driver of vegetation dynamics in the Grassland Biome and can occur when the fuel load is high. To avoid damage to the infrastructure, fire will have to be suppressed. If the grass layer is regularly mowed/brush cut, it should prevent grasses from becoming moribund in the absence of fire although mowing or brushcutting would reduce seed set.
- Grasslands have evolved under the grazing pressure from large ungulates. Mesic Highveld Grasslands are reasonably well adapted to grazing pressure under low to moderate stocking rates with adequate rest periods. The WEF development will still allow livestock or wildlife grazing.

Significance of environmental impacts:

Overall the significance of the environmental impacts was rated as low to very low, with cumulative impacts being rated as moderate before any mitigation. In summary:

- Since the development footprint is small, the loss of habitat or species will be limited.
- Since the turbine footprint is relatively small and spread across the site, the loss of prime habitat within the 'Vulnerable' Rand Highveld Grassland vegetation type can be constrained by well-planned positioning of the turbines. Vegetation clearance due to service roads generally has a larger impact than due to turbine locations, however since the roads will have a gravel surface animal movement should not be impaired. Furthermore, existing tracks should be preferred for upgrading to service roads. Beyond the permanent infrastructure footprint, environmental functions and processes should however, not be altered.
- The extent of clearing activities in the Rand Highveld Grassland vegetation type is small in relation to the remaining extent of the vegetation type and ecosystem threat status will not be affected.
- None of the habitats identified were rated as highly sensitive, and the overall impact per habitat type will be small.
- The impact on overall species and ecosystem diversity of the adjacent land will not be affected and the impact will be small.
- The impact on populations of threatened or protected species will be small if mitigation measures are applied.
- Depending on the type of fencing to be erected at some of the infrastructure, the WEF will contribute minimally to obstruction of animal movement.

Key environmental mitigation and management actions proposed

- A walkthrough would be needed prior to construction to inform permit applications for protected plant species.
- Ensure that the placing of infrastructure takes the sensitivity mapping of the ecological assessment into account to avoid and reduce impacts on species and habitats of conservation concern.
- Demarcate all infrastructure sites clearly to avoid unnecessary clearance of the vegetation.
- Avoid or minimise impacts that could potentially affect animal behaviour.
- Trenches should not be left open for long periods of time. Trenches should be inspected regularly for the presence of trapped animals.
- Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns.
- Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the site.
- Speed limits should be strictly adhered to.
- Dust control measures should be implemented.
- Permits have to be obtained for the removal of GDARDE protected species.
- Implement a monitoring program for the early detection of alien invasive plant species.
- Employ a control program to combat declared alien invasive plant species.

Preferred infrastructure locations

Access route:

- The access road is currently from an unnamed road to the east. The access road follows existing farm tracks more or less to the centre of the site. Although the road does cross a CBA2 (Important area) and ESAs it is acceptable because it follows an existing farm road.

Turbines:

- Turbines WTG04, WTG07 and WTG08 lie in ESAs and where possible the number of turbines should be limited within the ESA.

- All other turbines are situated in ONAs.

Ancillary areas (On-site IPP substation, batching plant, construction camp, laydown):

- These ancillary areas fall in a 'Least Concern' ecosystem and outside of CBA2s, ESAs and NPAES.

Roads:

- The road network within CBAs (only CBA2s are present on site) and ESAs should be minimised.
- Wherever possible, existing roads should be used.
- The construction of a road should be done in the most environmentally sensitive manner possible.
- A suitably qualified person should plan, design and supervise the proper construction of roads to minimize the impact on the environment.
- Roads should be provided with run-off structures to reduce the risk of erosion.
- Proper road maintenance procedures should be in place.

Final specialist statement and authorisation recommendation

The low impact significance after mitigation and low sensitivity rating for many of the habitats means the project could go ahead without major constraints, provided the mitigation measures and management actions proposed to conserve protected fauna and flora on the site are applied. **We thus recommend authorisation of the project provided all mitigation measures are implemented.**

SPECIALIST DECLARATION

This report has been prepared in terms of the Environmental Impact Assessment (EIA) Regulations under the National Environmental Management Act (Act No. 107 of 1998) (NEMA 2014, 2017) and the gazetted '*Procedures for the assessment and minimum criteria for reporting on identified environmental themes* (Government Gazette 43110, No. 320, 20 March 2020 (NEMA 2020a). Note that these protocols replace the requirements of Appendix 6 of the 2014 NEMA EIA Regulations.

Appointment of specialist

Ekotrust cc was originally commissioned by CSIR (EMS) Stellenbosch to provide an assessment on the terrestrial biodiversity and species of the Igolide Wind Energy Facility, located approximately 6 km northeast of Fochville, within the Merafong City Local Municipality in the Gauteng Province. However, **WSP Group Africa** was subsequently appointed as the new EAP for the project in 2023.

*Note: This specialist assessment was commissioned on **25 October 2020** (between ENERTRAG and Ekotrust) prior to the gazetting of the 'Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species' and the 'Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species' (GG 43855 / GN R1150, 30 October 2020)* (NEMA 2020b). *We refer to the following in the gazetted procedures published on 30 October 2020: **"The requirements of these protocols will apply from the date of publication, except where the applicant provides proof to the competent authority that the specialist assessment affected by these protocols had been commissioned by the date of publication of these protocols in the Government Gazette, in which case Appendix 6 of the Environmental impact Assessment Regulations, 2014, as amended, will apply to such applications."***

Company profile:

Name of Company: Ekotrust cc
(Registration number: CK90/05465/23)
Sole Member: Dr Noel van Rooyen
Founding date: 1990

Ekotrust cc specialises in habitat evaluation, vegetation classification and mapping, floristic diversity assessments, rare species assessments, alien plant assessments and management, wildlife management, wildlife production and economic assessments, veld condition assessment, bush encroachment, fire management, carrying capacity, wildlife numbers and ratios.

Specialist declaration

We, Noel van Rooyen and Gretel van Rooyen, as the appointed independent specialists, hereby declare that we:

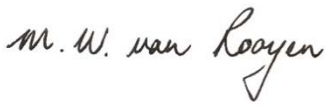
- act as independent specialists in this application;
- perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report, as it relates to our specialist input/study, to be objective, true and correct within the framework of assumptions and limitations;

- do not have and will not have any business, financial, personal or other interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations 2014, and amendments 2017, Procedures for the assessment and minimum requirements for reporting on identified environmental themes in terms of Sections 24(5) (a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation, and any specific environmental management act (NEMA 2020);
- declare that there are no circumstances that may compromise our objectivity in performing such work;
- have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- will comply with the Act, Regulations and all other applicable legislation;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- have no vested interest in the proposed activity proceeding;
- undertake to disclose to the applicant and the competent authority all material information in our possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; or the objectivity of any report, plan or document to be prepared by us for submission to the competent authority;
- all the particulars furnished by us in this form are true and correct; and
- realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Indemnity and conditions relating to this report:

The observations, findings, recommendations and conclusions provided in the current report are based on the compilers' best scientific and professional knowledge and other available information. If new information should become available Ekotrust cc reserves the right to modify aspects of the report. This report (hard copy and/or electronic) must not be amended or extended without the prior written consent of the author. Furthermore, any recommendations, statements or conclusions drawn from or based on this report must make reference to the report. If these recommendations, statements or conclusions form part of a main report relating to the current investigation, this report must be included in its entirety (as an Appendix).

Although Ekotrust cc has exercised due care in preparing this report, it accepts no liability, and by receiving this document, the client indemnifies Ekotrust cc against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, and by the use of the information contained in this document.

Signature of specialists:		
Name of specialists:	Dr N van Rooyen	Prof. MW van Rooyen
Date:	16 October 2023	16 October 2023

This report has been prepared in terms of the Environmental Impact Assessment (EIA) Regulations under the National Environmental Management Act (Act No. 107 of 1998) (NEMA 2014, 2017) and the gazetted '*Procedures for the assessment and minimum criteria for reporting on identified environmental themes* (Government Gazette 43110, No. 320, 20 March 2020 (NEMA 2020a). Note that this protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations.

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

AIS	Alien Invasive species
BA	Basic Assessment
BAR	Basic Assessment Report
CBA	Critical Biodiversity Area
CBD	Convention on Biodiversity
CITES	Convention on the International Trade in Endangered Species of Wild Fauna and Flora
CSIR	Council for Scientific and Industrial Research
DFFE	Department of Forestry, Fisheries and the Environment
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIAr	Environmental Impact Assessment Report
EMPr	Environmental Management Plan Report
ESA	Ecological Support Area
IUCN	International Union for the Conservation of Nature
I&APs	Interested and Affected Parties
GDARD	Gauteng Department of Agriculture and Rural Development
GDARDE	Gauteng Department of Agriculture, Rural Development & Environment
GIS	Geographical Information System
NEMA	National Environmental Management Act
NEM:BA	National Environmental Management: Biodiversity Act
NPAES	National Protected Area Expansion Strategy
ONA	Other Natural Areas
PA	Protected Area
SEA	Strategic Environmental Assessment
SANBI	South African National Biodiversity Institute
ToPS	Threatened and Protected Species
ToR	Terms of Reference
WEF	Wind Energy Facility
WSP	WSP Group Africa

GLOSSARY

Alien invasive species	Any species whose establishment and spread outside of its natural distribution range (i) threatens ecosystems, habitats or other species or has a demonstrable potential to threaten ecosystems, habitats or other species; and (ii) may result in economic or environmental harm or harm to human health.
Alternative	A possible course of action, in place of another, that would meet the same purpose and need (of the proposal). Alternatives can refer to any of the following, but are not limited to: alternative sites for development, alternative projects for a particular site, alternative site layouts, alternative designs, alternative processes and alternative materials.
Alluvium	Unconsolidated material deposited by flowing water
Biodiversity	The variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. It includes diversity within species, between species and of ecosystems.
Category 1a Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the act, as a species that must be combatted or eradicated. Landowners are obliged to take immediate steps to control Category 1a species in compliance with sections 75(1), (2) and (3) of the Act. If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must combat or eradicate the listed invasive species in accordance with such a programme.
Category 1b Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the act, as species that must be controlled. If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such a programme.
Category 2 Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the Act as species that require a permit to carry out a restricted activity specified in the Notice or an area specified in the permit, as the case may be. Permit-holders must ensure that specimens of the species do not spread outside of land or area specified in the Notice or permit.
Category 3 Listed Invasive Species	A species listed by notice in terms of section 70(1)(a) of the act, as species that are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of the Act, as specified in the Notice. However, a Category 3 Listed Invasive Species that occurs in riparian areas must be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.
Critical Biodiversity Areas	Areas required to meet biodiversity targets for ecosystems, species or ecological processes. CBAs are regarded as areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species.
Development	The building, erection, construction or establishment of a facility, structure or infrastructure, including associated earthworks or borrow pits, that is necessary for the undertaking of a listed or specified activity.
Development footprint	Any evidence of physical alteration as a result of the undertaking of any activity.
Ecological Support Areas	These are not essential for meeting biodiversity targets, but play an important role in supporting the functioning of Protected Areas or CBAs and are often vital for delivering ecosystem services. ESAs must be maintained in at least a functional and often natural state, but some limited habitat loss may be acceptable.
Endangered species	Any species of fauna and flora referred to in Appendix I and II of CITES (GDARD 1983).
Habitat	A place where a species or ecological community occurs naturally.
Indigenous vegetation	Vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Indigenous	A species that occurs, or has historically occurred, naturally in a free state in nature within the borders of the Republic, but excludes a species that has been introduced in the Republic as a result of human activity.
Introduced	In relation to a species, means the introduction by humans, whether deliberately or accidentally, of a species to a place outside the natural range or natural dispersal potential of that species;
Linear activity	An activity that is arranged in or extending along one or more properties and which affects the environment or any aspect of the environment along the course of the activity, and includes railways, roads, canals, channels, funiculars, pipelines, conveyor belts, cableways, power lines, fences, runways, aircraft landing strips, firebreaks and telecommunication lines.
Mitigate	The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.
"No-Go" option	The “no-go” development alternative option assumes the site remains in its current state, i.e. there is no development in the proposed project area.
Problem Animals	An animal declared to be a problem animal listed in Schedule 8 (GDARD 1983).
Protected plants and specially protected plants	Any species of flora specified in Schedules 11 and 12 of the Ordinance (GDARD 1983).
Protected game, ordinary game and protected wild animals	Any species of wild animal specified in Schedule 2, 3 & 4 of the Ordinance (GDARD 1983).
Watercourse	Includes (a) a river or spring; (b) a natural channel in which water flows regularly or intermittently; (c) a wetland, pan, lake or dam into which, or from which, water flows; and a reference to a watercourse includes, where relevant, its bed and banks.
Wetland	Land that is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

GENERAL INFORMATION

Study site: Igolide Wind Energy Facility (WEF): Portions 14, 20 and RE/22 of the farm Kraalkop 147 IQ and portions 8, 57, 65 and 66 of the farm Leeuwpoort 356 IQ

Proponent: Igolide Wind (Pty) Ltd

Approximate size of property: 680 ha

Environmental Assessment Practitioner (EAP):

WSP Group Africa
Building 1, Golder House, Maxwell Office Park
Magwa Crescent West,
Waterfall City, Midrand
South Africa.
Contact person: Ashlea Strong
Tel. +27 11 361 1392
Mobile: +27 82 786 7819
E-mail: Ashlea.Strong@wsp.com

Terrestrial Biodiversity and Species Assessment by:

This specialist assessment was undertaken by Dr Noel van Rooyen and Prof. Gretel van Rooyen of Ekotrust cc. The *Curriculum Vitae* of the specialists are included in Appendix F of this assessment.

Dr Noel van Rooyen Pr.Sci.Nat., Reg. no. 401430/83 - Botanical Sciences
Prof. Gretel van Rooyen Pr.Sci.Nat., Reg. no. 400509/14 – Ecological Sciences; LAkadSA, SAAB;
Address:
7 St George Street,
Lionviham,
Somerset West, 7130,

Mobile: 082 882 0886 (NvR)
072 025 3386 (GvR)

e-mails:
noel@ekotrust.co.za
gretel@ekotrust.co.za

TERMS OF REFERENCE

The Scope of Work for the terrestrial biodiversity and ecology specialist study includes the following tasks:

- Compilation of a specialist study in adherence to:
  - the Environmental Impact Assessment (EIA) Regulations under the National Environmental Management Act (Act No. 107 of 1998) (NEMA 2014, 2017) and the gazetted '*Procedures for the assessment and minimum criteria for reporting on identified environmental themes* (Government Gazette 43110, No. 320, 20 March 2020 (NEMA 2020a). Note that this protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations.
  - any additional relevant legislation and guidelines that may be deemed necessary.
- The assessment should be based on existing information, national and provincial databases, SANBI mapping, professional experience and field work conducted.
- Undertake a site inspection to identify the site sensitivities, and verify them in terms of the National Web-Based Screening Tool (https://screening.environment.gov.za/).
- If needed, liaise with the South African National Biodiversity Institute (SANBI) to obtain information on sensitive species flagged in the National Web-Based Screening Tool (where species names are obscured / only numbered).
- Describe the terrestrial ecological features of the project area, with focus on features that are potentially impacted by the proposed project. The description should include the major habitat forms within the study site, giving due consideration to terrestrial ecology (flora and fauna), Species of Conservation Concern (SCC) or Protected Species.
- If applicable, specify development set-backs / buffers, and provide clear reasons for these recommendations.
- Map the sensitive ecological features within the proposed project area, showing any "no-go" areas (i.e. "very high" sensitivity).
- Provide input on the preferred infrastructure locations following the sensitivity analysis.
- Provide sensitive features spatial data in a useable GIS format (.kmz /.shp).
- Provide an assessment of direct, indirect and cumulative impacts associated with the proposed WEF, with and without mitigation.
- Address relevant concerns / comments raised by Interested and Affected Parties and Stakeholders, including the Competent Authority, during Public Participation Processes.
- Identify relevant legislative requirements and permits that may be required.
- Recommend mitigation measures, best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts to be included in the Environmental Management Programme (EMPr).
- Update draft specialist study report after Environmental Assessment Practitioner (EAP) and client review (before public release) and after public review for submission to the Competent Authority for decision-making.
- Address any queries from the Competent Authority during the decision-making phase.

STATEMENTS, LIMITATIONS, ASSUMPTIONS AND UNCERTAINTIES

The following assumptions, limitations or uncertainties are listed regarding the evaluation of the impacts of the proposed Igolide project on the terrestrial biodiversity and ecology:

- The site visit was undertaken in January 2021 after the region had received good rains, thus the botanical assessment was conducted under favourable conditions.
- The area has been well collected in the past and the list of plant species that could potentially occur on site as obtained from the NewPosa database, is thus considered to provide a good representation of the potential flora on site. The NewPosa list was taken for an area far greater than the WEF site (grids 2627BC & 2627AD).
- Rare and threatened plant and animal species are generally uncommon and/or localised and the once-off survey may fail to locate such species.
- Rare plant species usually occur in specialised and localised habitats, thus special attention was given to these habitats. The list was supplemented by a list of SCC provided by GDARDE (2011) occurring on the farms in the immediate vicinity of the development.
- No aerial census, road census or trapping (either camera trapping or by way of Sherman traps) was conducted for fauna, since these methods generally provide an underrepresentation of the full faunal diversity within the limited timeframe available. Faunal lists were sourced from literature and the website of the Animal Demography Unit of the University of Cape Town.

1. INTRODUCTION

The proposed Igolide Wind Energy Facility (WEF) and its associated infrastructure near Fochville in Gauteng will be operated under a Special Purpose Vehicle (SPV), the Igolide Wind (Pty) Ltd (the "Proponent"). The proposed Project will be developed within a project area of approximately 680 hectares (ha). Within this project area, the extent of the Project footprint will be approximately 50 hectares (ha). The project is located approximately 6 km northeast of Fochville, within the Merafong City Local Municipality in the Gauteng Province of South Africa. The site location (centre point) is at 26° 27' 2.44" S; 27° 30' 58.82" E. The WEF comprises the following (full project description is given by the client):

- Ten wind turbine generators (WTGs) with a maximum capacity of up to 100 MW.
- Turbines with a hub height of up to 200 m, a rotor diameter of up to 200 m and tip height of up to 300 m.
- Foundation: Approximately 25 m diameter x 3 m deep. Volume to be excavated will be approximately 2 200m^3, in sandy soils due to access requirements and safe slope stability requirements.
- Turbine hardstand areas of approximately 1 ha per turbine. Hardstand does not require concrete.
- A 33/132kV on-site IPP substation, including the Battery Energy Storage System (BESS), with a total footpring of up to 2.5 ha. The on-site IPP substation will consist of a high voltage substation yard to allow for multiple (up to 132kV) feeder bays and transformers, control building, telecommunication infrastructure, and other substation components, as required. A 500m buffer around the on-site IPP substation has been identified to ensure flexibility in routing the powerline.
- The BESS storage capacity will be up to 100 MW/400 megawatt-hour (MWh) with up to four hours of storage.
- Medium voltage collector system will comprise cables up to and including 33 kV connecting the turbines to the on-site IPP substation and will be laid underground except where a technical assessment suggests that overhead lines are required.
- Access and internal roads with a width of 8 - 10 m will provide access to each turbine, the BESS, on-site substation, step-down substation and laydown area. The width will increase up to 20 m for turning circle/bypass areas to allow for larger component transport. Existing access roads will be used where possible to minimise impact. Where required, the width of the existing roads will be widened to ensure the passage of vehicles.
- Temporary construction camp of up to 1 ha.
- A temporary laydown area of 2 - 3 ha is envisaged.
    a. The Operation and Maintenance (O&M) building footprint is to be located near the on-site substation and will not exceed 0.5 ha. Typical areas include: Operations building – 20 m x 10 m = 200 m^2; Workshop and stores area – of ~300 m^2; and Refuse area for temporary waste storage and conservancy tanks to service ablution facility.
- The cement batching plant will have a footprint of 1 ha.
- Supporting infrastructure includes fencing, lighting, lightning protection, telecommunication infrastructure, stormwater channels, water pipelines, offices, gatehouse and security building.
- Grid (separate EA): A single or double circuit 132 kV overhead powerline and 132 kV switching station with a foorprint of 1.5 ha (adjacent to the on-site IPP substation) to feed the electricity generated by the proposed WEF into Eskom's Midas Main Transmission Substation via a 11 km overhead line.

Scoping and Environmental Impact Assessment processes are required for the proposed development of the Igolide WEF. As required in Part A of the Government Gazette 43110, GN 320, a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area.

This report presents the Specialist Terrestrial Biodiversity and Species Impact Assessment Report of the proposed Igolide site project. The scope, purpose and objectives of the report have essentially been summarised in the ToR.

2. APPROACH AND METHODOLOGY

2.1 Approach

The study commenced as a desktop study, followed by field-based surveys in January 2021. October to April is the main rainy season in the region when about 92% of the annual rainfall occurs, thus the site visits were undertaken at a favourable time.

The focus of the site visit was:

- to undertake a site sensitivity verification in order to confirm the current land use and environmental sensitivity as identified in the Screening Tool; and
- to conduct surveys (fauna and flora) of the Igolide site to identify sensitive habitats, to classify the vegetation into habitats (or plant communities), compile species lists and to search for Species of Conservation Concern (SCC). According to SANBI's (SANBI 2020) definition of SCC, these are species that have a high conservation importance in terms of preserving South Africa's high floristic and faunal diversity and include not only threatened species, but also those classified as Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient - Insufficient Information (DDD) (www.redlist.SANBI.org).

Digital information was obtained from GDARDE (GDARDE 2011, C-Plan V3.3) confirming that the 2011 version of C-Plan was currently still the correct version, but that an update should be available by 2024. Hard copy and digital information from spatial databases, such as BGIS of the South African Biodiversity Institute (SANBI) for maps of Critical Biodiversity Areas, Protected Areas, Protected Area Expansion Strategy, Freshwater Ecosystem Priority Areas; the geological survey maps (2626 Wes-Rand); land type maps (2626 Wes-Rand); topocadastral maps (1:50 000 maps); vegetation types of SANBI (2006 – 2018); NewPosa database of SANBI; and databases of the Animal Demography Unit, University of Cape Town, as well literature were sourced to provide information on the environment and biodiversity of the study area.

Satellite images (Google Earth) were used to stratify the area into relatively homogeneous terrain/vegetation units. The vegetation survey consisted of visiting the mapped units and systematically recording plant species on site and estimating their cover. A total of 31 sample plots were surveyed on the Igolide site. Physical habitat features were also noted. During the site visit, digital photographs were taken and representative photographs of the different habitats are included in the report. The site was also surveyed for rare, threatened and/or endemic plant species during the site visit.

The animal site survey was limited to day-time visual assessments on site. Animal species presence on site was mainly attained by means of direct or indirect sighting methods (animals, spoor, burrows, scats, sounds), whilst traversing the site by vehicle or on foot. Red-listed species are generally uncommon and/or localised and the survey may have been insufficient to record their presence at or near the proposed development. Furthermore, the owner of the participating property was consulted regarding sightings of especially mammal species on the property. Please note the avifauna and bats were assessed in the avifaunal and bat specialist assessments and are not part of the current report.

2.2 Vegetation and flora

The plant species data were summarised in a phytosociological table (Appendix A) and nine plant communities and a further five habitats were identified, described and mapped. The term species is used here in a general sense to denote species, subspecies and varieties. The checklist of plant species in Appendix B was compiled from the

NewPosa database of the South African National Biodiversity Institute (newposa.sanbi.org) and supplemented by own observations. The IUCN status, conservation and protected status of all plant species provided in Appendix B were determined from available literature and Acts, e.g. NewPosa database (newposa.sanbi.org), and Red list database (redlist.sanbi.org) of the South African National Biodiversity Institute; NEM:BA (2007c) (ToPS list); GDARD (1983), GDARDE (2011) and CITES (2023).

2.3 Fauna

Species lists (the term species is used here in a general sense to denote species, subspecies and varieties) of the faunal component were sourced from the Animal Demography Unit, University of Cape Town website (www.adu.uct.ac.za) and consulting of other available databases and/or relevant literature, e.g. Leeming (2003), Skinner and Chimimba (2005), Alexander and Marais (2007), Mecenero *et al.* (2013), Bates *et al.* (2014), Child *et al.* (2016) and DEA (2016) to determine the diversity, conservation status and distribution of relevant faunal species (Appendix C). These species lists were supplemented by own observations and those observed by the landowner.

2.4 Sensitivity assessment

Based on the environmental features and the plant species encountered in the on-site survey, a sensitivity assessment of the vegetation of each habitat was done (Chapter 10). Sensitive features are presented spatially in GIS format (provided as a separate .kmz file).

2.5 Sources of information

Vegetation:

- Vegetation types occurring in the area were obtained from Mucina & Rutherford (2006) and the revised national vegetation map produced by SANBI in 2018 (SANBI 2006-2018).
- Conservation status of the vegetation types was obtained from Mucina & Rutherford (2006) and the National List of Threatened Ecosystems (NEMA 2011, Skowno *et al.* 2019).
- Information on species endemic to a national vegetation type was obtained from Mucina & Rutherford (2006);
- The Igolide WEF does not occur in any Centre of Plant Endemism (Van Wyk & Smith 2001).
- A plant species checklist of the immediate region around the site (2627AD & 2627BC grids) was obtained from the NewPosa database of the South African National Biodiversity Institute (SANBI) and supplemented by own observations (Appendix B).
- The IUCN Red List Category for the plant species was extracted from the Threatened Species Programme as well as the NewPosa database of the South African National Biodiversity Institute (SANBI).
- GDARD (1983) was consulted to establish provincially specially protected and protected status of plant species including the GDARDE (2011) for rare plant species at and near the Igolide site (links provided by GDARDE).
- The National Protected tree list (NFA 2023) was consulted.

Fauna

- Lists of mammals, reptiles, frogs, scorpions, (Scorpiones), spiders (Arachnida), butterflies (Lepidoptera), lacewings (Neuroptera), dung beetles (Scarabinae) and dragonflies (Odonata) were extracted from the Animal Demography Unit, University of Cape Town website (http://vmus.adu.org.za) and supplemented by information gathered in Bates *et al*. (2014) for reptiles; Skinner and Chimimba (2005) for mammals; and Mecenero *et al.* (2013) for butterflies (Appendix C).
- The IUCN Red List Category for the animal species was extracted from Child *et al.* (2016) for mammals;

Bates *et al*. (2014) for reptiles; and Mecenero *et al.* (2013) for butterflies. No IUCN Categories are however available for lacewings, dung beetles, spiders and scorpions.

- GDARD (1983) was consulted to establish provincially specially protected and protected status of animal species.
- The avifauna and bat components are reported on separately (see specialist reports).

Other

- The GDARDE (2011) was consulted for maps indicating CBAs and ESAs in the region of the Igolide site (links provided by GDARDE).
- The National Protected Areas Expansion Strategy (NPAES 2018) was consulted for possible inclusion of the site into the expansion strategy.
- National Freshwater Ecosystem Priority Areas (FEPA) was consulted for rivers and wetlands.

Regulatory framework

This report has been prepared in terms of the Environmental Impact Assessment (EIA) Regulations under the National Environmental Management Act (Act No. 107 of 1998) (NEMA 2014, 2017) and the gazetted Environmental Assessment Protocol of the NEMA EIA Regulations (2014, as amended), where applicable (Government Gazette 43110, No. 320, 20 March 2020.

*Note: This specialist assessment was commissioned on **25 October 2020** (between ENERTRAG and Ekotrust) prior to the gazetting of the 'Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species' and the 'Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species' (GG 43855 / GN R1150, 30 October 2020)* (NEMA 2020b). *We refer to the following in the gazetted procedures published on 30 October 2020: **"The requirements of these protocols will apply from the date of publication, except where the applicant provides proof to the competent authority that the specialist assessment affected by these protocols had been commissioned by the date of publication of these protocols in the Government Gazette, in which case Appendix 6 of the Environmental impact Assessment Regulations, 2014, as amended, will apply to such applications."***

3. REGULATORY FRAMEWORK

3.1 Introduction

The White Paper on the conservation and sustainable use of South Africa's biodiversity and the National Environmental Management Act (Act No. 107 of 1998) specifies that due care must be taken to conserve and avoid negative impacts on biodiversity and that the sustainable, equitable and efficient use of biological resources must be promoted. Various acts provide control over natural resources in terms of their conservation, the use of biological resources and avoidance of negative impacts on biodiversity. Some international conventions are also relevant to sustainable development.

3.2 Natural resources

Terrestrial and other ecosystems and their associated species are widely used for commercial, semi-commercial and subsistence purposes through both formal and informal markets. While some of this use is well managed and/or sustainable, much is thought to be unsustainable. "Use" in this case refers to direct use, such as collecting, harvesting, hunting and fishing for human consumption and production, as well as more indirect use such as ecotourism and wildlife ranching.

3.3 Convention on Biodiversity (CBD)

South Africa is a signatory to the United Nations Convention on Biological Diversity (CBD), which was ratified in 1995. The CBD requires signatory states to implement the objectives of the Convention, which are the conservation of biodiversity; the sustainable use of biological resources; and the fair and equitable sharing of benefits arising from the use of genetic resources. According to Article 14 (a) of the CBD, each Contracting Party, as far as possible and as appropriate, must introduce appropriate procedures, such as environmental impact assessments of its proposed projects that are likely to have significant adverse effects on biological diversity, to avoid or minimize these effects and, where appropriate, to allow for public participation in such procedures.

3.4 National Environmental Management Act (Act No. 107 of 1998) (NEMA)

NEMA is the framework environmental management legislation, enacted as part of the government's mandate to ensure every person's constitutional right to an environment that is not harmful to his or her health or well-being. It is administered by the Department of Forestry, Fisheries and the Environment (DFFE), but several functions have been delegated to the provincial environment departments. One of the purposes of NEMA is to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment. The Act further aims to provide for institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state and to provide for the administration and enforcement of other environmental management laws.

The EIA Regulations Listing Notices of 2010 were repealed in 2014 and amended regulations and listings were published in 2014 and 2017 under the National Environmental Management Act (NEMA 2014, 2017). Listing Notice 1 (GRN No. 327), Listing Notice 2 (GRN No 325) and Listing Notice 3 (GRN No 324) of the 2017 Regulations list activities that may require Environmental Authorisation prior to commencement of an activity and identify competent authorities in terms of sections 24(2) and 24D of the Act.

Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA 1998, when applying for Environmental Authorisation were published in the Government Gazette 43110, No 320, 20 March 2020 and Government Gazette 43855 / GN R1150, 30 October 2020).

3.5 National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA)

As the principal national act regulating biodiversity protection, NEM:BA, which is administered by DFFE, is concerned with the management and conservation of biological diversity, as well as the use of indigenous biological resources in a sustainable manner. The term 'biodiversity', according to the Convention on Biodiversity (CBD), refers to the variability among living organisms from all sources including, *inter alia* terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity in genes, species and ecosystems.

Threatened ecosystems

Section 53 of NEM:BA lists the threatened status of ecosystems, i.e. critically endangered ecosystems, endangered ecosystems, and vulnerable ecosystems. The list of threatened ecosystems was published in 2011 (NEM:BA 2011). Thirty-four percent of South Africa's 440 terrestrial ecosystems are considered threatened. Of these, 5% are critically endangered (mostly in fynbos and forest biomes), 13% are endangered (mostly in the grassland and savanna biomes), and 16% are vulnerable (mostly in the fynbos and grassland biomes). The recent 2018 National Biodiversity Assessment (Skowno *et al.* 2019) includes the updated extent and status of threatened ecosystems, although not yet formally adopted under the NEM:BA.

Threatened or Protected Species (ToPS) Regulations

Section 56 of NEM:BA makes provision for the declaration of species which are of such high conservation value, national importance or are considered threatened that they need protection, i.e. critically endangered species, endangered species and vulnerable species. Lists of species that are threatened or protected, and associated activities that are prohibited and/or exempted from restriction were published in 2007 (NEMBA 2007c). Any proposed development involving one or more threatened or protected species and/or prohibited/restricted activities will require a permit in term of these Threatened or Protected Species (ToPS) Regulations.

Alien and Invasive Species (AIS) Regulations

Chapter 5 of NEM:BA provides for the protection of biodiversity from alien and invasive species. The act defines alien species and provides lists of invasive species in regulations. The Alien and Invasive Species (AIS) lists were published in Government Gazette No. 43726 of 18 September 2020 (NEM:BA 2020a). The Alien and Invasive Species (AIS) Regulations, in terms of Section 97(1) of NEM:BA, was subsequently published in Government Gazette No. 43735 of 25 September 2020 (NEM:BA 2020b).

In terms of the aforementioned legislation, the following categories of declared alien and invasive plants are recognised in South Africa (see Glossary for explanations):

1. Category 1a Listed Invasive Species
2. Category 1b Listed Invasive Species
3. Category 2 Listed Invasive Species
4. Category 3 Listed Invasive Species

3.6 The National Environmental Management: Protected Areas Act (Act No. 57 of 2003) (NEM:PAA)

NEM:PAA provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; and for matters in connection therewith.

3.7 National Forests Act (Act No. 84 of 1998) (NFA)

The National Forest Act makes provision for the declaration of for example specially protected areas, forest nature reserves, forest wilderness areas and protected woodlands. The latest list of declared protected tree species in terms of the NFA was published in 2023 (NFA 2023). In terms of section 15(1) of this act, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. The competent authority responsible for considering and issuing the license will be the national Department of Forestry, Fisheries and the Environment (DFFE).

3.8 Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA)

The objectives of the Conservation of Agricultural Resources Act are to provide for the conservation of the natural agricultural resources by the maintenance of the production potential of the land; by combating and preventing erosion and weakening or destruction of the water resources; and by protecting natural vegetation and combating weeds and invader plants. In order to achieve the objectives, certain control measures are prescribed to which land users must comply. The activities mentioned relate to:

- the cultivation of virgin soil;
- the irrigation of land;
- the prevention or control of waterlogging or salinisation of land;
- the utilisation and protection of vleis, marshes and water courses;
- the regulation of the flow pattern of run-off water;
- the utilisation and protection of vegetation; and
- the restoration or reclamation of eroded land.

3.9 Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES is an international agreement to which countries adhere voluntarily. The aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. The species covered by CITES are listed in three appendices reflecting the degree of protection that the species needs. Appendix I includes species that are threatened with extinction and trade in these species is permitted only in exceptional circumstances. Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. Appendix III lists species that are protected in at least one country that has asked other CITES parties for assistance in controlling the trade (Website: www.cites.org, accessed October 2020).

4. STUDY AREA

4.1 Location

The Igolide site covers an area of approximately 680 ha and is located northeast of Fochville on portions 14, 20 and RE/22 of the farm Kraalkop 147 IQ and portions 8, 57, 65 and 66 of the farm Leeuwpoort 356 IQ (Figures 1a, 1b & 2). The area falls within the West Rand District Municipality and the Merafong City Local Municipality in Gauteng province. The homestead on site is located at 26° 27' 04.2" S; 27° 30' 21.7" E.

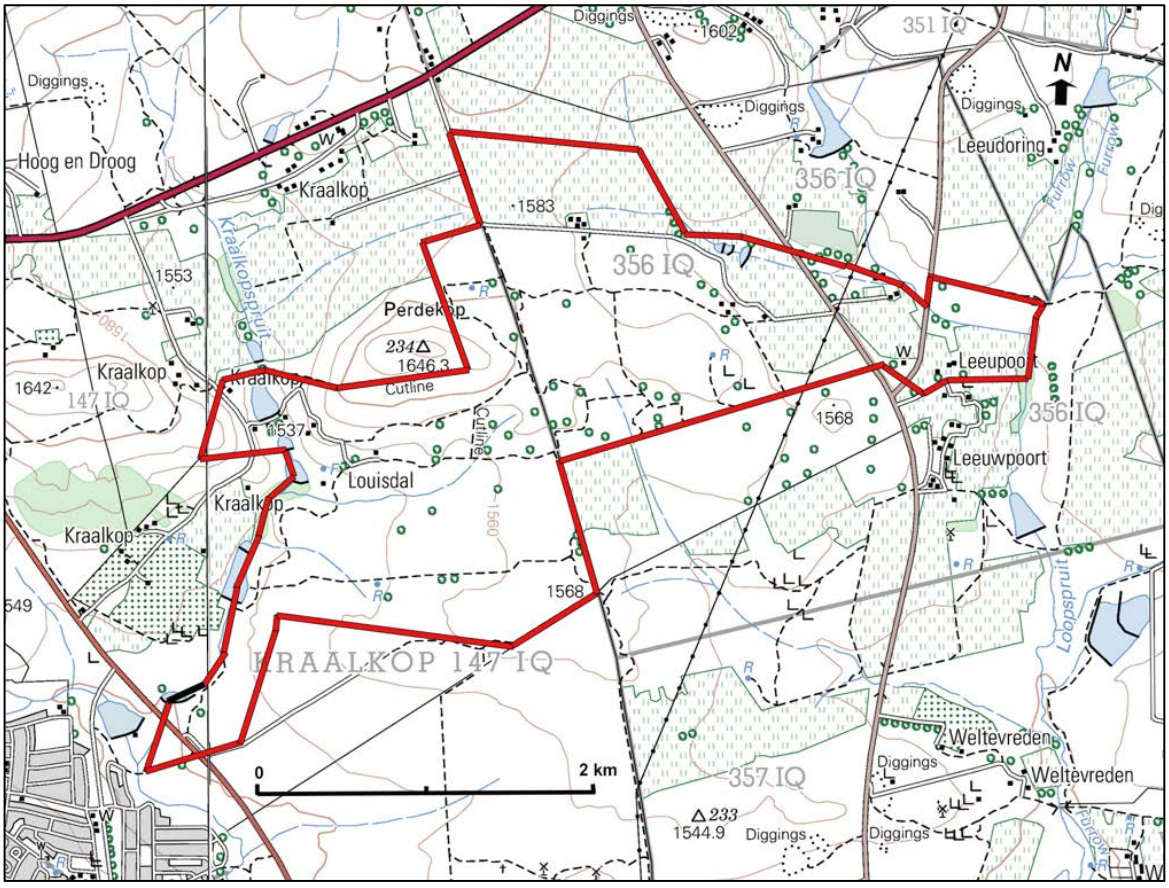


Figure 1: Topocadastral map of the Igolide WEF site (2627BC Westonaria 2010, 2627AD Carltonville 2010).

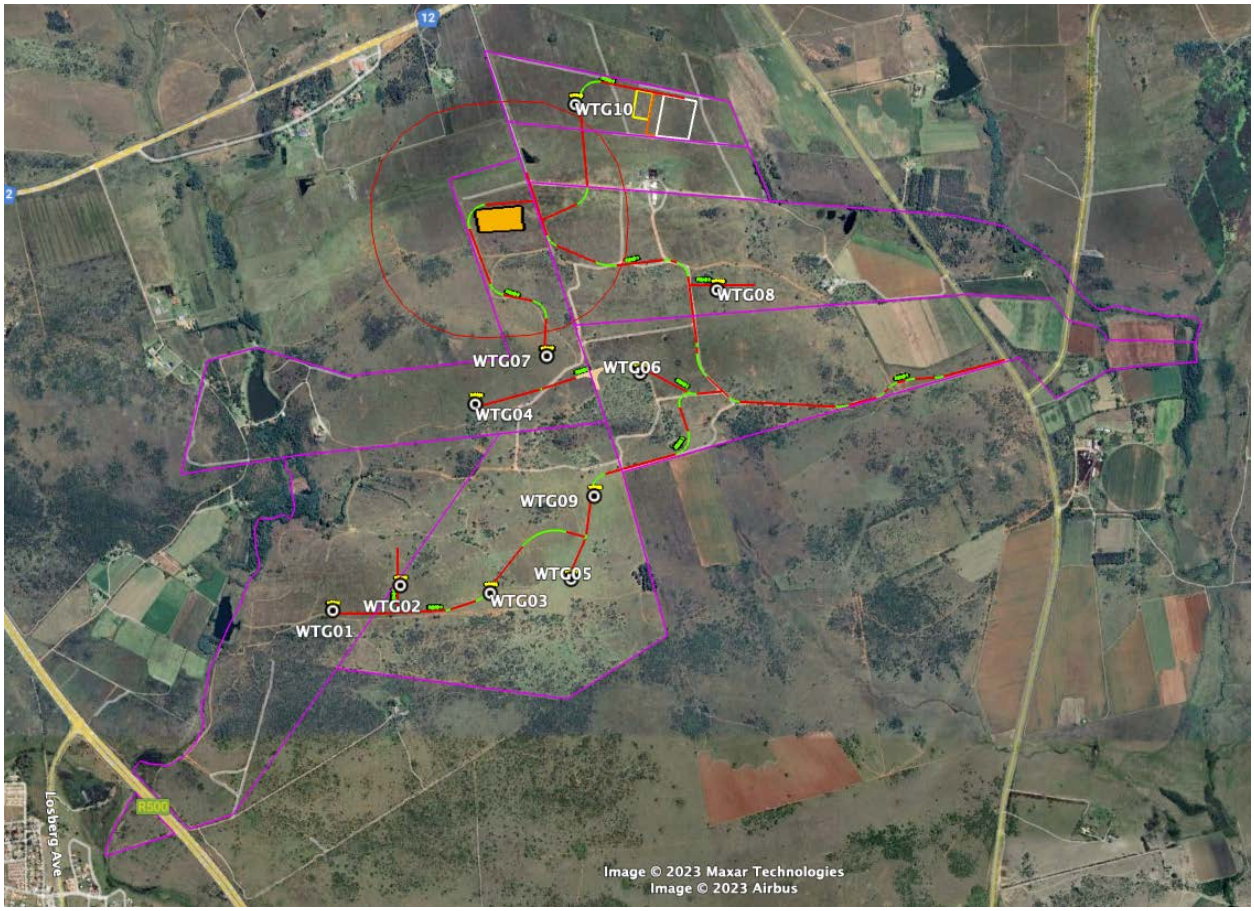


Figure 2: Google image of the Igolide WEF site with proposed roads and location of 10 turbines indicated (WTG01 – WTG10). Orange rectangle = on-site IPP substation/BESS; red/white/yellow rectangles = other ancillary areas (batching plant, construction camp and laydown).

4.2 Terrain morphology and drainage

The site is characterised by grassland on the sloping plains and low hills, with bushveld patches on the rocky plains and koppies (ridges). The altitude ranges from 1500 m at the lowest point in the west up to approximately 1620 m at the highest point on the hill in the central part of the site (Figure 1).

The site is drained from north to south on the western boundary by the Kraalkopspruit and its tributaries and by a stream in the east.

4.3 Climate

4.3.1 Regional climate (Mucina & Rutherford 2006)

The site falls in a strongly seasonal summer-rainfall, warm-temperate region, with very dry winters. The mean annual precipitation of the Rand Highveld Grassland is 654 mm (range from 570 mm in the west to 730 mm in the east) with a peak in rainfall in January. The annual precipitation coefficient of variation is 25%. Mean annual potential evaporation is 1926 mm, while the mean annual soil moisture stress is 73%. Mean annual temperature is 14.7°C and frost is frequent in winter with a mean of 32 days per annum.

4.3.2 Rainfall

The mean annual rainfall in the region ranges from 613 mm at Fochville to 652 mm at the farm Leeuwpoort (Table 1). The mean annual rainfall as measured at Carltonville is 646 mm (Table 2, Figure 3). The total annual rainfall at Carltonville during dry and wet years respectively may range from 421 mm to 1109 mm, indicating a high variation in the annual rainfall and therefore a rainfall scenario that is highly unpredictable. The rainy season at Carltonville is predominantly from October to April when about 92% of the annual rainfall occurs. December and January are the wettest months and the driest period is from June to August, when less than 10 mm of rain per month is recorded (Figure 3). Maximum rainfall measured over a 24-hour period at Carltonville was 159 mm, recorded in December. The highest monthly rainfall recorded was 272 mm, measured in January.

Table 1: Rainfall at some weather stations in the general environs of the Igolide site (Weather Bureau 1998)

	Mean Annual Rainfall (mm)				
Month	Fochville	Leeuwpoort	Carltonville	Potchefstroom	Elandsfontein
Jan	110	117	119	119	107
Feb	74	87	73	83	95
Mar	83	85	77	78	85
Apr	41	43	58	61	32
May	20	23	13	15	20
June	7	7	6	7	7
July	6	8	4	4	9
Aug	6	6	8	10	8
Sep	18	18	20	20	18
Oct	55	57	66	55	52
Nov	93	97	93	85	80
Dec	98	97	109	94	105
Year	613	652	646	631	618

Table 2: Maximum rainfall (mm) in 24 hours, highest maximum and lowest monthly minimum rainfall at Carltonville: 26° 20’ S; 27° 23’ E; 1500 m (Weather Bureau 1998)

	Rainfall (mm)			
Month	**Mean (month)**	**24 h max**	**Max per month**	**Min per month**
Jan	119	71	272	44
Feb	73	111	204	29
Mar	77	79	204	3
Apr	58	72	201	7
May	13	33	75	0
June	6	21	35	0
July	4	29	29	0
Aug	8	35	81	0
Sep	20	45	90	0
Oct	66	102	169	8
Nov	93	73	216	24
Dec	109	159	252	46
Year	646	159	1109	421

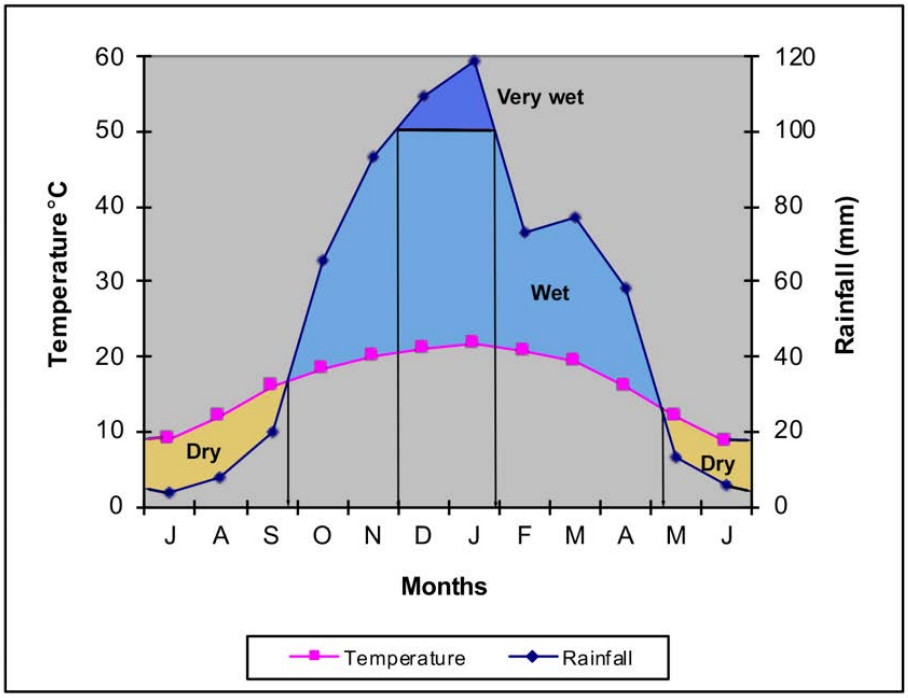


Figure 3: Climate diagram for Carltonville. Months on X-axis are from July to June. When the rainfall curve is below the temperature curve it indicates a dry period and when the monthly rainfall is higher than 100 mm it indicates a very wet period.

4.3.3 Temperature

The mean annual temperature for Carltonville is 16.3°C (Table 3) with the extreme maximum and minimum temperatures 37.1°C and -9.5°C respectively. The mean daily maximum for January is 27.9°C and for July it is 18.4°C, whereas the mean daily minimum for January is 16.5°C and for July it is 7.9°C. Frost may occur anytime from April to October.

Table 3: Temperature data (°C) for Carltonville: 26° 20’ S; 27° 23’ E; 1500 m (Weather Bureau 1998)

	Temperature (°C)												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Max	27.8	27.2	26.1	23.1	20.7	17.8	18.4	21.1	24.5	25.9	26.6	27.6	23.9
*Ext. Max	37.1	35.2	33.7	31.8	29.2	24.4	24.8	27.6	32.6	34.7	35	35.2	37.1
Min	16.5	16.9	14.5	9.8	8.8	3.5	7.9	8.7	8.4	11.5	8.8	15.1	3.5
*Ext. Min	7.5	5.5	2.0	-1.2	-5.6	-9.0	-8.8	-9.5	-3.3	-0.7	2.8	1.2	-9.5
Mean	21.6	20.9	19.5	15.9	12.1	8.7	9.0	11.9	16.1	18.4	20.0	21.1	16.3

Max = mean daily maximum temperature for the month
*Ext. Max = extreme maximum temperature recorded per month
Min = mean daily minimum temperature for the month
*Ext. Min = extreme minimum temperature recorded per month
Mean = mean monthly temperature for each month and for the year

4.3.4 Cloudiness and relative air humidity

At Potchefstroom, the cloud cover at 14:00 is the highest from November to March (4.5 – 4.8 eights) and the lowest in June, July and August (1.3 – 1.6 eights) (Table 4). The highest mean relative air humidity (%) at 08:00 occurs during

the autumn and winter months (March to July; 80 – 84%) and the lowest relative air humidity at 14:00 (27 - 28%) occurs in spring (August and September) (Weather Bureau 1998).

Table 4: Cloud cover at 14:00 and percentage relative air humidity at 08:00 and 14:00 at Potchefstroom: 26° 44' S; 27° 04' E; 1350 m (Weather Bureau 1988, 1998)

	Cloud (0-8)	Relative air humidity %	
	14:00	08:00	14:00
Jan	4.8	72	44
Feb	4.5	77	45
Mar	4.5	80	44
Apr	2.9	82	41
May	2.2	82	34
June	1.6	84	33
July	1.3	80	31
Aug	1.5	70	28
Sept	2.4	62	27
Oct	4.0	63	33
Nov	4.7	66	39
Dec	4.6	68	40
Year	3.3	74	37

4.4 Geology

The geology of the site is depicted in the 1:250 000 geological map 2626 West Rand (Figure 4). Most of the site is underlain by andesite (Vh) of the Hekpoort Formation, Pretoria Group, Transvaal Sequence. The northern part of the site consists of shale and hornfels (Vt) of the Timeball Hill Formation, Pretoria Group, Transvaal Sequence. A small section in the southeast is underlain by shale and quartzite (Vs) of the Strubenskop Formation, Pretoria Group, Transvaal Sequence.

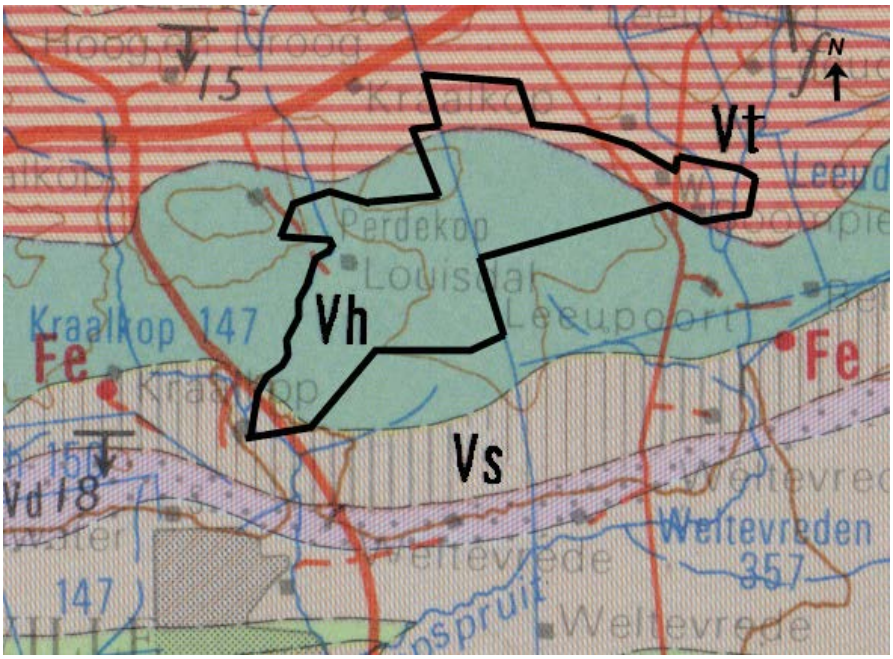


Figure 4. Geology of the Igolide site (2626 West Rand, Geological Survey 1986). Vh = andesite; Vs = shale and quartzite; Vt = shale and hornfels.

4.5 Land types

Land types denote areas that display a marked degree of uniformity with respect to terrain form, soil pattern and climate. A terrain unit within a land type is any part of the land surface with homogeneous form and slope. The site covers two land types consisting of the Ba and Fb Land Types (Figure 5). The Ba land type is classified as a plinthic catena where upland duplex and margalitic soils are rare. The soils are dystrophic and/or mesotrophic, with red soils occurring widespread. The Fb land type is dominated by Glenrosa and/or Mispah soil forms where lime is rare or absent in the upland soils, but generally present in low-lying soils.

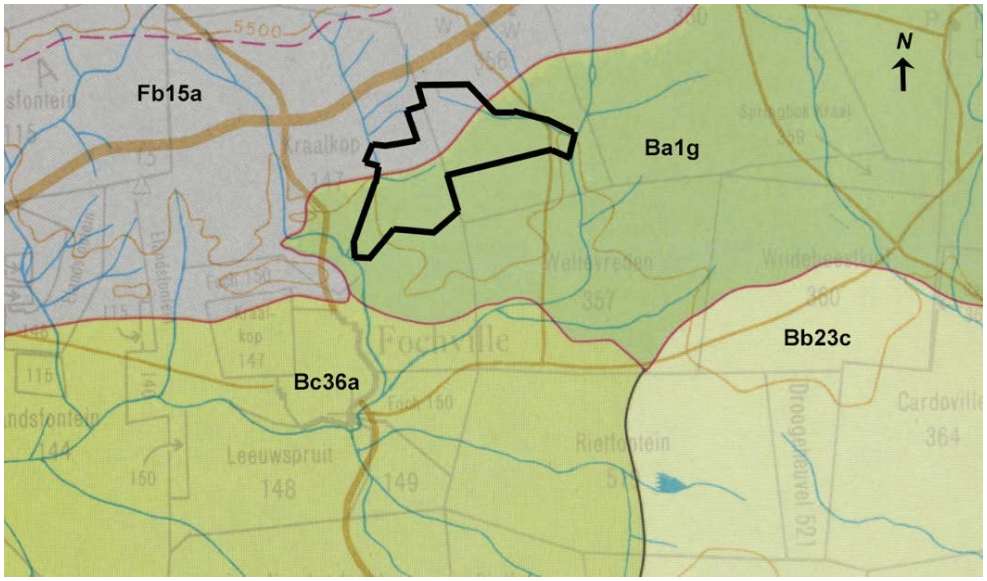


Figure 5. Land Types of the Igolide WEF site (2626 West Rand, Land Type Series 1979).

5. VEGETATION

5.1 Introduction

The site falls in the Grassland Biome, but in two Bioregions, i.e. the northern section of the site falls in the Central Bushveld Bioregion, while the remainder of the site falls in the Mesic Highveld Grassland Bioregion. The site does not fall within any Centre of Plant Endemism according to Van Wyk and Smith (2001).

5.2 Broad-scale vegetation types

Rand Highveld Grassland (Gm 11)

Most of the site is located in the Rand Highveld Grassland (Gm 11) (Figure 6) (Mucina & Rutherford 2006, SANBI 2018 revision). This vegetation type is heterogeneous and geographically disjunct. It covers a highly variable landscape with sloping plains and ridges elevated over the undulating surrounding plains. The vegetation comprises a species-rich sour grassland alternating with shrubland on rocky outcrops. The rocky hills support woody species such as *Senegalia caffra, Celtis africana, Protea caffra* and *Searsia* spp. Dwarf shrubs include *Seriphium plumosum* and *Searsia magalismontana*. The grass layer is characterised by *Eragrostis chloromelas, Diheteropogon amplectens, Loudetia simplex, Setaria sphacelata, Themeda triandra, Trachypogon spicatus* and *Tristachya rehmannii*. Common herbs include *Justicia anagalloides, Acalypha angustata, Helichrysum nudifolium, Nidorella hottentotica* and *Selago densiflora.*

Endemic taxa include *Melanospermum rudolfii, Polygala spicata, Anacampseros subnuda* subsp. *lubersii, Frithia humilis, Crassula arborescens* subsp*. undulatifolia, Delosperma purpureum, Encephalartos lanatus* and *E. middelburgensis.*

Although the conservation status of this vegetation type was listed as “Endangered” by Mucina & Rutherford (2006) it is listed as “Vulnerable” by NEMA (2011) and Skowno *et al*. (2019). Only 1.8% is statutorily conserved and almost half has been transformed mostly by cultivation, plantations and urbanisation (Skowno *et al*. 2019).

Gauteng Shale Mountain Bushveld (SVcb 10):

This vegetation type covers the northern parts of the Igolide site (Figure 6). The unit is characterised by low, broken ridges varying in steepness and with a high surface rock cover. The vegetation is a short (3–6 m tall) semi-open bushveld dominated by a variety of woody species including *Senegalia caffra, Dombeya rotundifolia, Vachellia karroo, Celtis africana, Combretum molle, Englerophytum magalismontanum, Protea caffra, Searsia magalismontana, Cussonia spicata, Zanthoxylum capense, Vangueria infausta, Ziziphus mucronata, Ancylobotrys capensis, Euclea crispa, Ehretia rigida, Diospyros lycioides* and *Grewia occidentalis.* The grass layer is characterised by *Hyparrhenia dregeana, Cymbopogon caesius, Cymbopogon pospischilii* and *Eragrostis curvula*. The conspicuous forbs include *Macledium zeyheri, Helichrysum nudifolium, Helichrysum rugulosum, Hermannia lancifolia, Senecio venosus and Hilliardiella elaeagnoides*. In rocky areas the ferns *Cheilanthes hirta* and *Pellaea calomelanos* are prominent.

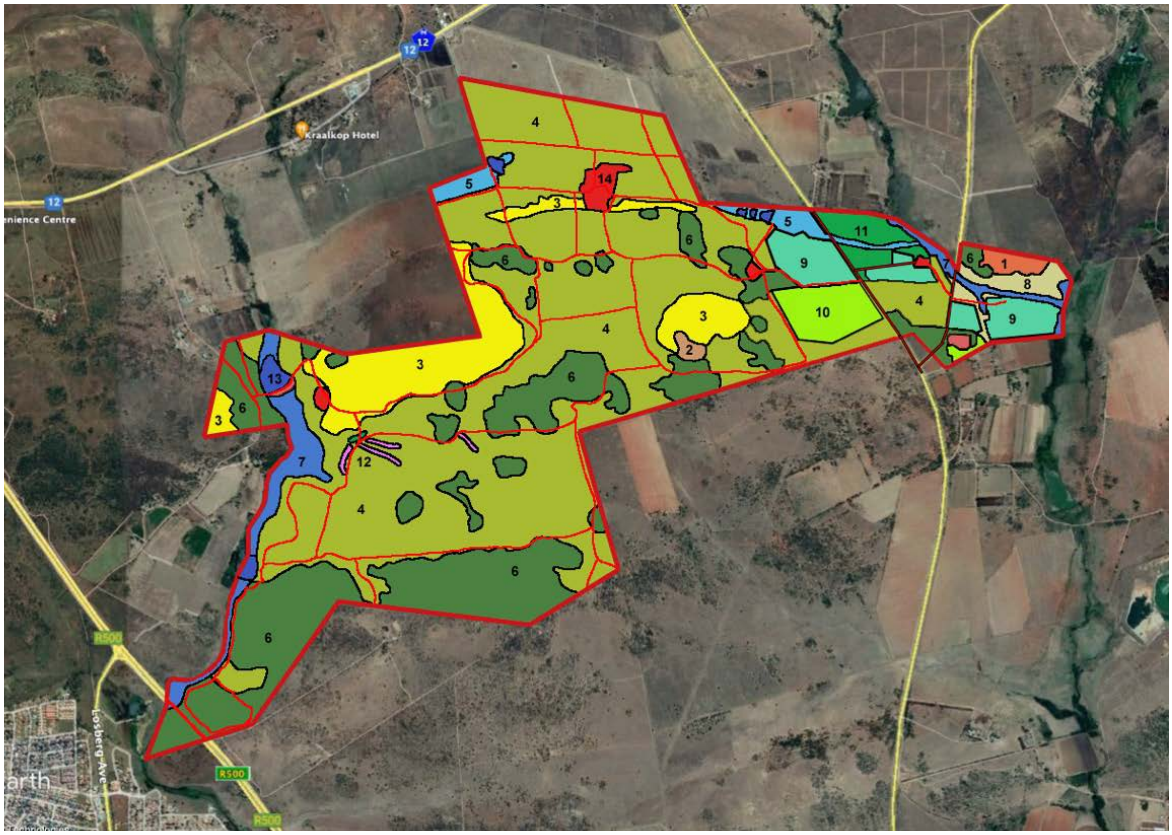
Although the conservation status of this vegetation type was listed as “Vulnerable” by Mucina & Rutherford (2006) it is listed as “Least Concern” by NEMA (2011) and Skowno *et al*. (2019). About 4.9% is statutorily conserved and more than 20% has been transformed mostly by cultivation, plantations, mines and quarries and urbanisation (Skowno *et al.* 2018).

Figure 6. Vegetation types in the region of the Igolide site (SANBI 2006-2018).

5.3 Description of habitats (plant communities)

Based on species composition, nine natural habitats (plant communities) were distinguished, described and mapped on the Igolide site (Figure 7). A further five man-made units were also distinguished (Figure 7):

1. *Trachypogon spicatus* grassland
2. *Melinis repens - Selaginella dregei* rocky grassland
3. *Cymbopogon caesius - Elionurus muticus* rocky grassland
4. *Hyparrhenia hirta - Eragrostis chloromelas* grassland
5. *Eragrostis plana - Trisetopsis imberbis* wetlands/floodplains
6. *Vachellia karroo - Ehretia rigida* rocky bushveld
7. *Salix babylonica - Phragmites australis* riverine vegetation
8. *Hyparrhenia tamba* floodplains
9. *Eragrostis tef - Tagetes minuta* abandoned cropland
10. Planted pasture (*Digitaria eriantha*)
11. *Eucalyptus camaldulensis* plantations (degraded)
12. Hedges (*Robinia* sp., *Pyracantha* sp., *Cedrus* sp., *Searsia pyroides*)
13. Dams
14. Habitation/infrastructure



Legend

1	*Trachypogon spicatus* grassland
2	*Melinis repens - Selaginella dregei* rocky grassland
3	*Cymbopogon caesius - Elionurus muticus* rocky grassland
4	*Hyparrhenia hirta - Eragrostis chloromelas* grassland
5	*Eragrostis plana - Trisetopsis imberbis* wetlands/floodplains
6	*Vachellia karroo - Ehretia rigida* rocky bushveld
7	*Salix babylonica - Phragmites australis* riverine vegetation
8	*Hyparrhenia tamba* floodplains
9	*Eragrostis tef - Tagetes minuta* abandoned cropland
10	Planted pasture (*Digitaria eriantha*)
11	*Eucalyptus camaldulensis* plantations (degraded)
12	Hedges (*Robinia* sp. *Pyracantha* sp., *Cedrus* sp. *Searsia pyroides)*
13	Dams
14	Habitation/infrastructure

Figure 7: Vegetation map of the Igolide site.

Habitat 1. *Trachypogon spicatus* grassland

This grassland covers a small area of the Igolide site and occurs on the plains near the eastern boundary (Figures 7 & 8). Surface rocks and gravel are absent and the deep, red, well-drained clayloam soils are derived from shale. This habitat resembles a planted pasture on cropland, however it is dominated by a rather unpalatable grass species *Trachypogon spicatus*. No trees or shrubs were noted in this habitat.

The diagnostic species of this habitat (community) is *Trachypogon spicatus* (species group 1, Appendix A).

- Dwarf shrubs cover 2% of the habitat and are represented by *Seriphium plumosum*.
- The grass layer is well developed and covers approximately 95% of the area. The dominant grass species is *Trachypogon spicatus*, with *Hyparrhenia hirta, Eragrostis chloromelas, Digitaria eriantha* and *Themeda triandra* occurring at low densities.
- Herbaceous species have a mean canopy cover of less than 2%. The most common species include

Hilliardiella elaeagnoides and *Helichrysum coriaceum.*

- No alien invasive plant species were recorded.

Figure 8: Habitat 1 – grassland dominated by *Trachypogon spicatus.*

Threatened (red listed) and/or protected species recorded in plant community 1:

IUCN list:	None
NEM:BA (ToPS):	None
NFA:	None
GDARD:	None
CITES:	None
Endemic species:	None

Habitat 2. *Melinis repens - Selaginella dregei* rocky grassland

This small rocky outcrop habitat occurs in the southeastern part of the site (Figures 7 & 9). Surface rocks cover 50–75% of the area with gravel covering 10–30% of the soil surface. The shallow, well-drained, red, loamy soils are derived from andesite.

The diagnostic species of this habitat (community) include *Searsia magalismontana, Selaginella dregei, Cyanotis speciosa, Oldenlandia herbacea* and *Oropetium capense* (species group 2, Appendix A).

- Trees (>3 m) have a mean canopy cover of less than 1% and are characterised by *Searsia leptodictya*.
- Shrubs cover on average 4% of the area and the most prominent species are *Searsia rigida, Diospyros lycioides, Euclea crispa* and *Zanthoxylum capense.*
- Dwarf shrubs cover 2% of the habitat and include *Searsia magalismontana* and *Lippia scaberrima*.
- The grass layer is poorly developed and covers approximately 20% of the area. The dominant grass species include *Cymbopogon caesius, Melinis repens* and *Microchloa caffra*. Other grass species are *Oropetium capense, Eragrostis gummiflua, Setaria sphacelata, Aristida congesta* subsp. *congesta, Cynodon dactylon* and *Eragrostis chloromelas*.
- Herbaceous species have a mean canopy cover of approximately 12%. The most common species include the ferns *Selaginella dregei* and *Pellaea calomelanos* and other forbs such as *Cyanotis speciosa, Hermannia transvaalense, Oldenlandia herbacea, Sphedamnocarpus pruriens, Selago densiflora* and *Monsonia angustifolia.*

- No alien invasive plant species were recorded.

Figure 9. Habitat 2: rocky outcrop (sheets) characterised by *Searsia magalismontana* and *Selaginella dregei*.

Threatened (red listed) and/or protected species recorded in plant community 2:

IUCN list:	None
NEM:BA (ToPS):	None
NFA:	None
GDARD:	*Gladiolus permeabilis*
CITES:	None
Endemic species:	None

Habitat 3. *Cymbopogon caesius - Elionurus muticus* rocky grassland

This rocky grassland occurs in the central parts of the site (Figures 7 & 10). Surface rocks cover 10–50% of the area, with a mean cover of 16%. Gravel covers from < 10% up to 30% of the soil surface with a mean of 12% cover. The shallow to intermediately deep, well-drained, red to red-brown, loam to sandy loam soils are derived from andesite.

The diagnostic species of this habitat (community) include *Indigofera hilaris, Elionurus muticus, Brachiaria serrata, Scabiosa columbaria* and *Striga elegans* (species group 3, Appendix A).

- Tall trees (>6 m) have a mean canopy cover of less than 1% and are characterised by *Celtis africana.*
- Trees (>3 – 6 m) have a mean canopy cover of 1% and are characterised by *Vachellia karroo, Searsia leptodictya* and *Searsia pyroides.*
- Shrubs cover on average 1% of the area and the most prominent species are *Diospyros lycioides, Searsia rigida, Euclea crispa* and *Zanthoxylum capense*.
- Dwarf shrubs cover 2% of the habitat and include *Lippia scaberrima, Solanum lichtensteinii, Seriphium plumosum, Asparagus suaveolens, Asparagus laricinus* and *Ziziphus zeyheriana*.
- The grass layer is well developed and covers approximately 87% of the area. The dominant grass species include *Cymbopogon caesius, Setaria sphacelata* and *Eragrostis chloromelas*. Other common grass species include *Elionurus muticus, Brachiaria serrata, Microchloa caffra, Trachypogon spicatus, Melinis repens, Themeda triandra* and *Hyparrhenia hirta*.
- Herbaceous species have a mean canopy cover of approximately 6%. The most common species include *Indigofera hilaris, Scabiosa columbaria, Striga elegans, Helichrysum rugulosum, Selago densiflora, Arctotis*

arctotoides, Plantago lanceolata, Tephrosia capensis and *Hermannia depressa*.

- The following alien invasive plant species were recorded: *Solanum sisymbriifolium, Verbena brasiliensis, Xanthium spinosum* and *Pyracantha angustifolia.*

Figure 10. Habitat 3: *Cymbopogon caesius - Elionurus muticus* rocky grassland.

Threatened (red listed) and/or protected species recorded in plant community 3:

IUCN list:	None
NEM:BA (ToPS):	None
NFA:	None
GDARD:	*Gladiolus permeabilis*
CITES:	None
Endemic species:	None

Habitat 4. *Hyparrhenia hirta - Eragrostis chloromelas* grassland

This natural grassland/old field grassland covers most of the site (Figures 7 & 11). The old field grasslands are most probably older than 10 years. Surface rocks and gravel are mostly absent from the area. The intermediate to deep, well-drained, orange-brown to red, loam to clayloam soils are derived from andesite.

The diagnostic species in this habitat (community) include *Sida rhombifolia, Aristida bipartita, Hermannia depressa* and *Nidorella anomala* (species groups 5, 6 & 9, Appendix A).

- Tall trees (>6 m) have a mean canopy cover of less than 1% and are characterised by *Vachellia karroo*.
- Trees (>3 – 6 m) and shrubs have a mean canopy cover of about 1% and are characterised by *Vachellia karroo* and *Searsia pyroides*.
- Dwarf shrubs cover less than 1% of the habitat and include *Asparagus laricinus, Solanum lichtensteinii, Lippia scaberrima* and *Seriphium plumosum*.
- The grass layer is well developed and covers up to a 98% of the area. The dominant grass species is *Hyparrhenia hirta*. Other common grass species include *Eragrostis chloromelas, Themeda triandra, Eragrostis plana, Cynodon dactylon, Eragrostis gummiflua, Paspalum dilatatum* and *Aristida congesta*.
- Herbaceous species have a mean canopy cover of approximately 7%. The most common species include the ferns and other forbs such as *Arctotis arctotoides, Selago densiflora, Plantago lanceolata, Conyza podocephala, Lactuca inermis, Helichrysum nudifolium, Helichrysum rugulosum*, the naturalised aliens

Erigeron sumatrensis and *Richardia brasiliensis* and the alien invasive *Verbena bonariensis*.

- The following alien invasive plant species were recorded: *Verbena brasiliensis* and *Verbena bonariensis.*

a.

b.

Figure 11 (a & b): Habitat 4: *Hyparrhenia hirta - Eragrostis chloromelas* grassland.

Threatened (red listed) and/or protected species recorded in plant community 4:

IUCN list:	None
NEM:BA (ToPS):	None
NFA:	None
GDARD:	None
CITES:	None
Endemic species:	None

Habitat 5. *Eragrostis plana - Trisetopsis imberbis* wetlands/floodplains

This wetland grassland occurs in the northwest and eastern parts of the site (Figures 7 & 12). Surface rocks and gravel are absent from this habitat. The deep, poorly drained, dark clayloam to clayey soils are alluvial in origin.

a.

b.

Figure 12 (a & b): Habitat 5: *Eragrostis plana - Trisetopsis imberbis* wetlands/floodplains.

The diagnostic species in this habitat (community) include *Trisetopsis imberbis, Andropogon eucomis, Panicum schinzii* and *Eragrostis rotifer* (species group 7, Appendix A).

- Trees (>3 m) have a mean canopy cover of less than 1% and are characterised by *Vachellia karroo, Salix babylonica* and *Searsia pyroides.*
- Shrubs cover on average 1% of the area and the most prominent species is *Diospyros lycioides*.
- Dwarf shrubs cover 1% of the habitat and include *Asparagus laricinus*.
- The grass layer is well developed and covers up to a 100% of the area. Dominant grass species are *Paspalum dilatatum, Eragrostis plana, Hyparrhenia hirta and Eragrostis gummiflua*. Other common grass species are *Cynodon dactylon*, *Trisetopsis imberbis, Andropogon eucomis, Panicum schinzii* and *Eragrostis rotifer.*
- Herbaceous species have a mean canopy cover of approximately 5%. The most common species include the sedges *Kyllinga erecta, Cyperus rupestris and Cyperus esculentus* and other forbs such as *Berkheya radula, Plantago lanceolata, Arctotis arctotoides, Selago densiflora* and the alien invasive *Verbena bonariensis.*
- The following alien invasive plant species were recorded: *Eucalyptus camaldulensis*, *Cirsium vulgare, Verbena brasiliensis* and *Verbena bonariensis.*

Threatened (red listed) and/or protected species recorded in plant community 5:

IUCN list:	None
NEM:BA (ToPS):	None
NFA:	None
GDARD:	None
CITES:	None
Endemic species:	None

Habitat 6. *Vachellia karroo - Ehretia rigida* rocky bushveld

This rocky bushveld occurs widespread across the site on rocky plains and koppies (Figures 7 & 13). Rocky structures are present in some areas indicating human occupation in the past. Surface rocks are absent on some of the plains, but cover up to 50% of the rocky outcrops (koppies), with a mean cover of 15%. Gravel is mostly absent, but covers < 10% of some of the sites, with a mean of 3% cover. The shallow to intermediately deep, well-drained, red soils are derived from andesite.

The diagnostic species of this habitat (community) include *Ehretia rigida, Searsia leptodictya, Gymnosporia polyacantha, Senegalia caffra, Senegalia hereroensis, Digitaria eriantha* and *Glandularia aristigera* (species group 11, Appendix A).

- Tall trees (>6 m) have a mean canopy cover of 7% and are characterised by *Senegalia caffra, Senegalia hereroensis, Vachellia karroo* and *Celtis africana.*
- Trees (>3 m) have a mean canopy cover of 13% and are characterised by *Vachellia karroo, Searsia leptodictya, Searsia pyroides, Ziziphus mucronata* and *Scolopia zeyheri.*
- Shrubs cover on average 11% of the area and the most prominent species are *Gymnosporia polyacantha, Ehretia rigida, Euclea crispa, Zanthoxylum capense, Searsia rigida* and *Gymnosporia buxifolia*
- Dwarf shrubs cover 3% of the habitat and include *Solanum lichtensteinii, Lippia scaberrima, Asparagus laricinus* and *Asparagus setaceus* and the naturalised alien *Solanum pseudocapsicum.*
- The grass layer is well developed and covers approximately 74% of the area. The dominant grass species include *Cynodon dactylon, Themeda triandra, Setaria sphacelata* and *Eragrostis plana*. Other common grass species are *Digitaria eriantha, Eragrostis curvula, Aristida congesta, Melinis repens, Eragrostis chloromelas, Urochloa mosambicensis* and *Hyparrhenia hirta*.
- Herbaceous species have a mean canopy cover of approximately 7%. The most common species include *Conyza podocephala, Senecio inornatus, Selago densiflora, Glandularia aristigera, Pentarrhinum insipidum* and *Leonotis martinicensis*, and the naturalised aliens *Achyranthes aspera, Schkuhria pinnata* and *Gomphrena celosioides.*
- The following alien invasive plant species were recorded: *Verbena brasiliensis, Cuscuta campestris, Solanum elaeagnifolium, Campyloclinium macrocephalum* and *Opuntia ficus-indica.*

Threatened (red listed) and/or protected species recorded in plant community 6:

IUCN list:	None
NEM:BA (ToPS):	None
NFA:	None
GDARD:	None
CITES:	None
Endemic species:	None

a.

b.

Figure 13 (a & b): Habitat 6: *Vachellia karroo - Ehretia rigida* rocky bushveld on the plains and koppies.

Habitat 7. *Salix babylonica - Phragmites australis* riverine vegetation

This riparian habitat occurs in the west and the east along perennial streams (Figures 7 & 14). Surface rocks and gravel are absent from this habitat. The deep, poorly drained, dark, clayloam to clayey soils are alluvial in origin. The diagnostic species for this habitat (community) are *Phragmites australis, Paspalum urvillei, Hemarthria altissima, Cyperus congestus, Typha capensis* and the alien trees *Salix babylonica, Populus x canescens, Acacia mearnsii, Acacia dealbata* and *Eucalyptus camaldulensis* (species group 15, Appendix A).

- Tall trees (>6 m) have a mean canopy cover of 27% and are characterised by the alien tree species *Populus x canescens, Salix babylonica, Eucalyptus camaldulensis, Acacia dealbata* and *Acacia mearnsii*.
- Trees (>3 m) have a mean canopy cover of 7% and are represented by *Celtis africana, Searsia pyroides, Vachellia karroo, Buddleja saligna* and *Kiggelaria africana.*
- Shrubs cover on average 2% of the area and the most prominent species is *Pyracantha angustifolia*.
- Dwarf shrubs cover 3% of the habitat and include *Asparagus laricinus*.
- The grass layer is moderately developed and covers approximately 53% of the area. The dominant grass

species are *Phragmites australis* and *Paspalum dilatatum*. Other grass species include *Panicum maximum, Eragrostis plana, Paspalum urvillei* and *Hemarthria altissima.*

- Herbaceous species have a mean canopy cover of approximately 8%. The most common species are the sedges *Cyperus congestus, Schoenoplectus corymbosus*, the bulrush *Typha capensis* and naturalised alien forbs such as *Tagetes minuta, Bidens bipinnata* and *Achyranthes aspera*.
- The following alien invasive plant species were recorded: *Populus x canescens, Acacia dealbata, Acacia mearnsii, Pyracantha angustifolia, Pyracantha crenulata, Verbena bonariensis, Ricinus communis* and *Ipomoea purpurea.*

a.

b.

Figure 14 (a & b): Habitat 7: *Salix babylonica - Phragmites australis* riverine vegetation.

Threatened (red listed) and/or protected species recorded in plant community 7:

IUCN list:	None
NEM:BA (ToPS):	None
NFA:	None
GDARD:	None
CITES:	None
Endemic species:	None

Habitat 8. *Hyparrhenia tamba* floodplains

This floodplain habitat occurs in the east of the site next to a stream (Figures 7 & 15). Surface rocks and gravel are absent from this habitat. The deep, poorly drained, dark clayloam to clayey soils are alluvial in origin.

Figure 15. Habitat 8: floodplains characterised by *Hyparrhenia tamba, Asparagus laricinus* and *Senecio imornatus.*

The diagnostic species of this habitat (community) are *Hyparrhenia tamba, Buddleja salviifolia* and *Sorghum halepense* (species group 16, Appendix A).

- Tall trees (>6 m) have a mean canopy cover of 2% and are characterised by *Vachellia karroo*.
- Trees (>3 m) have a mean canopy cover of 5% and are characterised by *Searsia pyroides, Celtis africana* and *Vachellia karroo.*
- Shrubs cover on average 3% of the area and the most prominent species are *Vachellia karroo* and *Searsia pyroides.*
- Dwarf shrubs cover less than 1% of the habitat and include *Asparagus laricinus*.
- The grass layer is well developed and covers approximately 80% of the area. The dominant grass species are *Hyparrhenia tamba, Hyparrhenia hirta* and *Cynodon dactylon*. Other grass species include *Paspalum dilatatum, Sorghum halepense* and *Urochloa mosambicensis*.
- Herbaceous species have a mean canopy cover of approximately 10%. The most common species are *Senecio inornatus, Berkheya radula* and the naturalised aliens *Verbena bonariensis, Erigeron sumatrensis, Tagetes minuta* and *Bidens bipinnata.*
- The following alien invasive plant species was recorded: *Verbena bonariensis.*

Threatened (red listed) and/or protected species recorded in plant community 8:

IUCN list:	None
NEM:BA (ToPS):	None
NFA:	None
GDARD:	None
CITES:	None
Endemic species:	None

Habitat 9. *Eragrostis tef - Tagetes minuta* abandoned cropland

This abandoned cropland occurs in the east of the site (Figures 7 & 16). Surface rocks and gravel are absent from this habitat. The deep, well-drained, red, clayloam soils are derived from shale.

Figure 16. Habitat 9: *Eragrostis tef - Tagetes minuta* abandoned cropland.

The diagnostic species in this habitat (community) include *Eragrostis tef, Amaranthus* sp*., Eleusine coracana* and *Datura ferox* (species group 20, Appendix A).

No trees or shrubs were noted in this habitat, but scattered individuals of *Celtis africana, Melia azedarach* and *Prunus* sp. occur on the boundary of the cropland.

- Dwarf shrubs cover 5% of the habitat and include *Asparagus laricinus* and the aliens *Datura ferox* and *Xanthium spinosum*.
- The grass layer is poorly developed and covers approximately 30% of the area. The dominant grass species are *Eragrostis tef* and *Cynodon d*actylon. Other grass species include *Eleusine coracana, Urochloa mosambicensis, Aristida congesta* subsp*. congesta* and *Sorghum halepense.*
- Herbaceous species have a mean canopy cover of approximately 35%. The most common species are *Helichrysum rugulosum, Erigeron sumatrensis, Verbena bonariensis, Tagetes minuta, Bidens pilosa, Zinnia peruviana, Cosmos bipinnatus* and *Amaranthus* sp.
- The following alien invasive plant species were recorded: *Datura ferox, Xanthium spinosum* and *Verbena bonariensis.*

Threatened (red listed) and/or protected species recorded in plant community 9:

IUCN list:	None
NEM:BA (ToPS):	None
NFA:	None
GDARD:	None
CITES:	None
Endemic species:	None

Habitat 10. Planted pasture

This pasture occurs in the east of the site and is dominated by *Digitaria eriantha* (Figure 17).

Figure 17. Habitat 10: grassland dominated by *Digitaria eriantha*.

Habitat 11. Degraded plantations/woodlots

These degraded plantations, consisting mainly of *Eucalyptus camaldulensis* and *Pinus* spp. occur in the east of the site along some of the drainage lines (Figure 18). Other species in this unit include *Searsia pyroides, Asparagus laricinus, Verbena bonariensis, Hyparrhenia hirta, Themeda triandra, Urochloa mosambicensis, Melinis repens, Eragrostis chloromelas* and *Digitaria eriantha.*

Figure 18. Habitat 11: *Eucalyptus camaldulensis* woodlots.

Habitat 12. Hedges/windbreaks

These hedges or windbreaks occur in the west near abandoned habitation and consist of a hedge of the alien *Robinia pseudoacacia* and a hedge of the alien *Pyracantha angustifolia*, a hedge dominated by the alien *Cedrus deodora* and one dominated by *Searsia pyroides* (Figures 19 & 20).

Figure 19. Habitat 12: Hedge of *Pyracantha angustifolia*.

Figure 20. Habitat 12: Lane of *Cedrus deodora.*

13. Dams

Two dams occur in the west in the Kraalkopspruit with some smaller dams in the north and west of the site (Figure 21). They form part of Community 7 with *Phragmites australis, Celtis africana, Searsia pyroides, Kiggelaria africana* and alien trees such as *Salix babylonica and Acacia dealbata*.

Figure 21. Dam in the Kraalkopspruit.

14. Habitation/infrastructure

These include three sites with homesteads, one site with farm infrastructure (sheds, workshop and farm machinery) and some chalets next the dam in the Kraalkopspruit.

6. ALIEN INVASIVE PLANT SPECIES

6.1 Introduction

An "invasive species" is any species whose establishment and spread outside of its natural distribution range (i) threatens ecosystems, habitats or other species or has a demonstrable potential to threaten ecosystems, habitats or other species; and (ii) may result in economic or environmental harm or harm to human health. Invasive alien plant species are globally considered as one of the greatest threats to biodiversity and ecosystems integrity.

The Alien and Invasive Species (AIS) Regulations and the Alien and Invasive Species (AIS) list was published in 2020 (NEM:BA 2020a & b).

Forty-nine (49) alien plant species were recorded on the Igolide site of which 21 are currently declared alien invasive species and 27 naturalised alien species (Appendic B). Another 46 alien species were listed by NewPosa for the region.

The following categories of declared weeds and invader plants are recognised in South Africa:

Category 1a Listed Invasive Species refers to species that must be combatted or eradicated. Landowners are obliged to take immediate steps to combat or eradicate Category 1a species.

Category 1b Listed Invasive Species refers to species that must be controlled. If an Invasive Species Management Programme has been developed, landowners are obliged to control the species in accordance with such a programme. The following species were recorded on Igolide:

Campuloclinium macrocephalum
Cuscuta campestris
*Eucalyptus camaldulensis**
Melia azedarach
Pyracantha angustifolia
Robinia pseudoacacia
Solanum pseudocapsicum
Verbena bonariensis
Xanthium spinosum
**exempted for an existing plantation*

Cirsium vulgare
Datura ferox
Ipomoea purpurea
Opuntia ficus-indica
Pyracantha crenulata
Solanum elaeagnifolium
Solanum sisymbriifolium
Verbena brasiliensis

Other 1b AIS listed for the region by NewPosa*:*

Agrimonia procera
Argemone ochroleuca
Datura stramonium
Xanthium strumarium

Araujia sericifera
Cestrum parqui
Phytolacca octandra

Category 2 Listed Invasive Species refers to species that require a permit to carry out a restricted activity e.g. cultivation, within an area specified in the Notice or an area specified in the permit, as the case may be. Category 2 includes plant species that have economic, recreational, aesthetic or other valued properties, notwithstanding their invasiveness. It is important to note that a Category 2 species that falls outside the demarcated area specified in the

permit, becomes a Category 1b invasive species. Permit-holders must take all the necessary steps to prevent the escape and spread of the species outside of the land or the area specified in the Notice or permit. The following species were recorded on Igolide:

Acacia dealbata	*Acacia mearnsii**
Ricinus communis	*Populus canescens*

*exempted for an existing plantation

Category 3 Listed Invasive Species refers to species that are subject to exemptions and prohibitions as specified in the Notice. Category 3 species are less-transforming invasive species that are regulated by activity. The principal focus with these species is to ensure that they are not introduced, sold or transported. However, a Category 3 plant species becomes a Category 1b species within riparian areas.

Twenty-seven naturalised weedy alien species were recorded on the Igolide site. Another 39 naturalised weedy alien species were also listed by NewPosa for the region (Appendix B).

One non-declared alien tree species was recorded on the Igolide site: *Cedrus deodora* and one non-declared alien tree species was listed by NewPosa for the region: *Ulmus parvifolia*

6.2 Prevention and control of alien invasive plant species

There are a number of strategies that can be employed to prevent the introduction of new invasive plant species:

- Limiting their introductions by humans;
- Creating a buffer zone of alien-free vegetation around the site;
- Integrated catchment management with the surrounding neighbours because areas around and upstream of the site provide an unlimited source of seed which invade downstream areas; and
- Maintening a healthy grass cover by sound veld management and judicious burning of the grass sward.

Alien invaders should be controlled by mechanical and/or chemical means. Mechanical means include ringbarking (girdling), uprooting, chopping, slashing and felling. An axe or chain saw or brush cutter can be used. Stumps or ringbarked stems should be treated immediately with a chemical weed killer. Follow-up treatment is sometimes needed.

7. FLORA: CHECKLISTS AND RED-LISTED AND/OR PROTECTED SPECIES

A list of plant species (the term species is used here in a general sense to denote species, subspecies and varieties) that could be found in the region (quarter degree grids: 2627 BC; 2627 AD) was downloaded from the South African Biodiversity Institute's website (SANBI: newposa.sanbi.org – accessed October 2021) (Appendix B). During the field surveys, 205 plant species were recorded on the Igolide site (Appendix A). Combined, the NewPosa list and the list for the current study yielded 624 species for the region.

The South African Threatened Species Programme website (redlist.sanbi.org) of SANBI; the National Forests Act (Act No. 84 of 1998) (NFA 2021); the National Environmental Management: Biodiversity Act (NEMBA 2007c) (ToPS list); CITES (2023) appendices and the lists of protected plant species of Gauteng (Transvaal Nature Conservation Ordinance (No. 12 of 1983) were consulted to classify the species in the study area into the relevant IUCN or protected categories (GDARD 1983; Appendix B). The draft list of the Gauteng Nature Conservation Bill of 2014 was also consulted (GDARD 2014a).

7.1 IUCN Red-listed species

For the IUCN Categories, the following definitions were applied (see Figure 22). **The colours in Figure 22 were applied to the checklist of plants and animals in this section as well as in Appendices B and C.**

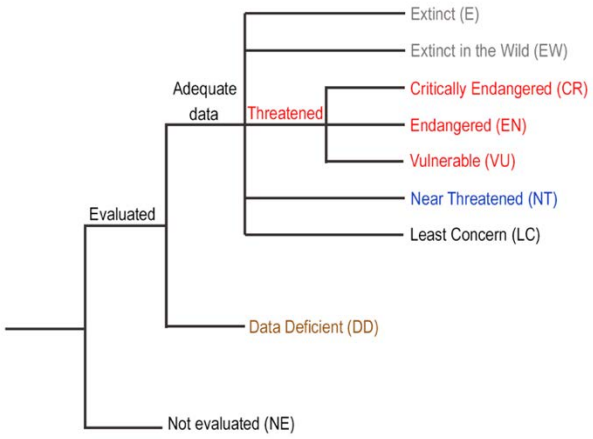


Figure 22: Schematic representation of the relationship between the various IUCN Red List Categories.

Extinct Categories:

- **Extinct (E):** A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
- **Extinct in the Wild (EW):** A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalised population (or populations) well outside the past range.

Threatened Categories:

- **Critically Endangered (CR):** A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
- **Endangered (EN):** A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that it is facing a very high risk of extinction.
- **Vulnerable (VU):** A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that it is facing a high risk of extinction.

Not Threatened Categories but regarded as SCC by SANBI:

- **Near Threatened (NT):** A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.
- **Data Deficient (DD):** A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. In this case the species would be classified as DDD. If however, taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible, the species is classified as DDT. The latter category cannot be considered as SCC.
- **Additional categories recognised by SANBI:** Although not threatened categories, SANBI have added the species classified as Critically Rare, Rare and Declining to their SCC.

Not Threatened Categories and not considered as SCC by SANBI

- **Least Concern (LC):** A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
- **Not Evaluated (NE):** A taxon is Not Evaluated when it is has not yet been evaluated against the five IUCN criteria. This category often applies to alien species.

Khadia beswickii (VU) is the only IUCN threatened species occurring in the region according to the NewPosa list (Appendix B). Near Threatened (NT), Data Deficient (DDD) and Data Deficient (Taxononically) (DDT) species are not classified as threatened according to the IUCN classification.

7.2 SANBI: Species of Conservation Concern

According to the South African National Biodiversity Institute (SANBI 2020), SCCs include all species that have been assessed according the IUCN Threatened or Red-List Criteria as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), as well as range-restricted species which are not declining and are nationally listed as Rare or Critically Rare. The DD category is split into those that are taxonomically unresolved (DDT) and those where insufficient data (DDD) are available to make a judgement on endangered status. The Taxonomically Data Deficient (DDT) species were excluded as SCC since taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of extinction risk is not possible.

The SCC species listed for the region (NewPosa list, SANBI) are *Khadia beswickii* (VU) and *Adromischus umbraticola* subsp. *umbraticola* (NT). These two species were not recorded on the Igolide site. Furthermore, two near threatened species, *Gnaphalium nelsonii* and *Cineraria austrotransvaalensis*, could potentially occur on site according to the Gauteng C-plan.

7.3 Screening Tool

The Screening Tool highlighted four plant species as being of concern. None of the SCC, including *Khadia beswickii,* were recorded on site and the Gauteng C-Plan did not reflect their possible occurrence on site.

7.4 Protected species

7.4.1 Gauteng (GDARD 1983; 2014a)

Thirteen (13) plant species are listed as protected in the region according to the GDARD (1983, 2014a). Most of these Schedule 11 species are members of the Asphodelaceae and Iridaceae.

One Schedule 11 Protected Plant Species was recorded during the site survey in January 2021 (see Appendix B):

Gladiolus permeabilis Iridaceae

Two rare plant species could potentially occur on the Igolide site according to data provided by GDARDE (2011, C-Plan). They are *Cineraria austrotransvaalensis* and *Gnaphalium nelsonii*, both with a Near Threatened status. Neither species are listed in the NewPosa species list for the region or were recorded on site during the site survey.

7.5 ToPS list (NEM:BA 2007c)

No species classified as protected within the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA 2007c) is listed for the study area and none were found at the site.

7.6 CITES appendices

Appendix II of CITES lists species that are not necessarily now threatened with extinction, but that may become so unless trade is closely controlled. Thirteen (13) Appendix II species are listed for the region including mostly *Aloe* species and species of the Orchidaceae. None of the CITES listed species were recorded during the site survey (Appendix B).

7.7 Protected Tree Species - National Forests Act (Act No. 84 of 1998)

No nationally protected tree species is listed for the site (NFA 2023) and none were recorded during the site visit.

7.8 Endemic species

Plant species endemic to the Rand Highveld Grassland Vegetation Type include the following (Mucina & Rutherford 2006):

Anacampseros subnuda subsp. *lubbersii*
Delosperma purpureum
Encephalartos middelburgensis
Melanospermum rudolfii
Crassula arborescens subsp. *undulatifolia*
Encephalartos lanatus
Frithia humilis
Polygala spicata

None of the listed species were recorded on the Igolide site.

No endemic species are listed for the Gauteng Shale Mountain Bushveld Vegetation Type.

7.9 Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA) and the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA 2020a & b)

A total of 49 alien species were recorded for the Igolide site (Appendix B) of which 21 species are categorised as invasive, 27 species as naturalised alien species and one alien tree species. Alien species with an invasive categorisation will have to be controlled during the construction and operational stages of the project. Alien invasive species listed for the study area include the following (the 21 species recorded during the site survey are marked with an asterisk):

*Acacia dealbata**
Opuntia ficus-indica

*Acacia mearnsii**
Agrimonia procera
Araujia sericifera
Argemone ochroleuca subsp. *ochroleuca*
*Campuloclinium macrocephalum**
Cestrum parqui
*Cirsium vulgare**
*Cuscuta campestris**
*Datura ferox**
Datura stramonium
*Eucalyptus camaldulensis**
*Ipomoea purpurea**
*Melia azedarach**
*Opuntia ficus-indica**
Phytolacca octandra
*Populus canescens**
*Pyracantha angustifolia**
*Pyracantha crenulata**
*Ricinus communis**
*Robinia pseudoacacia**
*Solanum elaeagnifolium**
*Solanum pseudocapsicum**
*Solanum sisymbriifolium**
*Verbena bonariensis**
*Verbena brasiliensis**
*Xanthium spinosum**
Xanthium strumarium

8. FAUNA: CHECKLISTS AND RED-LISTED AND/OR PROTECTED SPECIES

Species lists (the term species is used here in a general sense to denote species, subspecies and varieties) of the faunal component were sourced for the study area from the Animal Demography Unit, University of Cape Town website (http://vmus.adu.org.za) and supplemented by relevant literature to determine the conservation status.

8.1 Mammals

The site falls within the distribution range of 85 terrestrial mammal species (http://vmus.adu.org.za) (Appendix C). Note: This list was drawn from a far larger area than the site and includes several game farms.

8.1.1 IUCN threatened mammal species

Five IUCN threatened mammal species were listed for the environs of the Igolide site on the website of the Animal Demography Unit, University of Cape Town. None of these species were listed as SCC by the Screening Tool. The threatened category include species that are Critically Endangered (CR), Endangered (EN) and Vulnerable (VU).:

Redunca fulvorufula	Mountain reedbuck*	EN
Acinonyx jubatus	Cheetah	VU
Panthera pardus	Leopard	VU
Cloeotis percivali	Percival's short-eared trident bat	EN
Mystromys albicaudatus	African white-tailed rat	VU

*species recorded on site or confirmed by landowner

Six mammal species were listed as Near Threatened (a category that is not a threatened category in the IUCN classification) (none were recorded on the site):

Atelerix frontalis	Southern African Hedgehog	NT
Leptailurus serval	Serval	NT
Aonyx capensis	African clawless otter	NT
Miniopterus schreibersii	Schreibers's long-fingered bat	NT
Pipistrellus rusticus	Rusty pipistrelle	NT
Hydrictis maculicollis	Spotted-necked otter	VU

Mammals that were either sighted or confirmed by the landowner on site are indicated in Appendix C.

Southern Mountain reedbuck (*Redunca fulvorufula fulvorufula*)

The southern mountain reedbuck is listed as **Endangered A2b** (Taylor *et al*. 2016) due to large population declines in all protected areas for which long-term count data are available. However, the species has been extensively reintroduced into parts of its former range (Taylor *et al.* 2016). A large portion of the Igolide site is currently a game farm and the species could have been introduced.

It is important to note that because of their specialised habitat requirements, the distribution of the mountain reedbuck is patchy and discontinuous and that they are found only where there is suitable habitat. They favour grass-covered ridges and hillsides in broken, rocky country or high-altitude grasslands. They are dependent on steep

slopes, a well-developed grass layer and some scattered woody cover to evade predators. According to Rowe-Rowe (1983) the mountain reedbuck favours slopes with a gradient of 20□or more. In regions where cover is locally more abundant in lower valleys than on upper slopes and ridges, it often prefers the lower slopes. They avoid the open conditions with no cover associated with the summits of mountainous areas as well as dense woody cover (Mason 1977; Oliver *et al.* 1978; Skinner & Chimimba 2005). They also occur in dry hilly areas (such as the Nama-Karoo), utilising steep slopes and the bases of hills for grazing. The extent of available slopes for predator evasion is regarded as an indicator of the quality of their territory (Dunbar & Roberts 1992).

Note: The Screening Tool did not list the Southern mountain reedbuck for the site and it could thus have been introduced on site. Its presence on site and its status of "Endangered" should be taken into account when developing the Igolide site.

The Screening Tool highlighted the following two mammal species in the region. Neither of them were recorded on site during the survey although they may occur in the region:

Spotted-necked otter (*Hydrictis maculicollis*): Suitable habitat for the Spotted-necked otter is potentially available on site. It occurs widespread, but it is restricted to areas of permanent fresh water offering good shoreline cover and an abundant prey base. Overall, the population may be declining as river habitat is lost to development and infestations of alien species in riparian areas, and riverside vegetation degradation from overgrazing. The main interventions revolve around riparian protection. Thus, rivers should be carefully managed to increase flow and reduce turbidity, and development on banks should be restricted. The Igolide development will avoid all rivers and wetlands.

Maquassie musk shrew (*Crocidura maquassiensis*): This species is classified as Vulnerable (Taylor *et al*. 2016). It depends on wetlands as suitable habitat in savanna and grassland. Although it has a wide inferred extent of occurrence, it appears to be patchily distributed. The main threats to shrews are the loss or degradation of moist, productive areas such as wetlands and rank grasslands within suitable habitat. *Crocidura maquassiensis* has not been reported from Gauteng or North West Province post-1999 and thus there is a low probability for it to occur on site.

8.1.2 Provincially protected mammal species (GDARD 1983)

Ten of the terrestrial mammal species listed in Appendix C are Schedule 2 Protected Game in Gauteng. However, the hippopotamus was not recorded on site. The following nine species were recorded on the Igolide site:

Alcelaphus buselaphus caama	Red hartebeest
Connochaetes gnou	Black wildebeest
Kobus ellipsiprymnus ellipsiprymnus	Waterbuck
Oryx gazella	Gemsbok
Raphicerus campestris	Steenbok
Redunca fulvorufula	Mountain reedbuck
Taurotragus oryx	Cape eland
Giraffa giraffa giraffa	Giraffe
Lepus saxatilis	Scrub hare

Three mammal species listed in the ADU database for the region are Schedule 4 Protected Wild Animals (not recorded on site):

Acinonyx jubatus	Cheetah
Panthera leo	Lion

Panthera pardus	Leopard

Three species are listed as Schedule 8 Problem Animals (all recorded on site):

Canis mesomelas	Black-backed jackal
Chlorocebus pygerythrus pygerythrus	Vervet monkey
Caracal caracal	Caracal

8.1.3 Nationally Threatened or Protected Species: ToPS

According to ToPS legislation (NEMBA 2007c), three mammal species are listed as Vulnerable and five species are Protected (Appendix C).

Vulnerable:

Acinonyx jubatus	Cheetah
Panthera leo	Lion
Panthera pardus	Leopard

Protected:

Atelerix frontalis	Southern African hedgehog
Aonyx capensis	African Clawless otter
Connochaetes gnou	Black wildebeest*
Leptailurus serval	Serval
Hydrictis maculicollis	Spotted-necked otter

*recorded on site

8.2 Reptiles

Forty-four (44) reptile species are listed for the region (Appendix C). The list includes one IUCN threatened (Vulnerable) species, i.e. *Crocodylus niloticus* for the region, although not on site. Provincially protected reptile species include 26 Schedule 2 Protected Game and 17 Schedule 5 snakes. The python *Python natalensis* is the only protected reptile species according to the ToPS list (NEMBA 2007c).

8.3 Frogs

Sixteen species were listed for the region and the Giant Bull Frog *Pyxicephalus adspersus* is listed as Near Threatened and is also on the ToPS list as a protected species (NEMBA 2007c).

8.4 Lepidoptera

One of the 100 species of the Lepidoptera for the region is listed as Endangered, i.e. *Lepidochrysops praeterita* (Highveld giant cupid).

The two Lepidopteran species listed by the Screening Tool are unlikely to occur on site because their host plant was not recorded on site. According to the National Sensitive Species List of SANBI *Lepidochrysops praeterita* is not ranked as sensitive although it has an IUCN global status of Endangered. The species is not exploited, collected, traded or utilised in a targeted manner (http://nssl.sanbi.org.za/ species/lepidochrysops-praeterita). This taxon is confined to grassy, rocky, typically south-facing slopes, where its host plant (*Ocimum obovatum*) and, presumably,

its host ant occur. Most localities are within an altitudinal band between 1500 m and 1750 m. *Lepidochrysops praeterita* is highly localized and appears to have a very specific habitat niche.

Lepidochrysops procera: Although the species has a IUCN global status of Least Concern, it is a habitat specialist and rated as Rare. It is not regarded as sensitive in the National Sensitive Species List of SANBI and is not exploited, collected, traded or utilised in a targeted manner (http://nssl.sanbi.org.za/species/lepidochrysops-procera). Its habitat is rocky areas in grassland (and grassy areas in savanna), where its larval host plant, *Ocimum obovatum*, occurs. The host plant was not recorded on site.

8.5 Odonata

Fifty-three species of Odonata were listed for the region and all have a status of Least Concern according to the IUCN classification.

8.6 Scorpions

Four scorpion species are listed for the region and two are listed as ToPS species (NEMBA 2007c).

8.7 Spiders

All baboon spiders are provincially protected. One of the listed baboon spiders *Harpactira hamiltoni* is a ToPS protected species (NEMBA 2007c).

8.8 Other insects

According to the RSA Red List, *Clonia uvarovi* is rated as Vulnerable. It inhabits tall savanna woodland. The habitat on site has been decribed as bushveld which may be marginally suitable for the species. However, its habitat will not be affected by the turbines.

Note: **Bird and bat checklists will be provided and discussed in the avifaunal and bat specialist assessments.**

9. CONSERVATION

9.1 National Environmental Management: Protected Areas Act (Act No. 10 of 2003)

The study site is not located in a protected area.

9.2 National Protected Areas Expansion Strategy (NPAES)

The study site is part of the NPAES (NPAES 2018). None of the turbines is is located in the areas demarcated by the NPAES (Figure 23).

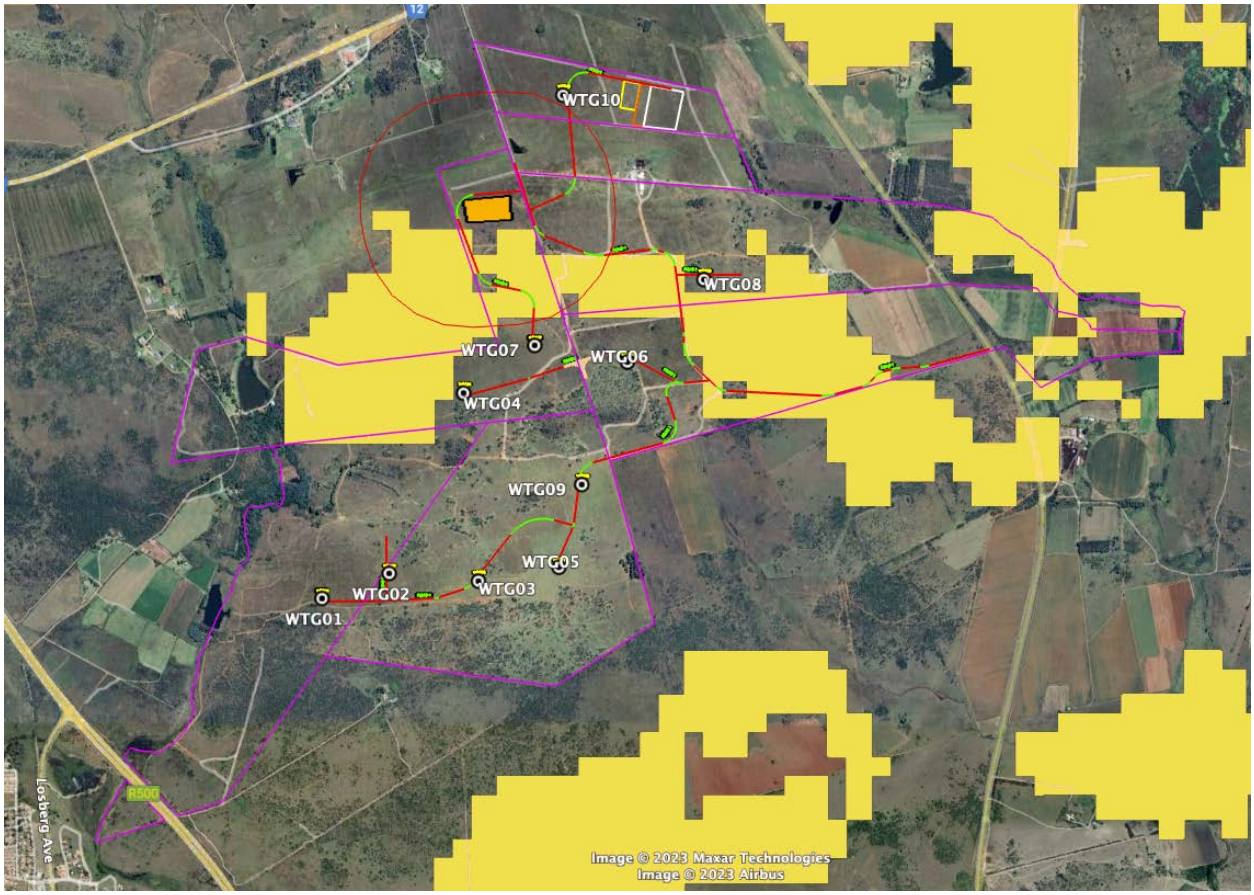


Figure 23. NPAES map of the Igolide WEF site (NPAES 2018, Yellow polygons) with proposed roads and location of 10 turbines (WTG) indicated. Orange rectangle = on-site IPP substation/BESS; red/yellow/white rectangles = other ancillary areas (batching plant, construction camp and laydown).

9.3 National list of ecosystems that are threatened and in need of protection

The site is located in the Gauteng Shale Mountain Bushveld and Rand Highveld Grassland (Mucina & Rutherford 2006, SANBI 2006-2018) vegetation types, that are classified as "Least Concern" and "Vulnerable" respectively (NEMA 2011, Skowno *et al*. 2019).

9.4 Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Other Natural Areas (ONAs)

Critical Biodiversity Areas (CBAs) are areas required to meet biodiversity targets for ecosystems, species or ecological processes. CBAs are regarded as areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species. The definitions for CBAs are (SANBI 2018):

- CBA 1 (CBA irreplaceable): Areas that are irreplaceable for meeting biodiversity targets. There are no other options for conserving the ecosystems, species or ecological processes in these areas (SANBI 2018).
- CBA 2 (CBA Important areas): Areas that are the best option for meeting biodiversity targets, in the smallest area, while avoiding conflict with other land uses.

The main reasons provided for the mapping of the CBAs (GDARDE 2011) were:

- Orange list plant habitat
- Red list invertebrate habitat
- Primary vegetation

The CBA map in Figure 24 indicates the presence of a CBA2 (Important area) on the rocky grassland habitats (Habitat 2 and Habitat 3, Figure 7) and parts of the rocky bushveld (Habitat 6) as well as grassland on the plains (Habitat 4).

The ESAs cover parts of the rocky grassland (Habitat 3), some of the rocky bushveld (Habitat 6) and wetlands/floodplains (Habitat 5). The ESAs also cover areas of abandoned cropland (Habitat 9) and planted pasture (Habitat 10) (Figure 7; CPlanV33_1110_ge 2017). Turbines 04, 07 and 08 lie in ESAs but outside the NPAES and their locations could be reconsidered.

According to the land use guidelines supplied by SANBI (2021) the loss of natural habitat should be avoided in CBAs and these areas should be maintained with natural vegetation as far as possible. Formal protection of CBAs should be actively promoted, together with the implementation of management plans to maintain or enhance biodiversity importance. Infrastructure development should be limited to existing degraded/modified footprints. Linear infrastructure is not desirable and should only be considered if all alternative alignments and design options have been assessed and are found to be unavailable. Where CBAs occur across part of a property, split zoning should be used, where feasible, to demarcate sensitive areas.

An Ecological Support Area (ESA) is not essential for meeting biodiversity targets, but plays an important role in supporting the ecological functioning in a CBA. ESAs need to be maintained in at least a functional and often natural state (SANBI 2021). It is important that a project should not result in impacts to threatened species or ecological processes. Infrastructure should be designed to avoid additional impacts on ecological processes.

Other Natural Areas (ONAs) have not been identified as a priority, but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Land use guidelines for Terrestrial Other Natural Areas (ONAs) are not required to meet biodiversity targets. ONAs represent a substantial part of the site and form a matrix within which the CBAs and ESAs occur (Figure 24). The site options for the on-site IPP substation/BESS facility and the other ancillary areas (batching plant, construction camp and laydown) fall in ONAs.

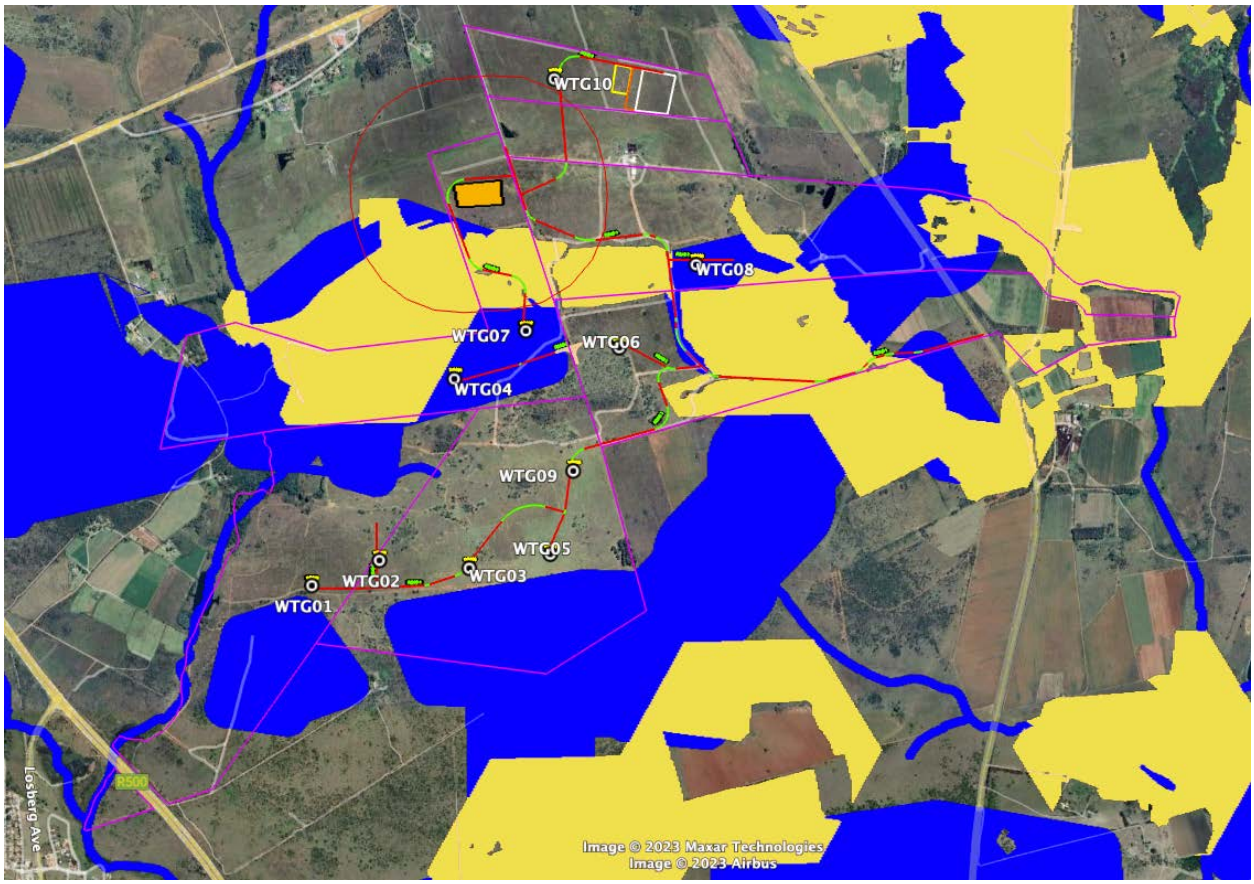


Figure 24: Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Other Natural Areas (ONAs) of the Igolide site and environs (biodiversityadvisor.sanbi.org) with proposed roads and location of 10 turbines (WTG) indicated. Orange rectangle = on-site IPP substation/BESS; red/yellow/white rectangles = other ancillary areas (batching plant, construction camp and laydown); Yellow polygons = CBA2 (important area); blue polygons = ESAs; not coloured areas = ONAs.

9.5 Freshwater Ecosystem Priority Areas (FEPAs)

Freshwater Ecosystem Priority Areas (FEPA) are priority areas for conserving freshwater ecosystems and supporting sustainable use of water resources and upstream management areas (Driver *et al*. 2012). According to the NFEPA there are two rivers/streams traversing the site – one on the western side and one on the eastern side. Additionally, there are several wetlands along the watercourses on site, particularly along the Kaalkopspruit. The buffers specified by the aquatic specialist should be observed. The current layout avoids the wetlands.

9.6 Ecological processes, functioning and drivers

Ecological processes include primary production, decomposition, nutrient cycling and fluxes of nutrients and energy. These processes will be altered by the clearing of the vegetation at the footprint of the WEF infrastructure. The impact is expected to be fairly small in relation to the adjacent landscape where no change to the ecological processes is anticipated. The relatively small footprint of the infrastructure will not hinder pollination by airborne pollinators. Migration of ground-dwelling organisms will be hindered locally at the construction sites, but ecological connectivity should not be disrupted during the operational phase. Overall, it is unlikely that the project will contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna

to respond to fluctuations in climate or other conditions. The infrastructure will not cause any additional impediment to ecological corridors and habitat fragmentation should not be an issue

The disturbance caused during construction will create conditions favourable for invasion by alien species. Since, the level of alien infestation at the site was moderate to high, an alien invasive plant species monitoring and control programme needs to be initiated to control invasions.

Fire is considered an important driver of vegetation dynamics in the Grassland and Savanna Biomes and can occur when the fuel load is high. To avoid damage to the infrastructure, fire will have to be suppressed. If the grass layer is regularly mowed/brush cut, it should prevent grasses from becoming moribund in the absence of fire although mowing or brushcutting would reduce seed set. Should fire be suppressed on site this could have long-term effects on the vegetation dynamics.

Grasslands have evolved under the grazing pressure from large ungulates. Mesic Highveld Grasslands are reasonably well adapted to grazing pressure under low to moderate stocking rates with adequate rest periods. The WEF development will still allow livestock or wildlife grazing.

9.7 Indigenous forests

No indigenous forests occur on the site.

10. ECOLOGICAL SENSITIVITY ANALYSIS: VEGETATION

10.1 Introduction

It should be clearly stated that the sensitivity model applied to the **vegetation data** in this report is not regarded as a substitute for defining a CBA. The sensitivity model scores ten different criteria for each habitat (plant community) and derives a sensitivity rating for each of the habitats (plant communities). The CBAs are delineated by the provinces and different criteria are used to delineate these areas (not only the vegetation), e.g. climate change land facets, wetland clusters, intact grassland patches and critical linkages.

Sensitivity is the vulnerability of a plant community or habitat to an impact, for example a wetland or ridge system would be more vulnerable to development than would a sandy plain. Several features of a site can be assessed to derive a sensitivity score, such as:

1. Threatened status of the regional vegetation types wherein the proposed site is situated:
2. Percentage of IUCN threatened (red-listed) plant species per habitat:
3. Number of protected tree species per habitat:
4. Percentage of provincially protected plant species per habitat:
5. Presence of endemic plant species per habitat or site (endemic to vegetation type):
6. Conservation value of plant community (habitat):
7. Species richness per habitat or per sample plot (number of plant species):
8. Degree of connectivity and/or fragmentation of the habitat, i.e. high connectivity and low fragmentation infers a low rating:
9. Soil erosion potential:
10. Resilience (this is a measure of the ability of a particular habitat to recover after an impact, i.e. high resilience infers low rating).

10.2 Sensitivity model

During the field survey, 31 sample plots were surveyed on the Igolide site.

The following **sensitivity model** (Table 5, Figure 25) was applied to the data for each habitat on site. This was achieved by weighting each criterion and calculating the sum for the habitat, which reflects the sensitivity and sensitivity ranking. A brief description of the sensitivity rating of the parameters is provided below:

1. **Threatened status of the ecosystem** (depends on the percentage area intact, or degree of transformation) (Mucina & Rutherford 2006, NEM:BA 2011, Skowno *et al.* 2019). The ecosystems are classified into the following categories:
   - Low sensitivity: If "Least Concern", the vegetation type has most of its habitat intact, i.e. more than 80%; or the vegetation type is adequately statutory or formally conserved in parks and reserves.
   - Moderate sensitivity: If “Vulnerable”, the vegetation type has from 60% to 80% of the ecosystem intact; less than 40% has been transformed which could result in some ecosystem functioning being altered, and/or the ecosystem is statutory poorly conserved. For example, the vegetation type is rich in plant species, but is not a pristine example of a vegetation type, therefore some transformation or disturbance occurred, such as human structures and degraded veld due to overgrazing and/or bush encroachment.

- High sensitivity: If “Endangered”, the vegetation type has from 40% to 60% of the ecosystem intact; or 40% to 60% transformed due to disturbance, cultivation or alien species; or the ecosystem is statutory poorly conserved e.g. less than about 3% conserved.
- Very high sensitivity: If “Critically Endangered”, the vegetation type has only 16% to 36% of the ecosystem intact. The richer the ecosystem is in terms of species, the higher the percentage threshold.

Category rating:

Low	(LT)	= 1
Moderate	(VU)	= 2
High	(EN)	= 3
Very high	(CE)	= 4

2. **Percentage of threatened (red-listed) plant species** (IUCN threatened status): The rating is determined by the presence of red-listed flora in a habitat (calculated as percentage of the total number of species per habitat).

Category rating:

None	(0%)	= 0
Low	(>0 – 2%)	= 1
Moderate	(>2 – 5%	= 2
High	(>5%)	= 3

3. **Presence of protected tree species** (NFA 2021): The presence protected tree species in a habitat is rated as follows:

Category rating:

None	(0 species)	= 0
Low	(1 - 2 species)	= 1
Moderate	(3 – 4 species)	= 2
High	(>4 species)	= 3

4. **Percentage of Gauteng protected plant species**: (Transvaal Nature Conservation Ordinance 1983) (GDARD 1983). The rating depends on the percentage of protected species in relation to the total plant species per habitat.

Category rating:

None	(0%)	= 0
Low	(>0 - 10%)	= 1
Moderate	(>10 – 20%)	= 2
High	(>20%)	= 3

5. **Percentage of plant species endemic to the particular vegetation type of Mucina & Rutherford** (2006): Refers to the number of species expressed as a percentage of the total number of species per habitat.

Category rating:

None	(0%)	= 0
Low	(>0 - 2%)	= 1
Moderate	(2–5%)	= 2
High	(>5%)	= 3

6. **Species richness per habitat:** Expressed as mean number of species per plot in a habitat.

Category rating:

Low	(<15)	= 1
Moderate	(15 – 30)	= 2
High	(>30)	= 3

7. **Conservation value of the habitat:** The assessment is made for the habitat in the broader region.

Category rating:

Low	= 1
Moderate	= 2
High	= 3

8. **Degree of connectivity and/or fragmentation of the ecosystem:** The degree of connectivity with surrounding or adjacent natural areas and/or fragmentation of habitats, thus high degree of connectivity and low degree of fragmentation infer a high rating.

Category rating (note reverse order)*:*

Low	= 3
Moderate	= 2
High	= 1

9. **Erosion potential of the soil:** The erosion potential of the soil is indicated as low, moderate or high, e.g. coarse sandy soils on plains have a low erosion potential.

Category rating:

Low	= 1
Moderate	= 2
High	= 3

10. **Resilience:** Is a measure of the ability of a particular habitat to recover to its current state after an impact, i.e. high resilience infers low rating.

Category rating (note reverse order):

Low	= 3
Moderate	= 2
High	= 1

Each criterium is weighted as follows in the model:

Threatened status of the vegetation type	x5
Percentage of threatened plant species	x4
Presence of protected tree species	x3
Percentage of Gauteng protected species	x4
Percentage of endemic species to vegetation type	x2
Species richness	x2
Conservation value (habitat)	x4
Degree of connectivity/fragmentation of habitat	x2

Erosion potential	x2
Resilience	x3

10.2.2 Sensitivity rating

The sum of all criteria is obtained per habitat and the sensitivity rating interpreted as follows:

≤ 39	= low	(L)	(rating scale = 1)
40 – 54	= moderate	(M)	(rating scale = 2)
55 – 69	= high	(H)	(rating scale = 3)
> 70	= very high	(VH)	(rating scale = 4)

In general, these sensitivity ratings are interpreted as follows:

- **Low** sensitivity means the sensitivity should not have an influence on the decision about the project. It is usually applicable to habitats that have been transformed, especially by human activities. However, no protected species may be removed/destroyed without a permit.
- **Moderate** means a sensitivity rating that is real and sufficiently important to require management, e.g. mitigation measures, management or protection of the rare/threatened fauna and flora, protection of a specific habitat on the property and/or rehabilitation.
- **High** means a sensitivity rating where the habitat should be excluded from any development.
- **Very high** means a sensitivity rating that should influence the decision whether or not to proceed with the project.

Table 5: Sensitivity of the different plant communities (habitats) identified on site (see Figure 25)

Community/Habitat	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Threatened status (x5)	10	10	5	10	10	10	10	10	10	5	5	5
% Threatened species (x4)	0	0	0	0	0	0	0	0	0	0	0	0
Number of protected trees (x3)	0	0	0	0	0	0	0	0	0	0	0	0
Gauteng species (x4)	0	4	4	0	0	0	0	0	0	0	0	0
Endemic species (x2)	0	0	0	0	0	0	0	0	0	0	0	0
Species richness (x2)	2	4	6	4	4	4	4	4	2	0	0	0
Conservation value (x4)	4	8	8	8	12	8	12	8	4	0	0	0
Connectivity (x2)	2	6	4	2	4	4	2	4	2	4	6	6
Erosion (x2)	4	2	4	4	4	4	6	4	4	2	2	2
Resilience (x3)	3	9	6	3	6	6	6	6	3	3	3	3
Sum:	25	43	37	31	40	36	40	36	25	19	16	16
Sensitivity rating:	**L**	**M**	**L**	**L**	**M**	**L**	**M**	**L**	**L**	**L**	**L**	**L**

Overall, the rocky outcrop (Habitat 2) and drainage lines (Habitats 5 & 7) were more sensitive than the other habitats on site. Habitats 9 – 12 are man-made habitats, e.g. cropland, planted pasture, plantations and wind breaks and all have a very low sensitivity rating. The dams are included in Habitat 7 and have been assigned a medium sensitivity in Figure 25.

The site options for the on-site IPP substation and BESS facility and the other ancillary areas (batching plant, construction camp and laydown) are shown in Figures 2, 23, 24 & 25. This site falls in an area with low habitat sensitivity. The WEF infrastructure is currently located predominantly in Habitat 4 (Grassland) and all rocky hills,

rocky outcrops (sheets) and drainage lines are avoided (Figures 7, 24 & 25). The ten turbines are located in a habitat with a low sensitivity rating for the vegetation (Habitat 4).

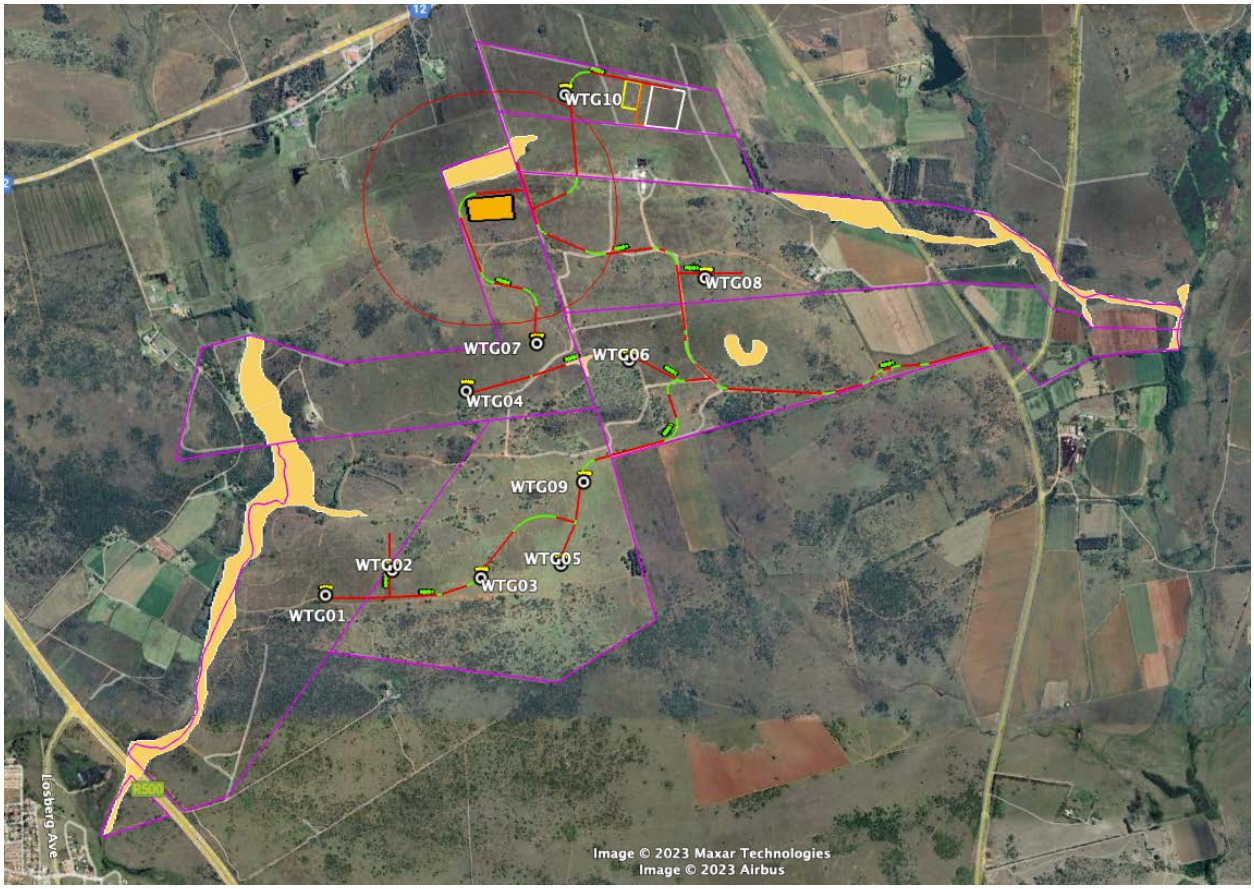


Figure 25. Sensitivity map of the plant communities (habitats) of the Igolide WEF site. Areas marked in yellow were classified as Medium Sensitivity in the Terrestrial Biodiversity and Species Specialist Assessment while the remainder of the habitats are indicated as low sensitivity. The proposed roads and location of 10 turbines (WTG) are indicated. Orange rectangle = on-site IPP substation/BESS; red/orange/white rectangles = other ancillary areas (batching plant, construction camp and laydown).

Buffers are applicable to the development along the watercourses. A buffer zone of 32 m is usually applied to drainage lines, but the bat and aquatic specialists may apply wider buffer zones along these habitats. It is recommended that the buffer zones specified in the aquatic report are used as guideline.

Only one species recorded on site is provincially protected (*Gladiolus permeabilis*) and no CITES listed species were encountered on site. Protected and CITES listed species were not considered as being of conservation concern because none of them qualify as SCC according to the SANBI definition (SANBI 2020). Furthermore, no ToPS listed species or species endemic to one of the national vegetation types were recorded on site.

11. SCREENING REPORT

11.1 Summary of Screening Tool results

11.1.1 Plant Species Theme

The Screening Tool rated the sensitivity of the Plant Species Theme as Medium (Figure 26).

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

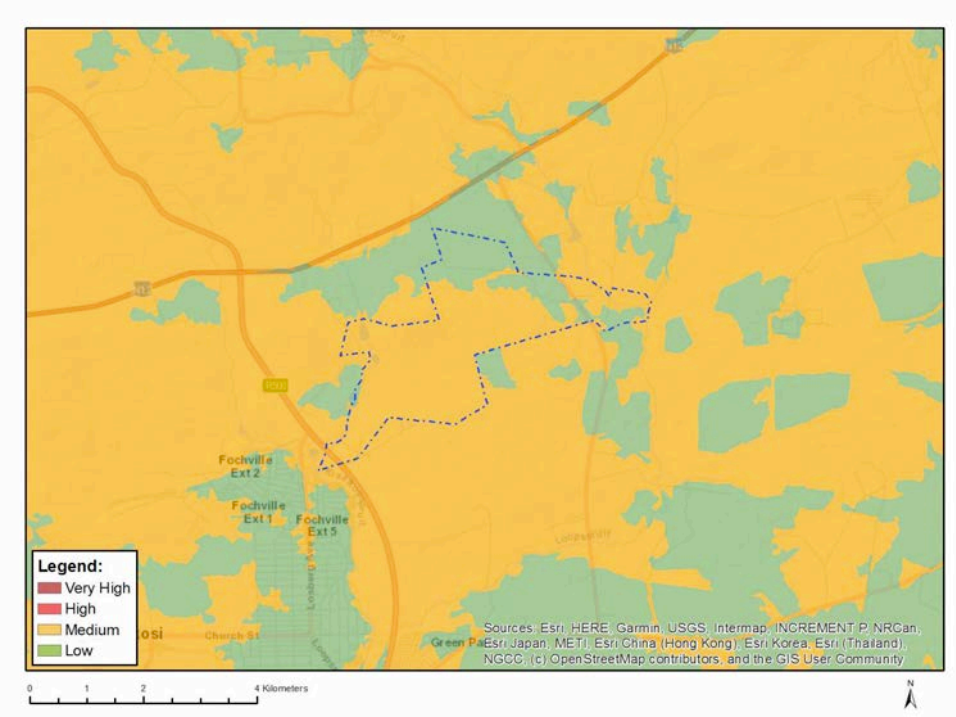


Figure 26: Map and outcome of the Plant Species Theme sensitivity generated by the Screening Tool.

The following plant species were highlighted as being of concern:

Sensitivity	Feature(s)
Medium	Sensitive species 1252
Medium	*Khadia beswickii*
Medium	Sensitive species 691
Medium	Sensitive species 1248

11.1.2 Animal Species Theme

The Screening Tool rated the sensitivity of the Animal Species Theme as Medium (Figure 27).

Very high sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

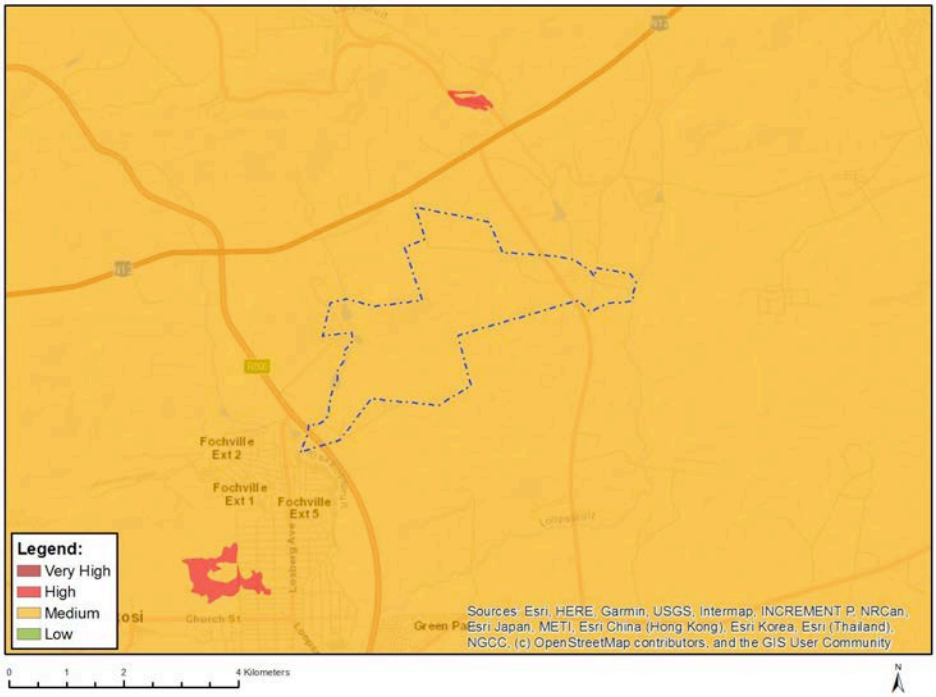


Figure 27: Map and outcome of Animal Species Theme sensitivity generated by the Screening Tool.

Animal species highlighted by the Screening Tool for the region:

Sensitivity	**Feature(s)**
Medium	Aves-*Tyto capensis*
Medium	Aves-*Hydroprogne caspia*
Medium	Aves-*Eupodotis senegalensis*
Medium	Insecta-*Lepidochrysops praeterita*
Medium	Insecta-*Lepidochrysops procera*
Medium	Mammalia-*Crocidura maquassiensis*
Medium	Mammalia-*Hydrictis maculicollis*
Medium	Invertebrate-*Clonia uvarovi*

11.1.3 Relative Terrestrial Biodiversity theme

The Screening Tool rated the sensitivity of the Relative Terrestrial Biodiversity theme as **Very High** (Figure 28). The following features were highlighted:

Very high sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity	Feature(s)
Very high	Critical Biodiversity Area
Very high	Ecological Support Area
Very high	Vulnerable ecosystem
Very high	Protected Areas Expansion Strategy

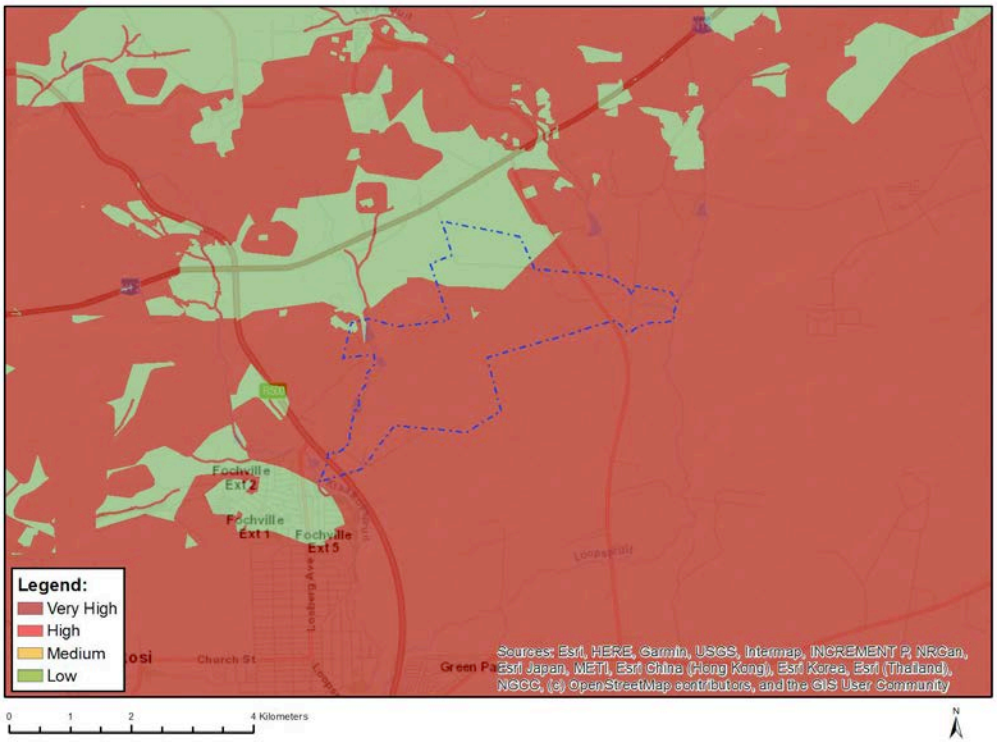


Figure 28: Map and outcome of Relative Terrestrial Biodiversity sensitivity generated by the Screening Tool.

11.2 Screening Tool in relation to background study and site verification

11.2.1 Plant Species Theme

The Screening Tool rated the sensitivity of the Plant Species Theme as medium. None of the SCC highlighted by the Screening Tool were recorded on site and the Gauteng C-Plan did not reflect their possible occurrence on site.

- *Khadia beswickii* (VU) occurs in rocky habitats on shallow soil (sheetrock) but was not recorded on site.
- Species 691 occurs in damp depressions in shallow soil over rock sheets. This type of habitat occurs in a small area on site but the species was not encountered during the vegetation survey.
- The wooded habitats on site may present suitable habitat for sensitive plant species 1248 and 1252 on the Screening Tool list, but they were not encountered during the site survey. Furthermore, the rocky habitats (sheets) and wooded habitats were avoided in the layout of the infrastructure on the Igolide site, thus these species should not be affected by the proposed development.
- Two near threatened species, *Gnaphalium nelsonii* and *Cineraria austrotransvaalensis*, could potentially occur on site according to the Gauteng C-plan, but these species were not mentioned by the screening tool.
- Considering the vegetation as a whole, our site surveys and sensitivity model applied to the vegetation data indicated that the vegetation across most of the site had a low sensitivity.
- Because none of the SCC highlighted by the Screening Tool were found on site, we suggest that the Plant Species Theme's site sensitivity is rated as **Low.**

11.2.2 Animal Species Theme

- The Screening Tool rated the sensitivity of the Animal Species Theme as medium.
- The two Lepidopteran species in the region (*Lepidochrysops praeterita* and *L. procera*) were not recorded and their host plant (*Ocimum obovatum*) was not encountered during the site survey. None of the

Lepidopteran species highlighted by the Screening Tool are listed on the ADU database for the site. According to the RSA Red List, *Clonia uvarovi* (Orthoptera) is rated as Vulnerable. It inhabits tall woodland savanna (http://speciesstatus.sanbi.org/assessment/last-assessment/4333/), and no tall woodland savanna is present on site. The habitat on site could be decribed as bushveld which may be marginally suitable for the species.

- The Maquassie Musk Shrew *Crocidura maquassiensis* (VU) depends on wetlands as suitable habitat in savanna and grassland. Although it has a wide inferred extent of occurrence, it appears to be patchily distributed. It has not been reported from Gauteng or North West Province post-1999 and thus there is a low probability for it to occur on site.
- Suitable habitat for the spotted-necked otter *Hydrictis maculicollis* is available on site. It occurs widespread, but it is restricted to areas of permanent fresh water offering good shoreline cover and an abundant prey base. The watercourses were avoided by the proposed development and bufferzones are applicable.
- **The avifaunal component will be addressed by the avifaunal specialist.**
- **Excluding the bird and bat components,** we would thus rate the sensitivity of the Animal Theme as **Low - Medium** based on the information provided above.

11.2.3 Relative Terrestrial Biodiversity Theme

- The Screening Tool rated the sensitivity of the Relative Terrestrial Biodiversity Theme as very high based on the presence of CBAs, ESAs, NPAES and a vulnerable ecosystem.
- The study area is not located in a nationally protected area.
- The study site is part of the NPAES (NPAES 2018) and all turbines are located outside the NPAES.
- CBAs and ESAs are present on the site (CPlanV33_1110_ge 2017) and development within the CBAs should best be avoided. Turbines WTG04, WTG07 and WTG08 lie in ESAs but outside the NPAES and their locations may be reconsidered.
- Our background study confirmed that the Rand Highveld Grassland vegetation type on site is listed as Vulnerable whereas the Gauteng Shale Mountain Bushveld is Least Concern. The turbines are currently located in both the Rand Highveld Grassland (7 turbines) and the Gauteng Shale Mountain Bushveld (3 turbines).
- The Freshwater Ecosystem Priority Areas (FEPAs) were not flagged by the Screening Tool.
- The current site clearly includes areas of very high sensitivity (CBA, ESAs and NPAES), but it also includes a large portion that has not been demarcated as very high sensitivity, thus ONA. According to the land use guidelines supplied by SANBI (2021), split zoning should be used, where feasible, to demarcate sensitive areas, where CBAs occur across part of a property. The development has been largely contained within areas that do not qualify as very high sensitivity, although three turbines are located in ESAs.

12. ENVIRONMENTAL IMPACTS

12.1 Introduction

In this section the issues, risks and impacts associated with the project from a terrestrial biodiversity and species viewpoint is presented.

12.2 Key issues

- A sizeable portion of the site falls within a 'Vulnerable' national vegetation type, i.e. the Rand Highveld Grassland and some of the proposed infrastructure is located in this vegetation type. However, from a **vegetation** point of view, the specific area where the turbines are placed (Habitat 4) has a low sensitivity and large areas are old abandoned fields.
- The footprint of the development is relatively small and has been estimated at 50 ha according to the project description provided by the applicant.

12.3 Impacts during the construction phase

12.3.1 Direct impacts during the construction phase

- Potential impact 1: Loss of vegetation/habitat
- Potential impact 2: The potential loss of threatened, protected, CITES listed and/or endemic plants/animals
- Potential impact 3: Loss of faunal habitat
- Potential impact 4: Direct faunal mortalities due to construction and increased traffic
- Potential impact 5: Increased dust deposition
- Potential impact 6: Increased human activity, noise and light levels
- Potential impact 7: Impact of roads

12.3.2 Indirect impacts during the construction phase

- Potential impact 1: Establishment of alien vegetation
- Potential impact 2: Increased water run-off and erosion
- Potential impact 3: Changes in animal behaviour

12.4 Impacts during the operational phase

12.4.1 Direct impacts during the operational phase

- Potential impact 1: Direct faunal mortalities
- Potential impact 2: Increased light and noise levels and changes in animal behaviour

12.4.2 Indirect impacts during the operational phase

- Potential impact 1: Establishment of alien vegetation
- Potential impact 2: Increased water run-off and erosion

12.5 Impacts during the decommissioning phase

12.5.1 Direct impacts during the decommissioning phase

- Potential impact 1: Direct faunal mortalities
- Potential impact 2: Increased dust deposition

12.5.2 Indirect impacts during the decommissioning phase

- Potential impact 1: Establishment of alien vegetation
- Potential impact 2: Increased water run-off and erosion

12.6 Cumulative impacts

- Cumulative impact 1: Vegetation loss and habitat destruction
- Cumulative impact 2: Compromising integrity of CBAs, ESAs and NPAES
- Cumulative impact 3: Reduced ability to meet conservation obligations & targets
- Cumulative impact 4: Loss of landscape connectivity and disruption of broad-scale ecological processes

13. ASSESSMENT OF SIGNIFICANCE OF ENVIRONMENTAL IMPACT

13.1 Introduction

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

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

Potential impacts and risks have been rated in terms of the direct, indirect and cumulative impacts:

- **Direct impacts:** Impacts that arise directly from activities that form an integral part of the Project. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
- **Indirect or secondary impacts:** Impacts that arise indirectly from activities not explicitly forming part of the Project. These impacts include induced changes (secondary impact) that may occur as a result of the activity and do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.
- **Cumulative impacts:** Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts. The cumulative impacts are assessed by identifying other wind and solar energy project proposals and other applicable projects, such as construction and upgrade of electricity generation, and transmission or distribution facilities in the local area (i.e. within 30 km of the proposed Igolide site) that have been approved (i.e. positive EA has been issued) or is currently underway.

A standard risk assessment methodology, provided by WSP, has been used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria presented in **Error! Reference source not found.**6.

Table 6: Impact criteria and the scores applied

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	[S = (E + D + R + M) X P] *Significance = (Extent + Duration + Reversibility + Magnitude) x Probability*				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

The significance of an impact is interpreted as follows (provided by WSP):

- Very low - the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making;
- Low - the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making;
- Moderate - the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated;
- High - the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making; and
- Very high - the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating).

The impacts of the proposed development on the terrestrial biodiversity and species were assessed based on the knowledge gained during the site visit and literature review. Each of the impacts is briefly described below in terms of the nature, status (positive, negative or neutral) and proposed mitigation measures. The significance of the impact without and with the mitigation measures applied is derived from the assessments of the extent, duration, magnitude, magnitude and probability of the impact by means of an equation.

Impact Mitigation

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

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in Figure 29 below.

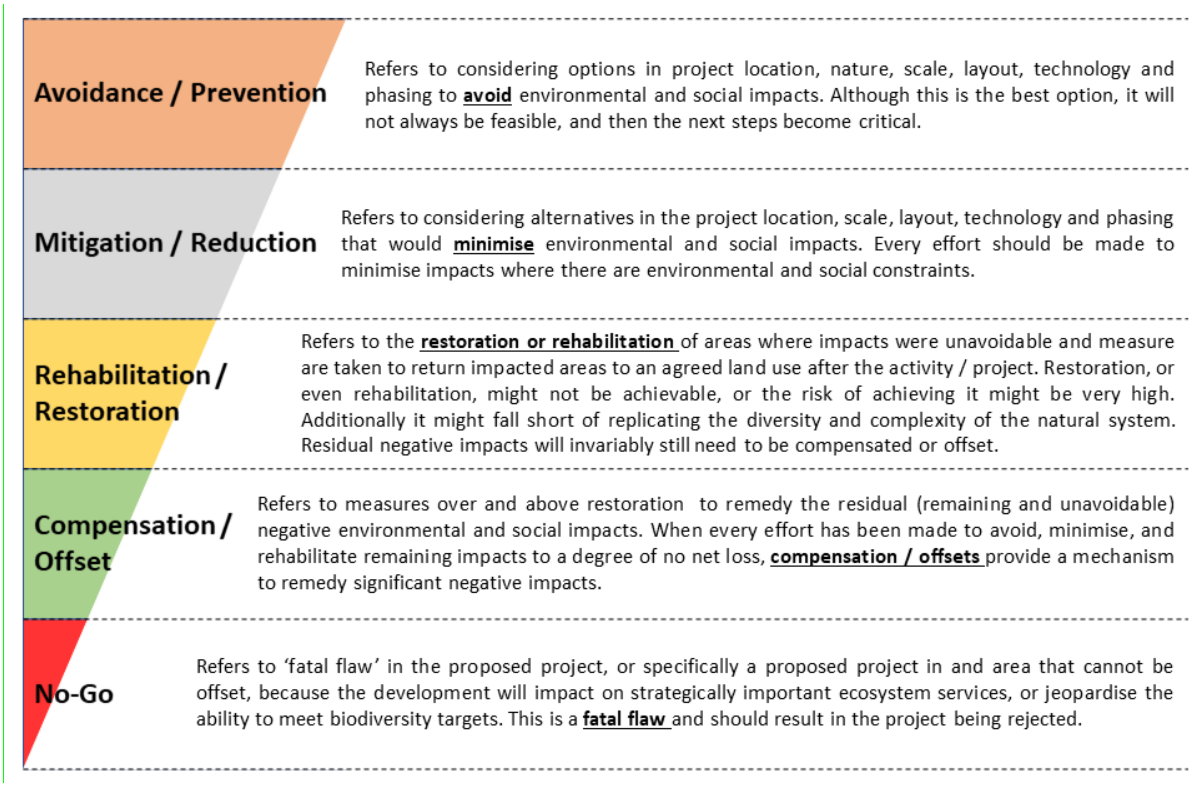


Figure 29: Schematic representation of the mitigation sequence/hierarchy.

13.2 Impacts during the construction phase and their significance

13.2.1 Direct impacts during the construction phase

Loss of vegetation/habitat

Nature: Natural vegetation will be cleared for new access roads, upgrading of existing tracks, laydown and construction sites, compound areas, substation, turbines and crane pads. The removal of indigenous vegetation may cause a loss of individuals of threatened, protected and/or endemic species and will also be accompanied by a loss of faunal habitat. However, no threatened or endemic species were found on site and only one provincially protected species with a Least

Concern status was recorded. None of the SCC listed by the Screening Tool, were recorded on site. Vegetation loss is generally also associated with increased water run-off and erosion (see indirect impacts).

Since the turbine footprint is relatively small and spread across the site, the loss of prime habitat within the Gauteng Shale Mountain Bushveld and the Rand Highveld Grassland vegetation types will be small. However, it is suggested that existing tracks should be followed wherever possible. Service roads generally have a larger impact on vegetation clearance than the turbines, however since the roads will have a gravel surface animal movement should still be possible. Beyond the permanent infrastructure footprint, environmental functions and processes should however, not be altered. The ancillary areas are located in the Gauteng Shale Mountain Bushveld which is classified as Least Concern.

Proposed mitigation measures:

- A walkthrough would be needed prior to construction to inform permit applications for protected plant species.
- Where possible, ESAs that are located in the Vulnerable Rand Highveld Grassland should be avoided.
- Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns. This includes awareness as to remaining within demarcated construction areas, no littering, handling of pollution and chemical spills, avoiding fire hazards and minimising wildlife interactions.
- Ensure that all temporary use areas e.g. laydown areas and construction camp, are located in areas of low sensitivity.
- Footprints of the turbines, crane pads, roads, construction and substation locations should be clearly demarcated. Vegetation clearance should be confined to the footprint of the development and unnecessary clearance should be avoided.
- The watercourses, rocky outcrops and rocky sheets should be avoided.
- All vehicles are to remain on demarcated roads and no driving through the veld should be allowed.
- No collection of 'fuelwood' should be allowed on site.
- The ECO is to provide supervision on vegetation clearing activities and other activities which may cause damage to the environment, especially when construction commences and most vegetation clearing is taking place.
- River/stream crossings should be placed in areas without extensive wetlands and preferably in areas where the risk of disruption and erosion is low. River/stream crossings should be specifically designed not to impede or disrupt the direction and flow of the water. Specific guidelines of the aquatic specialist should be followed.
- No plants may be translocated or otherwise uprooted or disturbed without express permission from the ECO.
- Permits are required for the destruction or removal of provincially specially protected or protected species.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1
Duration (D)	4	4
Reversibility (R)	3	3
Magnitude (M)	3	2
Probability (P)	4	3
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**44**	**30**

The potential loss of threatened, SCC, protected & endemic plant species

Nature: The clearance of the vegetation for new access roads, upgrading of existing tracks, construction site, substation, turbines and crane pads may cause a loss of individuals of threatened, protected or endemic plant species. The site visit did however, not reveal the presence of any species with an IUCN threatened status or SCC mentioned by the Screening Tool. Only one provincially protected plant species was present on site, i.e. *Gladiolus permeabilis*. As the protected plant species at the site is not threatened, the loss of a small number of individuals (if any should mitigation be applied) is not likely to threaten the local or regional population of this species. The loss of some individuals of protected species is unlikely to alter the patterns or processes of the natural system, in the sense that environmental functions and processes will temporarily or permanently cease. *Gladiolus permeabilis* is found in Habitats 2 & 3 which were avoided by the development. Nevertheless, permits need to be obtained for the destruction or removal of provincially specially protected or protected species.

Proposed mitigation measures:

- A walkthrough would be needed prior to construction to inform permit applications for protected plant species.
- Placement of infrastructure should be done in such a way as to minimise the impact on SCC or protected species.
- Construction crew, in particular the drivers, should undergo environmental training (induction) to make them aware of the importance of SCC and protected species.
- Permits are required for removal of protected species prior to construction, should avoidance not be possible.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1
Duration (D)	4	4
Reversibility (R)	4	4
Magnitude (M)	3	2
Probability (P)	2	1
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**24**	**11**

Loss of faunal habitat

Nature: Clearance of the vegetation due to new access roads, upgrading of existing tracks, construction site, substation, turbines and crane pads will be accompanied by a loss of faunal habitat.

The rare species reported for the Igolide site is the mountain reedbuck *Redunca fulvorufula* and its presence and its status of "Endangered" should be taken into account when developing the Igolide site. However, the species was probably reintroduced to the game farm.

The Screening Report refers to the Maquassie musk shrew *Crocidura maquassiensis* and the spotted-necked otter *Hydrictus maculicollis* as species of concern. *Crocidura maquassiensis* depends on wetlands as suitable habitat, whereas *Hydrictus maculicollis* is restricted to areas of permanent fresh water, offering good shoreline cover and an abundant prey base. *Crocidura maquassiensis* has not been reported from Gauteng or North West Province post-1999 and thus there is a very low probability for it to occur on site. Marginally suitable habitat for the spotted-necked otter is available on site. However, even if the species did occur on site it is unlikely that they would be affected by the development since their habitats will be avoided by the development. The two Lepidopteran species are unlikely to occur on site because their host plant was not recorded on site. The insect *Clonia uvarovi* inhabits tall woodland savanna, while the habitat on site could be decribed as bushveld. The bushveld may be marginally suitable for the species. Furthermore, the turbines are not located in any bushveld habitats.

Proposed mitigation measures:

- Vegetation clearance should be confined to the smallest possible footprint of the development and unnecessary clearance should be avoided.
- Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns.
- A speed limit (of e.g. 40 km/h or appropriate limit) should be set on all roads and strictly adhered to.
- Development should avoid drainage lines and rocky outcrops. The outcrops may be favoured habitat for reptiles and other species since they offer protection from predators.
- Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the sites.
- Observe buffer zones along drainage lines.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1
Duration (D)	4	4
Reversibility (R)	3	3
Magnitude (M)	3	2
Probability (P)	4	3
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**44**	**30**

Direct faunal mortalities due to construction and increased traffic

Nature: Faunal mortalities may be caused by construction at the footprint of the infrastructure, construction vehicles or other operational activities and by electrical fences, should they be erected around the construction site and substation. In particular slow-moving species such as tortoises, might be prone to these mortalities. When animals ingest waste material or become ensnared in wires, fatalities might occur.

Larger more mobile fauna such as antelope and larger predators will most likely move away from areas of high activity during the construction phase. Smaller and less-mobile animals are not as capable of moving away and may seek shelter down burrows and other shelter sites. None of the SCC listed in the Screening Tool were encountered on site and generally the protected species listed for the region occur at a low density and thus it is unlikely that they would be directly encountered by people at the Igolide WEF.

Proposed mitigation measures:

- Construction crew, in particular the drivers, should undergo environmental training to increase their awareness of environmental concerns in order to reduce the number of road kills. The crew should also be made aware of not harming or collecting species such as snakes, tortoises and owls which are often persecuted.
- Proper waste management procedures should be in place to avoid litter, food or other foreign material from lying around and all waste material should be removed from the site.
- Speed limits (e.g. 40 km/h or appropriate limit) should be set on all roads on site.
- Personnel should not be allowed to roam into the veld.
- Ensure that cabling and electrical infrastructure at the site are buried sufficiently deeply to avoid being excavated by fauna and that where such infrastructure emerges above-ground that it is sufficiently protected from gnawing animals.

- Any dangerous fauna (e.g. snakes, scorpions) that are encountered during construction should not be handled or molested by construction staff and the ECO or other suitably qualified persons should be contacted to remove the animals to safety.
- Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days, should have an escape ramp to allow any fauna that fall in to escape.
- Should electrical fences be erected it must be done according to the norms and standards of the Nature Conservation Authorities in Gauteng.
- Access to the site should be strictly regulated to reduce the opportunities for poaching.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1
Duration (D)	2	2
Reversibility (R)	4	4
Magnitude (M)	2	1
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**27**	**16**

Increased dust deposition

Nature: Increased dust deposition may harm physiological processes of plants and a reduction in the photosynthetic capacity of the plants may occur. The dust layer on the vegetation may also discourage herbivores from grazing or browsing. The increased dust levels will be temporary.

Proposed mitigation measures:

- Excessive dust must be reduced by spraying water onto the soil.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1
Duration (D)	2	2
Reversibility (R)	1	1
Magnitude (M)	2	2
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**18**	**12**

Increased human activity, noise and light levels

Nature: Construction activities will increase human presence, noise and light levels at the site. These activities may affect animal behaviour. Increased noise and light levels associated with the construction phase are temporary.

Proposed mitigation measures:

- The SANS standards should be adhered to in terms of noise levels.
- No major construction should be done at night.

- If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. Motion-detecting lights should also be considered.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1
Duration (D)	2	2
Reversibility (R)	1	1
Magnitude (M)	3	2
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**21**	**12**

Impacts of roads

Nature: Roads are referred to under several impacts, but a summary is provided in this section. Even in natural regions roads are intrusive and destructive and cause a disturbance. Their construction destroys the vegetation, leads to compaction of the soil and loss of habitat for small animals. Roads can create barriers for small animals, cutting off dispersal routes and fragmenting habitats. Animals crossing or moving along roads can also become easy targets for predators. Compacted roads also impact on the movement of subterranean and burrowing animals. Dust kicked up by vehicles coat the roadside plants making them less attractive to animals. Poorly planned roads often result in water erosion problems and busy roads affect the movement of especially shy animals. Some destruction of the vegetation adjacent to the footprint will also inevitably occur when preparing the sites. Unnecessary clearing of vegetation beyond the footprint of the development can however, largely be avoided.

Proposed mitigation measures:

- Wherever possible, existing roads/tracks should be used.
- The construction of a road should be done in the most environmentally sensitive manner possible.
- A suitably qualified person should plan, design and supervise the proper construction of roads to minimize the impact on the environment.
- Roads should be provided with run-off structures to reduce the risk of erosion.
- Proper road maintenance procedures should be in place.
- A long-term commitment to the maintenance of the road should be accepted. Roads can easily become ruts and erosion gullies if not properly planned and maintained.
- Driving in wet clayey soils after rain also result in deep tracks that damage the road surface and lead to other users bypassing such areas, thereby forming new tracks alongside the original ones.
- River/stream crossings should not be placed in areas with extensive wetlands and preferably in areas where the risk of disruption and erosion is low. All river/stream crossings should be inspected by the aquatic specialist during final design of the layout to ensure that optimal and acceptable locations have been chosen for river crossings.
- River/stream crossings should be specifically designed not to impede or disrupt the direction and flow of the water. Specific guidelines of the aquatic specialist should be followed.
- Roads should not have steep curbs.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1

Duration (D)	4	4
Reversibility (R)	3	3
Magnitude (M)	4	2
Probability (P)	4	3
Significance (S) [$S = (E + D + R + M)\ x\ P$]	**48**	**30**

13.2.2 Indirect impacts during the construction phase

Establishment of alien vegetation

Nature: As a result of the clearance of indigenous vegetation and resulting degradation, alien species might invade the area. At present the leve of alien infestation on site was rated as moderate to high. Twenty-one declared invasive species were noted on site and increased vehicle traffic may further facilitate the introduction of seeds of alien species. Infestation by invasive alien species may cause changes to the structure and functioning of the ecosystem which often exacerbate the further loss of indigenous vegetation. Bare areas that are not actively rehabilitated and areas receiving runoff are particularly vulnerable to alien infestation.

Proposed mitigation measures:

- Implement a monitoring program for the early detection of alien invasive plant species.
- A control program should be employed to combat declared alien invasive plant species in the most environmentally friendly manner that does not result in undesirable secondary impacts.
- Herbicides for the control of alien species should be applied according to the relevant instructions and by appropriately trained personnel.
- No alien species should be used in rehabilitation or landscaping.
- Use only plants and seed collected on-site for revegetation.
- Cleared areas may need to be fenced-off during rehabilitation to exclude livestock and wildlife.
- Material brought onto site e.g. building sand should be regularly checked for the germination of alien species.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	2	1
Duration (D)	4	3
Reversibility (R)	3	3
Magnitude (M)	3	2
Probability (P)	3	2
Significance (S) [$S = (E + D + R + M)\ x\ P$]	**36**	**18**

Increased water run-off and erosion

Nature: Increased erosion (water and wind) and water run-off will be caused by the clearing of the indigenous vegetation and compaction of soil. The roads traversing hill slopes will be the main source of erosion if not properly constructed and provided with water run-off structures. In addition, the hardened surfaces created by the roads, crane pads and other infrastructure elements will increase runoff, which will pose an erosion risk in the areas receiving the water, even if these areas have not been disturbed. Increased run-off and erosion could affect hydrological processes in the area and change water and silt discharge into the streams.

The site lies within the summer rainfall region and can experience intense thundershowers, which will increase the potential for erosion. On slopes, active rehabilitation and mitigation measures to prevent erosion will be required.

Proposed mitigation measures:

- Clearing of vegetation, compaction and levelling should be restricted to the footprint of the proposed development.
- All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area.
- A rehabilitation and revegetation plan should be developed as part of the EMP.
- Regular monitoring of the site during construction for erosion problems.
- Silt traps should be used where there is a danger of topsoil eroding and entering streams and other sensitive areas.
- If applicable, topsoil should be removed and stockpiled, then reapplied as soon as possible in order to facilitate regeneration of the natural vegetation on cleared areas.
- Where applicable, construct stabilisation structures on slopes to prevent erosion.
- Reduce activity on site after large rainfall events when the soils are wet. No driving off hardened roads until soils have dried out and the risk of bogging down has decreased.
- A suitably qualified person should plan, design and supervise the proper construction of roads to minimise the impact on the environment.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	3	2
Duration (D)	4	4
Reversibility (R)	4	3
Magnitude (M)	3	3
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**42**	**24**

Changes in animal behaviour

Nature: The increased human presence and/or construction operations will increase noise levels as well as light levels at night. The increased human presence, elevated noise and light levels, loss of animal habitat and compaction of soils may alter the behavioural patterns of some animals. Some of these changes may favour certain species and negatively affect others and consequently change the composition of the animal communities. Species with small territories will be negatively affected as well as species that live in the soil.

Research elsewhere showed that the response of animals to wind energy facilities was **highly species-specific** and could range from avoidance to a positive reaction. The response was apparently also depended on the level of predation, with no impact noted where predation pressure was low. Wind farms affect large terrestrial mammals mainly through an increase in human activity within the wind farm area. During the construction phase, the mobile large-mammal carnivores and ungulates may temporarily avoid the site, but when construction ceases and human presence decreases, these animals generally acclimate to the wind energy infrastructure. The impact on burrowing fauna may be higher, since these animals are usually sensitive to soil tremors and disturbances, and consequently they will likely move away from construction areas. It is anticipated that the impact of the Igolide site on the fauna would mostly be temporary, i.e. during the construction phase.

Proposed mitigation measures:

- Construction crew should undergo environmental training, by way of an induction course, to increase their awareness of environmental concerns.
- Development should avoid rocky outcrops and wetlands.
- Soil compaction should be kept to a minimum by restricting driving to designated roads.
- If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. Motion-detecting lights should also be considered.
- The mitigation measures as indicated by the noise specialist must be adhered to.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1
Duration (D)	3	2
Reversibility (R)	1	1
Magnitude (M)	3	2
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**24**	**12**

13.3 Impacts during the operational phase and their significance

13.3.1 Direct impacts during the operational phase

Direct faunal mortalities

Nature: Faunal mortalities may be caused by maintenance vehicles or other maintenance activities, electric fences and ingestion of waste material. In particular slow-moving species such as tortoises, might be prone to road mortalities. Fatalities might also arise when animals become ensnared in wires or in electric fences. Bird collisions with the wind turbine blades will be addressed by the avifaunal and bat specialists.

Although activity at the site is likely to be relatively low during operation, some impact on fauna may still occur as a result of personnel present on site as well as the operation of maintenance vehicles. Direct interactions between the turbines and terrestrial fauna (excluding avifauna and bats) are likely to be low. Major risk factors during operation are likely to be from vehicle collisions with fauna.

Proposed mitigation measures:

- Maintenance crew should undergo environmental training, by way of an induction course, to increase their awareness of environmental concerns.
- Access to the site should be strictly controlled.
- All excess wires, cables and waste material should be removed from the site.
- All vehicles at the site should adhere to a low speed limit (of e.g. 40 km/h (or whatever is appropriate) and slow-moving fauna such as tortoises on roads should be moved off the road.

Additional mitigation measures proposed:

- Electrical fences should be erected according to the norms and standards of the Nature Conservation Authorities in Gauteng.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1
Duration (D)	4	4
Reversibility (R)	4	4
Magnitude (M)	2	2
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**36**	**22**

Increased light and noise levels and changes in animal behaviour

Nature: The loss of vegetation cover, compacting of soils, increased noise levels and the increased human presence will alter animal behavioural patterns by making certain areas unavailable and making roads difficult to traverse, Some animal species will be more affected than others. These species might undergo a reduction in their population size.

According to Todd & Skowno (2014), small mammals, reptiles and amphibians are not likely to move away from the turbines on account of the noise as these animals do not rely on sound to forage and rely largely on plant cover and other avoidance measures to avoid predators. Although frogs communicate with their calls, the pitch of the noise generated by the turbines is not likely to be similar to that of the frogs and a significant impact is unlikely. Fauna which rely heavily on hearing for foraging or predator avoidance are potentially worst affected by the noise. This would include species that rely extensively on hearing for prey detection or predator avoidance. However, it is difficult to predict the impact on these species without entering into a high degree of speculation as there has been little research on this topic and hence there is no baseline in terms of known impacts due to turbine noise on fauna, especially within the South African context. However, noise due to turbines at the site will be variable and related to wind direction and operating conditions among other factors. As most fauna are adaptable with regards to noise, it is likely that any affected fauna would adapt to the local conditions and it is not likely that there would be any ecosystem-level or trophic impacts due to turbine noise. According to Todd & Skowno (2014) the possibility that predators such as jackal and caracal would prey more heavily on livestock or wildlife as a result of turbine noise, is not a likely scenario.

Proposed mitigation measures:

- The mitigation measures as indicated by the noise specialist must be adhered to.
- Maintenance crew should undergo environmental training, by way of an induction course, to increase their awareness of environmental concerns.
- Soil compaction should be kept to a minimum by restricting driving to designated roads.
- If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. Motion-detecting lights should also be considered.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1
Duration (D)	4	4
Reversibility (R)	3	1
Magnitude (M)	3	2
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**33**	**16**

13.3.2 Indirect impacts during the operational phase

Establishment of alien vegetation

Nature: As a result of the loss of indigenous vegetation and resulting degradation, primarily during the construction phase, alien species might invade the area. Alien invasive species are generally more common in road reserves than the adjacent undisturbed farmland. The invasion by alien species will continue unless controlled. Increased vehicle traffic may further facilitate the introduction of seeds of alien species. If not controlled, infestation by invasive alien species may eventually cause changes to the structure and functioning of the ecosystem which often exacerbate the further loss of indigenous vegetation.

Proposed mitigation measures:

- Implement a monitoring program for the early detection of alien invasive plant species and a control program to combat declared alien invasive plant species should be employed.
- No alien species should be used for landscaping, rehabilitation or any other purpose.
- Clearing of alien species should be done on a regular basis.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	2	1
Duration (D)	4	3
Reversibility (R)	3	3
Magnitude (M)	3	2
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**36**	**18**

Increased water run-off and erosion

Nature: Disturbance created during construction will take several years to fully stabilise and the increase in compacted areas as a result of roads, turbines and crane pads may increase runoff which will pose an erosion risk. Particular areas of concern would be roads traversing slopes as well as any infrastructure on slopes with erodible soils. Consequently, erosion risk during operation is likely to be centred on areas disturbed during construction and on areas receiving runoff from roads and similar hardened surfaces. Increased run-off and erosion could affect hydrological processes in the area and may change water discharge into the streams and increase silt load.

Proposed mitigation measures:

- Proper road maintenance procedures should be in place.
- Regular monitoring of the site during operation for erosion problems.
- Should new sections of the road be needed, a suitably qualified person should plan, design and supervise the proper construction of roads.
- Reduced activity at the site after large rainfall events when the soils are wet.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	2	2
Duration (D)	4	4
Reversibility (R)	3	3
Magnitude (M)	3	3
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**36**	**24**

13.4 Impacts during the decommissioning phase and their significance

13.4.1 Direct impacts during the decommissioning phase

Faunal mortalities

Nature: Faunal mortalities may be caused by vehicles or other decommissioning activities and waste. In particular slow-moving species such as tortoises, might be prone to road mortalities. When animals ingest waste material or become ensnared in it fatalities might also occur.

Proposed mitigation measures:

- Decommissioning crew should undergo environmental training to increase their awareness of environmental concerns.
- Speed limits (of e.g. 40 km/h) should be adhered to.
- Proper waste management procedures should be in place and no material should be left on site in order to prevent instances of ensnarement or ingestion of foreign material.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1
Duration (D)	1	1
Reversibility (R)	4	4
Magnitude (M)	2	1
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**24**	**12**

Increased dust deposition

Nature: Increased dust deposition may harm physiological processes of plants and a reduction in the photosynthetic capacity of the plants may occur. The dust layer on the vegetation may also discourage herbivores from grazing or browsing the dust covered vegetation. The increased dust levels will be temporary.

Proposed mitigation measures:

- Excessive dust must be reduced by spraying water onto the soil.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	1	1
Duration (D)	2	2
Reversibility (R)	1	1
Magnitude (M)	2	1
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**18**	**9**

13.4.2 Indirect impacts during the decommissioning phase

Establishment of alien vegetation

Nature: As a result of the decommissioning activities, areas will be disturbed and alien species might invade. Increased vehicle traffic may facilitate the introduction of seeds of alien species.

Proposed mitigation measures:

- Implement a monitoring program (e.g. at three month intervals) for at least three years after decommissioning to document alien infestation across the site.
- A control program to combat declared alien invasive plant species should be employed.
- Areas where turbines, crane pads or other infrastructure are removed, must be revegetated with indigenous plant species.
- No alien species should be used for rehabilitation/revegetation or any other purpose.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	2	1
Duration (D)	4	3
Reversibility (R)	3	1
Magnitude (M)	3	2
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**36**	**14**

Increased water run-off and erosion

Nature: Some of the existing roads might have to be upgraded and increased erosion and water run-off will thus be caused by the clearing of the indigenous vegetation and soil disturbance. Decommissioning would involve the removal of the infrastructure of the facility and the rehabilitation of the roads and other hard infrastructure of the facility. If the rehabilitation is not successful, this would leave the site vulnerable to erosion. Without management, increased run-off and erosion could affect hydrological processes in the area and may change water discharge into the streams and increase silt load.

Proposed mitigation measures:

- No new roads should be built.
- Proper road maintenance procedures should be in place during the decommissioning phase.
- Removal of all infrastructure components from the site.

- Rehabilitation of all cleared and disturbed areas with local species. Implement a monitoring programme (e.g. at six month intervals) for at least three years after decommissioning to document vegetation recovery on site.
- Off-site disposal of all facility components such as cabling and turbine parts.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	2	2
Duration (D)	4	4
Reversibility (R)	3	3
Magnitude (M)	3	3
Probability (P)	3	2
Significance (S) [$S = (E + D + R + M)\ x\ P$]	**36**	**24**

13.5 Cumulative impacts

The existing and proposed developments within 30 km from the site that were taken into consideration for cumulative impacts include:

- Renewable energy projects:

Only one renewable energy development occurs in the region within a 30 km radius from the Igolide site: (DFFE EGIS; REEA Quarter 1, 2023)

EAP: Aurecon SA Pty Ltd
Applicant: Sibanye Gold Limited
Development: Solar PV 200 MW
Status: Approved
DEA Reference: 14/12/16/3/3/2/919

This Sibanye Gold Limited development falls in the Gauteng Shale Mountain Bushveld vegetation type that has a status of "Least Concern".

Since the final grid route has not yet been determined, the cumulative assessment does not consider the grid.

Vegetation loss and habitat destruction

Nature: Vegetation loss, habitat destruction and possibly loss of SCC and protected species, can occur when considering all developments. The habitat destruction will lead to changes in the physical features of the habitat, with concomitant changes in ecological processes. Secondary vegetation may develop at sites where the vegetation was cleared or the soil compacted. The species composition may change and alien species might invade. Vegetation loss will also constitute the loss of animal habitat. It should however be noted that in the case of wind energy facilities vegetation loss due to habitat destruction is far more contained than in the case of solar facilities. The contribution by the Igolide site to the cumulative impact will likely be small.

Proposed mitigation measures:

- All projects should adhere to the site-specific recommendations of the ecologists to ensure that impacts are mitigated where possible.
- Placement of infrastructure should be done in such a way that no SCC or protected species are affected and

CBAs avoided and therefore a walkthrough before construction is commenced is required.

- Positioning of the wind turbines (i.e. avoiding CBAs and wherever possible ESAs) in the most environmentally responsible manner is crucial.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	3	3
Duration (D)	4	4
Reversibility (R)	3	3
Magnitude (M)	3	2
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**39**	**24**

Compromising integrity of CBA, ESA and NPAES

Nature: According to the mapping of CBAs in Gauteng, all turbines fall outside the CBA2 (Important area) and NPAES. Development within a CBA should not be allowed as such development may result in biodiversity loss and therefore compromise the integrity of the CBA. Since ESAs have also been awarded a 'Very High' sensitivity in the Screening Tool, the micrositing or repositioning of those turbines within ESAs should be considered. The on-site substation/BESS as well as the other ancillary areas (batching plant, construction camp and laydown) avoid CBAs and ESAs. Thus, the contribution of Igolide WEF to the cumulative impact will likely be small. It is assumed that authorisation would only be granted to projects that have similarly avoided CBAs and NPAES.

Proposed mitigation measures:

- A walkthrough would be needed prior to construction to inform permit applications for protected plant species.
- Avoid placing turbines and other large infrastructure in CBAs and wherever possible ESAs.
- Minimise the development footprint as far as possible.
- Stringent construction-phase monitoring of activities at the site to ensure that mitigation measures are adhered to and that the overall ecological impact of the development is maintained at a low level.
- Align roads and other infrastructure so that transformation within the CBAs and ESAs is minimised.
- The use of structures which may inhibit movement of fauna, e.g. mesh or electric fencing should be avoided where feasible.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	3	3
Duration (D)	4	4
Reversibility (R)	3	3
Magnitude (M)	3	2
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**39**	**24**

Reduced ability to meet conservation obligations & targets

Nature: The loss of unprotected vegetation types on a cumulative basis from the area may impact the countries'

ability to meet its conservation targets. The 'Vulnerable' Rand Highveld Grassland is a large national vegetation type but only 1.8% is currently conserved, with a conservation target of 24%. However, the direct physical impact of the Igolide WEF on the vegetation type will be small in extent (estimated at 50 ha by Enertrag) and the Igolide site is not located in a protected area but it does fall within the protected area expansion strategy (NPAES). No Special Conservation Zone occurs in the region (GDARDE 2011).

Proposed mitigation measures:

- A walkthrough would be needed prior to construction to inform permit applications for protected plant species.
- Ensure that habitats with a high to very high sensitivity are avoided.
- Minimise the development footprint as far as possible.
- Minimise placement of infrastructure within the Vulnerable Rand Highveld Grassland.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	3	3
Duration (D)	4	4
Reversibility (R)	3	3
Magnitude (M)	3	2
Probability (P)	3	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**39**	**24**

Loss of landscape connectivity and disruption of broad-scale ecological processes

Nature: The presence of the facility and the associated transformation of intact vegetation, could pose a threat to the connectivity of the landscape. For fauna the disruption is largely due to the hardened surfaces of the facility which also create open areas. Subterranean species that have to emerge from the soil to cross roads will be most affected. The severity of any these impacts for faunal species is likely to be relatively low as the roads required for operation are likely to still be of a natural surface such as gravel and would experience low traffic volumes.

Because of the relatively small footprint of the wind turbines, the facility is unlikely to disrupt pollination and dispersal processes that could cause spatial fragmentation of plant populations. The facility would still allow grazing by wildlife and livestock to continue. Fire would need to be controlled and this could affect the vegetation dynamics.

In the long-term the facility is not likely to create significant local or regional population-level impact on fauna or vegetation.

Proposed mitigation measures:

- Minimising the development footprint wherever possible.
- Revegetation of all cleared and bare areas created by the facility with local species.
- Fences and other structures which impede faunal movement should be avoided.
- Roads should not have steep curbs.

Significance without and with mitigation measures:

Parameter	Score without mitigation	Score with mitigation
Status	Negative	Negative
Extent (E)	3	3
Duration (D)	4	4
Reversibility (R)	3	3
Magnitude (M)	3	2
Probability (P)	2	2
Significance (S) $[S = (E + D + R + M)\ x\ P]$	**26**	**24**

Table 7: Overall Impact Significance (Post Mitigation)

Phase and impact	Significance before mitigation	Significance after mitigation
Construction		
Direct impacts		
Loss of vegetation/habitat	**44**	**30**
Potential loss of threatened, SCC, protected & endemic plant species	**24**	**11**
Loss of faunal habitat	**44**	**30**
Direct faunal mortalities due to construction and increased traffic	**27**	**16**
Increased dust deposition	**18**	**12**
Increased human activity, noise and light levels	**21**	**12**
Impacts of roads	**48**	**30**
Indirect impacts		
Establishment of alien vegetation	**36**	**18**
Increased water run-off and erosion	**42**	**24**
Changes in animal behaviour	**24**	**12**
Operational		
Direct impacts		
Direct faunal mortalities	**36**	**22**
Increased light and noise levels and changes in animal behaviour	**33**	**16**
Indirect impacts		
Establishment of alien vegetation	**36**	**18**
Increased water run-off and erosion	**36**	**24**
Decommissioning		
Direct impacts		
Direct faunal mortalities	**24**	**12**
Increased dust deposition	**18**	**9**
Indirect impacts		
Establishment of alien vegetation	**36**	**14**
Increased water run-off and erosion	**36**	**24**
Cumulative		
Vegetation loss and habitat destruction	**39**	**24**
Compromising integrity of CBA, ESA and NPAES	**39**	**24**
Reduced ability to meet conservation obligations & targets	**39**	**24**
Loss of landscape connectivity and disruption of broad-scale ecological processes	**26**	**24**

14. LEGISLATIVE AND PERMIT REQUIREMENTS

The following legislation is relevant to the development and may require permits from the relevant authority.

14.1 National Forest Act (Act No. 84 of 1998)(NFA 2021)

The National Forest Act provides for the protection of forests, as well as for specific tree species. In the case where a protected tree would have to be destroyed by the development an application for a license would have to be made. However, **no protected trees,** according to the protected tree list (NFA 2023), were observed and it is unlikely that any such species occur within the development footprint.

14.2 National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (ToPS list) (NEMBA 2007c)

NEMBA also deals with endangered, threatened and otherwise controlled species, under the ToPS Regulations (Threatened or Protected Species Regulations). A ToPS permit is required for any activities involving a ToPS listed species.

The only threatened or protected animal species (ToPS; NEMA 2007c) that was recorded on site was the black wildebeest (*Connochaetus gnou*). None of the mammals or carnivores are expected to be negatively affected by the development, but avifaunal and bat collisions need to be monitored (see avifaunal and bat specialist reports).

The following **threatened or protected faunal species** (ToPS) are listed for the general region:

Mammals:

Acinonyx jubatus	Cheetah	Vulnerable
Aonyx capensis	African Clawless Otter	Protected
Atelerix frontalis	Southern African Hedgehog	Protected
Connochaetes gnou	Black Wildebeest*	Protected
Hydrictis maculicollis	Spotted-necked Otter	Protected
Leptailurus serval	Serval	Protected
Panthera leo	Lion	Vulnerable
Panthera pardus	Leopard	Vulnerable

*species recorded on site

Reptiles:

Python natalensis	Southern African Python	Protected

Amphibians:

Pyxicephalus adspersus	Giant Bull Frog	Protected

14.3 Conservation of Agricultural Resources Act (Act No. 43 of 1983)

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. A total of 49 alien species were recorded for the Igolide site (Appendix B) of which 21 species are categorised as invasive, 27 species as naturalised alien species and one alien tree species.

Currently alien species abundance at the site is moderate except along the drainage lines where many alien invasive species are present. Disturbance associated with the construction phase would encourage alien invasion and the alien invasive species would need to be cleared on a regular basis. No permitting would be required for such activities, but an alien invasive species control programme should be initiated. Invasive alien species (and their category) likely to occur on site as listed in Chapter 6 and Appendix B.

14.4 Gauteng (GDARD 1983) – permit requirements

GDARDE is the regulatory authority in Gauteng for the issuing of permits for fauna, flora, hunting and CITES.

14.4.1 Flora (see Appendix B):

Subject to the provisions of the Transvaal Nature Conservation Ordinance (No. 12 of 1983), no person shall pick a protected plant or flower of such plant unless he is the holder of a permit which authorises him to do so unless the person is the owner of the land or a relative (Section 87 (1), GDARD 1983).

Subject to the provisions of this Ordinance, no person shall possess, pick, sell, purchase, donate or receive as a donation, import into or convey within the Province, export or remove from the Province a specially protected plant, unless he is the holder of a permit which authorises him to do so (Section 96 (1), GDARD 1983).

Schedule 12: Specially Protected Plants

No Schedule 12 plant species were recorded on site.

Schedule 11: Protected Plants

Thirteen (13) plant species in Appendix B are listed for the region as protected (Schedule 11: Protected Plants) according to GDARDE (1983), but only one Schedule 11 plant species was recorded on site: *Gladiolus permeabilis*.

14.4.2 Fauna (see Appendix C)

At the time of the survey the site was managed as a game farm. Under the Ordinance (GDARD 1983), the majority of mammals, reptiles and amphibians are listed as Schedule 2: Protected Game (see Appendix C). Twenty-three (23) mammal species were recorded on site (Appendix C). Eight species were classified as Schedule 2: Protected Game and two were classified as Schedule 8: Problem Animals.

However, no permits are required for animal species since none should be harmed by the development.

14.5 CITES (Convention on the International Trade in Endangered Species of Wild Fauna and Flora)

South Africa is a signatory to CITES and as such must comply with the import, export and re-export procedure as stipulated by CITES. GDARDE is the CITES Management and Scientific Authority for exports out of and imports into the respective province from or to other countries. According to GDARD (1983), every species of fauna and flora referred to in Appendix I and Appendix II of CITES shall be an endangered species or a rare species of fauna and flora respectively. Therefore no person shall import into or export or remove from the Province an endangered species or a rare species, unless he is the holder of a permit which authorises him to do so.

The following species occurring in the study area are CITES listed. However, no permits are required for animal species since none should be harmed by the development on Igolide.

The following species occurring in the region are CITES listed fauna:

Fauna:

Mammals:

Acinonyx jubatus	Cheetah	Appendix I
Aonyx capensis	African clawless otter	Appendix II
*Caracal caracal**	Caracal	Appendix II
*Giraffa giraffa giraffa**	Giraffe	Appendix II
Hippopotamus amphibius	Hippopotamus	Appendix II
Leptailurus serval	Serval	Appendix II
Panthera leo	Lion	Appendix II
Panthera pardus	Leopard	Appendix I

*Species recorded on site

Reptiles:

Kinixys lobatsiana	Lobatse hinged-back tortoise	Appendix II
Stigmochelys pardalis	Leopard tortoise	Appendix II

Flora:

The following are CITES listed plant species for the region, but **none were** recorded on site:

Aloe spp. (4 species listed for the region)	Asphodelaceae
Anacampseros filamentosa subsp. *filamentosa*	Anacampserotaceae
Anacampseros subnuda subsp. *subnuda*	Anacampserotaceae
Euphorbia clavarioides	Euphorbiaceae
Euphorbia spartaria	Euphorbiaceae

Orchidaceae (all species) – 6 species listed for the region

15. ENVIRONMENTAL MANAGEMENT PROGRAMME INPUT

Impact	Mitigation / Management Objectives	Mitigation / Management actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
A. IMPACTS ON TERRESTRIAL BIODIVERSITY AND SPECIES					
A. DESIGN PHASE					
Potential impact on terrestrial biodiversity and species as a result of the proposed WEF.	Avoid or minimise impacts on terrestrial biodiversity and species on site regarding the placement of the infrastructure. Avoiding ridges, rocky sheets and drainage lines will reduce the chances of loss of protected species and SCC (Screening Tool).	A walkthrough would be needed prior to construction to inform permit applications for protected plant species. Ensure that the placing of infrastructure takes the sensitivity mapping of the ecological assessment into account to avoid and reduce impacts on sensitive habitats and protected species.	Ensure that this is taken into consideration during the planning and design phase.	During design cycle and before construction commences.	Project Developer
B. CONSTRUCTION PHASE (consult Chapter 13 for more detail on mitigation)					
Loss of vegetation/habit at	Confine vegetation clearance to footprint and minimise disturbance of adjacent areas.	Demarcate all infrastructure sites clearly to avoid unnecessary clearance of the vegetation. Permits have to be obtained for the removal of Gauteng protected species within the footprint of the development.	Ensure that mitigation measures are enforced.	Daily	The Environmental Control Officer (ECO) should monitor and report any incidents to the Holder of the EA
Impact on animal species	Avoid or minimise impacts that could potentially affect animal behaviour.	Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns. Holes and trenches should not be left open for long periods of time. These should be regularly inspected for the presence of trapped animals. Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the site. Speed limit (of e.g. 40 km/h) should be strictly adhered to.	Ensure compliance with these mitigation measures.	Daily	The ECO should monitor and report to the Holder of the EA.
Increased dust levels	Avoid or minimise increased dust levels.	Dust control measures should be implemented.	Ensure that dust control measures are in place.	Daily	The ECO should monitor and report to the Holder of the EA.
Alien species invasion	Avoid invasion by alien species.	Implement a monitoring program for the early detection of alien invasive plant species.	Ensure implementation of a control programme	Daily	The ECO should monitor and report to the Holder of the EA.

Impact	Mitigation / Management Objectives	Mitigation / Management actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
		Employ a control program to combat declared alien invasive plant species.	to combat alien invasive plants.		
Run-off and erosion control	Avoid negative effects of run-off and water erosion by applying appropriate mitigation measures	All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area. Road maintenance procedures should be in place. Vegetation clearance and soil compaction should be minimized.	Ensure compliance with these mitigation measures.	Weekly	The ECO should monitor and report to the Holder of the EA.
C. OPERATIONAL PHASE (consult Chapter 13 for more detail on mitigation)					
Impact on animal species	Avoid or minimise impacts that could potentially affect animal behaviour.	Proper waste management procedures should be put in place. If there is any part of the site that needs to be lit at night for security reasons, then appropriate lighting should be installed to minimise negative effects on nocturnal animals. Motion-detecting lights should also be considered.	Ensure compliance with these mitigation measures.	Monthly	The EO should monitor and report to the Holder of the EA.
Alien species invasion	Avoid invasion by alien species.	Implement a monitoring program for the early detection of alien invasive plant species and employ a control program to combat declared alien invasive plant species.	Ensure implementation of a control programme to combat alien invasive plants.	Every three months	The EO should monitor and report to the Holder of the EA.
Run-off and erosion control	Avoid negative effects of run-off and water erosion by applying appropriate mitigation measures	All roads should have water diversion structures with energy dissipation features to slow and disperse the water into the receiving area. Road maintenance procedures should be in place. Vegetation clearance and soil compaction should be minimized.	Ensure compliance with these mitigation measures.	Weekly	The EO should monitor and report to the Holder of the EA.
C. DECOMMISSIONING PHASE (consult Chapter 13 for more detail on mitigation)					
Loss of vegetation/habitat	Minimise disturbance and clearance of vegetation.	Unnecessary clearance of natural vegetation should be avoided.	Ensure that mitigation measures are enforced.	Monthly	The EO should monitor and report to the Holder of the EA.
Impact on animal behaviour	Avoid or minimise impacts that could potentially affect animal behaviour.	Proper waste management procedures should be put in place.	Ensure compliance with these mitigation measures.	Monthly	The EO should monitor and report to the Holder of the EA.
Alien species invasion	Avoid invasion by alien species.	Implement a monitoring program for the early detection of alien invasive plant species and employ a control program to combat declared alien invasive plant species.	Ensure implementation of a control programme to combat alien invasive plants.	Every three months	The EO should monitor and report to the Holder of the EA.

16. Final Specialist Statement and Authorisation Recommendation

The low impact significance, after mitigation, and low sensitivity rating for many of the habitats means the project could go ahead without major constraints, provided the mitigation measures and management actions proposed to conserve protected fauna and flora on the site are applied. **We thus recommend authorisation of the project provided all mitigation measures are implemented.**

A brief summary of the most important considerations is provided below:

Vegetation and flora:

- **Vegetation types:** The Rand Highveld Grassland vegetation types is listed as "Vulnerable", while the Gauteng Shale Mountain Bushveld vegetation type is listed as "Least Concern". The placement of the turbines has avoided pristine habitat within the Rand Highveld Grassland. Since the turbine footprint is relatively small and spread across the site, the loss of prime habitat within the 'Vulnerable' Rand Highveld Grassland vegetation type is small in relation to the remaining extent of the vegetation type and ecosystem threat status will not be affected.
- **Screening Tool:** None of the plant species highlighted by the Screening Tool were encountered on site.
- **Threatened plant species:** No IUCN threatened or red listed plant species were encountered during the field survey.
- **Near Threatened plant species**: Two near threatened species, *Gnaphalium nelsonii* and *Cineraria austrotransvaalensis*, could potentially occur on site according to the Gauteng C-plan.
- **Protected plant species:** No CITES listed species, ToPS species or protected tree species were recorded on site.
- **Provincially protected species:** Only one provincially protected species with a Least Concern status, was recorded on site, i.e. *Gladiolus permeabilis* (Iridaceae).
- **Habitats:** Ten of the 13 habitats had a low sensitivity rating for the vegetation with three habitats rated as medium sensitivity (streams, wetlands and rocky outcrops).
- **Statement**: The Screening Tool rated the sensitivity of the Plant Species Theme as Medium. Because none of the SCC highlighted by the Screening Tool were found on site and large parts of the site were degraded due to previous cultivation, we suggest that the Plant Species Theme's site sensitivity is rated as **Low.**

Fauna

- **Note: bird and bat components – see avifaunal report.**
- **Screening Tool:** None of the animal species highlighted by the Screening Tool were encountered on site.
- **Threatened animal species:** The key faunal issue is the presence of the endangered mountain reedbuck, which could possibly have been re-introduced to the game farm. The mountain reedbuck was not listed by the Screening Tool.
- **Overall sensitivity of animal species theme:** This is rated as medium by the Screening Tool. Excluding the avifaunal component, we would suggest a **Low** - **Medium** sensitivity. If the suggested mitigation measures are followed, the threatened animal species should not be negatively affected by the WEF.

Conservation:

- **Vulnerable ecosystem:** The Rand Highveld Grassland vegetation type is listed as "Vulnerable" and covers a large portion of the site. Seven of the ten turbines are situated in this vegetation type.
- **Protected Areas:** The study area is not located in a protected area and the closest protected area, Abe Bailey Provincial Nature Reserve, is approximate 20 km to the northwest of the site.

- **National Protected Areas Expansion Strategy (NPAES):** The study site is part of the NPAES (NPAES 2018) and all turbines are located outside the NPAES.
- **Critical Biodiversity Areas (CBAs):** CBA2s (Important area) are present on the site (GDARDE 2011, C-Plan V3.3) and development within the CBAs should best be avoided. All turbines fall outside the CBA2s.
- **Ecological Support Areas (ESAs):** Turbines WTG04, WTG07 and WTG08 lie in ESAs. The extent of the development is relatively small and will not have a negative impact on the functionality of the broader ESA. Thus no additional loss of ecological connectivity in relation to the broader landscape is likely.
- **Other Natural Areas (ONAs):** Seven of the ten turbines are situated in ONAs.
- **Freshwater Ecosystem Priority Area (FEPA):** Two rivers cross the site with some wetlands delineated along the rivers. The development will avoid the rivers and wetlands. FEPAs were not highlighted by the Screening Tool.
- **Terrestrial Biodiversity Theme:** Although portions of the site qualify as CBA2s and ESAs and parts have been included in the NPAES, a substantial portion of the site has been identified as ONAs (even when in the Vulnerable vegetation type). The development has been largely contained in the ONAs. In the Screening Tool the Terrestrial Biodiversity Theme allocated a Very High sensitivity to the entire site. Although we agree that the current site clearly includes areas of very high sensitivity (CBA, ESAs and NPAES), it also includes a substantial portion that has **not** been demarcated as very high sensitivity, thus ONA. According to the land use guidelines supplied by SANBI (2021), split zoning should be used, where feasible, to demarcate sensitive areas, where CBAs occur across part of a property.

Ecological processes, function and drivers:

- Overall, it is unlikely that the development will contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions.
- The disturbance caused by the construction of the WEF will create conditions favourable for invasion by alien species.
- Fire is an important driver of vegetation dynamics in the Grassland Biome and can occur when the fuel load is high. To avoid damage to the infrastructure, fire will have to be suppressed. If the grass layer is regularly mowed/brush cut, it should prevent grasses from becoming moribund in the absence of fire although mowing or brushcutting would reduce seed set.
- Grasslands have evolved under the grazing pressure from large ungulates. Mesic Highveld Grasslands are reasonably well adapted to grazing pressure under low to moderate stocking rates with adequate rest periods. The WEF development will still allow livestock or wildlife grazing.

Significance of environmental impacts:

Overall the significance of the environmental impacts was rated as low to very low after mitigation, with only vegetation loss being rated as moderate after mitigation. Before mitigation many impacts were rated as moderate. In summary:

- Since the development footprint is small, the loss of habitat or species will be limited.
- Since the turbine footprint is relatively small and spread across the site, the loss of prime habitat within the 'Vulnerable' Rand Highveld Grassland vegetation type can be constrained by well-planned positioning of the turbines. Service roads generally have a larger impact on vegetation clearance, however since the roads will have a gravel surface animal movement should not be impaired. Furthermore, exiting tracks should be preferred for upgrading to service roads. Beyond the permanent infrastructure footprint, environmental functions and processes should however, not be altered.
- The extent of clearing activities in the Rand Highveld Grassland vegetation type is small in relation to the remaining extent of the vegetation type and ecosystem threat status will not be affected.
- The vegetation in none of the habitats identified were rated as highly sensitive, and the overall impact per habitat type will be small.

- The impact on overall species and ecosystem diversity of the adjacent land will not be affected and the impact will be small.
- The impact on populations of threatened or protected species will be small if mitigation measures are applied.
- Depending on the type of fencing to be erected at some of the infrastructure, the WEF will contribute minimally to obstruction of animal movement.

Key environmental mitigation and management actions proposed

- A walkthrough would be needed prior to construction to inform permit applications for protected plant species.
- Ensure that the placing of infrastructure takes the sensitivity mapping of the ecological assessment into account to avoid and reduce impacts on species and habitats of conservation concern.
- Demarcate all infrastructure sites clearly to avoid unnecessary clearance of the vegetation.
- Avoid or minimise impacts that could potentially affect animal behaviour.
- Trenches should not be left open for long periods of time. Trenches should be inspected regularly for the presence of trapped animals.
- Construction crew, in particular the drivers, should undergo environmental training (induction) to increase their awareness of environmental concerns.
- Proper waste management procedures should be in place to avoid waste lying around and to remove all waste material from the site.
- Speed limits should be strictly adhered to.
- Dust control measures should be implemented.
- Permits have to be obtained for the removal of GDARDE protected species.
- Implement a monitoring program for the early detection of alien invasive plant species.
- Employ a control program to combat declared alien invasive plant species.

Preferred infrastructure locations

Access route:

- The access road is currently from an unnamed road to the east. The access road follows existing farm tracks more or less to the centre of the site. Although the road does cross a CBA2 (Important area) and ESAs it is acceptable because it follows an existing farm road.

Turbines:

- Turbines WTG04, WTG07 and WTG08 lie in ESAs and where possible the number of turbines should be limited within the ESA.
- All other turbines are situated in ONAs.

Ancillary areas (On-site IPP substation, batching plant, construction camp, laydown):

- These ancillary areas fall in a Least Concern ecosystem and outside of CBA2s, ESAs and NPAES.

Roads:

- The road network within CBAs (only CBA2s are present on site) and ESAs should be minimised.
- Wherever possible, existing roads should be used.
- The construction of a road should be done in the most environmentally sensitive manner possible.
- A suitably qualified person should plan, design and supervise the proper construction of roads to minimize the impact on the environment.
- Roads should be provided with run-off structures to reduce the risk of erosion.
- Proper road maintenance procedures should be in place.

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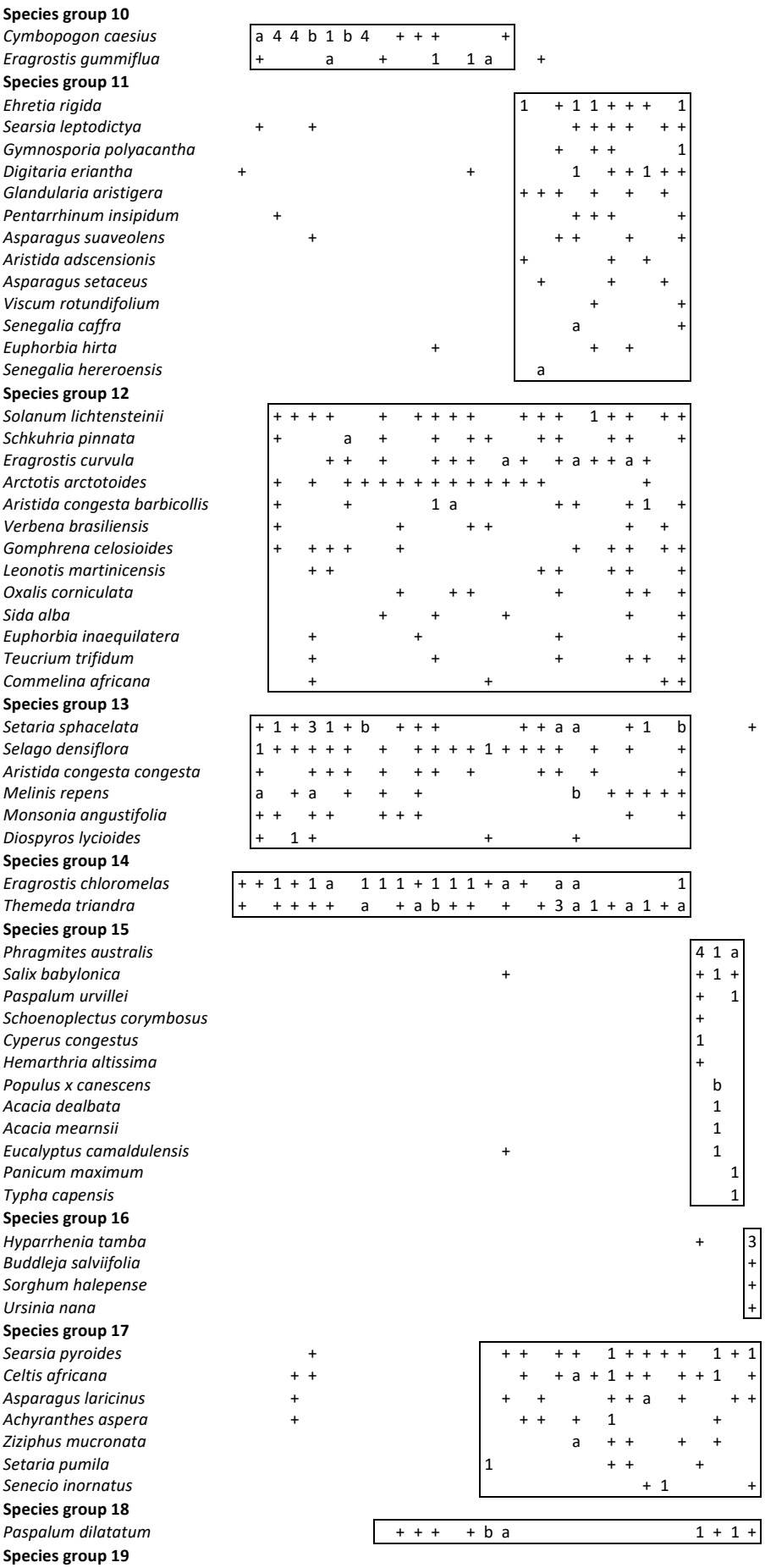
APPENDIX A: PHYTOSOCIOLOGICAL TABLE OF PLANT COMMUNITIES

Plant community	1	2	3						4						5		6										7			8	9
Sample plots	29	16	1	2	4	9	19	17	8	6	14	21	22	10	7	13	3	11	15	26	20	18	5	30	31	24	23	25	27	28	12
Species group 1																															
Trachypogon spicatus	5			+				b															+		1						
Species group 2																															
Selaginella dregei		a																													
Cyanotis speciosa		+																													
Hermannia transvaalensis		+																													
Oldenlandia herbacea		+																													
Oropetium capense		+																													
Searsia magalismontana		+																													
Sphedamnocarpus pruriens		+																													
Species group 3																															
Indigofera hilaris			+	+	+	+		+																							
Elionurus muticus				+	+	+	+																								
Brachiaria serrata			+		+			+																							
Scabiosa columbaria			+	+	+																										
Striga elegans			+	+	+																	+									
Exochaenium grande			+									+																			
Striga bilabiata			+	+																											
Pentanisia angustifolia			+	+																											
Solanum sisymbrifolium			+			+																									
Bulbostylis hispidula				+		+																									
Hermannia lancifolia						+	+																								
Ledebouria ovatifolia				+	+																										
Aristida canescens					1																										
Species group 4																															
Microchloa caffra		1			+	+	a																								
Searsia rigida		+		+	+			+															+			+					
Gladiolus permeabilis		+				+		+																							
Species group 5																															
Crassula lanceolata			+	+	+			+				+	+																		
Lippia scaberrima		+	+	+	+						+		+							+						+					
Tephrosia capensis			+	+	+		+	+			+																				
Eragrostis racemosa				+		+	+	+			+																				
Richardia brasiliensis			+	+		+	a	+		+	+	+	+	+																	
Hermannia depressa			+	+	+		+	+		+	+		+																		
Heteropogon contortus				+		+	+	+			+			+																	
Seriphium plumosum	+		+						+					+																	
Trichoneura grandiglumis							+		+		+																				
Taraxacum officinale						+							+																		
Crabbea acaulis			+								+																				
Species group 6																															
Sida rhombifolia									+				+	+																	
Triraphis andropogonoides									+																						
Aristida bipartita											+		+																		
Wahlenbergia virgata											+		+																		
Species group 7																															
Trisetopsis imberbis															a	+															
Andropogon eucomus															+	+															
Panicum schinzii															1																
Eragrostis rotifer																a															
Cirsium vulgare																+															
Berkheya radula																+														+	
Species group 8																															
Cyperus rupestris		+							+					+		+							+								
Dichondra micrantha									+	+						+															
Species group 9																															
Plantago lanceolata			+			+	+		+		+	+	+		+	+											+				
Nidorella anomala			+						+		+	+			+																
Oxalis obliquifolia			+						+	+		+		+	+			+													
Lactuca inermis					+	+				+			+	+	+	+			+												


Species group 10
Cymbopogon caesius
Eragrostis gummiflua
Species group 11
Ehretia rigida
Searsia leptodictya
Gymnosporia polyacantha
Digitaria eriantha
Glandularia aristigera
Pentarrhinum insipidum
Asparagus suaveolens
Aristida adscensionis
Asparagus setaceus
Viscum rotundifolium
Senegalia caffra
Euphorbia hirta
Senegalia hereroensis
Species group 12
Solanum lichtensteinii
Schkuhria pinnata
Eragrostis curvula
Arctotis arctotoides
Aristida congesta barbicollis
Verbena brasiliensis
Gomphrena celosioides
Leonotis martinicensis
Oxalis corniculata
Sida alba
Euphorbia inaequilatera
Teucrium trifidum
Commelina africana
Species group 13
Setaria sphacelata
Selago densiflora
Aristida congesta congesta
Melinis repens
Monsonia angustifolia
Diospyros lycioides
Species group 14
Eragrostis chloromelas
Themeda triandra
Species group 15
Phragmites australis
Salix babylonica
Paspalum urvillei
Schoenoplectus corymbosus
Cyperus congestus
Hemarthria altissima
Populus x canescens
Acacia dealbata
Acacia mearnsii
Eucalyptus camaldulensis
Panicum maximum
Typha capensis
Species group 16
Hyparrhenia tamba
Buddleja salviifolia
Sorghum halepense
Ursinia nana
Species group 17
Searsia pyroides
Celtis africana
Asparagus laricinus
Achyranthes aspera
Ziziphus mucronata
Setaria pumila
Senecio inornatus
Species group 18
Paspalum dilatatum
Species group 19

Eragrostis plana			+	+		+	+			+	b	a	1	+	b	b		3	a	1	a		+	a		a	1	+			
Vachellia karroo			+	+	1			+	+			1				+	3	a	3	a	b	a	a	a	a	b	+	1		1	
Hyparrhenia hirta	+		+	+	+	a		1	5	5	3	1	5	5	a	3		+				a	a	1		+		+		1	
Conyza podocephala			1				+		+	+		+		+		+		+					+	+	+	+		+			
Bidens bipinnata					+				+	+				+												+		+	+	+	
Species group 20																															
Eragrostis tef																															a
Amaranthus sp.																			+												a
Eleusine coracana																							+								1
Datura ferox																															1
Xanthium spinosum					+																										+
Species group 21																															
Erigeron sumatrensis													+	+	+				+						1					+	1
Verbena bonariensis									+				+	+	+	+													+	+	+
Tagetes minuta							+							+						+								+	+	+	a
Bidens pilosa																		+	+												+
Zinnia peruviana																+				+						+					1
Species group 22																															
Cynodon dactylon		+	+		+	+	+			+		b	a	+	1	+	4	3	a	+	5	+	4	+		a	+				a
Urochloa mosambicensis			+							+		1	+				+		+	1		+	+	a	1	+				+	1
Helichrysum rugulosum			+	+	+		a	+	+	+	+	a		+					+				+		+						1
Species group 23																															
Hilliardiella elaeagnoides	+		+																				+		+						
Pellaea calomelanos		+		+																		+									
Euclea crispa		+			+															+			+								
Zanthoxylum capense		+			+															+						+					
Pyracantha angustifolia			+	+																								+	+		
Gnidia capitata				+																			+								
Aerva leucura					+																					+					
Hibiscus trionum					+													+													
Hypoxis rigidula					+																					+					
Felicia muricata							1															+									
Helichrysum nudifolium								+	+																+						
Cyperus esculentus													+		+												+				
Oenothera rosea																+											+				
Cymbopogon pospischilii																									+	+					
Helichrysum coriaceum	+																														
Senecio harveianus			+																												
Tragus berteronianus			+																												
Digitaria diagonalis				+																											
Hilliardiella aristata				+																											
Gomphocarpus fruticosus				+																											
Kalanchoe paniculata				+																											
Linum thunbergii				+																											
Polygala hottentotta				+																											
Chlorophytum recurvifolium					+																										
Delosperma herbeum					+																										
Oxalis sp.					+																										
Senecio oxyriifolius					+																										
Tolpis capensis					+																										
Ziziphus zeyheriana					+																										
Panicum natalense						+																									
Diheteropogon amplectens						+																									
Indigofera sp.						+																									
Geigeria burkei						+																									
Orchidaceae								+																							
Ajuga ophrydis								+																							
Aristida spectabilis								+																							
Berkheya carlinopsis								+																							
Wahlenbergia sp.									+																						
Tephrosia sp.										+																					
Osteospermum muricatum											+																				
Pseudognaphalium luteo-album											+																				
Pimpinella transvaalensis													+																		
Oenothera indecora													+																		
Hypoxis argentea														+																	
Cyperus sp.															+																
Kyllinga erecta															+																
Helichrysum aureonitens															+																
Lobelia sp.																+															
Cuscuta campestris																	+														

Solanum elaeagnifolium	+
Chlorophytum fasciculatum	+
Eragrostis capensis	+
Gymnosporia buxifolia	+
Cleome monophylla	+
Lannea discolor	+
Lepidium africanum	+
Chamaecrista mimosoides	+
Cynoglossum hispidum	+
Albuca virens	+
Portulaca sp.	+
Solanum pseudocapsicum	+
Sporobolus fimbriatus	+
Ipomoea bathycolpos	+
Ledebouria revoluta	+
Scolopia zeyheri	+
Andropogon schirensis	+
Campuloclinium macrocephalum	+
Opuntia ficus-indica	+
Senecio sp.	+
Searsia lancea	+
Kiggelaria africana	+
Paspalum notatum	+
Persicaria lapathifolia	+
Ricinus communis	+
Buddleja saligna	+
Ipomoea purpurea	+
Pyracantha crenulata	+

APPENDIX B: PLANT SPECIES CHECKLISTS

[1]IUCN category
[2]GDARD (1983)
[3]CITES = Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES 2020)
[4]AIS = Alien and invasive species
[5]NAT = Naturalised alien species
[6]Plants observed during January 2021 site survey
Note: Species list based on NewPosa list for 2627BC and 2627AD and supplemented by own survey
Note: No ToPS species are listed
Note: No species endemic to the Rand Highveld Grassland are listed

Family	Species	Current survey[6]	IUCN[1]	GDARDE[2]	CITES[3]	NAT[5]	IAS 2020[4]
Cyperaceae	*Abildgaardia ovata*		LC				
Malvaceae	*Abutilon austro-africanum*		LC				
Fabaceae	*Acacia dealbata*	X					2
Fabaceae	*Acacia mearnsii*	X					2
Euphorbiaceae	*Acalypha angustata*	X	LC				
Euphorbiaceae	*Acalypha caperonioides var. caperonioides*		DDT				
Cucurbitaceae	*Acanthosicyos naudinianus*		LC				
Asteraceae	*Acanthospermum glabratum*					X	
Amaranthaceae	*Achyranthes aspera var. aspera*	X				X	
Amaranthaceae	*Achyranthes aspera var. sicula*					X	
Apocynaceae	*Acokanthera oppositifolia*		LC				
Lamiaceae	*Acrotome hispida*		LC				
Crassulaceae	*Adromischus umbraticola subsp. umbraticola*		NT	2014 Bill			
Amaranthaceae	*Aerva leucura*	X	LC				
Cyperaceae	*Afroscirpoides dioeca*		LC				
Rosaceae	*Agrimonia procera*						1b
Poaceae	*Agrostis lachnantha var. lachnantha*		LC				
Lamiaceae	*Ajuga ophrydis*	X	LC				
Hyacinthaceae	*Albuca virens subsp. virens*	X	LC				
Poaceae	*Alloteropsis semialata subsp. eckloniana*		LC				
Asphodelaceae	*Aloe bergeriana*		LC	Sch 11	App II		
Asphodelaceae	*Aloe subspicata*		LC	Sch 11	App II		
Asphodelaceae	*Aloe transvaalensis*		LC	Sch 11	App II		
Asphodelaceae	*Aloe verecunda*		LC	Sch 11	App II		
Amaranthaceae	*Alternanthera pungens*					X	
Amaranthaceae	*Amaranthus deflexus*					X	
Amaranthaceae	*Amaranthus hybridus subsp. hybridus var. hybridus*	X				X	
Amaranthaceae	*Amaranthus thunbergii*		LC				
Amaryllidaceae	*Ammocharis coranica*		LC				
Anacampserotaceae	*Anacampseros filamentosa subsp. filamentosa*		LC		App II		
Anacampserotaceae	*Anacampseros subnuda subsp. subnuda*		LC		App II		
Poaceae	*Andropogon eucomus*	X	LC				
Poaceae	*Andropogon schirensis*	X	LC				
Rubiaceae	*Anthospermum hispidulum*		LC				
Rubiaceae	*Anthospermum rigidum subsp. rigidum*		LC				
Menispermaceae	*Antizoma angustifolia*		LC				
Apocynaceae	*Araujia sericifera*						1b
Asteraceae	*Arctotis arctotoides*	X	LC				
Papaveraceae	*Argemone ochroleuca subsp. ochroleuca*						1b
Poaceae	*Aristida adscensionis*	X	LC				
Poaceae	*Aristida aequiglumis*		LC				
Poaceae	*Aristida bipartita*	X	LC				
Poaceae	*Aristida canescens subsp. canescens*	X	LC				
Poaceae	*Aristida congesta subsp. barbicollis*	X	LC				
Poaceae	*Aristida congesta subsp. congesta*	X	LC				

Poaceae	*Aristida diffusa subsp. burkei*		LC				
Poaceae	*Aristida spectabilis*	X	LC				
Poaceae	*Aristida stipitata subsp. graciliflora*		LC				
Asteraceae	*Artemisia afra var. afra*		LC				
Apocynaceae	*Asclepias adscendens*		LC				
Apocynaceae	*Asclepias brevipes*		LC				
Apocynaceae	*Asclepias eminens*		LC				
Apocynaceae	*Asclepias fallax*		LC				
Apocynaceae	*Asclepias fulva*		LC				
Apocynaceae	*Asclepias meyeriana*		LC				
Cyperaceae	*Ascolepis capensis*		LC				
Asparagaceae	*Asparagus asparagoides*		LC				
Asparagaceae	*Asparagus laricinus*	X	LC				
Asparagaceae	*Asparagus setaceaus*	X	LC				
Asparagaceae	*Asparagus suaveolens*	X	LC				
Apocynaceae	*Aspidoglossum biflorum*		LC				
Apocynaceae	*Aspidoglossum glabrescens*		LC				
Apocynaceae	*Aspidoglossum interruptum*		LC				
Apocynaceae	*Aspidoglossum ovalifolium*		LC				
Aspleniaceae	*Asplenium aethiopicum*		LC				
Aspleniaceae	*Asplenium cordatum*		LC				
Iridaceae	*Babiana bainesii*		LC				
Acanthaceae	*Barleria macrostegia*		LC				
Asteraceae	*Berkheya carlinopsis*	X	LC				
Asteraceae	*Berkheya radula*	X	LC				
Asteraceae	*Berkheya zeyheri subsp. zeyheri*		LC				
Apiaceae	*Berula repanda*		LC				
Poaceae	*Bewsia biflora*		LC				
Asteraceae	*Bidens bipinnata*	X				X	
Asteraceae	*Bidens pilosa*	X				X	
Acanthaceae	*Blepharis angusta*		LC				
Acanthaceae	*Blepharis innocua*		LC				
Acanthaceae	*Blepharis squarrosa*		LC				
Acanthaceae	*Blepharis stainbankiae*		LC				
Orchidaceae	*Bonatea antennifera*		LC	App II			
Amaryllidaceae	*Boophone disticha*		LC				
Poaceae	*Brachiaria deflexa*		LC				
Poaceae	*Brachiaria serrata*	X	LC				
Apocynaceae	*Brachystelma chloranthum*		LC				
Apocynaceae	*Brachystelma circinatum*		LC				
Apocynaceae	*Brachystelma foetidum*		LC				
Apocynaceae	*Brachystelma oianthum*		LC				
Poaceae	*Bromus catharticus*					X	
Scrophulariaceae	*Buddleja saligna*	X	LC				
Scrophulariaceae	*Buddleja salviifolia*	X	LC				
Asphodelaceae	*Bulbine abyssinica*		LC				
Asphodelaceae	*Bulbine capitata*		LC				
Asphodelaceae	*Bulbine narcissifolia*		LC				
Cyperaceae	*Bulbostylis burchellii*		LC				
Cyperaceae	*Bulbostylis hispidula*	X	LC				
Cyperaceae	*Bulbostylis oritrephes*		LC				
Asteraceae	*Campuloclinium macrocephalum*	X					1b
Cyperaceae	*Carex cognata*		LC				
Cyperaceae	*Carex glomerabilis*		LC				
Pinaceae	*Cedrus deodora*	X			Alien		
Cannabaceae	*Celtis africana*	X	LC				
Dipsacaceae	*Cephalaria pungens*		LC				
Dipsacaceae	*Cephalaria zeyheriana*		LC				
Apocynaceae	*Ceropegia rendallii*		LC				
Solanaceae	*Cestrum parqui*						1b
Scrophulariaceae	*Chaenostoma leve*		LC				
Fabaceae	*Chamaecrista biensis*	X	LC				
Fabaceae	*Chamaecrista comosa var. capricornia*		LC				

Verbenaceae	*Chascanum adenostachyum*		LC			
Verbenaceae	*Chascanum pinnatifidum var. pinnatifidum*		LC			
Pteridaceae	*Cheilanthes hirta var. hirta*		LC			
Pteridaceae	*Cheilanthes viridis var. viridis*		LC			
Amaranthaceae	*Chenopodium album*				X	
Poaceae	*Chloris pycnothrix*		LC			
Poaceae	*Chloris virgata*		LC			
Agavaceae	*Chlorophytum angulicaule*		LC			
Agavaceae	*Chlorophytum bowkeri*		LC			
Agavaceae	*Chlorophytum cooperi*		LC			
Agavaceae	*Chlorophytum fasciculatum*	X	LC			
Agavaceae	*Chlorophytum recurvifolium*	X	LC			
Agavaceae	*Chlorophytum transvaalense*		LC			
Agavaceae	*Chlorophytum trichophlebium*		LC			
Asteraceae	*Chrysocoma ciliata*		LC			
Asteraceae	*Cineraria albicans*		LC			
Asteraceae	*Cineraria aspera*		LC			
Asteraceae	*Cirsium vulgare*	X				1b
Cucurbitaceae	*Citrullus lanatus*		LC			
Cyperaceae	*Cladium mariscus subsp. jamaicense*		LC			
Ranunculaceae	*Clematis brachiata*		LC			
Cleomaceae	*Cleome maculata*		LC			
Cleomaceae	*Cleome monophylla*	X	LC			
Peraceae	*Clutia pulchella var. pulchella*		LC			
Cucurbitaceae	*Coccinia sessilifolia*		LC			
Cyperaceae	*Coleochloa setifera*		LC			
Commelinaceae	*Commelina africana var. barberae*	X	LC			
Commelinaceae	*Commelina africana var. lancispatha*		LC			
Commelinaceae	*Commelina benghalensis*		LC			
Commelinaceae	*Commelina livingstonii*		LC			
Convolvulaceae	*Convolvulus multifidus*		LC			
Convolvulaceae	*Convolvulus sagittatus*		LC			
Asteraceae	*Conyza podocephala*	X	LC			
Malvaceae	*Corchorus asplenifolius*		LC			
Asteraceae	*Coreopsis lanceolata*				X	
Asteraceae	*Cosmos bipinnatus*	X			X	
Acanthaceae	*Crabbea acaulis*	X	LC			
Acanthaceae	*Crabbea angustifolia*		LC			
Acanthaceae	*Crabbea hirsuta*		LC			
Crassulaceae	*Crassula capitella subsp. nodulosa*		LC			
Crassulaceae	*Crassula dependens*		LC			
Crassulaceae	*Crassula lanceolata subsp. transvaalensis*	X	LC			
Crassulaceae	*Crassula setulosa var. setulosa*		NE			
Crassulaceae	*Crassula setulosa var. setulosa forma setulosa*		NE			
Apocynaceae	*Cryptolepis oblongifolia*		LC			
Cucurbitaceae	*Cucumis heptadactylus*		LC			
Cucurbitaceae	*Cucumis hirsutus*		LC			
Cucurbitaceae	*Cucumis zeyheri*		LC			
Convolvulaceae	*Cuscuta campestris*	X				1b
Araliaceae	*Cussonia paniculata subsp. sinuata*		LC			
Araliaceae	*Cussonia spicata*		LC			
Commelinaceae	*Cyanotis speciosa*	X	LC			
Amaranthaceae	*Cyathula uncinulata*		LC			
Poaceae	*Cymbopogon caesius*	X	LC			
Poaceae	*Cymbopogon pospischilii*	X	LC			
Poaceae	*Cynodon dactylon*		LC			
Poaceae	*Cynodon dactylon*	X	LC			
Poaceae	*Cynodon hirsutus*		LC			
Boraginaceae	*Cynoglossum hispidum*	X	LC			
Boraginaceae	*Cynoglossum lanceolatum*		LC			
Cyperaceae	*Cyperus capensis*		LC			
Cyperaceae	*Cyperus congestus*	X	LC			
Cyperaceae	*Cyperus esculentus var. esculentus*	X	LC			

Cyperaceae	*Cyperus longus var. tenuiflorus*		NE			
Cyperaceae	*Cyperus margaritaceus var. margaritaceus*		LC			
Cyperaceae	*Cyperus rupestris*	X	LC			
Cyperaceae	*Cyperus semitrifidus*		LC			
Lobeliaceae	*Cyphia persicifolia*		LC			
Amaranthaceae	*Cyphocarpa angustifolia*		LC			
Solanaceae	*Datura ferox*	X				1b
Solanaceae	*Datura stramonium*					1b
Aizoaceae	*Delosperma herbeum*	X	LC			
Asteraceae	*Denekia capensis*		LC			
Apiaceae	*Deverra burchellii*		LC			
Caryophyllaceae	*Dianthus mooiensis subsp. mooiensis var. mooiensis*		NE			
Fabaceae	*Dichilus gracilis*		LC			
Fabaceae	*Dichilus lebeckioides*		LC			
Convolvulaceae	*Dichondra micrantha*	X			X	
Asteraceae	*Dicoma anomala subsp. anomala*		LC			
Asteraceae	*Dicoma anomala subsp. gerrardii*		LC			
Asteraceae	*Dicoma macrocephala*		LC			
Urticaceae	*Didymodoxa caffra*		LC			
Poaceae	*Digitaria diagonalis*	X	LC			
Poaceae	*Digitaria eriantha*	X	LC			
Poaceae	*Digitaria tricholaenoides*		LC			
Poaceae	*Digitaria velutina*		LC			
Poaceae	*Diheteropogon amplectens var. amplectens*	X	LC			
Asteraceae	*Dimorphotheca spectabilis*		LC			
Ebenaceae	*Diospyros lycioides subsp. guerkei*	X	LC			
Ebenaceae	*Diospyros whyteana*		LC			
Hyacinthaceae	*Dipcadi viride*		LC			
Brassicaceae	*Diplotaxis muralis*				X	
Orchidaceae	*Disperis micrantha*		LC	App II		
Droseraceae	*Drosera collinsiae*		LC			
Acanthaceae	*Dyschoriste costata*		LC			
Amaranthaceae	*Dysphania ambrosioides*				X	
Amaranthaceae	*Dysphania carinata*				X	
Amaranthaceae	*Dysphania multifida*				X	
Poaceae	*Echinochloa colona*		LC			
Boraginaceae	*Ehretia rigida subsp. nervifolia*	X	LC			
Poaceae	*Ehrharta erecta var. natalensis*		LC			
Amaranthaceae	*Einadia nutans subsp. nutans*				X	
Fabaceae	*Elephantorrhiza elephantina*		LC			
Poaceae	*Eleusine coracana subsp. africana*	X	LC			
Poaceae	*Elionurus muticus*	X	LC			
Poaceae	*Enneapogon scoparius*		LC			
Poaceae	*Eragrostis biflora*		LC			
Poaceae	*Eragrostis capensis*	X	LC			
Poaceae	*Eragrostis chloromelas*	X	LC			
Poaceae	*Eragrostis cilianensis*		LC			
Poaceae	*Eragrostis curvula*	X	LC			
Poaceae	*Eragrostis gummiflua*	X	LC			
Poaceae	*Eragrostis obtusa*		LC			
Poaceae	*Eragrostis patentipilosa*		LC			
Poaceae	*Eragrostis plana*	X	LC			
Poaceae	*Eragrostis racemosa*	X	LC			
Poaceae	*Eragrostis rotifer*	X	LC			
Poaceae	*Eragrostis sclerantha subsp. sclerantha*		LC			
Poaceae	*Eragrostis stapfii*		LC			
Poaceae	*Eragrostis superba*		LC			
Poaceae	*Eragrostis tef*	X			X	
Poaceae	*Eragrostis trichophora*		LC			
Ericaceae	*Erica alopecurus var. alopecurus*		LC			
Asteraceae	*Erigeron bonariensis*				X	
Asteraceae	*Erigeron canadensis*	X			X	

Fabaceae	*Eriosema burkei var. burkei*		LC			
Fabaceae	*Eriosema cordatum*		LC			
Brassicaceae	*Erucastrum austroafricanum*		LC			
Fabaceae	*Erythrina zeyheri*		LC			
Myrtaceae	*Eucalyptus camaldulensis*	X				1b exempted
Ebenaceae	*Euclea crispa subsp. crispa*	X	LC			
Hyacinthaceae	*Eucomis autumnalis subsp. clavata*		NE	Sch 11		
Orchidaceae	*Eulophia hians var. hians*		LC		App II	
Orchidaceae	*Eulophia ovalis var. ovalis*		LC		App II	
Euphorbiaceae	*Euphorbia clavarioides*		LC		App II	
Euphorbiaceae	*Euphorbia hirta*	X				X
Euphorbiaceae	*Euphorbia inaequilatera*	X	LC			
Euphorbiaceae	*Euphorbia spartaria*		LC		App II	
Euphorbiaceae	*Euphorbia striata*		LC			
Poaceae	*Eustachys paspaloides*		LC			
Gentianaceae	*Exochaenium grande*	X	LC			
Convolvulaceae	*Falkia oblonga*		LC			
Asteraceae	*Felicia muricata*	X	LC			
Iridaceae	*Freesia grandiflora subsp. grandiflora*		LC			
Cyperaceae	*Fuirena pubescens var. pubescens*		LC			
Asteraceae	*Galinsoga parviflora*					X
Asteraceae	*Gazania krebsiana subsp. serrulata*		LC			
Asteraceae	*Geigeria burkei subsp. burkei var. burkei*	X	NE			
Asteraceae	*Gerbera piloselloides*		LC			
Iridaceae	*Gladiolus antholyzoides*		LC	Sch 11		
Iridaceae	*Gladiolus crassifolius*		LC	Sch 11		
Iridaceae	*Gladiolus elliotii*		LC	Sch 11		
Iridaceae	*Gladiolus papilio*		LC	Sch 11		
Iridaceae	*Gladiolus permeabilis*	X	LC	Sch 11		
Verbenaceae	*Glandularia aristigera*	X	LC			
Thymelaeaceae	*Gnidia capitata*	X	LC			
Apocynaceae	*Gomphocarpus fruticosus subsp. fruticosus*	X	LC			
Apocynaceae	*Gomphocarpus rivularis*		LC			
Amaranthaceae	*Gomphrena celosioides*	X				X
Orobanchaceae	*Graderia subintegra*		LC			
Malvaceae	*Grewia flava*		LC			
Malvaceae	*Grewia occidentalis var. occidentalis*		LC			
Amaranthaceae	*Guilleminea densa*					X
Gunneraceae	*Gunnera perpensa*		LC			
Celastraceae	*Gymnosporia buxifolia*	X	LC			
Celastraceae	*Gymnosporia polyacantha subsp. vaccinifolia*	X	LC			
Orchidaceae	*Habenaria galpinii*		LC		App II	
Amaryllidaceae	*Haemanthus montanus*		LC			
Asteraceae	*Helichrysum aureonitens*	X	LC			
Asteraceae	*Helichrysum aureum var. monocephalum*		NE			
Asteraceae	*Helichrysum caespititium*		LC			
Asteraceae	*Helichrysum callicomum*		LC			
Asteraceae	*Helichrysum cerastioides var. cerastioides*		LC			
Asteraceae	*Helichrysum chionosphaerum*		LC			
Asteraceae	*Helichrysum coriaceum*	X	LC			
Asteraceae	*Helichrysum dregeanum*		LC			
Asteraceae	*Helichrysum lepidissimum*		LC			
Asteraceae	*Helichrysum nudifolium var. nudifolium*	X	LC			
Asteraceae	*Helichrysum nudifolium var. pilosellum*		LC			
Asteraceae	*Helichrysum paronychioides*		LC			
Asteraceae	*Helichrysum rugulosum*	X	LC			
Asteraceae	*Helichrysum setosum*		LC			
Rhamnaceae	*Helinus integrifolius*		LC			
Poaceae	*Hemarthria altissima*	X	LC			
Malvaceae	*Hermannia cordata*		LC			
Malvaceae	*Hermannia depressa*	X	LC			
Malvaceae	*Hermannia lancifolia*	X	LC			
Malvaceae	*Hermannia tomentosa*		LC			

Malvaceae	*Hermannia transvaalensis*	X	LC			
Apiaceae	*Heteromorpha arborescens var. abyssinica*		LC			
Poaceae	*Heteropogon contortus*	X	LC			
Malvaceae	*Hibiscus aethiopicus var. ovatus*		LC			
Malvaceae	*Hibiscus calyphyllus*		LC			
Malvaceae	*Hibiscus microcarpus*		LC			
Malvaceae	*Hibiscus trionum*	X			X	
Asteraceae	*Hilliardiella aristata*	X	LC			
Asteraceae	*Hilliardiella elaeagnoides*	X	LC			
Asteraceae	*Hilliardiella hirsuta*		LC			
Poaceae	*Hyparrhenia anamesa*		LC			
Poaceae	*Hyparrhenia dregeana*		LC			
Poaceae	*Hyparrhenia hirta*	X	LC			
Poaceae	*Hyparrhenia tamba*	X	LC			
Hypericaceae	*Hypericum lalandii*		LC			
Hypoxidaceae	*Hypoxis acuminata*		LC			
Hypoxidaceae	*Hypoxis argentea var. argentea*	X	LC			
Hypoxidaceae	*Hypoxis interjecta*		LC			
Hypoxidaceae	*Hypoxis iridifolia*		LC			
Hypoxidaceae	*Hypoxis rigidula var. rigidula*	X	LC			
Aquifoliaceae	*Ilex mitis var. mitis*		LC			
Fabaceae	*Indigastrum burkeanum*		LC			
Fabaceae	*Indigofera confusa*		LC			
Fabaceae	*Indigofera cryptantha var. cryptantha*		LC			
Fabaceae	*Indigofera hedyantha*		LC			
Fabaceae	*Indigofera hilaris var. hilaris*	X	LC			
Fabaceae	*Indigofera melanadenia*		LC			
Fabaceae	*Indigofera oxytropis*		LC			
Fabaceae	*Indigofera zeyheri*		LC			
Convolvulaceae	*Ipomoea bathycolpos*	X	LC			
Convolvulaceae	*Ipomoea crassipes var. crassipes*		LC			
Convolvulaceae	*Ipomoea oblongata*		LC			
Convolvulaceae	*Ipomoea obscura var. obscura*		LC			
Convolvulaceae	*Ipomoea ommanneyi*		LC			
Convolvulaceae	*Ipomoea purpurea*	X				1b
Cyperaceae	*Isolepis costata*		LC			
Scrophulariaceae	*Jamesbrittenia atropurpurea subsp. atropurpurea*		LC			
Scrophulariaceae	*Jamesbrittenia aurantiaca*		LC			
Juncaceae	*Juncus effusus*		LC			
Juncaceae	*Juncus exsertus*		LC			
Juncaceae	*Juncus oxycarpus*		LC			
Acanthaceae	*Justicia anagalloides*		LC			
Crassulaceae	*Kalanchoe paniculata*	X	LC			
Cucurbitaceae	*Kedrostis africana*		LC			
Aizoaceae	*Khadia beswickii*		VU	Bill 2014		
Achariaceae	*Kiggelaria africana*	X	LC			
Asphodelaceae	*Kniphofia porphyrantha*		LC			
Rubiaceae	*Kohautia amatymbica*		LC			
Rubiaceae	*Kohautia caespitosa subsp. brachyloba*		LC			
Rubiaceae	*Kohautia cynanchica*		LC			
Cyperaceae	*Kyllinga alba*		LC			
Cyperaceae	*Kyllinga erecta var. erecta*	X	LC			
Asteraceae	*Lactuca inermis*	X			X	
Asteraceae	*Lactuca serriola*				X	
Anacardiaceae	*Lannea discolor*	X	LC			
Verbenaceae	*Lantana rugosa*		LC			
Boraginaceae	*Lappula heteracantha*				X	
Thymelaeaceae	*Lasiosiphon canoargenteus*		LC			
Thymelaeaceae	*Lasiosiphon capitatus*		LC			
Thymelaeaceae	*Lasiosiphon kraussianus*		LC			
Thymelaeaceae	*Lasiosiphon sericocephalus*		LC			
Asteraceae	*Launaea rarifolia var. rarifolia*		LC			

Hyacinthaceae	*Ledebouria burkei subsp. burkei*		LC			
Hyacinthaceae	*Ledebouria cooperi*		LC			
Hyacinthaceae	*Ledebouria luteola*	X	LC			
Hyacinthaceae	*Ledebouria marginata*		LC			
Hyacinthaceae	*Ledebouria revoluta*	X	LC			
Poaceae	*Leersia hexandra*		LC			
Fabaceae	*Leobordea divaricata*		LC			
Fabaceae	*Leobordea hirsuta*		LC			
Fabaceae	*Leobordea mucronata*		LC			
Lamiaceae	*Leonotis martinicensis*	X	LC			
Brassicaceae	*Lepidium africanum subsp. africanum*	X	LC			
Fabaceae	*Lessertia frutescens subsp. microphylla*		LC			
Limeaceae	*Limeum viscosum subsp. viscosum var. glomeratum*		NE			
Limeaceae	*Limeum viscosum subsp. viscosum var. kraussii*		NE			
Scrophulariaceae	*Limosella longiflora*		LC			
Linaceae	*Linum thunbergii*	X	LC			
Verbenaceae	*Lippia scaberrima*	X	LC			
Boraginaceae	*Lithospermum cinereum*		LC			
Lobeliaceae	*Lobelia sonderiana*	X	LC			
Poaceae	*Lolium multiflorum*				X	
Asteraceae	*Lopholaena coriifolia*		LC			
Fabaceae	*Lotononis laxa*		LC			
Poaceae	*Loudetia simplex*		LC			
Malvaceae	*Malva parviflora var. parviflora*				X	
Scrophulariaceae	*Manulea paniculata*		LC			
Fabaceae	*Medicago sativa*				X	
Meliaceae	*Melia azedarach*	X				1b; 3 in urban areas
Fabaceae	*Melilotus albus*				X	
Poaceae	*Melinis nerviglumis*		LC			
Poaceae	*Melinis repens subsp. repens*	X	LC			
Fabaceae	*Melolobium microphyllum*		LC			
Oleaceae	*Menodora africana*		LC			
Lamiaceae	*Mentha aquatica*		LC			
Poaceae	*Microchloa caffra*	X	LC			
Phrymaceae	*Mimulus gracilis*		LC			
Cucurbitaceae	*Momordica balsamina*		LC			
Poaceae	*Monocymbium ceresiiforme*		LC			
Geraniaceae	*Monsonia angustifolia*	X	LC			
Geraniaceae	*Monsonia burkeana*		LC			
Iridaceae	*Moraea pallida*		LC			
Myrothamnaceae	*Myrothamnus flabellifolius*		DDT			
Scrophulariaceae	*Nemesia fruticans*		LC			
Amaryllidaceae	*Nerine laticoma*		LC	Sch 11		
Lythraceae	*Nesaea cordata*		LC			
Asteraceae	*Nidorella anomala*	X	LC			
Asteraceae	*Nidorella hottentotica*		LC			
Asteraceae	*Nidorella resedifolia subsp. resedifolia*		LC			
Asteraceae	*Nolletia rarifolia*		LC			
Nymphaeaceae	*Nymphaea nouchali var. caerulea*		LC			
Lamiaceae	*Ocimum obovatum subsp. obovatum var. obovatum*		NE			
Onagraceae	*Oenothera indecora*	X			X	
Onagraceae	*Oenothera jamesii*				X	
Onagraceae	*Oenothera rosea*	X			X	
Onagraceae	*Oenothera stricta subsp. stricta*				X	
Onagraceae	*Oenothera tetraptera*				X	
Rubiaceae	*Oldenlandia herbacea*	X	LC			
Oleaceae	*Olea europaea subsp. cuspidata*		LC			
Ophioglossaceae	*Ophioglossum polyphyllum var. polyphyllum*		LC			
Cactaceae	*Opuntia ficus-indica*	X				1b
Apocynaceae	*Orbea lutea subsp. lutea*		LC			
Poaceae	*Oropetium capense*	X	LC			

Apocynaceae	*Orthanthera jasminiflora*		LC			
Orchidaceae	*Orthochilus leontoglossus*		LC	App II		
Asteraceae	*Osteospermum muricatum subsp. muricatum*	X	LC			
Asteraceae	*Osteospermum scariosum var. scariosum*		NE			
Santalaceae	*Osyris lanceolata*		LC			
Oxalidaceae	*Oxalis corniculata*	X			X	
Oxalidaceae	*Oxalis obliquifolia*	X	LC			
Polygonaceae	*Oxygonum dregeanum subsp. canescens var. canescens*		NE			
Apocynaceae	*Pachycarpus schinzianus*		LC			
Poaceae	*Panicum maximum*	X	LC			
Poaceae	*Panicum natalense*	X	LC			
Poaceae	*Panicum repens*		LC			
Poaceae	*Panicum schinzii*	X	LC			
Papaveraceae	*Papaver aculeatum*		LC			
Chrysobalanaceae	*Parinari capensis subsp. capensis*		LC			
Poaceae	*Paspalum dilatatum*	X			X	
Poaceae	*Paspalum distichum*				X	
Poaceae	*Paspalum notatum*	X			X	
Poaceae	*Paspalum urvilei*	X			X	
Malvaceae	*Pavonia burchellii*		LC			
Fabaceae	*Pearsonia cajanifolia subsp. cajanifolia*		LC			
Fabaceae	*Pearsonia sessilifolia subsp. sessilifolia*		LC			
Fabaceae	*Pearsonia uniflora*		LC			
Geraniaceae	*Pelargonium luridum*		LC			
Pteridaceae	*Pellaea calomelanos var. calomelanos*	X	LC			
Poaceae	*Pennisetum thunbergii*		LC			
Rubiaceae	*Pentanisia angustifolia*	X	LC			
Apocynaceae	*Pentarrhinum insipidum*	X	LC			
Cucurbitaceae	*Peponium mackenii*		LC			
Poaceae	*Perotis patens*		LC			
Polygonaceae	*Persicaria lapathifolia*	X			X	
Poaceae	*Phragmites australis*	X	LC			
Phyllanthaceae	*Phyllanthus incurvus*		LC			
Phyllanthaceae	*Phyllanthus parvulus var. parvulus*		LC			
Phytolaccaceae	*Phytolacca octandra*					1b
Apiaceae	*Pimpinella transvaalensis*	X	LC			
Pittosporaceae	*Pittosporum viridiflorum*		LC			
Plantaginaceae	*Plantago lanceolata*	X	LC			
Plantaginaceae	*Plantago major*				X	
Lamiaceae	*Plectranthus ramosior*		LC			
Poaceae	*Pogonarthria squarrosa*		LC			
Caryophyllaceae	*Pollichia campestris*		LC			
Asteraceae	*Polydora angustifolia*		LC			
Polygalaceae	*Polygala gracilenta*		LC			
Polygalaceae	*Polygala hottentotta*	X	LC			
Polygalaceae	*Polygala rehmannii*		LC			
Polygalaceae	*Polygala transvaalensis subsp. transvaalensis*		LC			
Polygalaceae	*Polygala uncinata*		LC			
Polygonaceae	*Polygonum aviculare*				X	
Salicaceae	*Populus canescens*	X				2
Portulacaceae	*Portulaca quadrifida*	X	LC			
Potamogetonaceae	*Potamogeton schweinfurthii*		LC			
Verbenaceae	*Priva meyeri var. meyeri*		LC			
Proteaceae	*Protea caffra subsp. caffra*		LC			
Rosaceae	*Prunus sp.*	X				
Asteraceae	*Pseudognaphalium luteoalbum*	X			X	
Asteraceae	*Pseudognaphalium oligandrum*		LC			
Asteraceae	*Pseudopegolettia tenella*		LC			
Pteridaceae	*Pteris vittata*		LC			
Cyperaceae	*Pycreus mundii*		LC			
Rubiaceae	*Pygmaeothamnus zeyheri var. zeyheri*		LC			
Rosaceae	*Pyracantha angustifolia*	X				1b

Rosaceae	*Pyracantha crenulata*	X			1b
Brassicaceae	*Raphanus raphanistrum*			X	
Apocynaceae	*Raphionacme hirsuta*		LC		
Apocynaceae	*Raphionacme velutina*		LC		
Fabaceae	*Rhynchosia pedunculata*		LC		
Cyperaceae	*Rhynchospora brownii*		LC		
Rubiaceae	*Richardia brasiliensis*	X		X	
Euphorbiaceae	*Ricinus communis*	X			2
Apocynaceae	*Riocreuxia polyantha*		LC		
Fabaceae	*Robinia pseudoacacia*	X			1b
Lamiaceae	*Rotheca hirsuta*		LC		
Rubiaceae	*Rubia horrida*		LC		
Polygonaceae	*Rumex crispus*			X	
Salicaceae	*Salix babylonica var. babylonica*	X		X	
Lamiaceae	*Salvia stenophylla*		LC		
Dipsacaceae	*Scabiosa columbaria*	X	LC		
Amaryllidaceae	*Scadoxus puniceus*		LC		
Poaceae	*Schizachyrium sanguineum*		LC		
Asteraceae	*Schkuhria pinnata*	X		X	
Cyperaceae	*Schoenoplectus brachyceras*		LC		
Cyperaceae	*Schoenoplectus corymbosus*	X	LC		
Cyperaceae	*Schoenoplectus tabernaemontani*			X	
Cyperaceae	*Scirpoides burkei*		LC		
Salicaceae	*Scolopia zeyheri*	X	LC		
Anacardiaceae	*Searsia discolor*		LC		
Anacardiaceae	*Searsia lancea*	X	LC		
Anacardiaceae	*Searsia leptodictya*	X	LC		
Anacardiaceae	*Searsia magalismontana subsp. magalismontana*	X	LC		
Anacardiaceae	*Searsia pyroides var. gracilis*		LC		
Anacardiaceae	*Searsia pyroides var. integrifolia*		LC		
Anacardiaceae	*Searsia pyroides var. pyroides*	X	LC		
Anacardiaceae	*Searsia rigida var. dentata*		LC		
Anacardiaceae	*Searsia rigida var. margaretae*	X	LC		
Selaginellaceae	*Selaginella dregei*	X	LC		
Scrophulariaceae	*Selago densiflora*	X	LC		
Asteraceae	*Senecio affinis*		LC		
Asteraceae	*Senecio burchellii*		LC		
Asteraceae	*Senecio coronatus*		LC		
Asteraceae	*Senecio erubescens var. crepidifolius*		NE		
Asteraceae	*Senecio harveianus*	X	LC		
Asteraceae	*Senecio hieracioides*		LC		
Asteraceae	*Senecio inornatus*	X	LC		
Asteraceae	*Senecio isatideus*		LC		
Asteraceae	*Senecio oxyriifolius subsp. oxyriifolius*	X	LC		
Asteraceae	*Senecio venosus*		LC		
Fabaceae	*Senegalia caffra*	X	LC		
Fabaceae	*Senegalia hereroensis*	X	LC		
Asteraceae	*Seriphium plumosum*	X	LC		
Poaceae	*Setaria nigrirostris*		LC		
Poaceae	*Setaria pumila*	X	LC		
Poaceae	*Setaria sphacelata var. sphacelata*	X	LC		
Poaceae	*Setaria sphacelata var. torta*		LC		
Poaceae	*Setaria verticillata*		LC		
Malvaceae	*Sida chrysantha*		LC		
Malvaceae	*Sida alba*	X	LC		
Malvaceae	*Sida dregei*		LC		
Malvaceae	*Sida rhombifolia*	X	LC		
Caryophyllaceae	*Silene burchellii subsp. pilosellifolia*		LC		
Brassicaceae	*Sisymbrium turczaninowii*		LC		
Solanaceae	*Solanum elaeagnifolium*	X			1b
Solanaceae	*Solanum lichtensteinii*	X	LC		
Solanaceae	*Solanum nigrum*			X	

Solanaceae	*Solanum pseudocapsicum*	X				1b
Solanaceae	*Solanum sisymbriifolium*	X				1b
Asteraceae	*Sonchus dregeanus*		LC			
Asteraceae	*Sonchus oleraceus*				X	
Orobanchaceae	*Sopubia cana var. cana*		LC			
Poaceae	*Sorghum halepense*	X			X	
Fabaceae	*Spartium junceum*				X	
Caryophyllaceae	*Spergularia media*				X	
Malpighiaceae	*Sphedamnocarpus pruriens*	X	LC			
Fabaceae	*Sphenostylis angustifolia*		LC			
Poaceae	*Sporobolus congoensis*		LC			
Poaceae	*Sporobolus discosporus*		LC			
Poaceae	*Sporobolus fimbriatus*	X	LC			
Poaceae	*Sporobolus stapfianus*		LC			
Lamiaceae	*Stachys hyssopoides*		LC			
Lamiaceae	*Stachys natalensis var. galpinii*		LC			
Orobanchaceae	*Striga asiatica*		LC			
Orobanchaceae	*Striga bilabiata*	X	LC			
Orobanchaceae	*Striga elegans*	X	LC			
Asteraceae	*Symphyotrichum squamatum*				X	
Lamiaceae	*Syncolostemon canescens*		LC			
Asteraceae	*Tagetes minuta*	X			X	
Talinaceae	*Talinum caffrum*		LC			
Asteraceae	*Taraxacum brunneum*				X	
Asteraceae	*Taraxacum officinale*	X			X	
Asteraceae	*Tarchonanthus camphoratus*		LC			
Fabaceae	*Tephrosia capensis var. capensis*	X	LC			
Fabaceae	*Tephrosia elongata var. elongata*		LC			
Fabaceae	*Tephrosia semiglabra*		LC			
Lamiaceae	*Teucrium trifidum*	X	LC			
Poaceae	*Themeda triandra*	X	LC			
Santalaceae	*Thesium magalismontanum*		LC			
Santalaceae	*Thesium multiramulosum*		LC			
Santalaceae	*Thesium procerum*		LC			
Santalaceae	*Thesium resedoides*		LC			
Santalaceae	*Thesium transvaalense*		LC			
Santalaceae	*Thesium utile*		LC			
Asteraceae	*Tolpis capensis*	X	LC			
Asphodelaceae	*Trachyandra saltii var. saltii*		LC			
Poaceae	*Trachypogon spicatus*	X	LC			
Asteraceae	*Tragopogon dubius*				X	
Poaceae	*Tragus berteronianus*	X	LC			
Zygophyllaceae	*Tribulus terrestris*		LC			
Poaceae	*Trichoneura grandiglumis*	X	LC			
Poaceae	*Triraphis andropogonoides*	X	LC			
Poaceae	*Trisetopsis imberbis*	X	LC			
Poaceae	*Tristachya leucothrix*		LC			
Poaceae	*Tristachya rehmannii*		LC			
Iridaceae	*Tritonia nelsonii*		LC			
Malvaceae	*Triumfetta sonderi*		LC			
Fabaceae	*Tylosema esculentum*		LC			
Typhaceae	*Typha capensis*	X	LC			
Ulmaceae	*Ulmus parvifolia*				X	
Poaceae	*Urochloa mosambicensis*	X	LC			
Poaceae	*Urochloa panicoides*		LC			
Asteraceae	*Ursinia nana subsp. leptophylla*	X	LC			
Fabaceae	*Vachellia karroo*	X	LC			
Fabaceae	*Vachellia nilotica subsp. kraussiana*		LC			
Fabaceae	*Vachellia permixta*		LC			
Rubiaceae	*Vangueria pygmaea*		LC			
Verbenaceae	*Verbena bonariensis*	X				1b
Verbenaceae	*Verbena brasiliensis*	X				1b
Asteraceae	*Verbesina encelloides*	X			X	

Fabaceae	*Vigna unguiculata subsp. stenophylla*		LC			
Fabaceae	*Vigna vexillata var. vexillata*		LC			
Santalaceae	*Viscum rotundifolium*	X	LC			
Campanulaceae	*Wahlenbergia denticulata var. transvaalensis*		LC			
Campanulaceae	*Wahlenbergia undulata*	X	LC			
Campanulaceae	*Wahlenbergia virgata*	X	LC			
Solanaceae	*Withania somnifera*		LC			
Asteraceae	*Xanthium spinosum*	X				1b
Asteraceae	*Xanthium strumarium*					1b
Convolvulaceae	*Xenostegia tridentata subsp. angustifolia*		LC			
Xyridaceae	*Xyris capensis*		LC			
Scrophulariaceae	*Zaluzianskya elongata*		LC			
Scrophulariaceae	*Zaluzianskya katharinae*		LC			
Rutaceae	*Zanthoxylum capense*	X	LC			
Asteraceae	*Zinnia peruviana*	X			X	
Rhamnaceae	*Ziziphus mucronata subsp. mucronata*	X	LC			
Rhamnaceae	*Ziziphus zeyheriana*	X	LC			
Fabaceae	*Zornia milneana*		LC			

APPENDIX C: FAUNA CHECKLISTS (ADU DATABASE)

Database: ADU 2627B
[1]IUCN red list category
[2]GDARD (1983)
[3]CITES
[4]NEMBA (ToPS) - Threatened or Protected Species
Note: Current survey based on own observations and supplemented by observations from farm owners

MAMMALS

Family	Scientific name	Common name	IUCN RSA[1]	GDARD[2]	CITES[3]	NEMBA (ToPS)[4]	Current survey
Bathyergidae	*Cryptomys hottentotus*	Southern African Mole-rat	LC				
Bovidae	*Aepyceros melampus*	Impala	LC				X
Bovidae	*Alcelaphus buselaphus caama*	Red Hartebeest	LC	Sch 2			X
Bovidae	*Antidorcas marsupialis*	Springbok	LC				X
Bovidae	*Connochaetes gnou*	Black Wildebeest	LC	Sch 2		Prot	X
Bovidae	*Connochaetes taurinus taurinus*	Blue Wildebeest	LC				X
Bovidae	*Damaliscus pygargus phillipsi*	Blesbok	LC				X
Bovidae	*Kobus ellipsiprymnus ellipsiprymnus*	Waterbuck	LC	Sch 2			X
Bovidae	*Oryx gazella*	Gemsbok	LC	Sch 2			X
Bovidae	*Raphicerus campestris*	Steenbok	LC	Sch 2			X
Bovidae	*Redunca fulvorufula*	Mountain Reedbuck	EN	Sch 2			X
Bovidae	*Sylvicapra grimmia*	Grey Duiker	LC				
Bovidae	*Taurotragus oryx*	Cape Eland	LC	Sch 2			X
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	LC				X
Canidae	*Canis mesomelas*	Black-backed Jackal	LC	Sch 8			X
Cercopithecidae	*Chlorocebus pygerythrus pygerythrus*	Vervet Monkey	LC	Ssh 8			X
Cervidae	*Dama dama*	Fallow Deer	Introduced				X
Equidae	*Equus quagga*	Plains Zebra	LC				X
Erinaceidae	*Atelerix frontalis*	Southern African Hedgehog	NT	Sch 2		Prot	
Felidae	*Acinonyx jubatus*	Cheetah	VU	Sch 4	App I	VU	
Felidae	*Caracal caracal*	Caracal	LC	Sch 8	App II		X
Felidae	*Felis catus*	Domestic Cat	Introduced				
Felidae	*Leptailurus serval*	Serval	NT		App II	Prot	
Felidae	*Panthera leo*	Lion	LC	Sch 4	App II	VU	
Felidae	*Panthera pardus*	Leopard	VU	Sch 4	App I	VU	
Giraffidae	*Giraffa giraffa giraffa*	South African Giraffe	LC	Sch 2	App II		X
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	LC				
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	LC				X
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	LC				X
Hippopotamidae	*Hippopotamus amphibius*	Hippopotamus	LC	Sch 2	App II		
Hipposideridae	*Cloeotis percivali*	Percival's Short-eared Trident Bat	EN				
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	LC				
Leporidae	*Lepus saxatilis*	Scrub Hare	LC				X
Leporidae	*Pronolagus randensis*	Jameson's Red Rock Hare	LC				
Macroscelididae	*Elephantulus sp.*	Elephant Shrews					
Macroscelididae	*Elephantulus myurus*	Eastern Rock Elephant Shrew	LC				
Muridae	*Bla*	Veld rats					
Muridae	*Lemniscomys sp.*	Grass Mice					
Muridae	*Lemniscomys rosalia*	Single-Striped Lemniscomys	LC				
Muridae	*Mastomys sp.*	Multimammate Mice					
Muridae	*Mastomys coucha*	Southern African Mastomys	LC				
Muridae	*Mastomys natalensis*	Natal Mastomys	LC				
Muridae	*Otomys sp.*	Vlei Rats					
Muridae	*Otomys angoniensis*	Angoni Vlei Rat	LC				
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Grass Rat	LC				
Muridae	*Tatera sp.*						

Mustelidae	*Aonyx capensis*	African Clawless Otter	NT	App II	Prot	
Mustelidae	*Hydrictis maculicollis*	Spotted-necked Otter	VU		Prot	
Mustelidae	*Ictonyx striatus*	Striped Polecat	LC			
Mustelidae	*Mellivora capensis*	Honey Badger	LC			
Nesomyidae	*Dendromus mystacalis*	Chestnut African Climbing Mouse	LC			
Nesomyidae	*Mystromys albicaudatus*	African White-tailed Rat	VU			
Nesomyidae	*Steatomys sp.*	Fat Mice				
Nycteridae	*Nycteris thebaica*	Egyptian Slit-faced Bat	LC			
Procaviidae	*Procavia capensis*	Cape Rock Hyrax	LC			
Rhinolophidae	*Rhinolophus sp.*	Horseshoe Bats				
Rhinolophidae	*Rhinolophus clivosus*	Geoffroy's Horseshoe Bat	LC			
Rhinolophidae	*Rhinolophus darlingi*	Darling's Horseshoe Bat	LC			
Rhinolophidae	*Rhinolophus simulator*	Bushveld Horseshoe Bat	LC			
Sciuridae	*Xerus inauris*	South African Ground Squirrel	LC			X
Soricidae	*Crocidura sp.*	Shrews				
Soricidae	*Myosorex varius*	Forest Shrew	LC			
Soricidae	*Suncus sp.*	Dwarf Shrews				
Soricidae	*Suncus infinitesimus*	Least Dwarf Shrew	LC			
Suidae	*Phacochoerus africanus*	Warthog	LC			X
Vespertilionidae	*Miniopterus sp.*	Long-fingered Bats				
Vespertilionidae	*Miniopterus natalensis*	Natal Long-fingered Bat	LC			
Vespertilionidae	*Miniopterus schreibersii*	Schreibers's Long-fingered Bat	LC			
Vespertilionidae	*Myotis tricolor*	Temminck's Myotis	LC			
Vespertilionidae	*Neoromicia capensis*	Cape Serotine	LC			
Vespertilionidae	*Pipistrellus (Pipistrellus) rusticus*	Rusty Pipistrelle	LC			
Vespertilionidae	*Scotophilus dinganii*	Yellow-bellied House Bat	LC			
Viveridae	*Genetta maculata*	Common Large-spotted Genet	LC			
Viverridae	*Genetta genetta*	Common Genet	LC			
Viverridae	*Genetta tigrina*	Cape Genet (Cape Large-spotted Genet)	LC			

REPTILES

Family	Scientific name	Common name	IUCN RSA	GDARD	CITES ToPS
Agamidae	*Agama aculeata distanti*	Distant's Ground Agama	LC	Sch 2	
Agamidae	*Agama atra*	Southern Rock Agama	LC	Sch 2	
Chamaeleonidae	*Chamaeleo dilepis*	Common Flap-neck Chameleon	LC	Sch 2	
Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	LC	Sch 2	
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	LC	Sch 2	
Colubridae	*Dispholidus typus*	Boomslang	LC	Sch 2	
Colubridae	*Philothamnus semivariegatus*	Spotted Bush Snake	LC	Sch 2	
Colubridae	*Telescopus semiannulatus semiannulatus*	Eastern Tiger Snake	LC	Sch 2	
Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	LC	Sch 2	
Cordylidae	*Smaug vandami*	Van Dam's Dragon Lizard	LC	Sch 2	
Crocodylidae	*Crocodylus niloticus*	Nile Crocodile	VU (RSA)	Sch 2	
Elapidae	*Hemachatus haemachatus*	Rinkhals	LC	Sch 5	
Elapidae	*Naja annulifera*	Snouted Cobra	LC	Sch 5	
Gekkonidae	*Lygodactylus capensis*	Common Dwarf Gecko	LC	Sch 2	
Gekkonidae	*Lygodactylus ocellatus*	Spotted Dwarf Gecko	LC	Sch 2	
Gekkonidae	*Pachydactylus sp.*			Sch 2	
Gekkonidae	*Pachydactylus affinis*	Transvaal Gecko	LC	Sch 2	
Gekkonidae	*Pachydactylus capensis*	Cape Gecko	LC	Sch 2	
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	LC	Sch 2	
Lacertidae	*Nucras holubi*	Holub's Sandveld Lizard	LC	Sch 2	
Lacertidae	*Nucras lalandii*	Delalande's Sandveld Lizard	LC	Sch 2	
Lacertidae	*Pedioplanis lineoocellata lineoocellata*	Spotted Sand Lizard	LC	Sch 2	
Lamprophiidae	*Aparallactus capensis*	Black-headed Centipede-eater	LC	Sch 5	
Lamprophiidae	*Atractaspis bibronii*	Bibron's Stiletto Snake	LC	Sch 5	
Lamprophiidae	*Boaedon capensis*	Common House Snake	LC	Sch 5	
Lamprophiidae	*Lamprophis aurora*	Aurora Snake	LC	Sch 5	
Lamprophiidae	*Lycodonomorphus inornatus*	Olive Ground Snake	LC	Sch 5	
Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	LC	Sch 5	
Lamprophiidae	*Prosymna sundevallii*	Sundevall's Shovel-snout	LC	Sch 5	
Lamprophiidae	*Psammophis brevirostris*	Short-snouted Grass Snake	LC	Sch 5	

Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	LC	Sch 5		
Lamprophiidae	*Pseudaspis cana*	Mole Snake	LC	Sch 5		
Pelomedusidae	*Pelomedusa galeata*	South African Marsh Terrapin	NE	Sch 2		
Pythonidae	*Python natalensis*	Southern African Python	LC	Sch 5		Prot
Scincidae	*Afroablepharus wahlbergii*	Wahlberg's Snake-eyed Skink	LC	Sch 2		
Scincidae	*Trachylepis capensis*	Cape Skink	LC	Sch 2		
Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	LC	Sch 2		
Scincidae	*Trachylepis varia sensu lato*	Variable Skink	LC	Sch 2		
Testudinidae	*Kinixys lobatsiana*	Lobatse Hinged-back Tortoise	LC	Sch 2	App II	
Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	LC	Sch 2	App II	
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	LC	Sch 5		
Typhlopidae	*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake	LC	Sch 5		
Viperidae	*Bitis arietans arietans*	Puff Adder	LC	Sch 5		
Viperidae	*Causus rhombeatus*	Rhombic Night Adder	LC	Sch 5		

FROGS

Family	Scientific name	Common name	IUCN RSA	GDARD	CITES	ToPS
Bufonidae	*Schismaderma carens*	Red Toad	LC			
Bufonidae	*Sclerophrys capensis*	Raucous Toad	LC			
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	LC			
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	LC			
Hyperoliidae	*Semnodactylus wealii*	Rattling Frog	LC			
Pipidae	*Xenopus laevis*	Common Platanna	LC			
Ptychadenidae	*Ptychadena anchietae*	Plain Grass Frog	LC			
Pyxicephalidae	*Amietia sp.*					
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	LC			
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	LC			
Pyxicephalidae	*Amietia poyntoni*	Poynton's River Frog	LC			
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	LC			
Pyxicephalidae	*Pyxicephalus adspersus*	Giant Bull Frog	NT			Prot
Pyxicephalidae	*Tomopterna sp.*					
Pyxicephalidae	*Tomopterna cryptotis*	Tremelo Sand Frog	LC			
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	LC			

LEPIDOPTERA

Family	Scientific name	Common name	IUCN
EREBIDAE	*Ochrota unicolor*		Not listed
HESPERIIDAE	*Afrogegenes sp.*		
HESPERIIDAE	*Coeliades pisistratus*	Two-pip policeman	LC
HESPERIIDAE	*Eretis umbra umbra*	Small marbled elf	LC
HESPERIIDAE	*Gegenes pumilio gambica*	Dark dodger	LC
HESPERIIDAE	*Kedestes barberae barberae*	Freckled ranger	LC
HESPERIIDAE	*Kedestes lepenula*	Chequered ranger	LC
HESPERIIDAE	*Kedestes mohozutza*	Fulvous ranger	LC
HESPERIIDAE	*Kedestes nerva nerva*	Magaliesberg ranger	LC
HESPERIIDAE	*Metisella malgacha malgacha*	Grassveld sylph	LC
HESPERIIDAE	*Platylesches ayresii*	Peppered hopper	LC
HESPERIIDAE	*Platylesches dolomitica*	Spring hopper	LC
HESPERIIDAE	*Platylesches neba*	Flower-girl hopper	LC
HESPERIIDAE	*Spialia asterodia*	Star sandman	LC
HESPERIIDAE	*Spialia dromus*	Forest sandman	LC
HESPERIIDAE	*Spialia ferax*	Striped sandman	LC
HESPERIIDAE	*Spialia mafa mafa*	Mafa sandman	LC
HESPERIIDAE	*Spialia spio*	Mountain sandman	LC

HESPERIIDAE	*Tsitana tsita*	Dismal sylph	LC
LYCAENIDAE	*Actizera lucida*	Rayed blue	LC
LYCAENIDAE	*Aloeides aranda*	Yellow russet	LC
LYCAENIDAE	*Aloeides henningi*	Hillside russet	LC
LYCAENIDAE	*Aloeides molomo coalescens*	Mottled russet	LC
LYCAENIDAE	*Aloeides molomo molomo*	Mottled russet	LC
LYCAENIDAE	*Aloeides taikosama*	Dusky russet	LC
LYCAENIDAE	*Aloeides trimeni trimeni*	Brown russet	LC
LYCAENIDAE	*Anthene livida livida*	Pale ciliate blue	LC
LYCAENIDAE	*Axiocerses tjoane tjoane*	Eastern scarlet	LC
LYCAENIDAE	*Azanus jesous*	Topaz babul blue	LC
LYCAENIDAE	*Azanus moriqua*	Black-bordered babul blue	LC
LYCAENIDAE	*Azanus ubaldus*	Velvet-spotted babul blue	LC
LYCAENIDAE	*Cacyreus fracta fracta*	Water geranium bronze	LC
LYCAENIDAE	*Cacyreus marshalli*	Common geranium bronze	LC
LYCAENIDAE	*Cacyreus virilis*	Mocker bronze	LC
LYCAENIDAE	*Capys disjunctus*	Russet protea	LC
LYCAENIDAE	*Chilades trochylus*	Grass jewel blue	LC
LYCAENIDAE	*Cigaritis ella*	Ella's silverline	LC
LYCAENIDAE	*Cigaritis mozambica*	Mozambique silverline	LC
LYCAENIDAE	*Cigaritis natalensis*	Natal silverline	LC
LYCAENIDAE	*Cupidopsis cissus cissus*	Meadow blue	LC
LYCAENIDAE	*Cupidopsis jobates jobates*	Tailed meadow blue	LC
LYCAENIDAE	*Deudorix antalus*	Brown playboy	LC
LYCAENIDAE	*Eicochrysops messapus mahallakoaena*	Cupreous ash blue	LC
LYCAENIDAE	*Euchrysops dolorosa*	Sabie smoky blue	LC
LYCAENIDAE	*Euchrysops osiris*	Osiris smoky blue	LC
LYCAENIDAE	*Euchrysops subpallida*	Ashen smoky blue	LC
LYCAENIDAE	*Iolaus trimeni*	Protea sapphire	LC
LYCAENIDAE	*Lampides boeticus*	Pea blue	LC
LYCAENIDAE	*Lepidochrysops glauca*	Silvery giant cupid	LC
LYCAENIDAE	*Lepidochrysops ortygia*	Koppie giant cupid	LC
LYCAENIDAE	*Lepidochrysops patricia*	Patrician giant cupid	LC
LYCAENIDAE	*Lepidochrysops plebeia plebeia*	Twin-spot giant cupid	LC
LYCAENIDAE	*Lepidochrysops praeterita*	Highveld giant cupid	EN
LYCAENIDAE	*Lepidochrysops procera*	Potchefstroom giant cupid	LC
LYCAENIDAE	*Leptomyrina henningi henningi*	Plain black-eye	LC
LYCAENIDAE	*Leptotes pirithous pirithous*	Common zebra blue	LC
LYCAENIDAE	*Lycaena clarki*	Eastern sorrel copper	LC
LYCAENIDAE	*Stugeta bowkeri henningi*	Bowker's marbled sapphire	LC
LYCAENIDAE	*Tarucus sybaris sybaris*	Dotted pierrot	LC
LYCAENIDAE	*Thestor basutus capeneri*	Basuto skolly	LC
LYCAENIDAE	*Tuxentius melaena melaena*	Black pie	LC
LYCAENIDAE	*Uranothauma nubifer nubifer*	Black heart	LC
LYCAENIDAE	*Deudorix dinochares*	Apricot playboy	LC
LYCAENIDAE	*Zintha hintza hintza*	Hintza pierrot	LC
LYCAENIDAE	*Zizeeria knysna knysna*	African grass blue	LC
LYCAENIDAE	*Zizula hylax*	Tiny grass blue	LC
NOCTUIDAE	*Brephos festiva festiva*		Not listed
NYMPHALIDAE	*Acraea aglaonice*	Clear-spotted acraea	LC
NYMPHALIDAE	*Acraea barberi*	Waterberg acraea	LC
NYMPHALIDAE	*Acraea horta*	Garden acraea	LC
NYMPHALIDAE	*Acraea neobule neobule*	Wandering donkey acraea	LC
NYMPHALIDAE	*Byblia ilithyia*	Spotted joker	LC
NYMPHALIDAE	*Catacroptera cloanthe cloanthe*	Pirate	LC
NYMPHALIDAE	*Danaus chrysippus orientis*	African plain tiger	LC
NYMPHALIDAE	*Hamanumida daedalus*	Guineafowl	LC
NYMPHALIDAE	*Hypolimnas misippus*	Common diadem	LC
NYMPHALIDAE	*Junonia hierta cebrene*	Yellow pansy	LC
NYMPHALIDAE	*Junonia oenone oenone*	Dark blue pansy	LC
NYMPHALIDAE	*Junonia orithya madagascariensis*	African blue pansy	LC
NYMPHALIDAE	*Melanitis leda*	Common evening brown	LC
NYMPHALIDAE	*Paternympha narycia*	Spotted-eye small ringlet	LC
NYMPHALIDAE	*Precis archesia archesia*	Garden inspector	LC
NYMPHALIDAE	*Stygionympha wichgrafi wichgrafi*	Wichgraf's hillside brown	LC
NYMPHALIDAE	*Telchinia rahira rahira*	Marsh telchinia	LC
NYMPHALIDAE	*Telchinia serena*	Dancing telchinia	LC

NYMPHALIDAE	*Vanessa cardui*	Painted lady	LC
PAPILIONIDAE	*Papilio demodocus demodocus*	Citrus swallowtail	LC
PIERIDAE	*Belenois aurota*	Pioneer caper white	LC
PIERIDAE	*Catopsilia florella*	African migrant	LC
PIERIDAE	*Colias electo electo*	African clouded yellow	LC
PIERIDAE	*Colotis annae annae*	Scarlet tip	LC
PIERIDAE	*Colotis euippe omphale*	Southern round-winged orange tip	LC
PIERIDAE	*Colotis evagore antigone*	Small orange tip	LC
PIERIDAE	*Colotis evenina evenina*	African orange tip	LC
PIERIDAE	*Colotis lais*	Kalahari orange tip	LC
PIERIDAE	*Eurema brigitta brigitta*	Broad-bordered grass yellow	LC
PIERIDAE	*Mylothris rueppellii haemus*	Twin dotted border	LC
PIERIDAE	*Pinacopteryx eriphia eriphia*	Zebra white	LC
PIERIDAE	*Pontia helice helice*	Southern meadow white	LC
PIERIDAE	*Teracolus subfasciatus*	Lemon traveller	LC

SPIDERS

Family	Scientific name	Common name	IUCN	GDARD	ToPS
Agelenidae	FAMILY Agelenidae	Funnel-web spiders			
Araneidae	*Nephila fenestrata*	Black legged golden orb-web spider			
Araneidae	FAMILY Araneidae	Araneid orb-web spiders			
Araneidae	*Cyrtophora citricola*	Tropical tent-web spiders			
Araneidae	*Neoscona sp.*	Neoscona hairy field spiders			
Corinnidae	FAMILY Corinnidae	Dark sac spiders and ant-imitating sac spiders			
Dysderidae	*Dysdera crocata*	Long jawed 6 eyed or woodlouse spiders			
Eresidae	*Gandanameno sp.*	Tree velvet spiders			
Eutichuridae	FAMILY Eutichuridae	Sac spiders and long-legged sac spiders			
Gnaphosidae	*Camillina sp.*	Pearly-eyed ground spiders			
Hersiliidae	*Hersilia sp.*	Long-spinnered bark spiders			
Lycosidae	FAMILY Lycosidae	Wolf spiders			
Nephilidae	FAMILY Nephilidae	Golden orb-web spiders			
Oxyopidae	FAMILY Oxyopidae	Lynx spiders			
Oxyopidae	*Oxyopes sp.*	Grass lynx spiders			
Oxyopidae	*Peucetia sp.*	Green lynx spiders			
Philodromidae	Philodromus sp.	Shouldered running spiders			
Pholcidae	FAMILY Pholcidae	Daddy longlegs spiders			
Pholcidae	*Smeringopus sp.*	Common daddy longlegs spiders			
Pisauridae	*Nilus sp.*	Fish-eating or fishing spiders			
Pisauridae	*Rothus sp.*	Crowned pisaurids			
Salticidae	FAMILY Salticidae	Jumping spiders			
Salticidae	*Heliophanus sp.*	jumping spiders			
Salticidae	*Heliophanus pauper*	Kenyan heliophanus			
Salticidae	*Hyllus sp.*	Large jumping spiders			
Salticidae	*Nigorella hirsuta*	White-spotted nigorella jumping spiders			
Salticidae	*Thyene natalii*	Natal thyene jumping spiders			
Scytodidae	*Scytodes sp.*	spitting spiders			
Sparassidae	*Palystes sp.*	Rain spiders			
Tetragnathidae	FAMILY Tetragnathidae	Water orb-web spiders			
Tetragnathidae	*Leucauge sp.*	Silvr vlei or silver swamp spiders			
Tetragnathidae	*Tetragnatha sp.*	Long-jawed water orb-web spiders			
Theraphosidae	*Brachionopus sp.*	baboon spider		X	
Theraphosidae	*Harpactira hamiltoni*	babon spider		X	Prot
Theridiidae	*Enoplognatha sp.*	comb-footed or cobweb spiders			
Theridiidae	*Latrodectus geometricus*	Common brown button spiders			
Theridiidae	*Theridion sp.*	comb-footed or cobweb spiders			
Thomisidae	FAMILY Thomisidae	Crab spiders			
Thomisidae	*Misumenops rubrodecoratus*	Common rosy banded crab spiders			
Thomisidae	*Oxytate sp.*	crab spiders			
Thomisidae	*Thomisus sp.*	Flower crab spiders			
Thomisidae	*Thomisus citrinellus*	Variable spotted thomisus crab spiders			
Trochanteriidae	*Platyoides sp.*	scorpion spiders			
Trochanteriidae	*Platyoides walteri*	Common scorpion spiders			
Uloboridae	FAMILY Uloboridae	Hackled orb-web spiders			

Uloboridae	*Uloborus plumipes*	Feather lgged spiders

SCORPIONS

Family	Scientific name	ToPS
BUTHIDAE	*Pseudolychas ochraceus*	
BUTHIDAE	*Uroplectes triangulifer*	
HORMURIDAE	*Hadogenes gunningi*	Prot
SCORPIONIDAE	*Opistophthalmus pugnax*	Prot

APPENDIX D: SITE SENSITIVITY VERIFICATION

Prior to commencing with the Terrestrial Biodiversity Specialist Assessment in accordance with the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity (Government Notice 320, dated 20 March 2020), a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool.

The details of the site sensitivity verification are noted below:

Date of site visit	January 2021
Specialist name	Dr. Noel van Rooyen; Prof. Gretel van Rooyen
Professional registration number	401430/83 Botanical Science (NvR); 400509/14 Ecological Science (GvR)
Specialist affiliation / company	Ekotrust cc

The site sensitivity verification was undertaken using the following means:

- desk top analysis using satellite imagery;
- consulting geological, land type and vegetation type maps of the region;
- consulting provincial datasets on the latest versions of the mapping of CBAs, ESAs, ONAs, NPAES and PAs;
- checking distribution ranges of IUCN red-listed species and species highlighted by the Screening Tool;
- compiling plant and animal species checklist for the region; and
- on-site inspection.

To verify the site sensitivity of the Screening Tool, Google satellite images were studied beforehand and the site stratified into relatively homogenous physiographic-physionomic units or habitats. Sites were then selected to represent these habitats. During the field survey, 31 sampling sites were surveyed at the proposed Igolide development.

Animal Species Theme (bird and bat components are excluded – see specialist reports)

Screening Tool: The Screening Tool rated the sensitivity of the Animal Species Theme as **Medium.**

Sensitivity	**Feature(s)**
Medium	Aves-*Tyto capensis*
Medium	Aves-*Hydroprogne caspia*
Medium	Aves-*Eupodotis senegalensis*
Medium	Insecta-*Lepidochrysops praeterita*
Medium	Insecta-*Lepidochrysops procera*
Medium	Mammalia-*Crocidura maquassiensis*
Medium	Mammalia-*Hydrictis maculicollis*
Medium	Invertebrate-*Clonia uvarovi*

Site verification:

- **The avifaunal component will be addressed by the avifaunal specialist.**
- None of the animals listed in the Screening Tool were encountered on site.
- The Screening Tool listed *Lepidochrysops praeterita* and *Lepidochrysops procera* (Lepidoptera) as SCC for the site. Neither species was recorded on site and they are unlikely to occur there because their host plant (*Ocimum obovatum*) was not recorded on site.
- The Screening Tool listed *Clonia uvarovi* (Orthoptera) as SCC. *Clonia uvarovi* (Orthoptera) inhabits tall woodland savanna (http://speciesstatus.sanbi.org/assessment/last-assessment/4333/), and no tall woodland savanna is present on site. The woody habitat on site could be decribed as bushveld which may be marginally suitable for the species. Furthermore, the turbines are not located in any bushveld habitats.
- The Maquassie Musk Shrew *Crocidura maquassiensis* (VU) depends on wetlands as suitable habitat in savanna and grassland. Although it has a wide inferred extent of occurrence, it appears to be patchily distributed. It has not been reported from Gauteng or North West Province post-1999 and thus there is a very low probability for it to occur on site. It was also not listed on the ADU database for the region.
- Marginally suitable habitat for the spotted-necked Otter *Hydrictis maculicollis* is available on site. It occurs widespread, but it is restricted to areas of permanent fresh water offering good shoreline cover and an abundant prey base. The watercourses were however avoided by the development and bufferzones are applicable.
- Excluding the avifaunal component, we would thus rate the sensitivity of the Animal Theme as **Low - Medium** based on the information provided above.

Plant Species Theme

Screening Tool: The Screening Tool rated the sensitivity of the Plant Species Theme as **Medium.**

Sensitivity	Feature(s)
Medium	Sensitive species 1252
Medium	*Khadia beswickii*
Medium	Sensitive species 691
Medium	Sensitive species 1248

Site verification:

- Our site surveys and sensitivity model applied to the site data indicated that the vegetation of most of site had a low sensitivity.
- None of the SCC highlighted by the Screening Tool were recorded on site.
- *Khadia beswickii* occurs in rocky habitats on shallow soil (sheetrock), but was not recorded on site.
- Species 691 occurs in damp depressions in shallow soil over rock sheets. This type of habitat occurs on a small area on site, but was avoided by the development and the species was not encountered during the vegetation survey.
- The wooded habitats on site may present suitable habitat for plant species 1248 and 1252 on the list, but they were not encountered during the site survey. Furthermore, the rocky habitats (sheets) and wooded habitats were avoided in the layout of the infrastructure on the Igolide site.
- Two near threatened species, *Gnaphalium nelsonii* and *Cineraria austrotransvaalensis*, could potentially occur on site according to the Gauteng C-plan.
- Because none of the SCC highlighted by the Screening Tool were found on site, we suggest that the Plant Species Theme's site sensitivity is rated as **Low.**

Relative Terrestrial Biodiversity Theme

Screening Tool: The Screening Tool rated the sensitivity of the Relative Terrestrial Biodiversity theme as **Very High**.

Sensitivity	Feature(s)
Very high	Critical Biodiversity Area 2
Very high	Ecological Support Area
Very high	Vulnerable ecosystem
Very high	Protected Areas Expansion Strategy

Site verification:

- The Screening Tool rated the sensitivity of the Relative Terrestrial Biodiversity Theme as very high based on the presence of CBAs, ESAs, NPAES and a vulnerable ecosystem.
- The study area is not located in a protected area.
- The study site is part of the NPAES (NPAES 2018) and all turbines are located outside the NPAES.
- CBAs and ESAs are present on the site (CPlanV33_1110_ge 2017) and development within the CBAs should best be avoided. Turbines WTG04, WTG07 and WTG08 lie in ESAs and their positions may be reconsidered.
- Our background study confirmed that the Rand Highveld Grassland vegetation type on site is listed as Vulnerable whereas the Gauteng Shale Mountain Bushveld is Least Concern. The turbines are currently located in both the Rand Highveld Grassland (7 turbines) and the Gauteng Shale Mountain Bushveld (3 turbines). Since the turbine footprint is relatively small and spread across the site, the loss of prime habitat within the 'Vulnerable' Rand Highveld Grassland vegetation type is small in relation to the remaining extent of the vegetation type and ecosystem threat status will not be affected. Furthermore, most of the turbines in the Rand Highveld Grassland are not located in either CBAs or ESAs, but within areas demarcated a ONA. Although we agree that the current site clearly includes areas of very high sensitivity (CBA, ESAs and NPAES), it also includes a large portion that has not been demarcated as very high sensitivity, thus ONA. According to the land use guidelines supplied by SANBI (2021), split zoning should be used, where feasible, to demarcate sensitive areas, where CBAs occur across part of a property.
- The Freshwater Ecosystem Priority Areas (FEPAs) were not flagged by the Screening Tool.

Outcome of the site sensitivity verification:

- We suggest that the Plant Species Theme's site sensitivity is rated as **Low.**
- We would suggest the Animal Theme's (**bird and bat components excluded**) site sensitivity to be rated as **Low – Medium.**
- According to the land use guidelines supplied by SANBI (2021) split zoning should be used where CBAs occur across part of a property to demarcate sensitive areas. The current site clearly includes areas of very high sensitivity (CBA, ESAs and NPAES), but it also includes a large portion that has not been demarcated as very high sensitivity, thus ONA. According to the land use guidelines supplied by SANBI (2021), split zoning should be used, where feasible, to demarcate sensitive areas, where CBAs occur across part of a property. The development has been largely contained within areas that do not qualify as very high sensitivity, although three turbines are located in ESAs.

APPENDIX E: COMPLIANCE WITH THE TERRESTRIAL BIODIVERSITY PROTOCOL (GN 320, 20 MARCH 2020)

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	***Section where this has been addressed in the Specialist Report***
The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects: *2.3.1. a description of the ecological drivers or processes of the system and how the proposed development will impact these;*	*Chapters 9, Section 9.6; Chapter 17*
2.3.2. ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the preferred site;	*Chapter 9, Section 9.6*
2.3.3. the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	*Chapter 9, Sections 9.4 & 9.6*
2.3.4. the description of any significant terrestrial landscape features (including rare or important flora- faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments;	*Chapters 4 – 9*
2.3.5. a description of terrestrial biodiversity and ecosystems on the preferred site, including: *a) main vegetation types;* *b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified;* *c) ecological connectivity, habitat fragmentation, ecological processes and fine-scale habitats; and* *d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;*	*(a) Chapter 5* *(b) Chapters 5 & 9* *(c) Chapters 5 & 9* *(d) Chapters 5 – 9; Appendix A, B & C*
2.3.6. the assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the Screening Tool and verified through the site sensitivity verification; and	*Chapter 9 & 10*
2.3.7. the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify: *2.3.7.1. terrestrial critical biodiversity areas (CBAs), including:* *a) the reasons why an area has been identified as a CBA;* *b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;* *c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);* *d) the impact on ecosystem threat status;* *e) the impact on explicit subtypes in the vegetation;* *f) the impact on overall species and ecosystem diversity of the site; and* *g) the impact on any changes to threat status of populations of species of conservation concern in the CBA;*	*(a) Chapter 9, Appendix D* *(b) Chapter 9; Section 9.4* *(c) Chapter 12, 13 & 17* *(d) Chapter 17* *(e) n.a.* *(f) Chapters 12 & 13* *(g) Chapters 12 & 13*
2.3.7.2. terrestrial ecological support areas (ESAs), including: *a) the impact on the ecological processes that operate within or across the site;* *b) the extent the proposed development will impact on the functionality of the ESA; and* *c) loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;*	*(a) Chapter 9* *(b) Chapter 9* *(c) Chapter 9*
2.3.7.3. protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- *a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;*	*n.a.*
2.3.7.4. priority areas for protected area expansion, including- *a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;*	*n.a.*
2.3.7.5. SWSAs including: *a) the impact(s) on the terrestrial habitat of a SWSA; and*	*n.a. (Chapter 9 (section 9.8)*

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	***Section where this has been addressed in the Specialist Report***
b) the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in watercourses);	
2.3.7.6. FEPA subcatchments, including- *a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;*	*Chapter 9; Section 9.5*
2.3.7.7. indigenous forests, including: *a) impact on the ecological integrity of the forest; and* *b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.*	*n.a.*
3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:	
3.1.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	*Appendix F*
3.1.2. a signed statement of independence by the specialist;	*p. vii*
3.1.3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	*Chapter 2*
3.1.4. a description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	*Chapter 2*
3.1.5. a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	*p. xv*
3.1.6. a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	*Chapters 9, 10, 12, 13; Figures 23, 24 & 25; Sensitivity.kmz file*
3.1.7. additional environmental impacts expected from the proposed development;	*n.a.*
3.1.8. any direct, indirect and cumulative impacts of the proposed development;	*Chapters 12 & 13*
3.1.9. the degree to which impacts and risks can be mitigated;	*Chapters 12 & 13*
3.1.10. the degree to which the impacts and risks can be reversed;	*Chapters 12 & 13*
3.1.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;	*Chapters 12 & 13*
3.1.12. proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	*Chapter 15*
3.1.13. a motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	*n.a.*
3.1.14. a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	*Chapter 17*
3.1.15. any conditions to which this statement is subjected.	*Chapter 17*
3.2. The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr, where relevant.	*For EAP to incorporate*
3.2.1. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	*For EAP to append* *.*

APPENDIX F: Curriculum vitae: DR NOEL VAN ROOYEN

1. Biographical information

Surname	**Van Rooyen**
First names	**Noel**
ID number	**501225 5034 084**
Citizenship	**South African**
Business address	**Ekotrust CC** **7 St George Street** **Lionviham 7130** **Somerset West** **South Africa**
Mobile	**082 882 0886**
e-mail	**noel@ekotrust.co.za**
Current position	**Member of Ekotrust cc**
Professional registration	**Botanical Scientist : Pr.Sci.Nat; Reg no. 401430/83**

Academic qualifications include BSc (Agric), BSc (Honours), MSc (1978) and DSc degrees (1984) in Plant Ecology at the University of Pretoria, South Africa. Until 1999 I was Professor in Plant Ecology at the University of Pretoria and at present I am a member of Ekotrust cc.

2. Publications

I am the author/co-author of 128 peer reviewed research publications in national and international scientific journals and was supervisor or co-supervisor of 9 PhD and 33 MSc students. More than 400 projects were undertaken by Ekotrust cc as consultant over a period of more than 40 years.

Books

VAN ROOYEN, N. 2001. ***Flowering plants of the Kalahari dunes***. Ekotrust CC, Pretoria. (In collaboration with H. Bezuidenhout & E. de Kock).

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2019. ***Flowering plants of the southern Kalahari***. Somerset West.

Author / co-author of various chapters on the Savanna and Grassland Biomes in:

LOW, B. & REBELO, A.R. 1996. ***Vegetation types of South Africa, Lesotho and Swaziland*****,** Department of Environmental Affairs and Tourism, Pretoria.

KNOBEL, J. (Ed.) 1999, 2006. ***The Magnificent Natural Heritage of South Africa*****.** (Chapters on the Kalahari and Lowveld).

VAN DER WALT, P.T. 2010. **Bushveld.** Briza, Pretoria. (Chapter on Sour Bushveld).

Contributed to chapters on vegetation, habitat evaluation and veld management in the book:

BOTHMA, J. du P. & DU TOIT, J.G. (Eds). 2016**.** ***Game Ranch Management*****.** 5th edition**.** Van Schaik, Pretoria.

BOTHMA, J. du P. & DU TOIT, J.G. (Eds). 2021**.Wildplaasbestuur.** 5th edition**.** Van Schaik, Pretoria.

Co-editor of the book:

BOTHMA, J. du P. & VAN ROOYEN, N**.** (eds). 2005**.** ***Intensive wildlife production in southern Africa.*** Van Schaik, Pretoria.

3. Ekotrust CC: Core Services

Ekotrust CC specializes in vegetation surveys, classification and mapping, wildlife management, wildlife production and economic assessments, vegetation ecology, veld condition assessment, carrying capacity, biodiversity assessments, rare species assessments, carbon pool assessments and alien plant management.

4. Examples of projects previously undertaken

Numerous vegetation surveys and vegetation impact assessments for Baseline, Scoping and Environmental Impact Assessments (BAs & EIA's) were made both locally and internationally.

Numerous projects have been undertaken in game ranches and conservation areas covering aspects such as vegetation surveys, range condition assessments and wildlife management. Of note is the Kgalagadi Transfrontier Park; iSimangaliso Wetland Park, Ithala Game Reserve, Phinda Private Game Reserve, Mabula Game Reserve, Tswalu Kalahari Desert Reserve, Maremani Nature Reserve and Associate Private Nature Reserve (previously Timbavati, Klaserie & Umbabat Private Game Reserve).

Involvement in various research programmes: vegetation of the northern Kruger National Park, Savanna Ecosystem Project at Nylsvley, Limpopo; Kuiseb River Project (Namibia); Grassland Biome Project; Namaqualand and Kruger Park Rivers Ecosystem research programme.

5. Selected references of other projects done by Ekotrust CC

VAN ROOYEN, N., THERON, G.K., BREDENKAMP, G.J., VAN ROOYEN, M.W., DEUTSCHLäNDER, M. & STEYN, H.M. 1996. *Phytosociology, vegetation dynamics and conservation of the southern Kalahari*. Final report: Department of Environmental Affairs & Tourism, Pretoria.

VAN ROOYEN, N. 1999 & 2017. The vegetation types, veld condition and game of Tswalu Kalahari Desert Reserve.

VAN ROOYEN, N. 2000. Vegetation survey and mapping of the Kgalagadi Transfrontier Park. Peace Parks Foundation, Stellenbosch.

VAN ROOYEN, N, VAN ROOYEN, M.W. & GROBLER, A. 2004. Habitat evaluation and stocking rates for wildlife and livestock - PAN TRUST Ranch, Ghanzi, Botswana.

VAN ROOYEN, N. 2004. Vegetation and wildlife of the Greater St Lucia Wetland Park, KZN.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2008. Vegetation classification, habitat evaluation and wildlife management of the proposed Royal Big Six Nsubane-Pongola Transfrontier Park, Swaziland. Ekotrust cc.

VAN ROOYEN, N., VAN DER MERWE, H. & Van Rooyen, M.W. 2011. The vegetation of the NECSA Vaalputs site. Report to NECSA.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2014. Ecological evaluation and wildlife management on Ndzalama Nature Reserve and adjacent farms, Gravelotte, Limpopo province.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2016. Ecological evaluation of the farm Springbokoog in the Van Wyksvlei region of Northern Cape, including a habitat assessment for the introduction of black rhinoceros. Ekotrust.

VAN ROOYEN, M.W. & VAN ROOYEN, N. & VAN DEN BERG, H. 2016. Kathu Bushveld study: Research offset for first development phase of Adams Solor Energy Facility. Project conducted for Department of Environment and Nature Conservation Northern Cape (DENC) and the Department of Agriculture, Forestry and Fisheries (DAFF).

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2018. Environmental screening study for the proposed essential oils and Moringa oil enterprise on Ferndale farm, Bathurst, Eastern Cape. Ekotrust cc, Somerset West.

VAN ROOYEN, M.W., GAUGRIS, J.Y. & VAN ROOYEN, N. 2018. Dish Mountain gold project, Republic of Ethiopia: Natural resource use evaluation - baseline report. FFMES, Report to SRK Consulting.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2018. Report on the terrestrial ecology (flora & fauna). Basic assessment report for the proposed development of the 325 MW Kudusberg Wind Energy Facility in the Northern and Western Cape. Ekotrust cc, Somerset West.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2019. Proposed amendments to the Ishwati Emoyeni Wind Energy Facility (WEF) of Special Energy Project (PTY) LTD, a subsidiary of Windlab Systems (PTY) LTD. Ekotrust cc, Somerset West.

6. Selected peer-reviewed research publications

VAN ROOYEN, N. 1978. A supplementary list of plant species for the Kruger National Park from the Pafuri area.

Koedoe 21: 37 - 46.
VAN ROOYEN, N., THERON, G.K. & GROBBELAAR, N. 1981. A floristic description and structural analysis of the plant communities of the Punda Milia - Pafuri - Wambiya area in the Kruger National Park, Republic of South Africa. 2. The sandveld communities. *Jl S. Afr. Bot.* 47: 405 - 449.
VAN ROOYEN, N., THERON, G.K. & GROBBELAAR, N. 1986. The vegetation of the Roodeplaat Dam Nature Reserve. 4. Phenology and climate. *S. Afr. J. Bot*. 52: 159 - 166.
VAN ROOYEN, N. 1989. Phenology and water relations of two savanna tree species. *S. Afr. J. Sci*. 85: 736 - 740.
VAN ROOYEN, N., BREDENKAMP, G.J. & THERON, G.K. 1991. Kalahari vegetation: Veld condition trends and ecological status of species. *Koedoe* 34: 61 - 72.
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JELTSCH, F., MILTON, S.J., DEAN, W.R.J. & VAN ROOYEN, N. 1997. Analyzing shrub encroachment in the southern Kalahari: a grid-based modelling approach. *Journal of Applied Ecology* 34 (6): 1497 - 1509.
VAN ROOYEN, N. & VAN ROOYEN, M.W. 1998. Vegetation of the south-western arid Kalahari: an overview. *Trans. Roy. Soc. S. Afr*. 53: 113 -140.
DE VILLIERS, A.J., VAN ROOYEN, M.W., THERON, G.K. & VAN ROOYEN, N. 1999. Vegetation diversity of the Brand-se-Baai coastal dune area, West Coast, South Africa: a pre-mining benchmark survey for rehabilitation. *Land Degradation & Development* 10: 207 - 224.
VAN ESSEN, L.D., BOTHMA, J. DU P., VAN ROOYEN, N. & TROLLOPE, W.S.W. 2002. Assessment of the woody vegetation of Ol Choro Oiroua, Masai Mara, Kenya. *Afr. J. Ecol.* 40: 76 - 83.
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VAN ROOYEN, M.W., THERON, G.K., VAN ROOYEN, N., JANKOWITZ, W.J. & MATTHEWS, W.S. 2004. Mysterious circles in the Namib Desert: review of hypotheses on their origin. *Journal of Arid Environments* 57: 467-48.
STEENKAMP, J.C. VOGEL, A., VAN ROOYEN, N., & VAN ROOYEN, M.W. 2008. Age determination of *Acacia erioloba* trees in the Kalahari. *Journal of Arid Environments* 72: 302 - 313.
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VAN ROOYEN, M.W., VAN ROOYEN, N., MIABANGANA, E.S., NSONGOLA, G., GAUGRIS, V. & GAUGRIS, J.Y. 2019. Floristic composition, diversity and structure of the rainforest in the Mayoko District, Republic of Congo. *Open Journal of Forestry* 9: 16-69. https://doi.org/10.4236/ojf.2019.91002.
VAN DER MERWE, H., VAN ROOYEN, N., BEZUIDENHOUT, H., BOTHMA, J. DU P. VAN ROOYEN, M.W. 2019. *Vachellia erioloba* dynamics over 38 years in the Kalahari Gemsbok National Park, South Africa. *Koedoe* a1534. https://doi.org/ 10.4102/koedoe.v61i1.1534
VAN DER MERWE, H., VAN ROOYEN, N., BEZUIDENHOUT, H., BOTHMA, J. DU P. & VAN ROOYEN, M.W. 2020. Woody vegetation change over more than 30 years in the interior duneveld of the Kalahari Gemsbok National Park. *Bothalia* 50 (1), a2 http://dx.doi.org/10.38201/btha.abc.v50.i1.2

Curriculum vitae

PROF GRETEL VAN ROOYEN

1. Biographical information

Surname	Van Rooyen
First names	Margaretha Wilhelmine
ID number	5004130033084
Home address	7 St George Street Lionviham 7130 Somerset West South Africa
Mobile	072 025 3386
e-mail	Gretel@ekotrust.co.za
Current position	Professor in Plant Ecology Scientific advisor - Ekotrust
Academic qualifications	BSc; BSc (Hons), HNOD, MSc (Botany), PhD (Plant ecology)

2. Books or book chapters

Van Rooyen, M.W. 1999. Functional aspects of short-lived plants. In: W.R.J. Dean & S.J. Milton (Eds) *The Karoo: Ecological patterns and processes*. Cambridge University Press, Cambridge. pp. 107-122.

Le Roux, A. & Van Rooyen, M.W. 1999. The Succulent Karoo. In: J. Knobel (ed.) *The magnificent heritage of South Africa.* Sunbird Publishing, Llandudno. pp. 94-107.

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Appendix B

CURRICULUM VITAE

Aisling Dower

Ecologist, Biodiversity Group Lead Africa

CAREER SUMMARY

Aisling is an ecologist with over 16 years consulting experience in Europe and sub-Saharan Africa. Experienced in designing, costing and conducting baseline flora and fauna surveys, ecosystem services assessments, ecological impact assessment and development of mitigation, compensation and offsetting measures for projects in the mining, O&G, waste, transport, land development and power generation sectors.

She has completed baseline biodiversity studies and ecosystem service reviews for numerous projects in Southern Africa, East Africa, and Central and West Africa, and is experienced in conducting such assessments to satisfy both national environmental regulations and international financing requirements particularly those demanded by the International Finance Corporation's 2012 Performance Standards. She has worked on biodiversity-related projects in Ireland, UK, Kosovo, Gabon, Guinea, Guinea-Bissau, Kenya, DRC, Mozambique and Uganda, in addition to numerous projects in South Africa, covering northern temperate, Mediterranean, tropical rainforest, desert, savanna and coastal environments.

1 year with WSP

16 years of experience

Area of expertise

Designing, Costing & Conducting Baseline Flora & Fauna Surveys, Impact Assessments, Biodiversity Monitoring Plans, Mitigation and Offset Strategies

Critical Habitat Assessments in line with IFC and WB requirements

Ecosystem Services Assessments in line with IFC and WB requirements

Biodiversity due diligence audits and red flag assessments

Language

English – Fluent

French – Intermediate (B1)

EDUCATION

Master of Science (Hons) Applied Environmental Science, University College Dublin, Dublin, Ireland	2007
Bachelor of Science (Hons) Zoology, University College Cork, Cork, Ireland	2005

ADDITIONAL TRAINING

Tools for Wetland Assessment (WET-Health, WET-Ecoservices) Rhodes University	August 2016
Mainstreaming Biodiversity into Business National Business and Biodiversity Network	November 2014
First Aid Level 1 Action Training Academy	July 2014
Wetland Management: Introduction and Delineation University of the Free State	November 2013
Flora of Witwatersrand Botany Dept, University of Witwatersrand	October 2013

Aisling Dower

Ecologist, Biodiversity Group Lead Africa

Mammal Identification the Mammal Society	May 2009
Bat Detector Workshop, Bat Conservation Ireland	June 2007- June 2008
Irish Botany National Botanic Gardens, Glasnevin	2008
Outdoor Safety & First Aid Mountain Rescue Trainer, November 2007	November 2007

PROFESSIONAL MEMBERSHIPS

Professional Natural Scientist (Pr. Sc. Nat.) 114477/15	2015 - present
Member of South African Bat Assessment Association	2020 - present
Member of International Association for Impact Assessment South Africa (5817)	2017 - present

PROFESSIONAL HISTORY

WSP Group Africa (Pty) Ltd.: Biodiversity Group Lead	July 2021 – present
Golder Associates Africa (Pty) Ltd. – Johannesburg. Senior Ecologist.	February 2013 – June 2021
Golder Associates Ireland – Naas, Ireland. Ecologist.	April 2008– January 2013
NATURA Environmental Consultants – Wicklow, Ireland. Ecologist.	September 2007-March 2008

PROJECT EXPERIENCE

Biodiversity

Confidential, Iron Ore ESIA, Gabon
2022 - Ongoing
Biodiversity Specialist
Lead for development of IFC PS6 standard biodiversity impact assessment, including Critical Habitat assessment, flora, fauna, aquatic ecosystems and ecosystem services impact assessment.

Confidential, Wind Energy Facility, Mozambique
2023
Biodiversity Specialist
Lead for development of IFC PS6 standard biodiversity impact assessment, including Critical Habitat assessment, ecosystem services impact assessment, and Biodiversity Management Plan.

Kamoa, Biodiversity Mitigation and Offset Strategy, DRC
2023
Biodiversity Specialist
Lead biodiversity specialist for biodiversity mitigation and offset strategy development.

Confidential, Gas to Power Plant, Nacala Mozambique
2022
Biodiversity Specialist
Compliance audit for IFC PS6 standards and gap analysis.

Confidential, Road Development, Senegal
2022
Biodiversity Specialist
Compliance audit for IFC PS6 standards and gap analysis.

Aisling Dower

Ecologist, Biodiversity Group Lead Africa

Confidential, Hydroelectric Dam, Cote d'Ivoire
2021
Biodiversity Specialist
BAP implementation audit and red flag analysis for lenders subscribing to WB standards and IFC PS6.

Confidential, Proposed Bauxite Mine, Cameroon
2021
Biodiversity Specialist
Capacity building of local consultants for IFC PS6-standard baseline surveys and impact assessment.

Globeleq, Large Infrastructure Barging Route, Marine Ecology Impact Assessment, Vilankulo, Mozambique
2020
Lead Biodiversity Specialist
Marine baseline surveys including sea grass and coral reef extent and condition assessments, to inform micro routing of a proposed barging route in close proximity to Bazaruto Archipelago National Park

Konza Techno City, Biodiversity Baseline and BMP Review, Machakos, Kenya
2019
Biodiversity Specialist
On behalf of the lending institution, was responsible for review of the initial biodiversity baseline study and BMP, and development of recommendations for additional work required to ensure that the baseline and BMP are of the standard necessary to satisfy the requirements of Performance Standard 6.

TKBV, Proposed Oil Field Development, Turkana, Kenya
2014 - 2019
Lead Ecologist
Screening for Critical Habitats as defined by IFC PS6 and IFC GN6, 2012. Desktop biodiversity description and remote land cover sensing to inform scoping report and fieldwork planning for biodiversity and ecosystem services baseline data gathering phase. Authored Biodiversity baseline report and impact assessment to Kenyan and IFC standards

Ahafo North Mine, Biodiversity Baseline and IA, Brong-Ahafo, Ghana
2018
Lead Ecologist
Consolidated biodiversity data from previous studies with up-to-date baseline data on aquatic ecosystems and vegetation into an updated biodiversity baseline report and impact assessment for the proposed mining of Ahafo North

Globeleq, Beach Landing Sites, Marine and Coastal baseline and Critical Habitat Assessment, Vilanculos, Mozambique
2018
Lead Ecologist
Authored marine and coastal baseline study report based on available reports and data. Determined species and ecosystem triggers of Critical Habitat in the study area and assessed impacts and developed bespoke mitigation measures to ensure NNL of natural habitat and NG of critical habitat

Kinsevere Copper Mine, ESIA, Haut-Katanga, DRC
2018
Lead Ecologist
Consolidated biodiversity data from previous studies with up-to-date baseline data on flora and birds into an updated biodiversity baseline report and impact assessment for the proposed expansion of TSF to adjoining tenement
CNOOC, Oil Exploration Block, Biodiversity Baseline and Impact Assessment, Hoima, Uganda
2018

Aisling Dower

Ecologist, Biodiversity Group Lead Africa

Biodiversity Specialist
Baseline biodiversity description to inform the overall Environmental Baseline Report for that exploration block. Updated biodiversity impact assessment chapter and authored cumulative impact assessment report for the project

Kamoa Copper, Proposed Copper Mine, Katanga, DRC
2017
Lead Ecologist
Ecosystem services review and impact assessment to satisfy the requirements of IFC PS6 for a proposed copper mine development.

Confidential Client, Bokpoort Solar PV & CSP Tower, Northern Cape, South Africa
2016
Authored Ecosystem Services
Conducted specialist bat baseline study and impact assessment for solar PV and CSP tower project. Authored ecosystem services review and impact assessment for the full project.

CNOOC, Kingfisher Development Area, Lake Albert, Hoima, Uganda
2015
Biodiversity Specialist
Ecosystems goods and services assessment to IFC PS6 standards, for a proposed oil development project on the shore of Lake Albert

SMFG, Nimba Fauna Baseline, Guinea
2020
Terrestrial Fauna Ecologist
Complied baseline fauna report for the ESIA, including update of baseline information with results of various taxonomic studies done since the original 2013 baseline, and critical habitat-triggering species descriptions

Confidential Client, Mine ESIA, KwaZulu-Natal, South Africa
2013
Ecologist
Ecosystems goods and services assessment to IFC PS6 standards, for a proposed magnetite mine in an area of tribal lands in KZN, also known for its rich biodiversity.

SMFG, Bat survey of proposed mine site, Nimba, Guinea
2012
Lead Ecologist
Conducted extensive wet and dry season bat presence and activity surveys and established population status of a Critically Endangered bat species within proposed site. Produced Critical Habitat mapping and reporting in accordance with requirements of IFC Performance Standard 6.

Confidential Client, Bat survey of proposed mine site, Gabon
2012
Lead Ecologist
Bat survey of proposed mine site in a remote rainforest area in Gabon. Conducted wet and dry season bat presence and activity surveys to get a baseline bat species list for the proposed site, which included new bat records for Gabon.

Wetland Ecology

Confidential client, WEF wetland offset strategy, Mpumalanga, South Africa
2023
Ecologist
Wetland impact assessment and mitigation/offset strategy for proposed wind energy facility.

Aisling Dower

Ecologist, Biodiversity Group Lead Africa

Glencore, Wetland rehabilitation project, South Africa
2018 - ongoing
Wetland ecologist
Wetland rehabilitation design input, baseline assessments and monitoring for wetland rehabilitation project intended as an offset for wetland loss to authorised coal mining activity.

Seriti, Kriel, South Africa
2022-ongoing
Ecologist
Wetland impact assessment and mitigation/offset strategy for proposed opencast coal project.

Eskom, Lethabo Power Station, South Africa
2021
Ecologist
Wetland impact assessment and mitigation/offset strategy for proposed opencast coal project.

Exxaro, Coal Mine, South Africa
2021
Ecologist
Wetland impact assessment and mitigation/offset strategy for proposed opencast coal project.

Glencore, Coal Mine, South Africa
2021
Ecologist
Wetland audit and water use authorization audit for consolidated WUL for Tweefontein and Impunzi operations.

Sasol, Wetland and watercourse rehabilitation strategy, Secunda, South Africa
2019
Ecologist
Wetland and watercourse rehabilitation strategy and associated water use authorisations for Secunda operation.

AGA, Pipeline wetland assessment, Gauteng, South Africa
2019
Ecologist
Wetland delineation, baseline PES, EIS and EcoServices scores and impact assessment for proposed water return pipeline.

Twinsaver, Water Use License, Gauteng, South Africa
2018
Ecologist
Wetland delineation, baseline PES, EIS, and EcoServices scores and impact assessment for ESIA for water use license application

Breede-Gouritz Catchment Management Agency, Catchment Management Strategy, Western Cape, South Africa
2016
Ecologist
Wetland situation assessment for Breede-Gouritz catchment management strategy

Exxaro, Belfast Implementation Project, Mpumalanga, South Africa
2015 - 2018
Ecologist

Aisling Dower

Ecologist, Biodiversity Group Lead Africa

Wetland baseline monitoring to inform environmental impact assessment, including multi-seasonal surveys and updates of PES, EIS and WET-Ecoservices scores for each HGM unit concerned.

Kangra Kuisipongo Overland Conveyor ESIA, Kwazulu Natal, South Africa 2017
Ecologist
Conducted wetland delineation and baseline assessment (PES, EIS, Wet Ecoservices) and impact assessment of overland coal conveyor

Mafube LifeX Project, Mpumalanga, South Africa
2015 – 2017
Ecologist
Wetland mitigation strategy fieldwork and assessments. Ongoing project support during construction through monitoring and management of construction activities, and overseeing implementation of WUL conditions on the ground

BECSA Middelburg, ESIA Mpumalanga, South Africa
2015
Ecologist
Wetland delineation and assessment of proposed sludge pipeline river crossings, and wetlands lying within 500m of proposed slurry dump pits to inform Water Use Licence application and EIA.

Metmar Steelpoort, WULA, Limpopo, South Africa
2014
Ecologist
Delineation and assessment of floodplains of the Steelpoort River, upstream, within and downstream of the proposed site of an open cast pit.

Mooifontein, WULA, Arnot, Mpumalanga, South Africa
2014
Ecologist
Bird and amphibian surveys of pans and wetlands within mining rights area to update PES and EIS, for use in determining wetland reserve

Interwaste, WULA, Amadwala, Gauteng, South Africa
2014
Ecologist
Delineated wetlands and assessed Present Ecological Status, Ecological Importance and Sensitivity, and Ecosystem services provided by each wetland within project area of influence. Conducted impact assessment and devised mitigation measures and monitoring regimes

Mining

Confidential, Sand mining ESIA, KZN
2022 - Ongoing
Biodiversity Specialist
Lead for biodiversity baseline and impact assessment, in line with NEMA reporting protocols and DWS requirements.

Confidential Client, Proposed Mine expansion ESIA, Northern Cape
2022
Biodiversity Specialist
Lead for biodiversity baseline and impact assessment, in line with NEMA reporting protocols and DWS requirements.

Aisling Dower

Ecologist, Biodiversity Group Lead Africa

AngloAmerican, Coal Operations, Mpumalanga
2020
Biodiversity Specialist
Lead for biodiversity value assessment and biodiversity management plan with the aim of securing net gain of natural habitat across six operations.

Confidential Client, Bankable Feasibility Study, Mpumalanga, South Africa
2019
Author
Responsible for authoring environment chapter of BFS.

Belfast, Implementation Project, Mpumalanga, South Africa
2015 - 2018
Lead
Led three years of pre-construction wetland monitoring including assessment of PES, EIS and EcoServices for mining right area

Phalaborwa Mine, Biomonitoring, Limpopo, South Africa
2015-ongoing
Biological Monitoring
Of the Oliphants and Selati Rivers, including assessment of fish populations, aquatic macroinvertebrates and riparian vegetation to monitor the condition of habitat in the vicinity of the mine, observing any significant changes and providing advice to PMC on biodiversity management. This ongoing project continues to be conducted in compliance with the most rigorous health and safety standards, due to the frequent presence of dangerous large mammal fauna including elephant, buffalo and lion in and around the mine site.

Tshikondeni Mine, Rehabilitation Plan, Limpopo, South Africa
2014
Ecologist on Terrestrial Ecology Team
Responsible for undertaking wet and dry season field survey work to determine baseline large and small mammal, bat and bird diversity and vegetation community mapping for development of a rehabilitation plan for mined areas.

Renewable Power

Confidential, WEF and Solar ESIA, Mpumalanga
2022 - Ongoing
Biodiversity Specialist
Lead for biodiversity baseline and impact assessment, in line with NEMA reporting protocols and DWS requirements.

Eskom, Komati Solar PV and BESS ESIA, Mpumalanga
2022 - Ongoing
Biodiversity Specialist
Lead for biodiversity baseline and impact assessment, in line with NEMA reporting protocols and DWS requirements.

Bokpoort, CSV and PV developments, Northern Cape, South Africa
2017
Ecologist
Biodiversity and ecosystem Services Baseline and impact assessment as part of overall ESIA for two PV and one CSV development on adjoining properties.

Eskom, Solar Park - Gordonia Park substation powerline, Northern Cape, South Africa
2016

Aisling Dower

Ecologist, Biodiversity Group Lead Africa

Ecologist
Conducted survey of powerline route to identify cluster of protected trees, other plants of conservation importance, and areas potentially important to bird species of concern to inform the final routing and placement of pylons and bird deterrents

Kendal Power Plant, EIA, Mpumalanga, South Africa
2013
Ecologist
Terrestrial vegetation, bird and mammal monitoring to assess impacts of existing ash dump, and compile baseline data for proposed new ash dump.

Eskom, Ndumo-Gezisa Powerline Route Corridor, Impact Assessment, KwaZulu-Natal, South Africa
2013
Ecologist
Terrestrial flora and fauna assessment of route corridor options for proposed powerline approx. 30 km long. Studies included small and large mammals, birds, reptiles and vegetation mapping.

Eskom, Vaalbank 88 Kv Powerline - Basic Assessment, Gauteng, South Africa
2014
Ecologist
Terrestrial and wetland baseline study and impact assessment reports to assess the impacts of a proposed powerline corridor and switching station footprint.

PUBLICATIONS

Journal Articles

Monadjem, A., L. Richards, P. J. Taylor, C. Denys, A. Dower and S. Stoffberg. Diversity of *Hipposideridae* in the Mount Nimba massif, West Africa, and the taxonomic status of *Hipposideros lamottei*. Acta Chiropterologica, 15(2) (2013), 341-352.

Other

The Status of E.U. Protected Habitats and Species in Ireland. National Parks & Wildlife Service, 2008.

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

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