

Appendix H.5

TERRESTRIAL BIODIVERSITY ASSESSMENT





SCIENTIFIC TERRESTRIAL SERVICES

Terrestrial Biodiversity Assessment

AS PART OF THE ENVIRONMENTAL
AUTHORISATION PROCESS FOR THE
PROPOSED 150 MEGAWATT (MW) TOURNEE 2
SOLAR PARK NEAR THUTHUKANI,
MPUMALANGA PROVINCE.

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Reference:

STS 22 - 2094

Date:

July 2023



Part of the SAS Environmental Group of Companies

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EXECUTIVE SUMMARY

Scientific Terrestrial Services (Pty) Ltd (STS) was appointed to conduct a terrestrial biodiversity assessment as part of the Environmental Authorisation (EA) application process for the proposed Tournée 2 Solar Photovoltaic (PV) Park near Thuthukani, Mpumalanga Province. Tournée 2 Solar PV Park is on the remaining portion of Portion 3 of the farm DWARS-IN-DE-WEG 350 (344.1 hectares (ha) in extent), and Portion 6 of the farm DWARS-IN-DE-WEG 350 (161.1 ha in extent). The closest town, Thuthukani, which is located within the Lekwa Local Municipality and Gert Sibande District Municipality, approximately 10.5 kilometres (km) west of the proposed Tournée 2 Solar PV Park area. The proposed Tournée 2 Solar PV Park is located adjacent (north) to the Tutuka Power Station Ashing facility.

Tournée 2 Solar PV Park will consist of 150 megawatt (MW) PV solar energy facilities (PVSEF) within a total area of approximately 537,78 ha, of which 297 ha were considered as developable areas (i.e., for the placement of the bi-facial panels). The total footprint of the Independent Power Producer (IPP) site substation and battery energy storage system (BESS) will be up to 7 ha in extent (4 ha for the BESS and 1.5 ha for the IPP portion of the substation). The substation will consist of a high voltage substation yard to allow for multiple (up to) 132 kilovolt (kV) feeder bays and transformers, control building, telecommunication infrastructure, access roads, etc. The associated BESS storage capacity will be up to 150 MW/600 megawatt-hour (MWh) with up to four hours of storage. Additional surface infrastructure is associated with the Tournée 2 Solar PV Park namely a concrete batching plant, construction camp, laydown areas, operational and management (O&M) building, paved areas, developable areas (i.e., where the bi-facial panels will be placed), access roads, internal roads; and an interconnected overhead power line (OHPL).

The field assessment was undertaken during summer (6th to 9th February 2023). The field assessment aimed to determine the ecological status of the Tournée 2 Solar PV Park and to “ground-truth” the results of the desktop databases.

DESKTOP ASSESSMENT RESULTS

The Tournée 2 Solar PV Park occurs within the remaining extent of the Soweto Highveld Grassland vegetation type based on spatial data from the National Biodiversity Assessment (NBA; 2018); this vegetation type is considered to be of vulnerable (VU) in terms of threat status and is currently Not Protected (NP). This vegetation type was used as the reference state against which the ground-truthed vegetation communities were compared (descriptions as per Mucina and Rutherford (2006) are provided in Section 3 of this report).

From a provincial biodiversity management perspective, the Mpumalanga Biodiversity Sector Plan (MBSP) 2022 dataset, the Tournée 2 Solar PV Park area is associated with Other Natural Areas (majority of the Tournée 2 Solar PV Park area), Heavily Modified areas (large portions of the Tournée 2 Solar PV Park area), Moderately Modified areas (smaller section adjacent to Heavily modified areas) and a very small section of the proposed Tournée 2 Solar PV Park is identified as Optimal Critical Biodiversity Area (CBA).

HABITAT AND SPECIES SUMMARIES

Based on the results of the field investigations conducted between the 6th and 9th of February 2023, three habitat units were identified within the Tournée 2 Solar PV Park, namely:

- **Grassland Habitat (114,22 ha):** The Grassland Habitat is located in the middle of the Tournée 2 Solar PV Park area, between Transformed Habitat (i.e., cultivated areas) and Freshwater Ecosystems. The dominant land-use associated with the remaining sections of Grassland Habitat is grazing by livestock such as cattle;
- **Freshwater Ecosystem (13,48 ha):** Two Freshwater features (i.e., Channel Valley Bottom [CVB] Wetlands) are located within the Tournée 2 Solar PV Park, the larger of the two CVB wetlands are located in the north, while the smaller CVB wetland is located within the eastern border of the Tournée 2 Solar PV Park. The Freshwater Ecosystems meets the definition of a watercourse in terms of the description provided within the National Water Act, 1998 (Act No. 36 of 1998) (NWA); the Freshwater features identified within the Tournée 2 Solar PV Park have been delineated by a qualified freshwater ecologist (SAS 22- 1193, 2023); and



- **Transformed Habitat (202,5 ha):** The majority of the Tournée 2 Solar PV Park is comprised of Transformed Habitat. The Transformed Habitat is associated with cultivated areas, with *Zea mays* (i.e., maize) and *Glycine max* (i.e., soybean) plantations. These areas have been significantly transformed and are no longer considered to support indigenous vegetation (as per National Environmental Management Act 1998 (Act No 107 of 1998) (NEMA) definition).

From a floral perspective, the data gathered during the site visit indicate that the Transformed Habitat is of **low** sensitivity, the Grassland Habitat is of **intermediate** sensitivity and the Freshwater Ecosystems are of **moderately high** sensitivity. These sensitivities consider various aspects, such as the presence or potential for floral species of conservation concern (SCC) (both threatened species as well as protected species), habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity (compared to a reference type).

From a faunal ecological and resource management perspective, the Transformed Habitat Unit obtained a **low** sensitivity, the Grassland Habitat is of **intermediate**, and the Freshwater Ecosystems are of **moderately high** sensitivity. These sensitivities are based on historic and current anthropogenic activities that have altered the presence or the potential for faunal SCC, have degraded habitat integrity and increased levels of disturbance, and have diminished the presence of preferred habitat and overall faunal diversity within several sections of the site.

IMPACT STATEMENT

The proposed activities will largely occur within Transformed habitat (approximately 190 ha of the total 505,2 ha); however various components of the Tournée 2 Solar PV Park will occur within the Grassland Habitat (approximately 92 ha of the total 505,2 ha). The proposed activities will impact on these habitat units to varying degrees, as depicted in the below table.

Table A1: Breakdown of the extent of habitat units impacted within the Tournée 2 Solar PV.

Habitat Unit	Proposed infrastructure	Extent of habitat units impacted by proposed activities (ha)
Grassland Habitat	Internal roads	2,6
	Access road	0,04
	Facility substation & Eskom collector station	3,00
	Cement batching	3,01
	BESS	4,01
	Operations and Management (O&M) building	0,15
	Construction camp	0,50
	Paved area	0,25
	Laydown area	1,50
	Developable area	75,77
	Interconnected Over Head Power Line (OHPL)	4,9
Freshwater Ecosystems	Interconnected OHPL	0,76
Transformed Habitat	Laydown area	0,501
	Internal roads	4,95
	Developable area	188,12
	Access roads	0,03
	Interconnected OHPL	56,4

The greatest impacts to floral and faunal communities and ecology (i.e., habitat, diversity, and SCC) are anticipated from the construction phase of the project, where the direct loss of habitat and species will take place through vegetation clearing activities. The Decommissioning phase can allow for reinstatement of some indigenous vegetation but achieving the pre-development landscape is possible but will require significant effort.

Floral Impact Discussion:



Large extents of the Tournée 2 Solar PV Park are located in the Transformed Habitat (i.e., low sensitivity areas); however, the remaining footprint areas are located in the Grassland Habitat (i.e., intermediate sensitivity areas). Taking the current layout into account (where sensitive habitat such as the Freshwater Ecosystems are already excluded from the proposed footprint areas), avoidance of impacts within habitat units of moderately high sensitivity (i.e., Freshwater Ecosystems) was achieved, but was not possible for the intermediate sensitivity Grassland Habitat. As such, mitigation of impacts within the Grassland Habitat should focus on minimisation through 1) adequate planning, 2) ensuring footprints remain within authorised areas, 3) edge effect management such as alien and invasive plant (AIP) control, and 4) sound planning of stormwater management and erosion control.

The most significant negative impacts are associated with the Developable Areas as bi-facial panels are proposed, i.e., this requires the complete modification of ground cover with semi-reflective gravel. The complete loss of vegetation communities and alteration of nutrient cycles are considered to impact on the longevity and productivity of the soils over the long term. Therefore, any further permanent loss of natural communities outside of the proposed footprints is to be avoided, and a possible mitigation to consider is the use of semi-permeable surfaces for the access roads to maintain soil health for potential increased success of rehabilitation activities during the decommissioning and rehabilitation phase. The incorporation of stormwater management plans and AIP control plans are suggested to reduce indirect impact associated with the Tournée 2 Solar PV Park development.

Habitat for two threatened species is considered to be present within the Freshwater Ecosystems namely, *Kniphofia typhoides* (near-threatened (NT)) (flowering season: February-March) and Sensitive species 691 (VU) (flowering season: February-March). Neither of these species are anticipated to be impacted by the proposed project given that the footprint areas were designed in such a way that the Freshwater Ecosystems and their associated 32 m buffer (as stipulated by the Freshwater Ecological Report (SAS 22-1193, 2023)) are excluded from the final layout. However, if any of these species are encountered within the footprint areas (however unlikely) during the pre-construction floral walkdown (which must take place during the species flowering season), the number of individuals within the direct footprint areas must be recorded. In the case of *Kniphofia typhoides* (which has a high Probability of Occurrence within the Freshwater Ecosystems) and Sensitive species 691 (which has a medium Probability of Occurrence within the Freshwater Ecosystems), the current exclusion of the Freshwater Ecosystems (and a 32 m buffer) from the proposed layout of the Tournée 2 Solar PV Park provides a substantial environmental buffer for this species and protection of this species' habitat to sustain viable populations. Should any individuals of *Kniphofia typhoides* or Sensitive species 691 be encountered during the pre-construction walkdown, these species must be relocated to the protected Freshwater Ecosystems. Fire is an important environmental driver for the species *Kniphofia typhoides*, therefore a Fire Management Plan should also be investigated and developed before the commencement of the construction activities.

Furthermore, the Tournée 2 Solar PV Park is associated with habitat that supports provincially protected floral species (as per the Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998) (MNCA)) and habitat for other provincially protected species (see Section 3; Part B). The proposed activities will therefore directly impact on these species' numbers within the footprint areas. Consultation with the MTPA (for provincially protected species) regarding permits or authorisation for the relocation will be dependent on the outcome of the pre-construction floral walkdown. Where provincially protected species are encountered, permits from the regional authorities need to be obtained to remove affected individuals before any construction commences.

Faunal Impact Discussion:

Majority of Tournée 2 Solar PV Park is located in the Transformed Habitat (low sensitivity); however, the remaining proposed footprint areas are located in the Grassland Habitat (intermediate sensitivity). Taking the current layout into consideration, where sensitive habitat such as Freshwater Ecosystems are already excluded from the proposed footprint areas, avoidance of impacts within habitat units of intermediate sensitivity is not possible. As such, mitigation of impacts should focus on minimisation of edge effects through 1) adequate planning, 2) ensuring footprints remain within authorised areas, 3) edge effect management such as AIP control and erosion control, and 4) sound planning of stormwater management.



The most significant negative impacts are associated with the Developable Areas as bi-facial panels are proposed, this requires the complete modification, by means of vegetation clearing, of ground cover with semi-reflective gravel. As a result of the loss of habitat, faunal species abundances and diversity will also be impacted upon, as the footprint area will no longer be able to support faunal species. As a result of the habitat loss and the construction of the proposed Tournée 2 Solar PV Park and boundary fences, habitat connectivity and the movement of fauna through the Tournée 2 Solar PV Park will also be impacted upon. The loss of habitat and connectivity may have a negative impact on faunal species in the region and consequently a potential decrease in species carrying capacity. Decreased habitat connectivity may further impact on breeding populations, limiting gene flow (breeding) opportunities for faunal species inhabiting the natural areas around the solar farm footprint.

A single SCC was confirmed for the proposed Tournée 2 Solar PV Park, namely *Aonyx capensis* (Cape Clawless Otter). Several other faunal SCC POC's ranging from low to medium for the proposed Tournée 2 Solar PV Park will utilise the Freshwater Ecosystem habitat as preferred habitat and throughfare to the larger area. The proposed layout of Tournée 2 Solar PV Park is kept outside of the Freshwater Ecosystem habitat and proposed mitigations will keep the Freshwater Ecosystem habitat connected as a throughfare to the larger area. With the majority of these SCC likely to be associated with the solar farm footprint area. Vegetation clearance activities and earth works will place many SCC at risk, not only from a loss of habitat but also potential mortalities. This is of increased importance when considering invertebrate SCC, as many of these species are slow moving and live in burrows and under rocks. As such, these species are unlikely to be able to escape ahead of ground clearing activities. As such, it is essential that these species be actively searched for ahead of earth works. Where this is not feasible, as species are observed when vegetation clearance takes place, they are to be appropriately rescued and relocated. Provided that mitigation measures are implemented, the overall impact to faunal SCC as a result of the construction and operation activities is unlikely to significantly impact SCC populations in the region.

Reasoned Opinion:

It is the opinion of the ecologists that several aspects of the proposed Tournée 2 Solar PV Park development (especially the developable areas) will result in moderate-high impacts to the receiving environment. However, with adequate implementation of the suggested mitigation measures and avoiding development within the recommended SCC buffers, the impacts associated with the Tournée 2 Solar PV Park development can be reduced to acceptable levels, taking into consideration the aim of the Decommissioning phase and subsequent rehabilitation of the Tournée 2 Solar PV Park development. This study is deemed to provide the relevant information required to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the Tournée 2 Solar PV Park will be made in support of the principle of sustainable development.





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AUTHORISATION PROCESS FOR THE
PROPOSED 150-MEGAWATT (MW) TOURNEE 2
SOLAR PARKS NEAR THUTHUKANI,
MPUMALANGA PROVINCE.

Part A: Background Information

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S. Leigh Daniels
Report Reference: STS 22 - 2094
Date: July 2023



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DOCUMENT GUIDE

The table below provides a guide to the reporting of biodiversity impacts as they relate to 1) Government Notice No. 320 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Biodiversity** as published in Government Gazette 43110 dated 20 March 2020, and 2) Government Notice No. 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Plant and Animal Species** as published in Government Gazette 43855 dated 30 October 2020.

Theme-Specific Requirements as per Government Notice No. 320 Terrestrial Plant Species Theme – Very High Sensitivity Rating as per Screening Tool Output		
No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
2	Terrestrial Biodiversity Specialist Assessment	
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	Part A – C: Cover Page Part A: Appendix E
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	Part A: Section 1
2.3	The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these;	Part B: Section 3 (flora) Part C: Section 3 (fauna)
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	Part B: Section 3 (flora) Part C: Section 3 (fauna)
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	Part A: Section 3 (desktop analysis) Part B: Section 3 (flora) Part C: Section 3 (fauna)
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of Strategic Water Source Areas (SWSAs) or Freshwater Ecosystem Priority Area (FEPA) sub catchments;	Part A: Section 3 (desktop analysis) Part B: Section 3 (flora) Part C: Section 3 (fauna)
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: <ol style="list-style-type: none"> 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; 	Part A: Section 3 (desktop analysis) Part B: Section 3 (flora) Part C: Section 3 (fauna)
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	Areas of low sensitivity was prioritised.
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: <ol style="list-style-type: none"> a) <i>the reasons why an area has been identified as a CBA;</i> b) <i>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;</i> c) <i>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);</i> d) <i>the impact on ecosystem threat status;</i> e) <i>the impact on explicit subtypes in the vegetation;</i> f) <i>the impact on overall species and ecosystem diversity of the site; and</i> 	Part A: Section 3 (desktop analysis) Part B: Section 3 and 5 Part C: Section 3



	g) <i>the impact on any changes to threat status of populations of species of conservation concern in the CBA;</i>	
2.3.7.2	Terrestrial Ecological Support Areas (ESAs), including: a) <i>the impact on the ecological processes that operate within or across the site;</i> b) <i>the extent the proposed development will impact on the functionality of the ESA; and</i> c) <i>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;</i>	
2.3.7.3	Protected areas as defined by the National Environmental Management Protected Areas Act, 2004 including- a) <i>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;</i>	Part A: Section 3 (desktop analysis)
2.3.7.4	Priority areas for protected area expansion, including- a) <i>the way in which the proposed development will compromise or contribute to the expansion of the protected area network;</i>	Part A: Section 3 (desktop analysis)
2.3.7.5	SWSAs including: a) <i>the impact(s) on the terrestrial habitat of a SWSA; and</i> b) <i>the impacts of the proposed development on the SWSA water quality and quantity (e.g., describing potential increased runoff leading to increased sediment load in water courses);</i>	Part A: Section 3 (desktop analysis) This section is covered in the Freshwater Ecological Assessment (SAS 22- 1193, 2023)
2.3.7.6	FEPA sub catchments, including- a) <i>the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;</i>	This section is covered in the Freshwater Ecological Assessment (SAS 22- 1193, 2023)
2.3.7.7	Indigenous forests, including: a) <i>impact on the ecological integrity of the forest; and</i> b) <i>percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.</i>	No Forests were identified within the Tournée 2 Solar PV Park
2.4	The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.	
	Part B: Results of the Floral Assessment as well as conclusions on Terrestrial Biodiversity as it relates to vegetation communities. Part C: Results of the Faunal Assessment as well as conclusions on Terrestrial Biodiversity as it relates to faunal communities.	
3	Terrestrial Biodiversity Specialist Assessment Report	
3.1	The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:	
3.1.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Part A: Appendix E
3.1.2	A signed statement of independence by the specialist;	Part A: Appendix E
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;	Part B: Section 1 (flora) Part C: Section 1 (fauna)
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;	Part A: Appendix C Part B: Section 2 (flora) Part B: Appendix A (flora) Part C: Section 2 (fauna) Part C: Appendix A (fauna)
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;	Part B: Section 1 (flora) Part C: Section 1 (fauna)
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Part B: Section 4 (flora) Part C: Section 4 (fauna)
	Impact Assessment Requirements	Part B: Section 6 (flora)



	<p>3.1.7 Additional environmental impacts expected from the proposed development;</p> <p>3.1.8 Any direct, indirect and cumulative impacts of the proposed development;</p> <p>3.1.9 The degree to which impacts and risks can be mitigated;</p> <p>3.1.10 The degree to which the impacts and risks can be reversed;</p> <p>3.1.11 The degree to which the impacts and risks can cause loss of irreplaceable resources;</p> <p>3.1.12 Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);</p>	Part C: Section 6 (fauna)
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;	Not applicable. Low sensitivity areas were verified as such and the proposed layout optimised within these areas.
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	Part A: Executive summary Part B: Section 7 (flora) Part C: Section 7 (fauna)
3.1.15	Any conditions to which this statement is subjected.	Part B: Section 6 (flora) Part C: Section 6 (fauna)
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.	This report is submitted to the EAP and applicant and will be appended to the EIA / EMP by the EAP in due course as part of the application process
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	



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GLOSSARY OF TERMS

Most definitions are based on terms and concepts elaborated by Richardson et al. (2011), Hui and Richardson (2017), Wilson et al. (2017), Skowno et al. (2019), and SANBI (2016), with consideration to their applicability in the South African context, especially South African legislation [notably the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004; **NEMBA**), and the associated Alien and Invasive Species Regulations, 2020].

Alien species (syn. exotic species ; non-native species)	A species that is present in a region outside its natural range due to human actions (intentional or accidental) that have enabled it to overcome biogeographic barriers.
Biological diversity or Biodiversity (as per the definition in NEMBA)	The variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and includes diversity within species, between species, and of ecosystems.
Biome - as per Mucina and Rutherford (2006); after Low and Rebelo (1998).	A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate, and major large-scale disturbance factors (such as fires).
Bioregion (as per the definition in NEMBA)	A geographic region which has in terms of section 40(1) been determined as a bioregion for the purposes of this Act.
Critical Biodiversity Area (CBA)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation, and ridges.
Corridor	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
Disturbance	A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions.
Ecoregion	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
Endangered	Organisms in danger of extinction if causal factors continue to operate.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g., southern Africa), national (South Africa), provincial, regional, or even within a particular mountain range.
Ecological Support Area (ESA)	An ESA provides connectivity and important ecological processes between CBAs and are therefore important in terms of habitat conservation.
Ground-Truth	To check the accuracy of (remotely sensed data) by means of in-situ observations.
Habitat (as per the definition in NEMBA)	A place where a species or ecological community naturally occurs.
Important Bird and Biodiversity Area (IBA)	The IBA Programme identifies and works to conserve a network of sites critical for the long-term survival of bird species that: are globally threatened, have a restricted range, are restricted to specific biomes/vegetation types or sites that have significant populations.
Indigenous vegetation (as per the definition in NEMA)	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Invasive species	Alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.
Listed alien species	All alien species that are regulated in South Africa under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004), Alien and Invasive Species Regulations, 2020.
Least Threatened	Least threatened ecosystems are still largely intact.



Native species (syn. indigenous species)	Species that are found within their natural range where they have evolved without human intervention (intentional or accidental). Also includes species that have expanded their range as a result of human modification of the environment that does not directly impact dispersal (e.g., species are still native if they increase their range as a result of watered gardens but are alien if they increase their range as a result of spread along human-created corridors linking previously separate biogeographic regions).
RDL (Red Data listed) species	According to the Red List of South African plants (http://redlist.sanbi.org/) and the International Union for Conservation of Nature (IUCN), organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
Species of Conservation Concern (SCC)	The term SCC in the context of this report refers to all RDL (Red Data) and IUCN (International Union for the Conservation of Nature) listed threatened species as well as protected species of relevance to the project.



LIST OF ACRONYMS

AC	Alternating Current
AIP	Alien and Invasive Plant
BESS	Battery Energy Storage System
BGIS	Biodiversity Geographic Information Systems
CARA	Conservation of Agricultural Resource Act
CBA	Critical Biodiversity Area
CR	Critically Endangered
CVB	Channel Valley Bottom
DC	Direct Current
DFFE	Department of Forestry, Fisheries and the Environment
EGI	Electricity Grid Infrastructure
E-GIS	Environmental Geographical Information Systems
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EN	Endangered
ESA	Ecological Support Area
EW	Extinct in the Wild
GIS	Geographic Information System
GN	Government Notice
Ha	Hectares
IBA	Important Bird Area
IEM	Integrated Environmental Management
IPP	Independent Power Producer
IUCN	International Union for the Conservation of Nature
km	Kilometres
kV	Kilovolt
m	Metres
M²	Square meters
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential for Evaporation
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MBCP	Mpumalanga Biodiversity Conservation Plan
MBSP	Mpumalanga Biodiversity Sector Plan
MFD	Mean Frost Days
MNCA	Mpumalanga Nature Conservation Ordinance
MTPA	Mpumalanga Tourism and Parks Agency
MW	Mega watt
MWh	Mega Watt Hours
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEMPAA	National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
NFA	National Forest Act, 1998 (Act No. 84 of 1998)
NP	Not Protected
NPAES	National Protected Areas Expansion Strategy
NT	Near-threatened
NWA	National Water Act, 1998 [Act No. 36 of 1998]



O&M	Operations and Maintenance
OHPL	Over-head power line
PV	Photovoltaic
PVSEF	Photovoltaic Solar Energy Facilities
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
RDL	Red Data List
REDZ	Renewable Energy Development Zone
RLE	Red List of Ecosystems
SABAP 2	Southern African Bird Atlas 2
SACAD	South Africa Conservation Areas Database
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SAPAD	South Africa Protected Area Database
SCC	Species of Conservation Concern
SEA	Strategic Environmental Assessment
STS	Scientific Terrestrial Services (Pty) Ltd
SWSA	Strategic Water Source Area
TOPS	Threatened Or Protected Species
VEGMAP	National Vegetation Map Project
VU	Vulnerable
WSAs	Water Source Areas



1 INTRODUCTION

Scientific Terrestrial Services (Pty) Ltd. (STS) was appointed to conduct a terrestrial biodiversity assessment as part of the Environmental Authorisation (EA) application process for the proposed Tournée 2 Solar Photovoltaic (PV) Park near Thuthukani, Mpumalanga Province (Figure 1 and 2).

1.1 Background Information and Project Description

Tournée 2 Solar PV Park is on the remaining portion of Portion 3 of the farm DWARS-IN-DE-WEG 350 (344.1 hectares (ha) in extent), and Portion 6 of the farm DWARS-IN-DE-WEG 350 (161.1 ha in extent). The Tournée 2 Solar PV Park is surrounded by various major roadways including the R38, which is located approximately 5 kilometres (km) south of the proposed Tournée 2 Solar PV Park and the R38 located 1.5 km West of the proposed Tournée 2 Solar PV Park. The closest town, Thuthukani, occurring within the Lekwa Local Municipality and Gert Sibande District Municipality, approximately 10.5 km west of the proposed Tournée 2 Solar PV Park area. The proposed Tournée 2 Solar PV Park is located adjacent to the Tutuka Power Station Ashing facility (Figures 1 and 2). The development footprint, and all the accompanying infrastructure associated with the proposed PV park, will henceforth be referred to as the "**Tournée 2 Solar PV Park**".

Tournée 2 Solar PV Park will consist of 150 megawatt (MW) PV solar energy facilities (PVSEF) within a total area of approximately 573, 78 ha, of which 297 ha were considered as developable areas (i.e., for the placement of the bi-facial panels will be placed). The final developable areas will be determined in the Environmental Impact Assessment (EIA) phase once the layout has been finalised. The total footprint of the Independent Power Producer (IPP) site substation and battery energy storage system (BESS) will be up to 7 ha in extent (4 ha for the BESS and 3 ha for the IPP portion of the substation). The substation will consist of a high voltage substation yard to allow for multiple (up to) 132 kilovolt (kV) feeder bays and transformers, control building, telecommunication infrastructure, access roads, etc. The associated BESS storage capacity will be up to 150 MW/600 megawatt-hour (MWh) with up to four hours of storage.

It is proposed that Lithium Battery Technologies, such as Lithium Iron Phosphate or Lithium Nickel Manganese Cobalt oxides will be considered as the preferred battery technology. The main components of the BESS include the batteries, power conversion system and transformer which will all be stored in various rows of containers.



The Operations and Maintenance (O&M) building footprint is expected to be 1 500 square-meters (m²) (including stores and workshop). Internal roads of the Tournée 2 Solar PV Park will be up to 4 meters (m) to 5 m in width and approximately 20 km in length. During the construction phase, the construction camp and laydown area will include a typical construction camp area of 5000 m², a typical laydown area of 20 000 m² and septic tanks and portable toilets. The proponent provided preliminary development and exclusion areas for the Tournée 2 Solar PV Park (Figure 3); however, the layout will be finalised based on the results of all specialists and presented in the EIA report. The proposed layout can be seen in Figure 3 below.

The purpose of the facility is to generate clean electricity from a renewable energy source (i.e., solar radiation) to contribute to the National Energy Grid. Table 1 below indicates a summary of the project details. Table 1 below indicates a summary of the project details.

Table 1: Project details for the proposed Tournée 2 Solar PV Park.

Farm Portions Combined Extent	573.78 ha
Buildable Area (subject to finalisation)	~297 ha
Contracted Capacity of PVSEF	Contracted Capacity of PVSEF is 150MW, BESS capacity will be up to 150 MW/600MWh. Area required = 40 000 m ²
Associated Infrastructure	Internal Roads up to 4 m wide and up to 20 km long. Access Roads up to 8 m wide.
	Back-to-back substation (including facility substation, and Eskom collector/switching station) will consist of a high voltage substation yard to allow for multiple (up to) 132 kV feeder bays and transformers, control buildings, telecommunications infrastructure, access roads, etc. - 30,000 m ²
	IPP site substation and BESS: Total footprint will be up to 7 ha in extent (4 ha for the BESS and 3 ha for the IPP portion of the substation).
	An up to 132 kV Overhead Powerline (“OHPL”). The final interconnection solution will be dependent on the requirements of Eskom, which are still to be defined.
	Cables - Communication, Alternating Current (AC) and Direct current (DC) cables installed underground and overhead. AC cabling up to 33 kV between project components
	Paved areas (m ²) - 2 500.
	O&M building (m ²) - 1 500.
	Construction phase: Construction camp area (m ²) –5,000 (100 m x 50 m) Laydown area (m ²) - 20,000 (100 m x 200 m) Temporary concrete batching plant - Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo - 30 000 m ² Septic tanks, and portable toilets.
	PV Modules (~297 ha).
Technical Specifications	Tier 1 bi-facial installed on single axis tracker mounting structures. Height: up to 6 m above ground level. Includes inverters and transformers.
	Lithium-Ion Batteries used for BESS
	Fencing around development area.



The purpose of this report (Part A) is to update, where necessary, information pertaining to the biodiversity of the proposed Tournée 2 Solar PV Park from a desktop conservation database perspective. It is the objective of this desktop assessment to provide detailed information to guide the fieldwork components (discussed in Parts B and C) to ensure that all relevant ecological aspects are considered prior to performing the field assessments. This report is not a standalone report and should be considered together with the outcome of the biodiversity assessments (floral assessment in Part B and the faunal assessment in Part C).

1.2 Scope of Work

Specific outcomes in terms of Part A of the report are as follows:

- To update the desktop assessment using all relevant information as presented by the South African National Biodiversity Institute's (SANBI) Biodiversity Geographic Information Systems (BGIS) website (<http://bgis.sanbi.org>) and the Department of Forestry, Fisheries and the Environment (DFFE) Environmental Geographical Information Systems (E-GIS) website (<https://egis.environment.gov.za/>). The desktop assessment aims to gain background information on the physical habitat and potential floral and faunal ecology associated with the Tournée 2 Solar PV Park;
- To state the indemnity and terms of use of this report (Appendix A) as well as to provide the details of the specialists who prepared the reports (Appendix E);
- To outline the legislative requirements that were considered for the assessment (Appendix B of this report); and
- To provide the methodologies followed relating to the impact assessment and development of the mitigation measures (Appendix C) that were applied in the floral and faunal assessments (Part B and Part C).



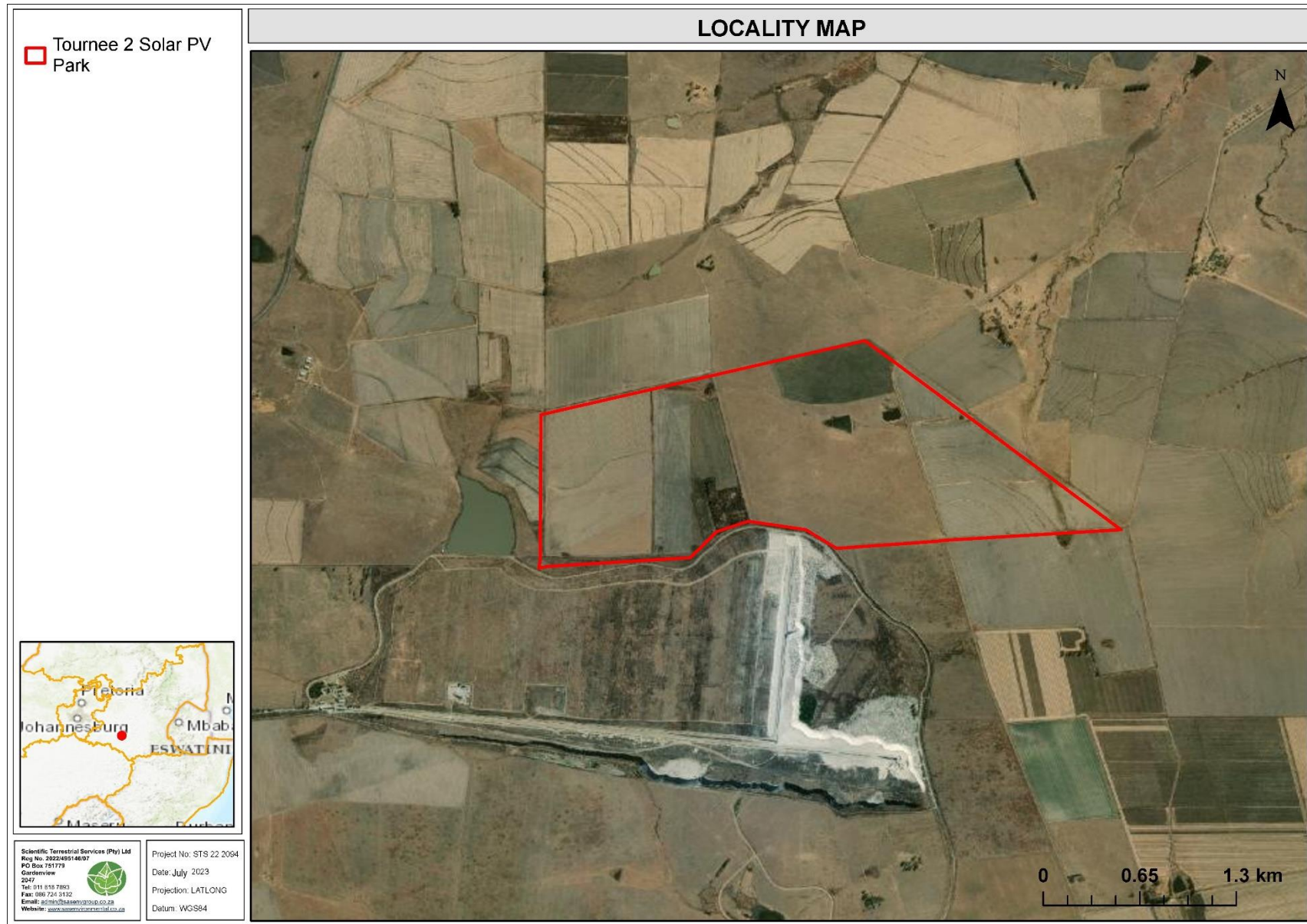


Figure 1. Digital satellite image depicting the Tournée 2 Solar PV Park within greater project area in relation to surrounding area.



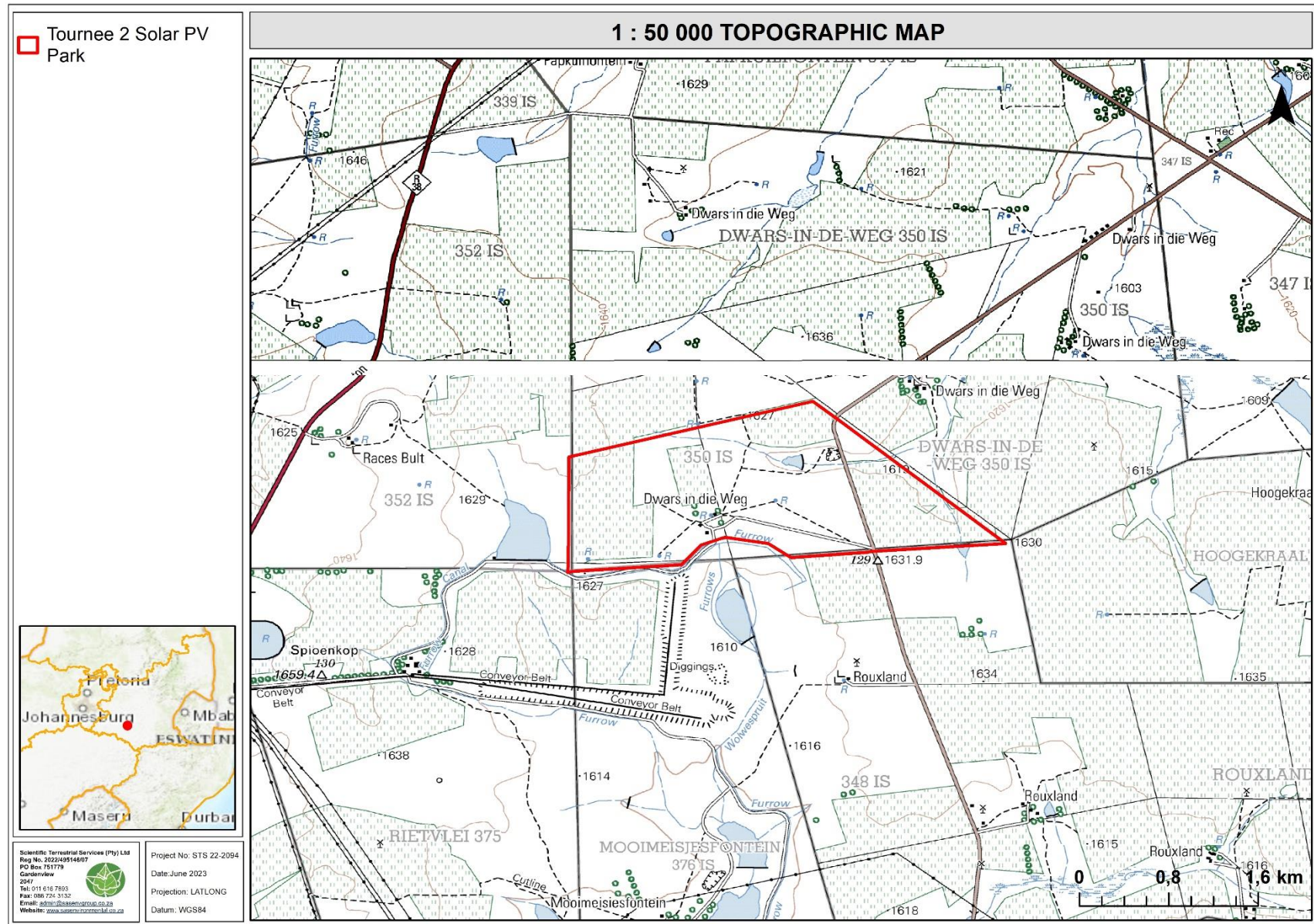


Figure 2. The Tournée 2 Solar PV Park depicted on a 1:50 000 topographical map in relation to the surrounding area.



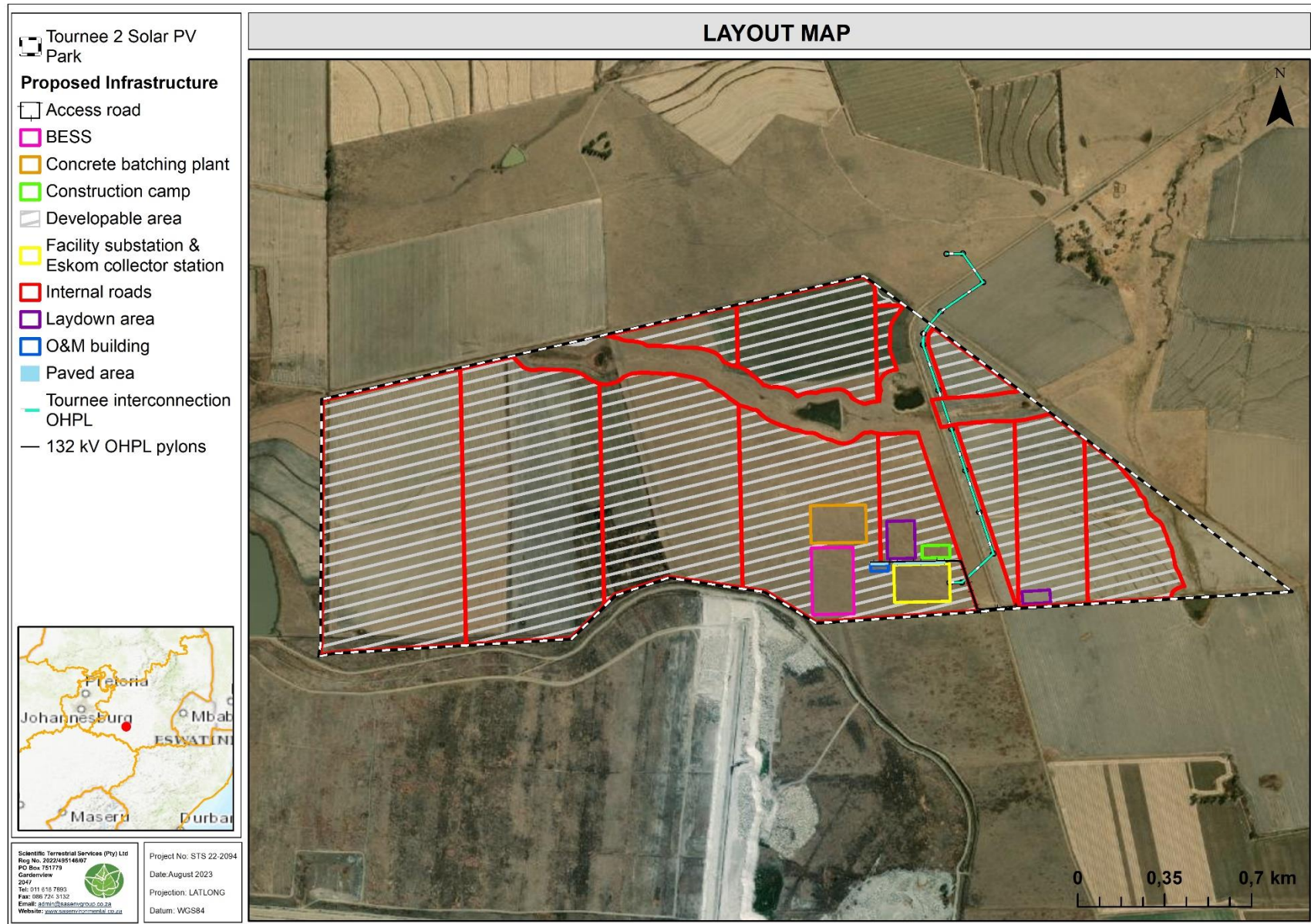


Figure 3: The proposed layout option for the Tournée 2 Solar PV Park.



1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The biodiversity desktop assessment is confined to the Tournée 2 Solar PV Park and does not include detailed results of the adjacent properties, although ecological important or sensitive areas according to the desktop databases of surrounding areas and the greater project area have been included on the relevant maps;
- The DFFE Screening Tool (hereafter “Screening Tool”) provides names of Sensitive Species likely to be present within Tournée 2 Solar PV Park and its surrounds. Within the Screening Tool outcome, the names of some species are not provided. These species are rather assigned a number keeping them unidentifiable (e.g., Sensitive Species 1). This procedure is followed because of the vulnerability of the species to threats such as illegal harvesting and overexploitation. According to the best practice guidelines provided by the SANBI, the identity of Sensitive Species may not appear in the final EIA report nor any of the specialist reports released into the public domain. However, the conservation threat status of such species has been provided; and
- It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the assessed area’s actual site characteristics at the scale required to inform more intricate planning, e.g., at the scale needed for an EA. Nevertheless, this information is useful as background information to the study and is important in legislative contextualisation of risk and impact and was used as a guideline to inform the biodiversity assessment (refer also to Parts B and C), and to focus on areas and aspects of increased conservation importance. It must, however, be noted that site assessment of key areas may potentially contradict the information contained in the relevant databases, in which case the site verified, ground-truthed information must carry more weight in the decision-making process.

1.4 Legislative Requirements

The following legislative requirements were considered during the assessment:

- The Constitution of the Republic of South Africa, 1996¹;
- The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA);
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);

¹ Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the ‘Constitution of the Republic of South Africa, 1996’. It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the acts amending it are allocated act numbers.



- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
 - Government Notice (GN) number 2747: The Revised National List of Ecosystems that are Threatened and in need of Protection, published in Gazette No. 47526, dated 18 November 2022, as it relates to the NEMBA;
 - GN number R.1020: Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25 September 2020 as it relates to the NEMBA;
 - Government Notice number 1003: Alien and Invasive Species Lists, 2020, in Government Gazette 43726 dated 18 September 2020; and
 - GN number 30568: Threatened or Protected Species (TOPS) list dated 14 December 2007, as it relates to the NEMBA.
- The National Forest Act, 1998 (Act No. 84 of 1998, amended) (NFA);
 - GN 1935: List of Protected Tree Species as published in the Government Gazette 46094 dated 25 March 2022, as it relates to the NFA;
- The National Environmental Management: Protected Areas Act, 2003 (Act. No. 57 of 2003) (NEMPAA); and
- Government Gazette 45421 dated 10 May 2019 as it relates to the DFFE national environmental screening report required with an application for environmental authorisation as identified in regulation 16(1)(v) of EIA Regulations:
 - For the Terrestrial Biodiversity Theme: GN 320 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity as published in Government Gazette 43110 dated 20 March 2020; and
 - For Animal and Plant Species Themes: GN 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant and Animal Species as published in Government Gazette 43855 dated 30 October 2020;
- The Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998) (MNCA).

The details of each of the above, as they pertain to this study, are provided in Appendix B of this report.



2 ASSESSMENT APPROACH

Maps and digital satellite images were generated prior to the field assessment to determine broad habitats, vegetation types and potentially sensitive sites. The biodiversity desktop assessment is confined to the Tournée 2 Solar PV Park and does not include the neighbouring and adjacent properties, although the sensitivity of surrounding areas is included on the respective maps. Relevant databases and documentation that were considered during the assessment of the Tournée 2 Solar PV Park include²:

- National Protected Areas Expansion Strategy (NPAES) – 2018 database;
- The South African Conservation Areas Database, Quarter 4 (SACAD, 2022);
- The South African Protected Areas Database, Quarter 4 (SAPAD, 2022);
- The Mpumalanga Biodiversity Sector Plan (MBSP) – 2022 terrestrial data set;
- The National Vegetation Map Project (VEGMAP), with the below vector dataset used for information on Biomes, Bioregions and Vegetation Type(s):
 - 2018 Final Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI, 2018a).
- The 2022 Red List of Ecosystems (RLE) for the terrestrial realm for South Africa (SANBI 2022a and 2022b);
- From the National Biodiversity Assessment (NBA, 2018) Terrestrial Assessment project (Skowno et al., 2019):
 - 2018 Terrestrial ecosystem threat status and protection level - remaining extent (SANBI, 2018b); and
 - 2018 Terrestrial ecosystem threat status and protection level layer (SANBI, 2018c).
- The Important Bird and Biodiversity Areas (IBA) Programme and vector dataset (BirdLife South Africa, 2015; Marnewick et al., 2015a and 2015b), in conjunction with the South African Bird Atlas Project 2 (SABAP 2);
- From the 2017 Strategic Water Source Areas (SWSA) project:
 - 2017 SWSA **Surface water** (Water Research Commission, 2017).
- The International Union for Conservation of Nature (IUCN); and
- The National Web-Based Environmental Screening Tool (accessed 2023).

² Datasets obtained from:

- SANBI BGIS (2023). The South African National Biodiversity Institute - Biodiversity GIS (BGIS) [online]. URL: <http://bgis.sanbi.org> as retrieved in 2023; and
- Department of Environmental Affairs (DEA) Environmental Geographical Information Systems (E-GIS) website. URL: <https://egis.environment.gov.za/>



The field assessment was undertaken during summer (6th to 9th February 2023). The field assessment aimed to determine if any changes have taken place pertaining to the ecological status of the Tournée 2 Solar PV Park and to “ground-truth” the results of the desktop databases.

3 RESULTS OF THE DESKTOP ANALYSIS

The below section provides the outcome of the desktop research for the Tournée 2 Solar PV Park.

3.1 Conservation Characteristics of the Tournée 2 Solar PV Park based on National and Provincial Datasets

The following section contains data accessed as part of the desktop assessment and are presented as a “dashboard” report below (Table 2). The dashboard report aims to present concise summaries of the data on as few pages as possible to allow for improved assimilation of results by the reader to take place. Where required, further discussion and interpretation are provided.



Table 2: Summary of the biodiversity characteristics associated with the Tournée 2 Solar PV Park [Quarter Degree Squares (QDS) 2629CD].

DETAILS OF THE TOURNÉE 2 SOLAR PV PARK IN TERMS OF THE 2018 FINAL VEGMAP OF SOUTH AFRICA, LESOTHO, AND SWAZILAND (SANBI, 2006-2018) ORIGINAL EXTENT OF VEGETATION TYPES		DESCRIPTION OF THE SOWETO HIGHVELD GRASSLAND ASSOCIATED WITH THE TOURNÉE 2 SOLAR PV PARK (MUCINA & RUTHERFORD, 2006)													
Biome	The Tournée 2 Solar PV Park is situated within the Grassland Biome .	Distribution	Mpumalanga, Gauteng (and to a very small extent also in neighbouring Free State and North-West) Provinces: In a broad band roughly delimited by the N17 road between Ermelo and Johannesburg in the north, Perdekop in the southeast and the Vaal River (border with the Free State) in the south. It extends further westwards along the southern edge of the Johannesburg Dome (including part of Soweto) as far as the vicinity of Randfontein. In southern Gauteng it includes the surrounds of Vanderbijlpark and Vereeniging as well as Sasolburg in the northern Free State.												
Bioregion	The Tournée 2 Solar PV Park is situated within the Mesic Highveld Grassland Bioregion .														
Vegetation Type	The Tournée 2 Solar PV Park occurs within the Soweto Highveld Grassland (Gm8) vegetation type.														
CONSERVATION DETAILS PERTAINING TO THE TOURNÉE 2 SOLAR PV PARK (VARIOUS DATABASES)		Climate	Summer-rainfall region. Cool-temperate climate with thermic continentality (high extremes between maximum summer and minimum winter temperatures, frequent occurrence of frost, large thermic diurnal differences, especially in autumn and spring).												
National Biodiversity Assessment (2018) Figure 4	The Tournée 2 Solar PV Park is largely transformed, and vast sections thereof are identified as being within the remaining extent of the Soweto Highveld Grassland . This vegetation type is considered vulnerable (VU) and Not Protected. Ecosystem types are categorised ³ as “not protected”, “poorly protected”, “moderately protected” and “well protected” based on the proportion of each ecosystem type that occurs within a protected area recognised in the NEMPAA and compared with the biodiversity target for that ecosystem.		<table border="1"> <thead> <tr> <th>MAP (mm)</th> <th>MAT (°C)</th> <th>MFD (days)</th> <th>MAPE (mm)</th> <th>MASMS (%)</th> </tr> </thead> <tbody> <tr> <td>662</td> <td>14.8</td> <td>41</td> <td>2060</td> <td>75</td> </tr> </tbody> </table>	MAP (mm)	MAT (°C)	MFD (days)	MAPE (mm)	MASMS (%)	662	14.8	41	2060	75		
		MAP (mm)	MAT (°C)	MFD (days)	MAPE (mm)	MASMS (%)									
		662	14.8	41	2060	75									
Altitude (m)	1 420–1 760														
		Conservation	Endangered (EN) . Target 24%. Only a handful of patches statutorily conserved (Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, Rolfe’s Pan Nature Reserves) or privately conserved (Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves, Heidelberg Natural Heritage Site). Almost half of the area already transformed by cultivation, urban sprawl, mining and building of road infrastructure. Some areas have been flooded by dams (Grootdraai, Leeuwkuil, Trichardtsfontein, Vaal, Willem Brummer). Erosion is generally very low (93%).												

³ The ecosystem protection level status is assigned using the following criteria:

- i. If an ecosystem type has more than 100% of its biodiversity target protected in a formal protected area either A or B, it is classified as Well Protected;
- ii. When less than 100% of the biodiversity target is met in formal A or B protected areas it is classified as Moderately Protected;
- iii. If less than 50% of the biodiversity target is met, it is classified as Poorly Protected; and
- iv. If less than 5% it is Hardly Protected.



<p>National Red Listed Ecosystems (2022) Figure 5</p>	<p>Based on the National RLE Database (SANBI; 2022a and 2022b), vast sections of the Tournée 2 Solar PV Park are identified as being within the remaining extent of the VU Soweto Highveld Grassland. The trigger for the threatened ecosystem was A3, B1 (i) which indicates that this ecosystem is in a historic decline (national data) and that this ecosystem has a restricted distribution.</p>	<p>Vegetation & landscape features (Dominant Floral Taxa in Appendix D)</p>	<p>Gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by <i>Themeda triandra</i> and accompanied by a variety of other grasses such as <i>Elionurus muticus</i>, <i>Eragrostis racemosa</i>, <i>Heteropogon contortus</i> and <i>Tristachya leucothrix</i>. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.</p>
	<p>The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value. The revised list (known as the RLE 2022) is based on assessments that followed the IUCN RLE Framework (version 1.1) and covers all 456 terrestrial ecosystem types described in South Africa (Mucina and Rutherford 2006; with updates described in Dayaram et al., 2019). The revised list identifies 120 threatened terrestrial ecosystem types (55 Critically Endangered [CR], 51 EN and 14 VU types).</p> <p>Following a series of consultations with conservation authorities and the public in 2020/21, the revised list of terrestrial ecosystems that are threatened and in need of protection was approved by the Minister for implementation in August 2022. The revised list was published in the Government Gazette (Gazette Number 47526, Notice Number 2747) and came into effect on 18 November 2022.</p>		<p>Geology & Soils</p>
<p>STRATEGIC WATER SOURCE AREAS FOR SURFACE WATER (2017)</p>		<p>MPUMALANGA BIOBASE (2002)</p>	
<p>Surface water SWSAs are defined as areas of land that supply a disproportionate (i.e., relatively large) quantity of mean annual surface water runoff in relation to their size. They include transboundary areas that extend into Lesotho and Swaziland. The sub-national Water Source Areas (WSAs) are not nationally strategic as defined in the report but were included to provide a complete coverage.</p>		<p>The demarcation of floristic regions is based on groups of taxa with more or less similar geographical distributions. Floristic regions can be classified hierarchically to reflect similarities and differences between regions. A phytochorion is a floristic (phytogeographical) region of any rank. At a particular scale, a phytochorion may also be called a 'centre of endemism' when distinguished by a high concentration of endemic plant taxa (van Wyk & Smith 2001). Phytochoria usually incorporates different vegetation types, so it may include forest, grassland, and bushveld, but these will have common recurring floristic elements.</p>	
<p>Name & Criteria</p>	<p>The Tournée 2 Solar PV Park is not within 10 km of a SWSA.</p>	<p>Phyto Regions and centres of Endemism</p>	<p>The Tournée 2 Solar PV Park is not located within any Phyto regions and / or centres of endemism.</p>



MPUMALANGA BIODIVERSITY SECTOR PLAN (2022) TERRESTRIAL DATABASE – FIGURE 7	
Other Natural Areas	<p>A large extent of the Tournée 2 Solar PV Park is represented by Other Natural Areas (approximately 179.4 ha). These areas are generally located within sections of Tournée 2 Solar PV Park that are not cultivated. These are Natural areas which are not identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs), but which provide a range of ecosystem services from their ecological infrastructure.</p> <p><u>Primary Objective:</u> Minimise habitat and species loss through strategic landscape planning and ensure basic ecosystem functionality.</p>
Heavily modified	<p>Much of the Tournée 2 Solar PV Park occurs within Heavily Modified areas (approximately 162.6 ha). These are areas currently modified to such an extent that any valuable biodiversity and ecological functions have been lost to, in this case, the cultivated areas.</p> <p><u>Primary Objective:</u> Manage the land-use in a biodiversity-friendly manner aiming to maximise ecological functionality.</p>
Moderately modified - Old lands	<p>The presence of Moderately Modified areas (old lands) is generally adjacent to the Heavily Modified areas (approximately 8.4 ha) and, these areas are old, cultivated lands that have been allowed to recover (within the last 80 years), and support some natural vegetation. Although biodiversity patterns and ecological functioning may have been compromised, the areas may still play a role in supporting biodiversity and providing ecosystem services.</p> <p><u>Primary Objective:</u> Moderately modified areas (old lands) should be stabilised and restored where possible, especially for soil carbon and water-related functionality. In old lands, stabilise ecosystems and manage them to restore ecological functionality, particularly soil carbon and water related functionality, using indigenous plant cover. Old lands should be burnt and grazed appropriately.</p>
Critical Biodiversity Area: Optimal	<p>A very small portion of the proposed Tournée 2 Solar PV Park is identified as Optimal CBA (approximately 0.33 ha), located in the western corner of the proposed Tournée 2 Solar PV Park. These are areas required to meet targets and with irreplaceability values of more than 80%; Critical linkages or pinch-points in the landscape that must remain natural; and often include CR ecosystems, or hosts species of conservation concern.</p> <p>The CBA Optimal Areas (previously called ‘important and necessary’ in the Mpumalanga Biodiversity Conservation Plan (MBCP) are the areas optimally located to meet both the various biodiversity targets and other criteria defined in the analysis. Although these areas are not ‘irreplaceable’ they are the most efficient land configuration to meet all biodiversity targets and design criteria.</p> <p><u>Primary Objective:</u> Maintain in a natural state with no loss of ecosystems, functionality or species; some flexibility in land-use options.</p>
NATIONAL PROTECTED AND CONSERVATION AREAS – VARIOUS DATABASES	
SAPAD (2022, Q4); SACAD (2022, Q4); NPAES (2018); and IBA (2015)	<p>The SAPAD⁴ (2022, Q4) and SACAD⁵ (2022, Q4) databases did not identify any areas that are nationally protected or considered national conservation areas to be located within the Tournée 2 Solar PV Park boundary or within 10 km of the Tournée 2 Solar PV Park.</p>

⁴ **SAPAD (2022):** The definition of protected areas follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the “System of Protected Areas”, which consists of the following kinds of protected areas - 1. Special nature reserves; 2. National parks; 3. Nature reserves; 4. Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003); 5. World heritage sites declared in terms of the World Heritage Convention Act; 6. Marine protected areas declared in terms of the Marine Living Resources Act; 7. Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and 8. Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

⁵ **SACAD (2022):** The types of conservation areas that are currently included in the database are the following: 1. Biosphere reserves, 2. Ramsar sites, 3. Stewardship agreements (other than nature reserves and protected environments), 4. Botanical gardens, 5. Transfrontier conservation areas, 6. Transfrontier parks, 7. Military conservation areas and 8. Conservancies.



	<p>The NPAES (2018) database did not identify any priority focus areas within the Tournée 2 Solar PV Park, however, is located immediately adjacent to the Tournée 2 Solar PV Park (on the north western boundary). This however does not intersect with the distribution of the Tournée 2 Solar PV Park itself and therefore the proposed development will not impact any NPAES focus areas (Figure 6).</p> <p>The IBA (2015) database did not identify the any IBAs within the proposed of the Tournée 2 Solar PV Park, or within 10 km thereof.</p>
<p>NATIONAL WEB-BASED ENVIRONMENTAL SCREENING TOOL (accessed 2022)</p>	
<p>The Screening Tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the Environmental Authorisation process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below:</p> <ul style="list-style-type: none"> ➤ <u>Very High</u>: Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 square kilometres (km²) are considered Critical Habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under CR, EN, or VU D criteria of the IUCN or species listed as Critically/ Extremely Rare under South Africa’s National Red List Criteria. For each species reliant on a Critical Habitat, all remaining suitable habitat has been manually mapped at a fine scale. ➤ <u>High</u>: Recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level. ➤ <u>Medium</u>: Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. ➤ <u>Low</u>: Areas where no Species of Conservation Concern (SCC) are known or expected to occur. 	
<p>Animal Species Figure 10</p>	<p>For the Animal Species theme, the Tournée 2 Solar PV Park is considered to have a medium sensitivity (however some section are identified as low sensitivity areas) due to potential suitable habitat for the following trigger species:</p> <ul style="list-style-type: none"> - Medium: <i>Aves</i>: <i>Tyto capensis</i> (African Grass Owl; VU), <i>Hydroprogne caspia</i> (Caspian tern; VU) and <i>Eupodotis senegalensis</i> (White Bellied Korhaan; VU). <i>Insecta</i>: <i>Lepidochrysops procera</i> (Potchefstroom Blue; Rare) and <i>Mammalia</i>: <i>Crocidura maquassiensis</i> (Maquassie Musk Shrew; VU).
<p>Plant Species Figure 11</p>	<p>For the Plant Species theme, the Screening Tool identified the Tournée 2 Solar PV Park as a low and medium sensitivity area. There are large portion of the Tournée 2 Solar PV Park considered to have a low sensitivity, with a portion in the centre of the Tournée 2 Solar PV Park identified as a medium sensitivity areas. The medium sensitivity is associated with the “other natural areas” as identified by the MBSP (2019). The sensitivity of the Tournée 2 Solar PV Park is due to the potential presence of habitat for the following trigger species:</p> <ul style="list-style-type: none"> - Medium: Sensitive species 1252 ⁶(VU) and Sensitive species 691(VU).
<p>Terrestrial Sensitivity</p>	<p>The Terrestrial Sensitivity for the entire Tournée 2 Solar PV Park is considered to be a very high. The trigger features include CBA 2 and a VU ecosystem.</p>
<p>RENEWABLE ENERGY DEVELOPMENT ZONES AND CORRIDORS- FIGURE 8</p>	
<p>The proposed Tournée 2 Solar PV Park is not located within any Renewable Energy Development Zone (REDZ).</p>	
<p>STRATEGIC TRANSMISSION CORRIDORS- FIGURE 9</p>	
<p>The proposed Tournée 2 Solar PV Park is not located within any Strategic Transmission Corridors.</p> <p>The five strategic transmission corridors were assessed as part of the 2016 Electricity Grid Infrastructure (EGI) Strategic Environmental Assessment (SEA). These corridors were Gazetted for implementation on 16 February 2018 in government Gazette 41445, GN 113. The gazette documented notice given by the minister of environmental affairs of alternative procedures to be followed when applying for EA for large scale electricity transmission and distribution development activities, identified in terms of section 24(2)(a) of the NEMA in the identified strategic transmission corridors (i.e., Areas declared as geographical areas of strategic importance).</p>	

NBA = National Biodiversity Assessment; SAPAD = South African Protected Areas Database; SACAD = South African Conservation Areas Database; NPAES = National Protected Areas Expansion Strategy; IBA = Important Bird Area; MAP = Mean Annual Precipitation; MAT = Mean Annual Temperature; MAPE = Mean Annual Potential Evaporation; MFD = Mean Frost Days; MASMS = Mean Annual Soil Moisture Stress (% of days when evaporative demand was more than double the soil moisture supply); CBA = Critical Biodiversity Areas; ESA = Ecological Support Area.

⁶ According to the best practise guidelines provided by SANBI, the name of sensitive species provided by the Online EIA Screening Tool may not appear in the final EIA report nor any of the specialist reports released into the public domain. This is to protect species that are under threat to factors such as illegal harvesting and overexploitation.



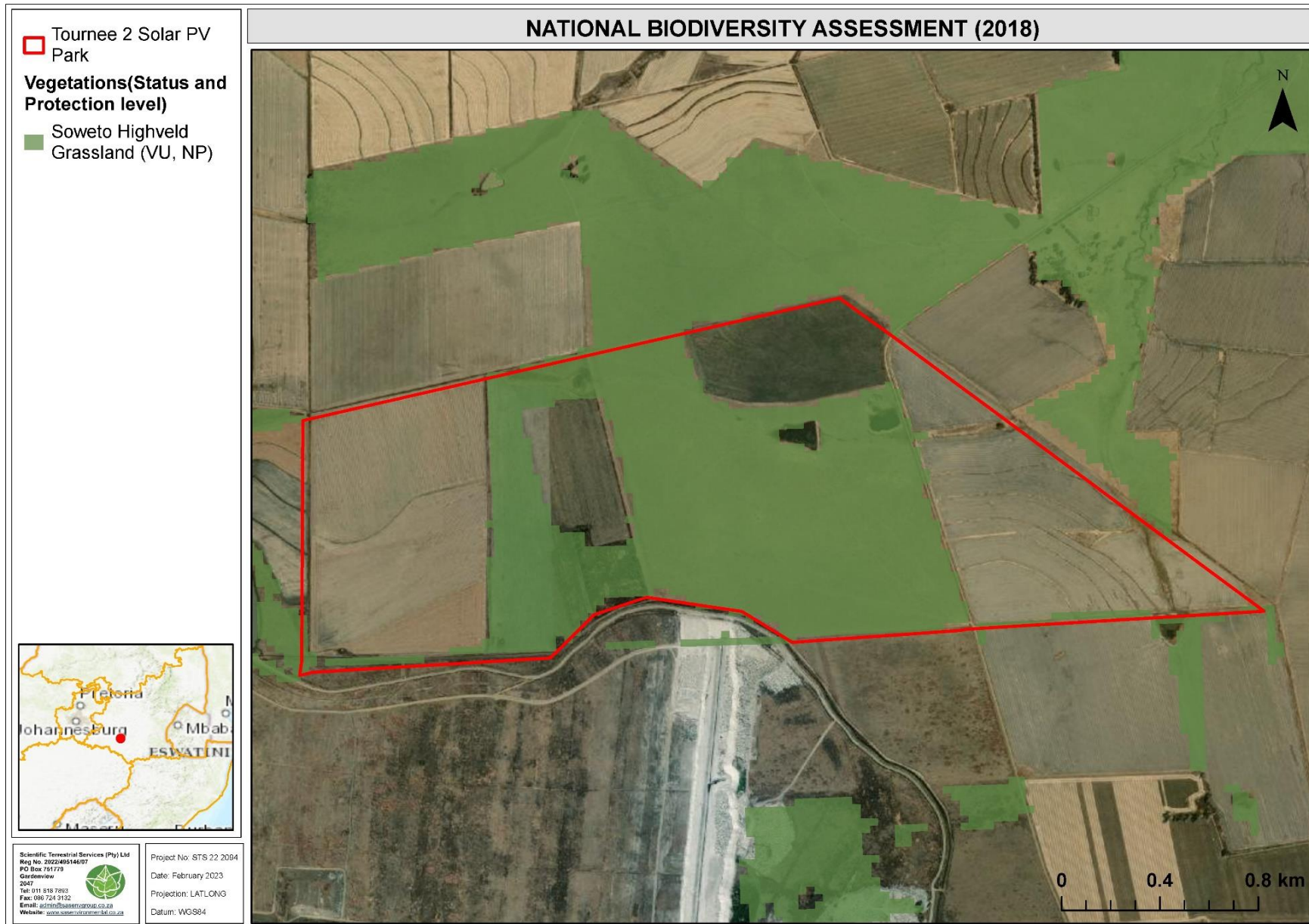


Figure 4: The remaining extent of the vegetation type associated with the Tournée 2 Solar PV Park according to the 2018 terrestrial NBA dataset.



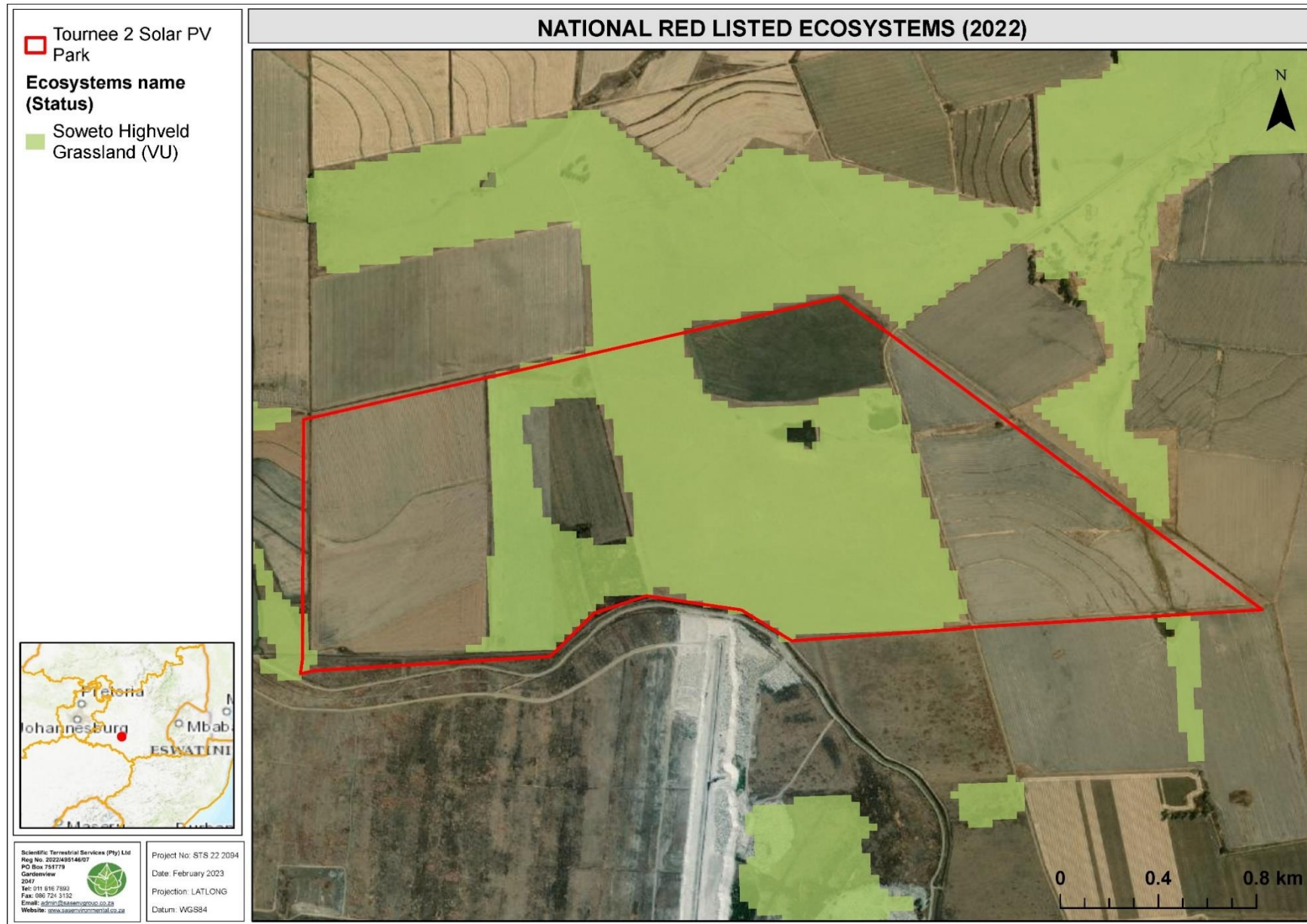


Figure 5: The Tournée 2 Solar PV Park in relation to the remaining extent of the RLE (2022, database).



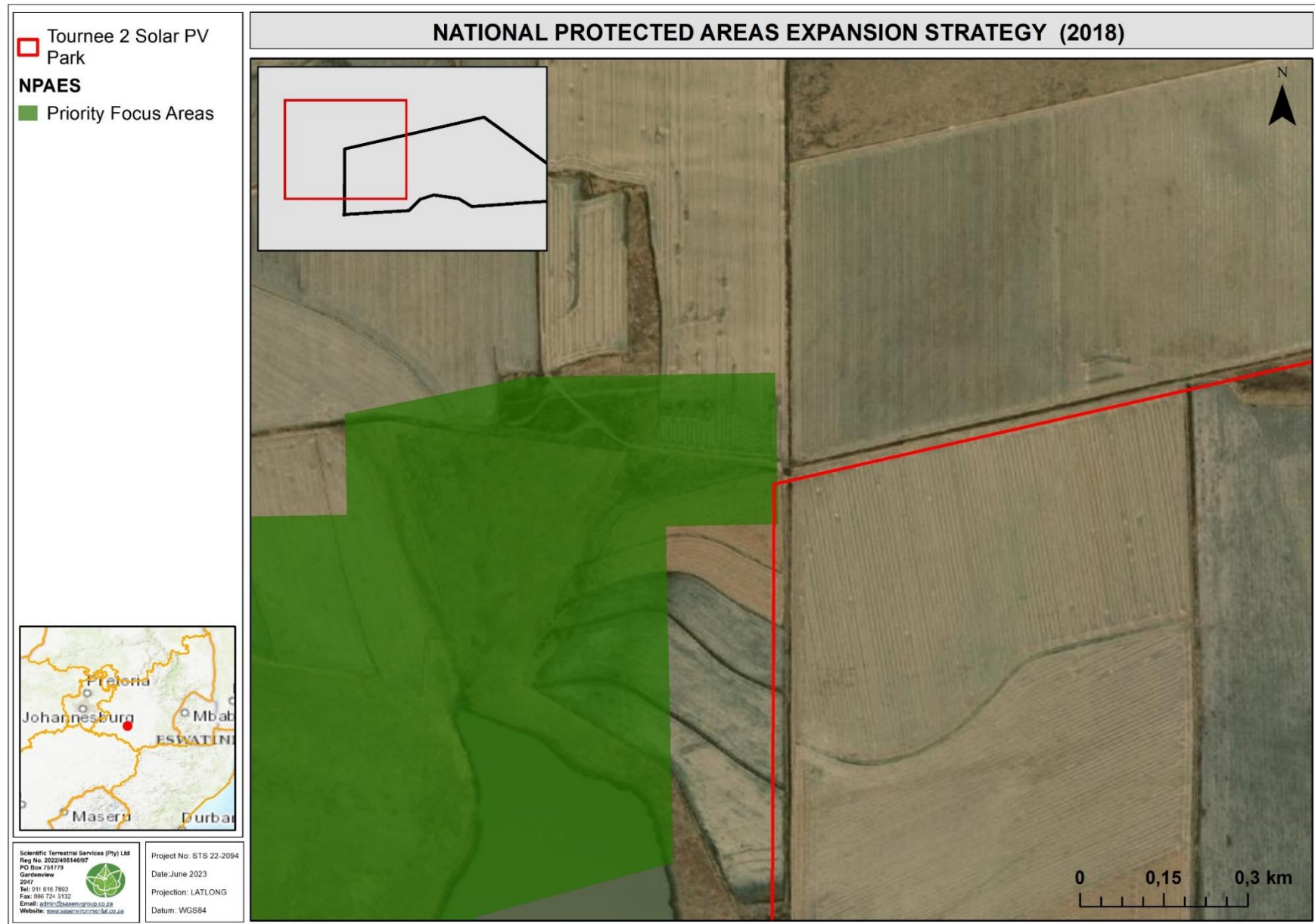


Figure 6: NPAES areas adjacent to the Tournée 2 Solar PV Park as indicated by the NPAES database (2018).



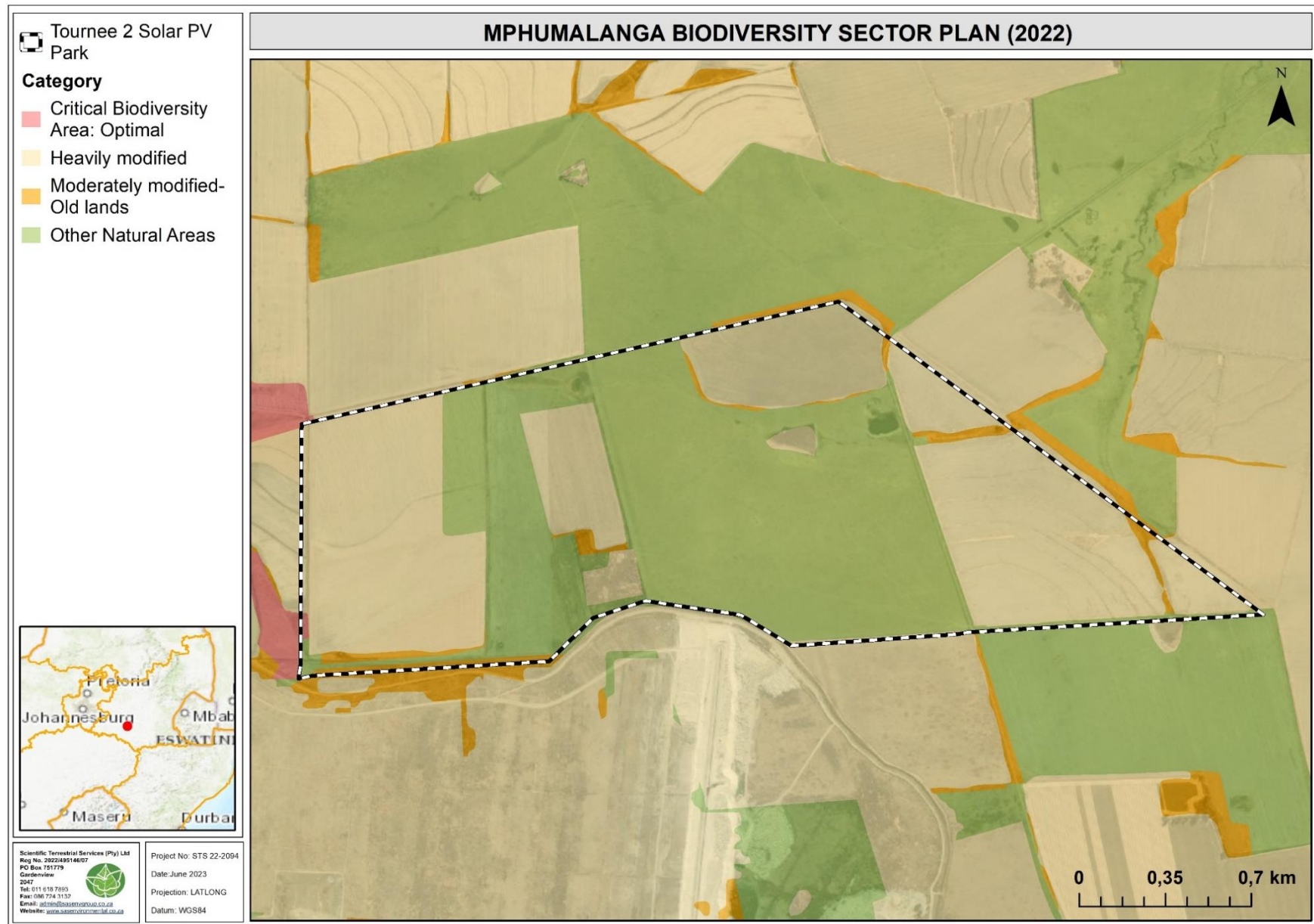


Figure 7: The Tournée 2 Solar PV Park in relation to the 2022 MBSP spatial dataset.



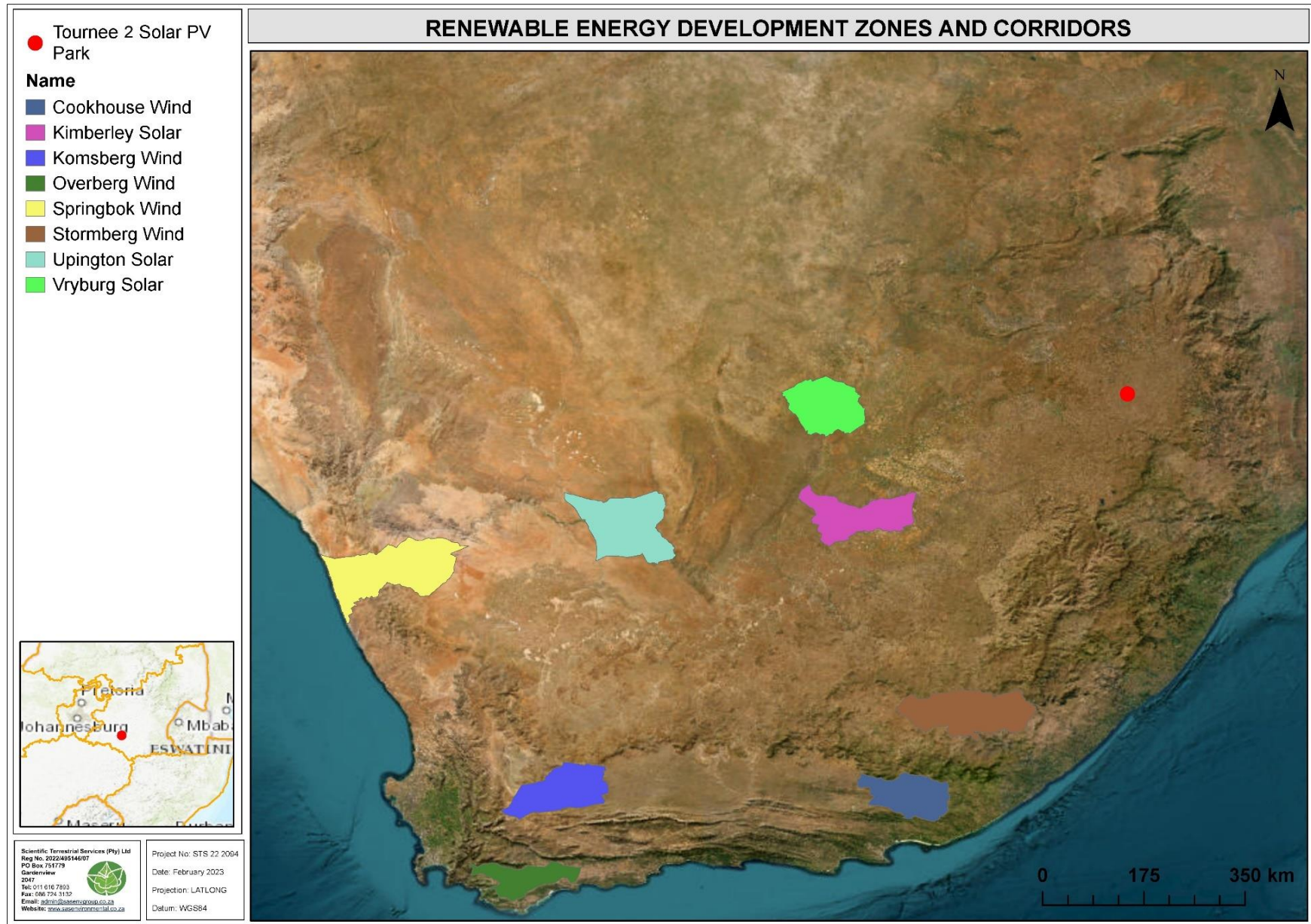


Figure 8: REDZ as part of the Phase 1 and Phase 2 SEA for Wind and Solar PV Energy in South Africa, 2019.



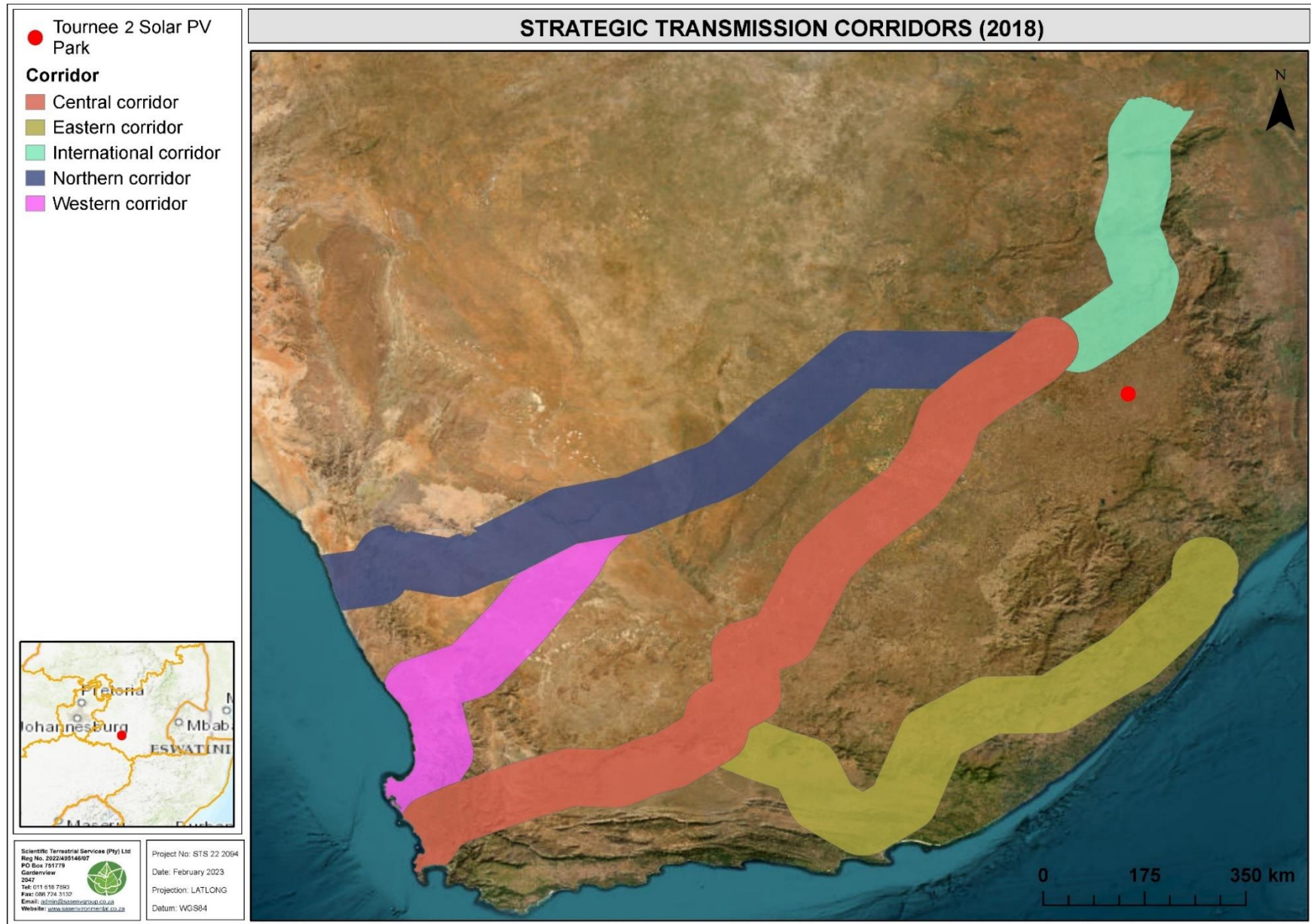


Figure 9: Strategic Transmission Corridors as set out by the EGI SEA.



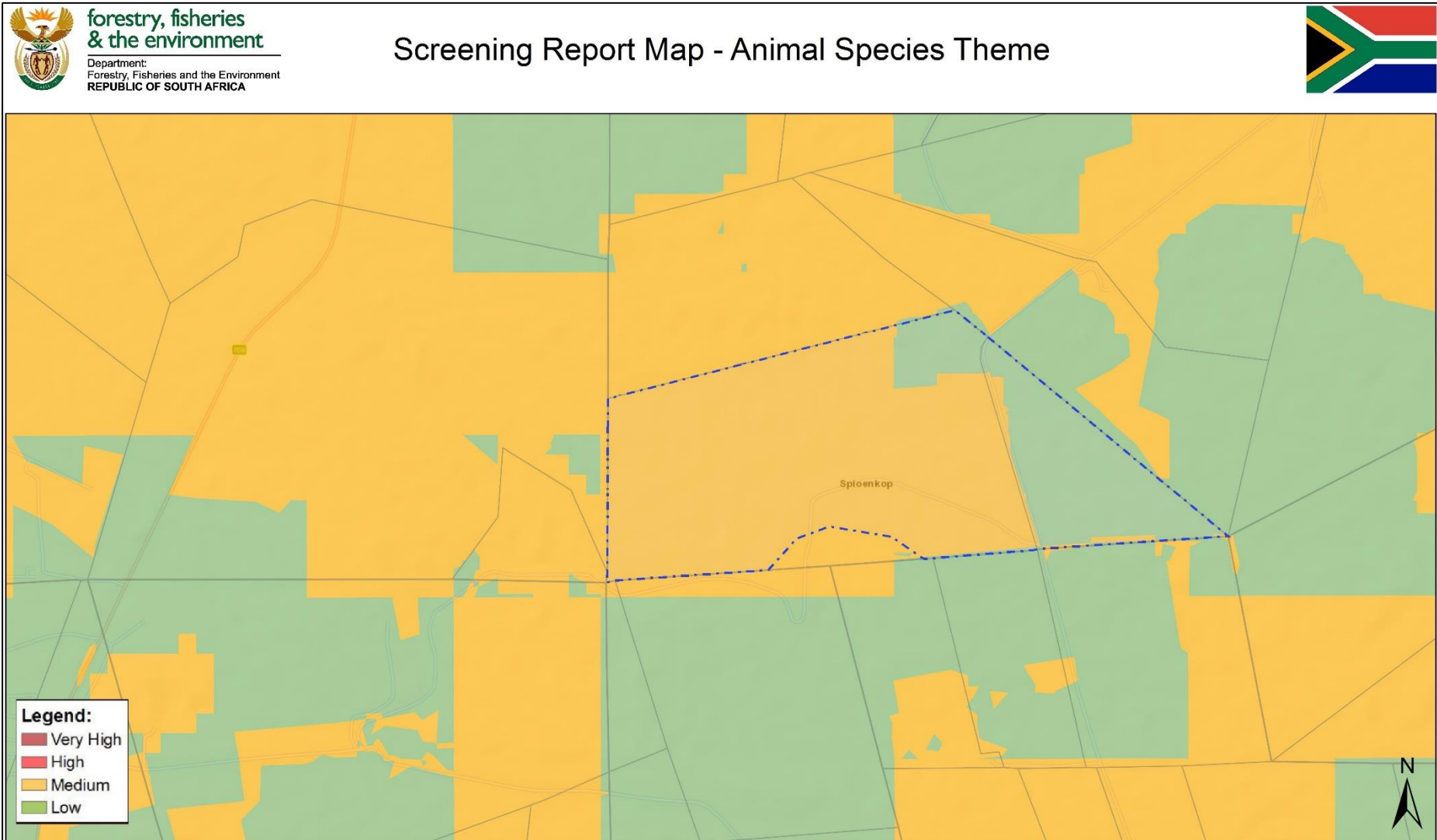


Figure 10: Animal Species Theme sensitivity for the Tournée 2 Solar PV Park as obtained from the Screening Tool (accessed 2023).



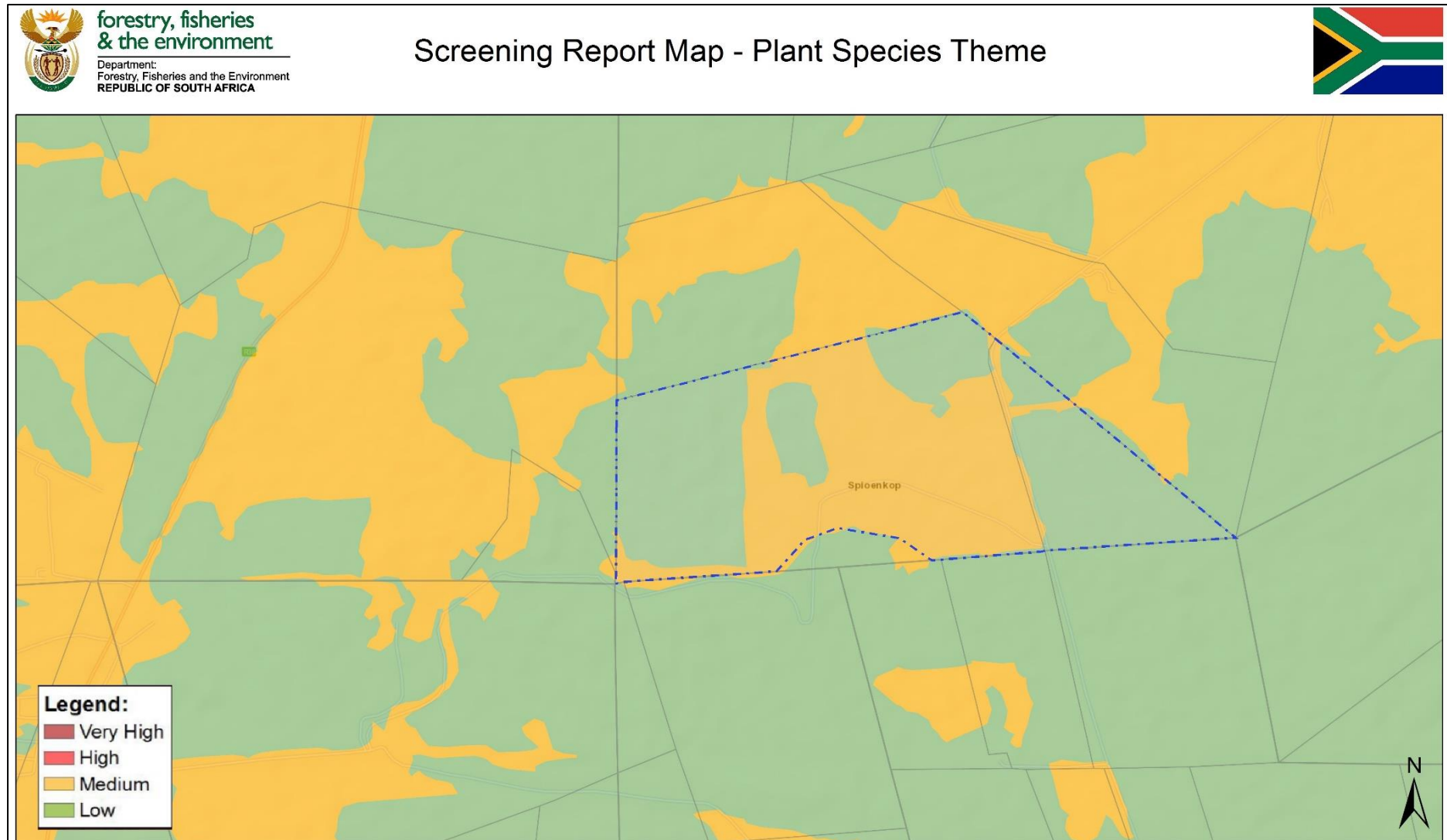


Figure 11: Plant Species Theme sensitivity for the Tournée 2 Solar PV Park as obtained from the Screening Tool (accessed 2023).



4 STRUCTURE OF THE BIODIVERSITY REPORT

Part A of this report served to introduce the Tournée 2 Solar PV Park, as well as the general approach to the study. Part A also presents the results of general desktop information reviewed as part of the study, including the information generated by the relevant authorities as well as the context of the site in relation to the surrounding anthropogenic activities and ecological character.

Part B presents the results of the floral field assessment, data analyses and discussion of the results. Part B then presents the results of the impact assessment, where the impacts on floral ecology and biodiversity are discussed.

Part C presents the results of the faunal field assessment, data analyses and discussion of the results. Part C then presents the results of the impact assessment, where the impacts on faunal ecology and biodiversity are discussed.



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APPENDIX A: Indemnity and Terms of Use of this Report

The findings, results, observations, conclusions, and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and STS and its staff reserve the right to, at their sole discretion, modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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This report must not be altered or added to or used for any other purpose other than that for which it was produced without the prior written consent of the author(s). This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.



APPENDIX B: Legislative Requirements

THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA, 1996

The environment and the health and well-being of people are safeguarded under the Constitution of the Republic of South Africa, 1996 by way of Section 24. Section 24(a) guarantees a right to an environment that is not harmful to human health or well-being and to environmental protection for the benefit of present and future generations. Section 24(b) directs the state to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure the ecologically sustainable development and use of natural resources (including water and mineral resources) while promoting justifiable economic and social development. Section 27 guarantees every person the right of access to sufficient water, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive realisation of this right. Section 27 is defined as a socio-economic right and not an environmental right. However, read with Section 24 it requires of the state to ensure that water is conserved and protected and that sufficient access to the resource is provided. Water regulation in South Africa places a great emphasis on protecting the resource and on providing access to water for everyone.

THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) (NEMA)

The National Environmental Management Act, 1998 (Act No.107 of 1998) (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations (GN R326 as amended in 2017 and well as listing notices 1, 2 and 3 (GN R327, R325 and R324 of 2017), state that prior to any development taking place which triggers any activity as listed within the abovementioned regulations, an environmental authorisation process needs to be followed and environmental authorisation obtained. This could follow either the Basic Assessment process or the Environmental Impact Assessment process depending on the nature of the activity and scale of the anticipated impacts.

THE NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT, 2004 (ACT NO. 10 OF 2004) (NEMBA)

The objectives of this act are (within the framework of NEMA) to provide for:

- The management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity;
- The use of indigenous biological resources in a sustainable manner;
- The fair and equitable sharing among stakeholders of the benefits arising from bio prospecting involving indigenous biological resources;
- To give effect to ratify international agreements relating to biodiversity which are binding to the Republic;
- To provide for cooperative governance in biodiversity management and conservation; and
- To provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of the surrounding areas are not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of the benefits arising from indigenous biological resources.

Furthermore, a person may not carry out a restricted activity involving either:

- a) A specimen of a listed threatened or protected species;
- b) Specimens of an alien species; or
- c) A specimen of a listed invasive species without a permit.



GOVERNMENT NOTICE NUMBER R.1020: ALIEN AND INVASIVE SPECIES REGULATIONS, 2020 (IN GOVERNMENT GAZETTE 43735), INCLUDING GOVERNMENT NOTICE NUMBER 1003: ALIEN AND INVASIVE SPECIES LISTS, 2020 (IN GOVERNMENT GAZETTE 43726) AS IT RELATES TO THE NEMBA

NEMBA is administered by the Department of Environmental Affairs and aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. In terms of alien and invasive species. This act in terms of alien and invasive species aims to:

- Prevent the unauthorized introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur,
- Manage and control alien and invasive species, to prevent or minimize harm to the environment and biodiversity; and
- Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

Alien species are defined, in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No 10 of 2004) as:

- (a) A species that is not an indigenous species; or
- (b) An indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.

Categories according to NEMBA (Alien and Invasive Species Regulations, 2020):

- **Category 1a:** Invasive species that require compulsory control;
- **Category 1b:** Invasive species that require control by means of an invasive species management programme;
- **Category 2:** Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread; and
- **Category 3:** Ornamentally used plants that may no longer be planted.

NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT, 2003 (ACT NO. 57 OF 2003) AS AMENDED⁷ (NEMPAA)

The objective of this act is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological biodiversity 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; for the continued existence, governance and functions of South African National Parks; and for matters in connection thereof.

⁷ Amendments to the NEMPAA:

- National Environmental Management: Protected Areas Amendment Act 31 of 2004 – Gazette No. 27274, No. 131. Commencement date: 1 November 2005 [Proc. No. R. 58, Gazette No. 28123]
- National Environment Laws Amendment Act 14 of 2009 – Gazette No.32267, No. 617. Commencement date: 18 September 2009 [Proc. 65, Gazette No. 32580]
- National Environmental Management: Protected Areas Amendment Act 15 of 2009 – Gazette No. 32660, No. 748. Commencement date: 23 October 2009 – except for sections 1 and 8 [Proc. No. 69, Gazette No. 32660]
- Schedule 2 amended by Government Notice R236 in Government Gazette 36295 dated 27 March 2013. Commencement date: 1 April 2013 of sections 1 and 8 (relating to Schedule 2) of the National Environmental Management Protected Areas Amendment Act, 15 of 2009 [Proc. No. 7, Gazette No. 36296]
- National Environmental Management: Protected Areas Amendment Act 21 of 2014 - Government Notice 445 in Government Gazette 37710 dated 2 June 2014. Commencement date: 2 June 2014.
- Schedule 2 amendment by General Notice 2 of 2016 in Government Gazette 39728 dated 25 February 2016. Commencement date: 25 February 2016.



THE CONSERVATION OF AGRICULTURAL RESOURCES ACT, 1983 (ACT NO. 43 OF 1983) (CARA)

Removal of the alien and weed species encountered in the application area must take place in order to comply with existing legislation (amendments to the regulations under the CARA, 1983 and Section 28 of the NEMA, 1998). Removal of AIP and weed species should take place throughout the construction and operation, phases in line with an approved AIP Management Plan.

THE MPUMALANGA NATURE CONSERVATION ACT, 1998 (ACT NO. 10 OF 1998) (MNCA)

The Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998) (MNCA) provides for the protection of indigenous plants. Subject to the provisions of this Act, no person shall:

- Pick, be in possession of, sell, purchase, donate, receive as a gift, import into, export, or remove from the Province, or convey:
 - A specially protected plant; or
 - A protected plant.
- Pick any indigenous plant:
 - On a public road;
 - On land next to a public road within 100 m measured from the centre of the road;
 - Within an area bordering any natural watercourse, whether wet or dry, up to and within 50 m from the high watermark on either side of the natural watercourse; or
 - In a Provincial Park, a site of Ecological Importance or a Protected Natural Environment.

The below schedules were applicable for the floral and faunal assessments (Part B and C):

- Schedule 1: Specifically Protected Game (Section 4 (1) (a));
- Schedule 2: Protected Game (Section 4 (1) (b));
- Schedule 4: Protected Wild Animals (Section 4 (1) (d));
- Schedule 7: Invertebrates (Section 35 (1));
- Schedule 11: Protected Plants (Section 69 (1) (a)); and
- Schedule 12: Specifically Protected Plants (Section 69 (1) (b)).



APPENDIX C: Impact Assessment Methodology

The methods implemented within this report were provided by the proponent. The impact methodology is as follows:

EIA PHASE

Assessment of Impacts and Mitigation

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 direct⁸, indirect⁹, secondary¹⁰ as well as cumulative¹¹ impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e., residual impact). The significance of environmental aspects is determined and ranked by considering the criteria¹² presented in Error! Reference source not found..

Table C1: Impact Assessment Criteria and Scoring System

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

⁸ Impacts that arise directly from activities that form an integral part of the Project.

⁹ Impacts that arise indirectly from activities not explicitly forming part of the Project.

¹⁰ Secondary or induced impacts caused by a change in the Project environment.

¹¹ Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

¹² The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.



CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact 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:			$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$		
IMPACT SIGNIFICANCE RATING					
Total Score	4 to 15	16 to 30	31 to 60	61 to 80	81 to 100
Environmental Significance Rating (Negative (-))	Very low	Low	Moderate	High	Very High
Environmental Significance Rating (Positive (+))	Very low	Low	Moderate	High	Very High

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.

Impacts on biodiversity can largely take place in four ways (DEA *et al.*, 2013):

- **Direct impacts:** are impacts directly related to the project including project aspects such as site clearing, water abstraction and discharge of water from riverine resources;
- **Indirect impacts:** are impacts associated with a project that may occur within the zone of influence in a project such as surrounding terrestrial areas and downstream areas on water courses;
- **Induced impacts:** are impacts directly attributable to the project but are expected to occur due to the activities of the project. Factors included here are urban sprawl and the development of associated industries; and
- **Cumulative impacts:** can be defined as the sum of the impact of a project as well as the impacts from past, existing, and reasonably foreseeable future projects that would affect the same biodiversity resources. Examples include numerous mining operations within the same drainage catchment or numerous residential developments within the same habitat for faunal or floral species.

Given the limited resources available for biodiversity management and conservation, as well as the need for development, efforts to conserve biodiversity need to be strategic, focused, and supportive of sustainable development. This is a fundamental principle underpinning South Africa's approach to the management and conservation of its biodiversity and has resulted the definition of a clear mitigation strategy for biodiversity impacts.

'Mitigation' is a broad term that covers all components of the 'mitigation hierarchy' defined hereunder. It involves selecting and implementing measures – amongst others – to conserve biodiversity and to protect the users of biodiversity and other affected stakeholders from potentially adverse impacts as a result of mining or any other land use. The aim is to prevent adverse impacts from occurring or, where this is unavoidable, to limit their significance to an acceptable level. Offsetting of impacts is considered to be the last option in the mitigation hierarchy for any project.

The mitigation hierarchy (Figure D17) in general consists of the following in order of which impacts should be mitigated (DEA *et al.*, 2013):

- **Avoid/prevent impact:** can be done through utilising alternative sites, technology, and scale of projects to prevent impacts. In some cases, if impacts are expected to be too high the "no project" option should also be considered, especially where it is expected that the lower levels of mitigation will not be adequate to limit environmental damage and eco-service provision to suitable levels;
- **Minimise impact:** can be done through utilisation of alternatives that will ensure that impacts on biodiversity and ecoservices provision are reduced. Impact minimisation is considered an essential part of any development project;
- **Rehabilitate impact:** is applicable to areas where impact avoidance and minimisation are unavoidable where an attempt to re-instate impacted areas and return them to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land. Rehabilitation can however not be considered as the primary mitigation tool as even with significant resources and effort rehabilitation usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological function to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the setting of a project. Practical rehabilitation should consist of the following phases in best practice:



- **Structural rehabilitation** which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long terms sustainable ecological structure;
 - **Functional rehabilitation** which focuses on ensuring that the ecological functionality of the ecological resources on the focus area supports the intended post closure land use. In this regard special mention is made of the need to ensure the continued functioning and integrity of wetland and riverine areas throughout and after the rehabilitation phase;
 - **Biodiversity reinstatement** which focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local post closure land uses. In this regard special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community or community suitable for supporting the intended post closure land use; and
 - **Species reinstatement** which focuses on the re-introduction of any ecologically important species which may be important for socio-cultural reasons, ecosystem functioning reasons and for conservation reasons. Species re-instatement need only occur if deemed necessary.
- **Offset impact:** refers to compensating for residual or unavoidable negative impacts on biodiversity. Offsetting should take place to address any impacts deemed to be unacceptable which cannot be mitigated through the other mechanisms in the mitigation hierarchy. The objective of biodiversity offsets should be to ensure no net loss of biodiversity. Biodiversity offsets can be considered to be a last resort to compensate for residual negative impacts on biodiversity.

The significance of residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss or irreplaceable biodiversity the residual impacts should be considered to be of *very high significance* and when residual impacts are considered to be of *very high significance*, offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss. In the case of residual impacts determined to have *medium to high significance*, an offset initiative may be investigated. If the residual biodiversity impacts are considered of low significance no biodiversity offset is required.¹³

In light of the above discussion the following points present the key concepts considered in the development of mitigation measures for the proposed project:

- Mitigation and performance improvement measures and actions that address the risks and impacts¹⁴ are identified and described in as much detail as possible;
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation, or compensation where possible; and
- Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, with estimates of the resources (including human resource and training requirements) and responsibilities for implementation wherever possible.

The mitigation sequence/hierarchy is shown in Error! Reference source not found. below.

¹³ Provincial Guideline on Biodiversity Offsets, Western Cape, 2007.

¹⁴ Mitigation measures should address both positive and negative impacts



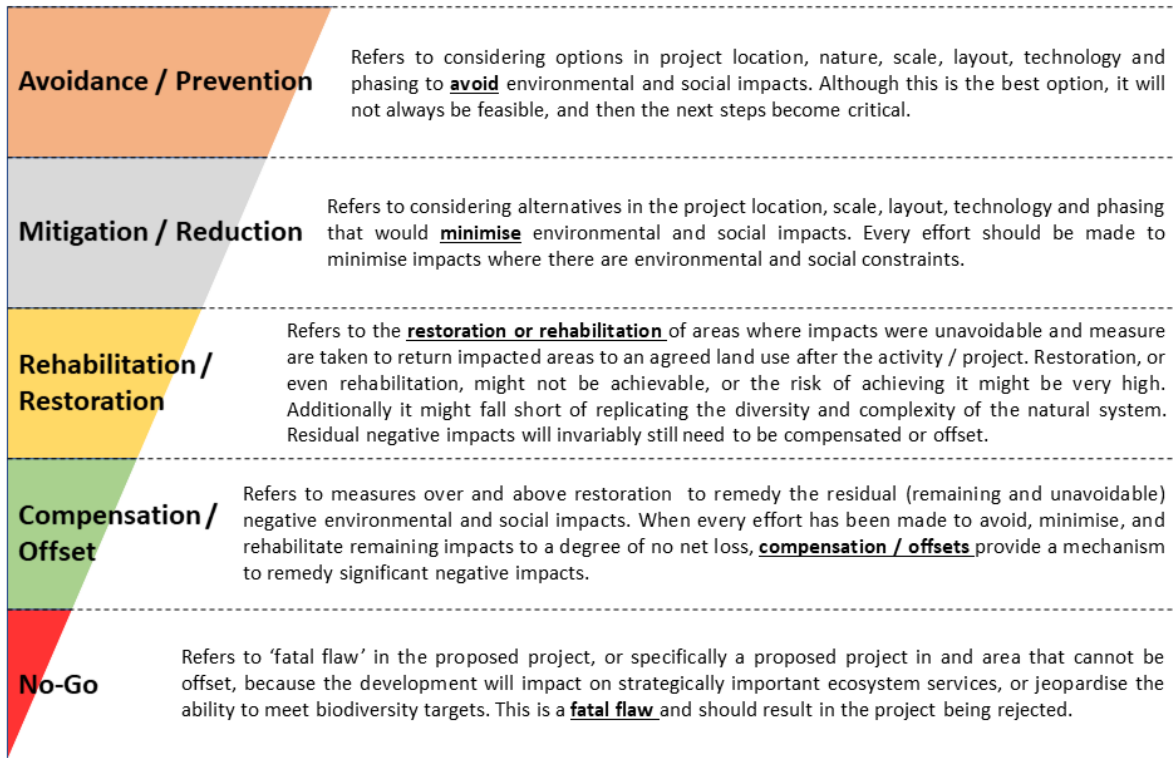


Figure C1: Mitigation Sequence/Hierarchy.

Recommendations

Recommendations were developed to address and mitigate impacts associated with the proposed development. These recommendations also include general management measures which apply to the proposed development as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the operation from planning, through to construction and operational phases.



APPENDIX D: Reference Vegetation Type

Soweto Highveld Grassland (GM8)



Figure D1: Gm 8 Soweto Highveld Grassland: Typical mesic highveld grassland with *Themeda triandra* and several *Eragrostis* species still found in some parts of the southern Gauteng in natural condition (page 397 Mucina & Rutherford 2006).

Table D1: Floristic species of the Soweto Highveld Grassland (Mucina & Rutherford, 2006).

Plant Community	Species
Dominant and typical floristic species	
Woody Layer	
Low Shrubs	<i>Anthospermum hispidulum</i> , <i>A. rigidum</i> subsp. <i>pumilum</i> , <i>Berkheya annectens</i> , <i>Felicia muricata</i> , <i>Ziziphus zeyheriana</i> .
Forb layer	
Herbaceous climber	<i>Rhynchosia totta</i> .
Herbs	<i>Hermannia depressa</i> (d), <i>Acalypha angustata</i> , <i>Berkheya setifera</i> , <i>Dicoma anomala</i> , <i>Euryops gilfillanii</i> , <i>Geigeria aspera</i> var. <i>aspera</i> , <i>Graderia subintegra</i> , <i>Haplocarpha scaposa</i> , <i>Helichrysum miconiifolium</i> , <i>H. nudifolium</i> var. <i>nudifolium</i> , <i>H. rugulosum</i> , <i>Hibiscus pusillus</i> , <i>Justicia anagalloides</i> , <i>Lippia scaberrima</i> , <i>Rhynchosia effusa</i> , <i>Schistostephium crataegifolium</i> , <i>Selago densiflora</i> , <i>Senecio coronatus</i> , <i>Hilliardiella elaeagnoides</i> , <i>Wahlenbergia undulata</i> .
Geophytic Herbs	<i>Haemanthus humilis</i> subsp. <i>hirsutus</i> , <i>H. montanus</i> .
Graminoid layer	
Graminoids	<i>Andropogon appendiculatus</i> (d), <i>Brachiaria serrata</i> (d), <i>Cymbopogon pospischilii</i> (d), <i>Cynodon dactylon</i> (d), <i>Elionurus muticus</i> (d), <i>Eragrostis capensis</i> (d), <i>E. chloromelas</i> (d), <i>E. curvula</i> (d), <i>E. plana</i> (d), <i>E. planiculmis</i> (d), <i>E. racemosa</i> (d), <i>Heteropogon contortus</i> (d), <i>Hyparrhenia hirta</i> (d), <i>Setaria nigrirostris</i> (d), <i>S. sphacelata</i> (d), <i>Themeda triandra</i> (d), <i>Tristachya leucothrix</i> (d), <i>Andropogon schirensis</i> , <i>Aristida adscensionis</i> , <i>A. bipartita</i> , <i>A. congesta</i> , <i>A. junciformis</i> subsp. <i>galpinii</i> , <i>Cymbopogon caesius</i> , <i>Digitaria diagonalis</i> , <i>Diheteropogon amplexens</i> , <i>Eragrostis micrantha</i> , <i>E. superba</i> , <i>Harpochloa falx</i> , <i>Microchloa caffra</i> , <i>Paspalum dilatatum</i> .



APPENDIX E: Details, Expertise And Curriculum Vitae of Specialists

1. (a) (i) Details of the specialist who prepared the report

Charne Gouws	MSc Plant Science (University of Pretoria)
Christien Steyn	MSc Plant Science (University of Pretoria)
Hennie de Beer	BTech Nature Conservation (Tshwane University of Technology)
Paul Da Cruz	BA (Hons) (Geography and Environmental Studies) (University of the Witwatersrand)
Samantha Leigh Daniels	PhD (Plant Science) (University of Pretoria)
Stephen van Staden	MSc Environmental Management (University of Johannesburg)

1. (A). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	Scientific Terrestrial Services		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047	Fax:	086 724 3132
Telephone:	011 616 7893		
Name / Contact person:	Charne Gouws		
E-mail:	charne@sasenvgroup.co.za		
Qualifications	MSc (Plant Science) (University of Pretoria) BSc (Hons) Plant Science (University of Pretoria) BSc (Environmental Sciences) (University of Pretoria)		
Registration / Associations	SANAP (South African National Antarctic Programme) Golden Key Honorary Society		
Name / Contact person:	Christien Steyn		
E-mail:	christien@sasenvgroup.co.za		
Qualifications	MSc (Plant Science) (University of Pretoria) BSc (Hons) Plant Science (University of Pretoria) BSc (Environmental Sciences) (University of Pretoria)		
Registration / Associations	Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 127823/21) Member of the Botanical Society of South Africa (BotSoc) Member of the Grassland Society of South Africa (GSSA) Member of the Land Rehabilitation Society of Southern Africa (LARSSA) Member of the South African Association of Botanists (SAAB) Member of the South African Wildlife Management Association (SAWMA)		
Name / Contact person:	Hennie de Beer		
E-mail:	hennie@sasenvgroup.co.za		
Qualifications	BTech Nature Conservation (Tshwane University of Technology) National Diploma Nature Conservation (Tshwane University of Technology)		
Name / Contact person:	Paul		
E-mail:	paul@sasenvgroup.co.za		
Qualifications	BA (Hons) (Geography and Environmental Studies) (University of the Witwatersrand) BA (Geography) (University of the Witwatersrand)		
Registration / Associations	Registered Certificated Scientist at South African Council for Natural Scientific Professions (SACNASP) Registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioners Association of South Africa (EAPASA) Member of the South African Wetland Society (SAWS)		
Name / Contact person:	Samantha Leigh Daniels		
E-mail:	samantha@sasenvgroup.co.za		

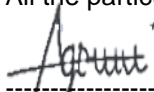


Qualifications	PhD (Plant Science) (University of Pretoria) MSc (Plant Science) (University of Pretoria) BSc (Hons) Zoology & Entomology (University of Pretoria) BSc Zoology & Entomology (University of Pretoria)
Registration / Associations	Member of the South African Association of Botanists (SAAB) Member of the Botanical Society of South Africa (BotSoc) Member of the Association for Tropical Biology and Conservation (ATBC)
Name / Contact person:	Stephen van Staden
E-mail:	stephen@sasenvgroup.co.za
Qualifications	MSc Environmental Management (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health Practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum Member of the Gauteng Wetland Forum Member of International Association of Impact Assessors (IAIA) South Africa; Member of the Land Rehabilitation Society of South Africa (LaRSSA)

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Charne Gouws, declare that -

- I act as the **independent specialist** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.



Specialist Signature



I, Christien Steyn, declare that -

- I act as the **independent specialist (reviewer)** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct



Signature of the Specialist

I, Paul da Cruz, declare that -

- I act as the **independent specialist (reviewer)** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct



Signature of the Specialist



I, Hennie de Beer, declare that -

- I act as the **independent specialist** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct



Signature of the Specialist

I, Samantha-Leigh Daniels, declare that -

- I act as the **independent specialist (reviewer)** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct



Signature of the Specialist



I, Stephen van Staden, declare that -

- I act as the **independent specialist (reviewer)** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct



Signature of the Specialist





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHARNE GOUWS

PERSONAL DETAILS

Position in Company	Floral Ecologist
Joined SAS Environmental Group of Companies	2022

MEMBERSHIP IN PROFESSIONAL SOCIETIES

SANAP (South African National Antarctic Programme)
Golden Key Honorary Society

EDUCATION

Qualifications

MSc Plant Science (University of Pretoria)	2021
BSc (Hons) Plant Science (University of Pretoria)	2018
BSc Environmental Science (University of Pretoria)	2017

Short courses and Training

- Advanced Grass Identification Course (2019)
- CREW Tree Identification Course (2019)
- ISO 140001 Environmental Management Course (2020)
- Ecological Practices and Theory Short Course (2020)

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Limpopo, Mpumalanga, Northern Cape, KwaZulu-Natal and Eastern Cape

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Desktop Studies, Mapping and Background Information Research
- Plant permits





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTIEN STEYN

PERSONAL DETAILS

Position in Company	Floral Ecologist
Joined SAS Environmental Group of Companies	2018

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 127823/21)

Member of the Botanical Society of South Africa (BotSoc)

Member of the Grassland Society of South Africa (GSSA)

Member of the Land Rehabilitation Society of Southern Africa (LARSSA)

Member of the South African Association of Botanists (SAAB)

Member of the South African Wildlife Management Association (SAWMA)

EDUCATION

Qualifications

MSc Plant Science (University of Pretoria)	2017
BSc (Hons) Plant Science (Invasion Biology) (University of Pretoria)	2014
BSc Environmental Science (University of Pretoria)	2013

Short courses and Training

- BotSoc Branch: Species Environmental Assessment Guidelines Course (2022).
- Advanced Grass Identification Course (2021).
- Practical Plant Identification, including Herbarium Usage and Protocols.
- Vegetation Classification and Mapping: Use of Geographic Information System for understanding vegetation pattern and biodiversity conservation.
- Introduction to Statistics for Biologists: Applications of plant ecology principles in plant conservation, i.e., species distribution modelling, alien plant invasions, conservation planning.
- International Plant Functional Trait Course: Hands-on, field-based exploration of plant functional traits, along with experience in the usage of plant traits data in climate-change research and ecosystem ecology. <https://www.uib.no/en/rq/EECRG/97477/plant-functional-traits-course-2>

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Northern Cape, Free State

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Terrestrial Ecological and Biodiversity Scoping Assessments
- Terrestrial Ecological and Biodiversity Screening Assessments
- Floral Assessments
- Input into Terrestrial Rehabilitation Plan design with the focus on the re-establishment of vegetation
- Floral Rescue and Relocation Plans
- Alien and Invasive Plant Control and Management Plans (AIPCPs)
- Alien and Invasive Plant Identification and awareness training
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting
- Desktop Studies, Mapping and Background Information Research





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF **HENNIE DE BEER**

PERSONAL DETAILS

Position in Company	Faunal Ecologist
Joined SAS	2014, 2023

EDUCATION

Qualifications

BTech Nature Conservation (Tshwane University of Technology)	2021
National Diploma Nature Conservation (Tshwane University of Technology)	2008

COUNTRIES OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Eastern Cape, Western Cape, Northern Cape and Freestate
Mozambique

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Faunal Assessments
- Avifaunal Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

Freshwater Assessments

- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Rehabilitation Assessment / Planning





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF SAMANTHA-LEIGH DANIELS

PERSONAL DETAILS

Position in Company	Floral Ecologist
Joined SAS Environmental Group of Companies	2020

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Association of Botanists (SAAB)
 Member of the Botanical Society of South Africa (BotSoc)
 Member of the Association for Tropical Biology and Conservation (ATBC)

EDUCATION

Qualifications

PhD (Plant Science) (University of Pretoria)	2023
MSc (Plant Science) (University of Pretoria)	2017
BSc (Hons) Zoology & Entomology (University of Pretoria)	2014
BSc Zoology & Entomology (University of Pretoria)	2013

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Free State

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Terrestrial Ecological and Biodiversity Scoping Assessments
- Terrestrial Ecological and Biodiversity Screening Assessments
- Floral Assessments
- Alien and Invasive Control Plan (AICP)
- Terrestrial Monitoring
- Desktop Studies, Mapping and Background Information Research

Training

- Plant species identification
- Herbarium usage and protocols





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF PAUL DA CRUZ

PERSONAL DETAILS

Position in Company	Senior Ecologist
Joined SAS Environmental Group of Companies	2022

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Certificated Scientist at South African Council for Natural Scientific Professions (SACNASP)
Registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioners Association of South Africa (EAPASA)
Member of the South African Wetland Society (SAWS)

EDUCATION

Qualifications

BA (Hons) (Geography and Environmental Studies) (University of the Witwatersrand)	1998
BA (Geography) (University of the Witwatersrand)	1997

Short Courses

Taxonomy of Wetland Plants (Water Research Commission)	2017
Advanced Grass Identification (Frits van Outshoorn)	2010
Grass Identification (Frits van Outshoorn),	2009
Soil Form Classification and Wetland Delineation; (TerraSoil Science)	2008

AREAS OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana

DEVELOPMENT SECTORS OF EXPERIENCE

1. Renewable energy (Wind and solar)
2. Linear developments (energy transmission, telecommunication, pipelines, roads, border infrastructure)
3. Nature Conservation and Ecotourism Development
4. Commercial development
5. Residential development
6. Environmental and Development Planning and Strategic Assessment
7. Industrial/chemical; Non-renewable power Generation

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- EIA / BA Applications
- Environmental Authorisation Amendments
- EMPr Compilation
- Environmental Compliance Monitoring (Environmental Auditing)
- Environmental Screening Assessments and Listing Notice 3 Trigger Identification / Mapping
- Strategic Environmental Assessments and Environmental Management Frameworks
- EIA / Specialist Study Peer Review

Freshwater Assessments

- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Assessments in support of Environmental Screening Assessments, Precinct Planning & SEA
- Wetland Construction (Compliance) Monitoring

Biodiversity Assessments

- Avifaunal Assessments
- Strategic Biodiversity Assessment

Visual Impact Assessment

- Visual Impact Assessments

GIS / Spatial Analysis

- GIS Spatial Analysis and Listing Notice 3 mapping





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF **STEPHEN VAN STADEN**

PERSONAL DETAILS

Position in Company	Group CEO, Water Resource Discipline Lead, Managing Member, Ecologist, Aquatic Ecologist
Joined SAS Environmental Group of Companies	2003 (year of establishment)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health Practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
Member of the Gauteng Wetland Forum
Member of International Association of Impact Assessors (IAIA) South Africa;
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000

Short Courses

Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017
Tools for Wetland Assessment (Rhodes University)	2017
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2018
Wetland Management: Introduction and Delineation (WLID1502S) (University of the Free State)	2018
Hydropedology and Wetland Functioning (TerraSoil Science and Water Business Academy)	2018

AREAS OF WORK EXPERIENCE

South Africa – All Provinces

Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia

Eastern Africa – Tanzania Mauritius

West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona

Central Africa – Democratic Republic of the Congo

DEVELOPMENT SECTORS OF EXPERIENCE

1. Mining: Coal, chrome, Platinum Group Metals (PGMs), mineral sands, gold, phosphate, river sand, clay, fluorspar
2. Linear developments (energy transmission, telecommunication, pipelines, roads)
3. Minerals beneficiation
4. Renewable energy (Hydro, wind and solar)
5. Commercial development
6. Residential development
7. Agriculture
8. Industrial/chemical

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

Freshwater Assessments

- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning



- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Offset Plans
- Hydropedological Assessment
- Pit Closure Analysis
- Aquatic Ecological Assessment and Water Quality Studies**
- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans
- Biodiversity Assessments**
- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Biodiversity Offset Plan
- Soil and Land Capability Assessment**
- Soil and Land Capability Assessment
- Hydropedological Assessment
- Visual Impact Assessment**
- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments

