SCIENTIFIC TERRESTRIAL SERVICES

Reg No. 2005/122/329/23
VAT Reg No. 4150274472
PO Box 751779
Gardenview
2047
Tel: 011 616 7893
Fax: 086 724 3132
Email: admin@sasenvgroup.co.za
www.sasenvironmental.co.za

BIODIVERSITY ASSESSMENT AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE DEVELOPMENT OF THE SCAFELL CLUSTER, SOLAR PHOTOVOLTAIC FACILITY, FREE STATE PROVINCE

Prepared for

SLR Consulting (Pty) Ltd.

June 2021

Prepared by: Scientific Terrestrial Services CC
Report author: S. L. Daniels
D. van der Merwe
Report reviewer: C. Steyn (Pr.Sci.Nat)
C. Hooton
N. Cloete (Pr.Sci.Nat)
S. van Staden (Pr.Sci.Nat)
K. Marais (Pr. Sci.Nat)
Report Reference: STS 200077

EXECUTIVE SUMMARY

Scientific Terrestrial Services CC (STS) was appointed to conduct a biodiversity assessment as part of the Environmental Impact and Environmental Authorisation (EA) process for the development of four solar photovoltaic (PV) facilities, namely Damlaagte Solar PV Facility, Scafell Solar PV Facility, Vlakfontein Solar PV Facility, and Ilikwa Solar PV Facility, which are collectively referred to as the "Scafell Cluster". The assessment also includes development of associated infrastructure (substations and powerline corridors). The Scafell Cluster and associated infrastructure are located approximately 19 km west of the town of Sasolburg, Free State Province, and is henceforth referred to as the "study area" unless specifically referring to individual PV Facilities or specific infrastructure.

Each of the PV Facilities are located adjacent to each other and are situated approximately 19 km west of Sasolburg and 22 km north-east of Parys. Each project will require a Battery Energy System (BESS) and grid connection infrastructure to facilitate grid connection between each solar PV facility and the existing Scafell Substation.

The baseline results for the floral and faunal assessments are presented for the entire study area; however, the impact assessments are presented separately for each Solar PV facility for both the floral and faunal assessment and are based on the layout provided below:

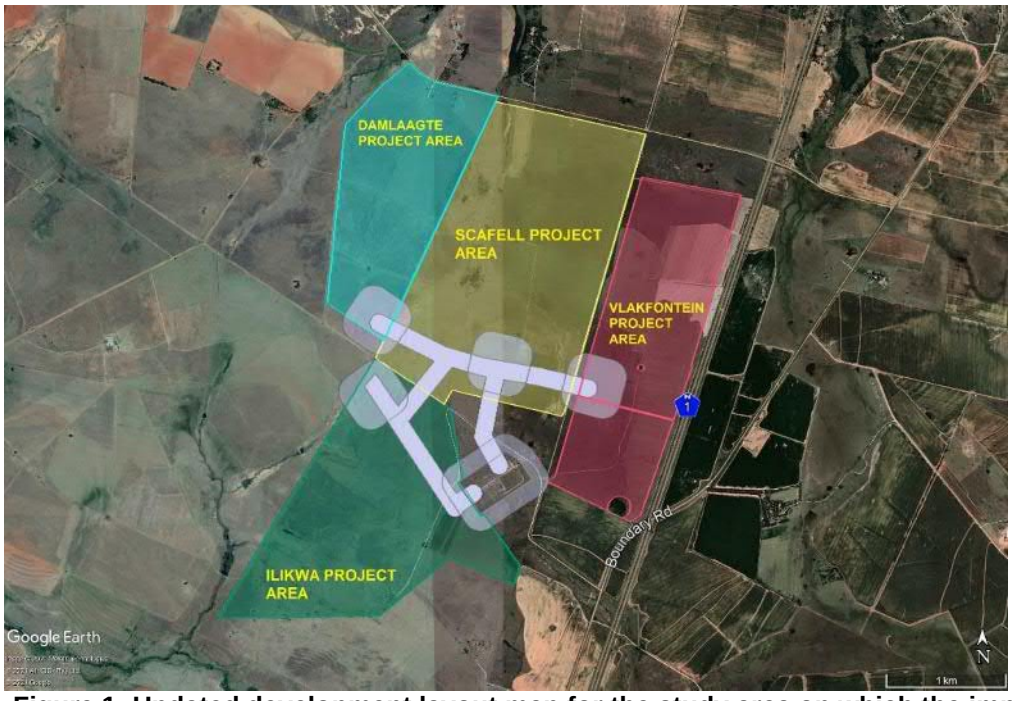


Figure 1: Updated development layout map for the study area on which the impact assessment is based.

Vegetation characteristics:

During the field assessment, three broad habitat units, with associated subunits, were identified. The units within the study area are:

1) Transformed Habitat;
2) Grassland habitat;
    - Degraded Grassland;
    - *Seriphium*-dominated Grassland;
    - *Themeda*-rich Grassland; and
3) Freshwater Habitat.

The following represents the habitat units associated with the four different PV facility projects.

Habitat unit / PV facility	Transformed Habitat	Grassland Habitat			Freshwater Habitat
		Degraded Grassland	*Seriphium*-dominated Grassland	*Themeda*-rich Grassland	
Scafell PV facility		X	X	X	X
Damlaagte PV Facility		X	X		
Vlakfontein PV Facility	X		X	X	X
Ilikwa PV facility		X	X	X	X

From a floral perspective, the Transformed Habitat scored a low sensitivity, the Degraded Grassland Subunit scored a moderately low sensitivity, the *Seriphium*-dominated Grassland Subunit scored an intermediate sensitivity and the *Themeda*-rich Grassland Subunit and the Freshwater Habitat Unit both scored a moderately high sensitivity. In terms of fauna, it is considered that the Freshwater Habitat unit was of moderately high sensitivity while the *Seriphium*-dominated Grassland and the *Themeda*-rich Grassland Subunits scored an intermediate sensitivity. The Transformed Habitat was the least sensitive and is of low sensitivity. Lastly the Degraded Grassland is of moderately low sensitivity.

Conservation significance of the study area:

According to Mucina and Rutherford (2018 database), the entire study area falls within the vulnerable Soweto Highveld Grassland (i.e., the reference state). The proposed development will occur within the Soweto Highveld Grassland which is listed as a threatened ecosystem (National Threatened Ecosystems, 2011, and NBA, 2018), and is classified as **vulnerable**. The study area is further associated with Critical Biodiversity Area 2 (CBA2) and Ecological Support Area 1 & 2 (ESA1 & ESA2) as per the 2015 Free State Biodiversity.

According to the Free State Biodiversity Plan, i) the Scafell PV Facility is associated with areas classified as CBA2, ESA1, and ESA2, ii) the Damlaagte PV Facility is associated with areas classified as ESA1, ESA2, and "Degraded Areas", iii) the Vlakfontein PV Facility is associated with areas classified as CBA2, ESA1, ESA2 and "Degraded Areas", and iv) the Ilikwa PV Facility is associated with areas classified as ESA1, ESA2 and "Other Areas".

Based on the results of the field assessment, the vegetation communities within the Transformed Habitat Unit, the Degraded Grassland and the *Seriphium*-dominated Grassland Subunits no longer represent the reference vegetation type as both species composition and vegetation structure have been modified due to historic and current impacts. However, the *Themeda*-rich Grassland Subunit, although not fully representative of the reference vegetation type, shares an affinity with the Soweto Highveld Grassland in terms of forb and grass species composition.

Species diversity and habitat integrity **per Solar PV Facility and associated Grid Corridors**:

Scafell PV Facility: three habitat units/subunits were located within this PV Facility: *Seriphium*-dominated Grassland Subunit (intermediate Sensitivity), *Themeda*-rich Grassland Subunit (moderately high sensitivity) and a large area of Freshwater Habitat (moderately high sensitivity). Development within this PV Facility will result in the greatest loss to both the *Themeda*-rich Grassland Subunit and the Freshwater Habitat Units well as the potential loss of suitable habitat for several floral SCC that are associated with the habitat units / subunits. From a faunal perspective this PV Facility comprised of the greatest diversity of fauna and preserved the most valuable habitat for faunal SCC (both breeding and feeding). Maintaining movement corridors for fauna between portions of the *Seriphium*-dominated Grassland Subunit and the *Themeda*-rich Grassland Subunit are important to maintain ecological processes and services.

Damlaagte PV Facility: three habitat units/subunits were located within this PV Facility: The Transformed Habitat Unit (low sensitivity), Degraded Grassland Subunit (moderately low sensitivity), and large areas of the *Seriphium*-dominated Grassland Subunit (intermediate Sensitivity). Development within this Area will result in the greatest loss to the *Seriphium*-dominated Grassland Subunit. A large section of this PV Facility comprises the Degraded Grassland Subunit in which AIP species are prolific. AIP management and control during and post construction of any development within this area is of particular importance. Although no SCC were recorded within this PV Facility, suitable habitat for several floral SCC species is present, particularly within the *Seriphium*-dominated Grassland habitat.

The homogenous nature of the landscape and the reduced areas of sensitive faunal habitat with limited movement corridors, competition from domestic grazers and limited shelter do not lend themselves to maintaining high faunal diversity. Thus, impacts to fauna within this portion will be lower in their impact rating as compared to Scaffel and Ilikwa.

Vlakfontein PV Facility: four habitat units/subunits, including the Transformed Habitat (low sensitivity), *Seriphium*-dominated Grassland Subunit (intermediate Sensitivity), *Themeda*-rich Grassland Subunit (moderately high sensitivity) and a small area of Freshwater Habitat (moderately high sensitivity) were located within this PV Facility. Development within this PV Facility will result in the potential loss of suitable habitat for several floral SCC that are associated with the habitat units / subunits within the PV Facility. The small extent of *Seriphium*-dominated Grassland Subunit and *Themeda*-rich Grassland Subunit and the remaining transformed habitat adjacent a National highway reduces the faunal sensitivity of the farm portion. Faunal SCC may utilise this farm portion temporarily for foraging but it unlikely that breeding will occur here.

Ilikwa PV Facility: five habitat units/subunits were located within this PV Facility: The Degraded Grassland Subunit (moderately low sensitivity), *Seriphium*-dominated Grassland Subunit (intermediate Sensitivity), *Themeda*-rich Grassland Subunit (moderately high sensitivity) and a small area of Freshwater Habitat (moderately high sensitivity). The Damlaagte PV Facility comprises of sections of both the Degraded Grassland Subunit and the Transformed Habitat Unit in which AIP species are prolific. AIP management and control during and post construction of any development within this area is of particular importance. Development within this PV Facility will result in the potential loss of suitable habitat for several floral SCC that are associated with the habitat units / subunits associated with the PV Facility (particularly the *Seriphium*-dominated and the *Themeda*-rich Grassland subunits). Faunal diversity within the *Seriphium*-dominated Grassland Subunit and *Themeda*-rich Grassland Subunit within the northern portion of the study area maintain important processes and functions. Impacts to these areas should be limited and movement of fauna should be maintained to preserve the integrity of these subunits.

Species of Conservation Concern (SCC):

The Online National Web-Based Environmental Screening Tool for the study area indicated that the **Plant Species Theme** is of medium sensitivity (in which Sensitive species 691[1] and Sensitive species 1252 are potentially located). The **Animal Species Theme** was of medium sensitivity, and *Lepidochrysops procera* (Potchefstroom Blue) was identified as a potential SCC within the area by the screening tool. The **Terrestrial Biodiversity Theme** was of a very high sensitivity. Triggered features of this theme include the presence of CBA2, ESA1, ESA2, and a vulnerable ecosystem (i.e., the Soweto Highveld Grassland).

No nationally threatened SCC (i.e., Red Data Listed plants), as defined in Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), or protected trees as defined by the National Forest Act, 1998 (Act No. 84 of 1998) (NFA) were recorded during the site assessment and it is unlikely that suitable habitat for such species is available within the study area. Several provincially protected species (as listed below) as listed in Schedule 6 (Protected Plants) of the Free State Nature Conservation Ordinance, 1969 (Ordinance No. 8 of 1969) (FSNCO) were observed in the study area.

Provincial floral SCC as per the FSNCO that were recorded in each PV Facility are provided below:

- **Scafell PV Facility**: *Aloe davyana, Crinum bulbispermum, Helichrysum chionosphaerum*, *Helichrysum acutatum* and *Boophone disticha;*
- **Damlaagte PV Facility***: Crinum bulbispermum*, *Helichrysum chionosphaerum* and *Helichrysum acutatum;*

[1] The Department of Environmental Affairs screening tool provides names of sensitive species likely to be present within the study area and its surrounds. Within the screening tool outcome, the names of some species are not provided, and these species are rather assigned a number keeping them unidentifiable (e.g., Sensitive species 1). This procedure is attributed to the vulnerability of the species to threats such as illegal harvesting and overexploitation. According to the best practise guidelines provided by South African National Biodiversity Institute (SANBI), the name 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 the species has been provided

- **Vlakfontein PV Facility**: *Crinum bulbispermum, Helichrysum chionosphaerum*, *Helichrysum acutatum* and *Boophane disticha; and*
- **Ilikwa PV Facility**: *Aloe davyana, Crinum bulbispermum, Helichrysum chionosphaerum*, *Helichrysum acutatum* and *Boophane disticha.*

Permits will be required should any of the protected species be removed, destroyed, or relocated with the Department Forestry, Fisheries, and the Environment (DFFE) and the Department of Economic Development, Tourism and Environmental Affair (DESTEA). It is recommended that a walkdown of the footprint area is conducted prior to construction activities commencing, where these species are marked for rescued and relocated (permit application will be required). If rescue and relocation activities are successful, the anticipated impact on the populations of provincially protected flora will be minimal.

Several listed fauna SCC, which include, Antbear (*Orycteropus afer*, P[2]), Lanner Falcon (*Falco biarmicus*, VU), Secretarybird (*Sigattarius serpentarius*, VU) and Black-winged Pratincole (*Glareola nordmanni*, VU) do have suitable foraging habitat within the study area and will not be restricted to a particular farm portion. The African Marsh Harrier (*Circus ranivorus*, EN), African Grass Owl (*Tyto capensis*, VU) and African Bullfrog (*Pyxicephalus adspersus*, P) do have suitable breeding habitat within the Freshwater Habitat, mostly restricted to the Scafell farm portion. Lastly, *Harpactira hamiltoni* (Golden Starburst Baboon Spider, P) is likely to breed within the study area throughout the broad grassland habitat unit.

Floral Impact Assessment Results per Solar PV Facility and associated Grid Corridors:

The Impact assessment was conducted for each PV Facility based on the amended layout (as illustrated in the map above)

Scafell PV Facility: Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between **very high** and **medium**. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity for the study area (particularly within the Scafell boundary) can mostly be reduced to **very high** and **very low** significance. Impact on floral SCC varies significantly between the habitat units. Prior to mitigation measures implemented, impact significance on floral SCC varies between **very high** and **low**. With mitigation measures implemented, the impact significance can be reduced to **medium** and **very low.**

Damlaagte PV Facility: Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between **medium** and **very low**. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity for the Damlaagte Solar PV Facility can mostly be reduced to **very low** and **insignificant** impact levels. Impact on floral SCC varies significantly between the habitat units. Prior to mitigation measures implemented, impact significance on floral SCC varies between **medium** and **very low**. With mitigation measures implemented, the impact significance can be reduced to **very low** and **insignificant.**

Vlakfontein PV Facility: Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between **high** and **low**. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity for the Vlakfontein Solar PV Facility can mostly be reduced to **medium** and **low** impact levels. Impact on floral SCC varies significantly between the habitat units. Prior to mitigation measures implemented, impact significance on floral SCC varies between **medium** and **low**. With mitigation measures implemented, the impact significance can be reduced to **very low** and **insignificant.**

Ilikwa PV Facility: Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between **high** and **low**. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity for the Ilikwa Solar PV Facility can mostly be reduced to **medium** and **very low** impact levels. Impact on floral SCC varies significantly between the habitat units. Prior to mitigation measures implemented, impact significance on floral SCC varies between **high** and **low**. With mitigation measures implemented, the impact significance can be reduced to **medium** and **very low.**

[2] Protected

Faunal Impact Assessment Results per Solar PV Facility and associated Grid Corridors:

Scafell PV Facility: Prior to mitigation measures being implemented, impact significance on faunal habitat and diversity varies between **very high** and **high** for the more impactful construction and operational and maintenance phases. With mitigation measures implemented, the direct and indirect impacts on the faunal habitat and diversity for the study area (particularly within the Scafell boundary) can mostly be reduced to **high and low** significance. Impact on faunal SCC varies significantly between the habitat units Prior to mitigation measures implemented, impact significance on faunal SCC varies between **very high** and **high**. With mitigation measures implemented, the impact significance can be reduced to **high** and **low.**

Damlaagte PV Facility: Prior to mitigation measures being implemented, impact significance on faunal habitat and diversity varies between **high** and **very low** for the more impactful construction and operational and maintenance phases. With mitigation measures implemented, the direct and indirect impacts on the faunal habitat and diversity for the Damlaagte Solar PV Facility can mostly be reduced to **low** and **very low** impact levels. Impact on faunal SCC varies significantly between the habitat units Prior to mitigation measures implemented, impact significance on faunal SCC varies between **low** and **very low**. With mitigation measures implemented, the impact significance can be reduced to **low** and **very low.**

Vlakfontein PV Facility: Prior to mitigation measures being implemented, impact significance on faunal habitat and diversity varies between **high** and **very low** for the more impactful construction and operational and maintenance phases. With mitigation measures implemented, the direct and indirect impacts on the faunal habitat and diversity for the Vlakfontein Solar PV Facility can mostly be reduced to **low** and **very low** impact levels. Impact on faunal SCC varies significantly between the habitat units Prior to mitigation measures implemented, impact significance on faunal SCC varies between **low** and **very low**. With mitigation measures implemented, the impact significance can be reduced to **low** and **very low.**

Ilikwa PV Facility: Prior to mitigation measures being implemented, impact significance on faunal habitat and diversity varies between **very high** and **high** for the more impactful construction and operational and maintenance phases. With mitigation measures implemented, the direct and indirect impacts on the faunal habitat and diversity for the Ilikwa Solar PV Facility can mostly be reduced to **high** and **low** impact levels. Impact on faunal SCC varies significantly between the habitat units Prior to mitigation measures implemented, impact significance on faunal SCC varies between **very high** and **high**. With mitigation measures implemented, the impact significance can be reduced to **medium** and **low.**

Development constraints and opportunities:

Development opportunities within the study area are possible and can be optimised in areas of low to moderately low sensitivity, which are associated with the Degraded Grassland and Transformed Habitat. Development of areas of intermediate sensitivity can be optimised depending on the surrounding habitat: where links between habitats of intermediate sensitivity and moderately high sensitivity occur (e.g., within Scafell, north of the Ilikwa and eastern boundary of the Damlaagte PV Facilities), development should be avoided. In areas in which in habitat of intermediate sensitivity link with less sensitive habitat, particularly the Degraded Grassland and the Transformed habitat (as is present on the Vlakfontein PV Facility, Damlaagte PV Facility, and the southern parts of the Ilikwa PV Facility), development can be optimised.

Concluding Remarks:

From a floral perspective, the Scafell PV Facility is deemed to receive the greatest negative impacts in which the largest portions of habitats of moderately high sensitivity, namely the *Themeda*-rich Grassland Subunit and the Freshwater Habitat, will be impacted. Furthermore, CBA2, ESA1 & ESA2 habitat will be greatly impacted if the proposed development is authorized within this PV facility.The remaining three PV facilities are of lower sensitivity given that they support larger areas of habitats with a lower sensitivity, namely the Transformed Habitat, the Degraded Grassland, and the *Seriphium*-dominated Grassland Subunits.

From a faunal perspective it is deemed that the farm portions Vlakfontein and Damlaagte comprise of faunal compositions which are of lower sensitivity than those within the Scafell and Ilikwa because of the homogenous nature of the vegetation, previous agricultural transformation, and the reduced abundance of niche habitat. To a large extent this situation is mimicked within Ilikwa. However, within the Ilikwa farm portion sensitive faunal habitat are located within the Central and north-eastern portions of the farm where higher floral diversity improves faunal habitat. Should large portions within the central and northeastern sections of this farm be transformed without consideration for corridors and faunal movement high impacts will occur. Within Scafell a large wetland system transvers the farm portion diagonally offering valuable habitat, niche habitat and a corridor for movement of fauna. Perceived impacts to on the floral and faunal habitat, diversity and SCC will be greatest within this farm portion as it comprises of the most diverse and species rich habitat.

It is the opinion of the ecologists that this study provides 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 study area will be made in support of the principle of sustainable development.

SCIENTIFIC TERRESTRIAL SERVICES

Reg No. 2005/122/329/23
VAT Reg No. 4150274472
PO Box 751779
Gardenview
2047
Tel: 011 616 7893
Fax: 086 724 3132
Email: admin@sasenvgroup.co.za
www.sasenvironmental.co.za

BIODIVERSITY ASSESSMENT AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE DEVELOPMENT OF THE SCAFELL CLUSTER, SOLAR PHOTOVOLTAIC FACILITY, FREE STATE PROVINCE

Prepared for

SLR Consulting (Pty) Ltd.

June 2021

Part A: Background Information

Prepared by: Scientific Terrestrial Services
Report author S. L. Daniels
Report reviewers C. Steyn (Pr.Sci.Nat)
N. Cloete (Pr.Sci.Nat)
Report Reference: STS 200077

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.

No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
Theme-Specific Requirements as per Government Notice No. 320 Terrestrial Biodiversity Theme – Very High Sensitivity Rating as per Screening Tool Output		
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 B1-4**: Section 3 (flora) **Part C1-4:** Section 3 (fauna)
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	**Part B1-4**: Section 3 (flora) **Part C1-4:** 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 B1-4**: Section 3 (flora) **Part C1-4:** 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 B1-4:** Section 3.1 – 3.4 (flora) **Part C1-4:** Section 3.2 – 3.7 (fauna)
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;	**Part A**: Section 3 (desktop analysis) **Part B1-4**: Section 3 (flora) **Part C1-4:** 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	Not Applicable.
2.3.7	**The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:**	
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: *a) the reasons why an area has been identified as a CBA;* *b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;* *c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);* *d) the impact on ecosystem threat status;* *e) the impact on explicit subtypes in the vegetation;* *f) the impact on overall species and ecosystem diversity of the site; and*	**Part A**: Section 3 **Part B1-4**: Section 3; Section 5.3.3 **Part C1-4:** Section 3

No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
	g) *the impact on any changes to threat status of populations of species of conservation concern in the CBA;*	
2.3.7.2	Terrestrial Ecological Support Areas (ESAs), including: *a) the impact on the ecological processes that operate within or across the site;* *b) the extent the proposed development will impact on the functionality of the ESA; and* c) *loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;*	
2.3.7.3	Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- *a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;*	**Part A**: Section 3 (desktop analysis) **Part B1-4**: Not applicable **Part C1-4:** Not applicable
2.3.7.4	Priority areas for protected area expansion, including- *a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;*	**Part A**: Section 3 (desktop analysis)
2.3.7.5	SWSAs including: *a) the impact(s) on the terrestrial habitat of a SWSA; and* b) *the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);*	Not Applicable
2.3.7.6	FEPA sub catchments, including- *a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;*	Not Applicable
2.3.7.7	Indigenous forests, including: *a) impact on the ecological integrity of the forest; and* b) *percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.*	Not Applicable
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 B1-4:** Section 1.4 (flora) **Part C1-4:** Section 1.3 (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 B1-4:** Section 2 (flora) **Part B1-4:** Appendix A (flora) **Part C1-4:** Section 2 (fauna) **Part C1-4**: 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 B1-4:** Section 1.4 (flora) **Part C1-4:** Section 1.3 (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 B1-4:** Section 4 (flora) **Part C:** Section 4 (fauna)
	Impact Assessment Requirements	**Part B1-4:** Section 5 (flora) **Part C1-4:** Section 5 (fauna)

No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
	3.1.7 Additional environmental impacts expected from the proposed development; 3.1.8 Any direct, indirect and cumulative impacts of the proposed development; 3.1.9 The degree to which impacts and risks can be mitigated; 3.1.10 The degree to which the impacts and risks can be reversed; 3.1.11 The degree to which the impacts and risks can cause loss of irreplaceable resources; 3.1.12 Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	
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 to this report**
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 B1-4:** Section 5 (flora) **Part C1-4:** Section 5 (fauna)
3.1.15	Any conditions to which this statement is subjected.	**Part B1-4:** Section 5.4 (flora) **Part C1-4:** Section 5 (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.	**Not Applicable to this report**
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	**Not Applicable to this report**

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

GLOSSARY OF TERMS

Most definitions are based on terms and concepts elaborated by Richardson *et al*. (2011), Hui and Richardson (2017) and Wilson *et al*. (2017), 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), and the associated Alien and Invasive Species (A&IS) 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 also 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 is therefore important in terms of habitat conservation.
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 No. 10 of 2004), Alien and Invasive Species (A&IS) 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).
Red Data listed (RD) 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

AICP	Alien and Invasive Control Plans
BGIS	Biodiversity Geographic Information Systems
BMP	Biodiversity Management Plan
BESS	Battery Energy Storage System
BotSoc	Botanical Society of South Africa
CARA	Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
CBA	Critical Biodiversity Area
CEM	Certificate in Environmental Law for Environmental Managers
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
E-GIS	Environmental Geographical Information Systems
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
ESA	Ecological Support Area
FSNCO	Free State Nature Conservation Ordinance, 1969 (Ordinance No. 8 of 1969)
GIS	Geographic Information System
GPS	Global Positioning System
GSSA	Grassland Society of South Africa
Ha	Hectare
IAIAsa	International Affiliation for Impact Assessments South Africa Group
IBA	Important Bird Area
IEM	Integrated Environmental Management
IUCN	International Union for the Conservation of Nature
MAMSL	Meters Above Mean Sea Level
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential for Evaporation
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
NBA	National Biodiversity Assessment
NFA	National Forest Act, 1998 (Act No. 84 of 1998)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004)
NPAES	National Protected Areas Expansion Strategy
PRECIS	Pretoria Computer Information Systems
PV	Photovoltaic
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
SAAB	South Africa Association of Botanists
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
SWSA	Strategic Water Source Area
STS	Scientific Terrestrial Services CC
TOPS	Threatened or Protected species (in terms of NEMBA)
WSA	Water Source Area

1 INTRODUCTION

Scientific Terrestrial Services (STS) was appointed to conduct a Baseline Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) and Environmental Authorisation (EA) process for the development of four solar photovoltaic (PV) facilities, namely Damlaagte Solar PV Facility, Scafell Solar PV Facility, Vlakfontein Solar PV Facility, and Ilikwa Solar PV Facility, which are collectively referred to as the "Scafell Cluster". The assessment also includes development of associated infrastructure (substations and powerline corridors). The Scafell Cluster and associated infrastructure will henceforth collectively be referred to as the "study area". The location and extent of the study area is indicated in Figures 1 and 2.

The study area is located approximately 19 km west of the town of Sasolburg in the Ngwathe Local Municipality which is an administrative area in the Fezile Dabi District Municipality of the Free State Province. The R59 run approximately 3.5 km south of the study area, and the N1 run immediately adjacent to the study area in the east. The proposed study area will cover an area of approximately 839 ha. For a detailed project description of all proposed development activities, please refer to Section 1.1 below.

The baseline results of the floral and faunal assessments (description of the floral and faunal habitat units, floral and faunal species of conservation concern assessment and habitat sensitivity analysis) are based on the initial layout provided by the proponent (i.e., Figure 3). After the completion of the baseline assessment, small changes to the proposed study area layout were made (Figure 7). The impacts associated with the development of the PV facilities are this based on the updated layout and will be presented separately for each of the four PV Facilities (namely Damlaagte Solar PV Facility, Scafell Solar PV Facility, Vlakfontein Solar PV Facility, and Ilikwa Solar PV Facility). Within each report (for each PV Facility), an impact discussion and assessment are presented of all potential pre-construction, construction, operational and maintenance phase impacts associated with the development of each Solar PV facility.

The purpose of this report (Part A) is to define the biodiversity of the study area 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 B1-4 and C1-4) 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).

1.1 Project Description

The proposed Scafell Cluster development entails the construction and operation of four solar PV facilities located within the Ngwathe Local Municipality of the Free State Province. The proposed solar energy projects (referred to above as the Scafell Cluster) consist of the following (Figure 3):

- Scafell solar PV facility located on Portion 3 of the Farm Will Grange 246;
- Damlaagte solar PV facility located on the remaining extent of the Farm Damlaagtes 229;
- Vlakfontein solar PV facility located on portion 6 of the Farm Vlakfontein 161; and
- Iliwa solar facility located on portion 5 of the farm Proceederfontein 100.

Each solar energy project will require a Battery Energy Storage System (BESS) and grid connection infrastructure (as listed below) to facilitate grid connection between each solar PV facility and the existing Scafell Substation. The associated infrastructure required for the Scafell Cluster includes:

- Additional Scafell substation;
- Damlaagte substation;
- Vlakfontein substation;
- Ilikwa substation;
- Suite collector substation; and
- Suite grid corridors.

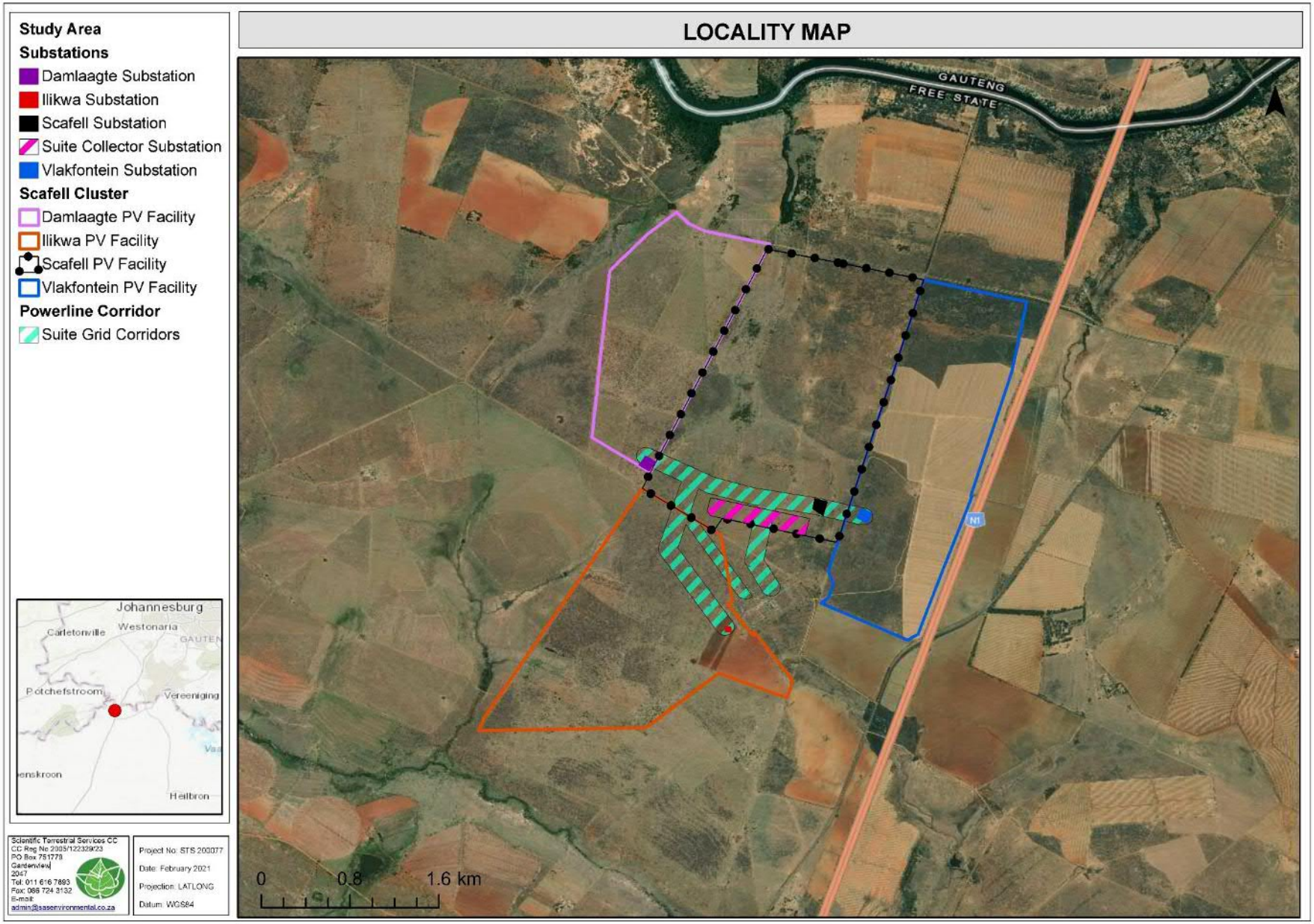


Figure 1: The study area in relation to the surrounding area.

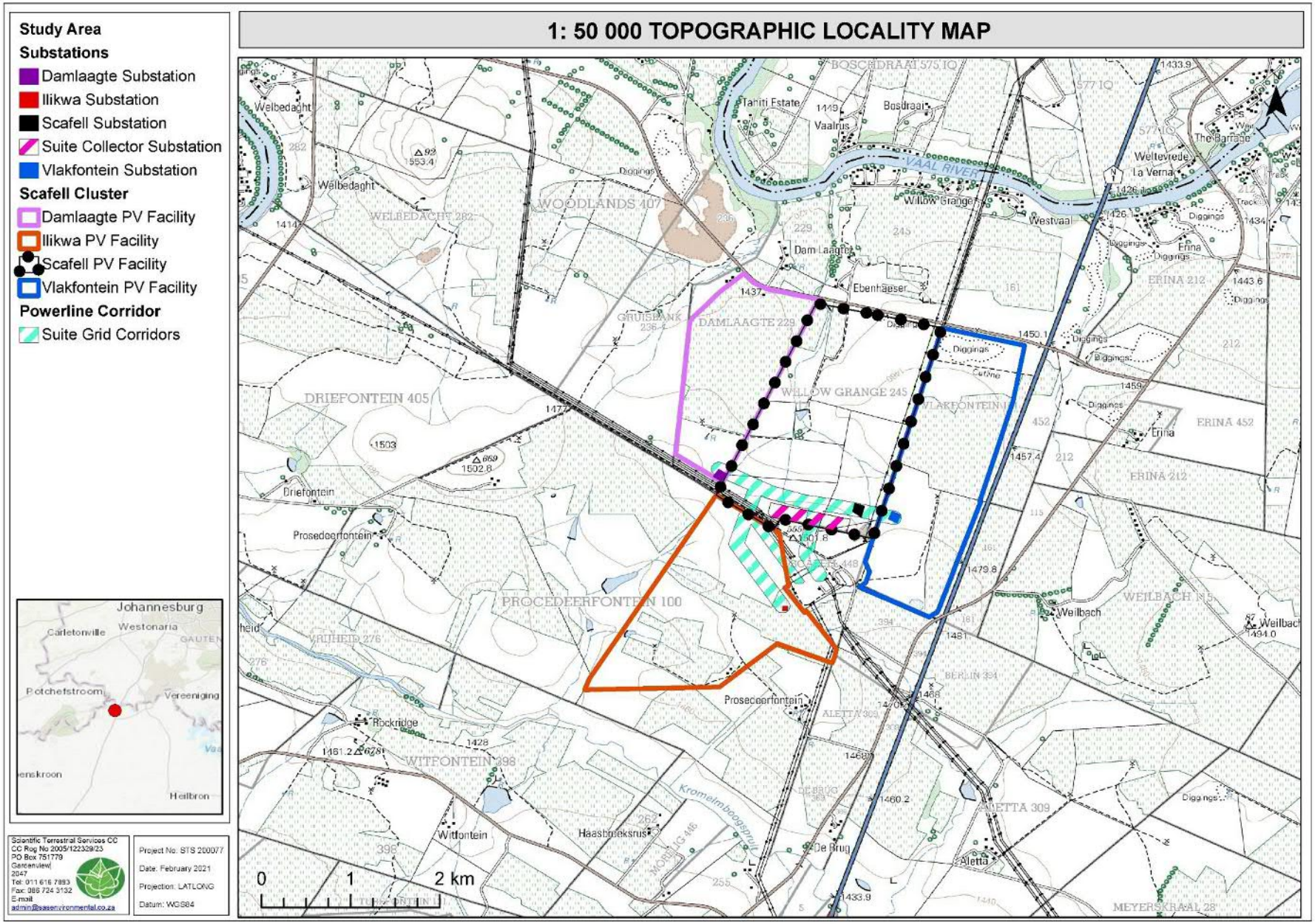


Figure 2: The study area depicted on a 1:50 000 topographical map in relation to the surrounding area.

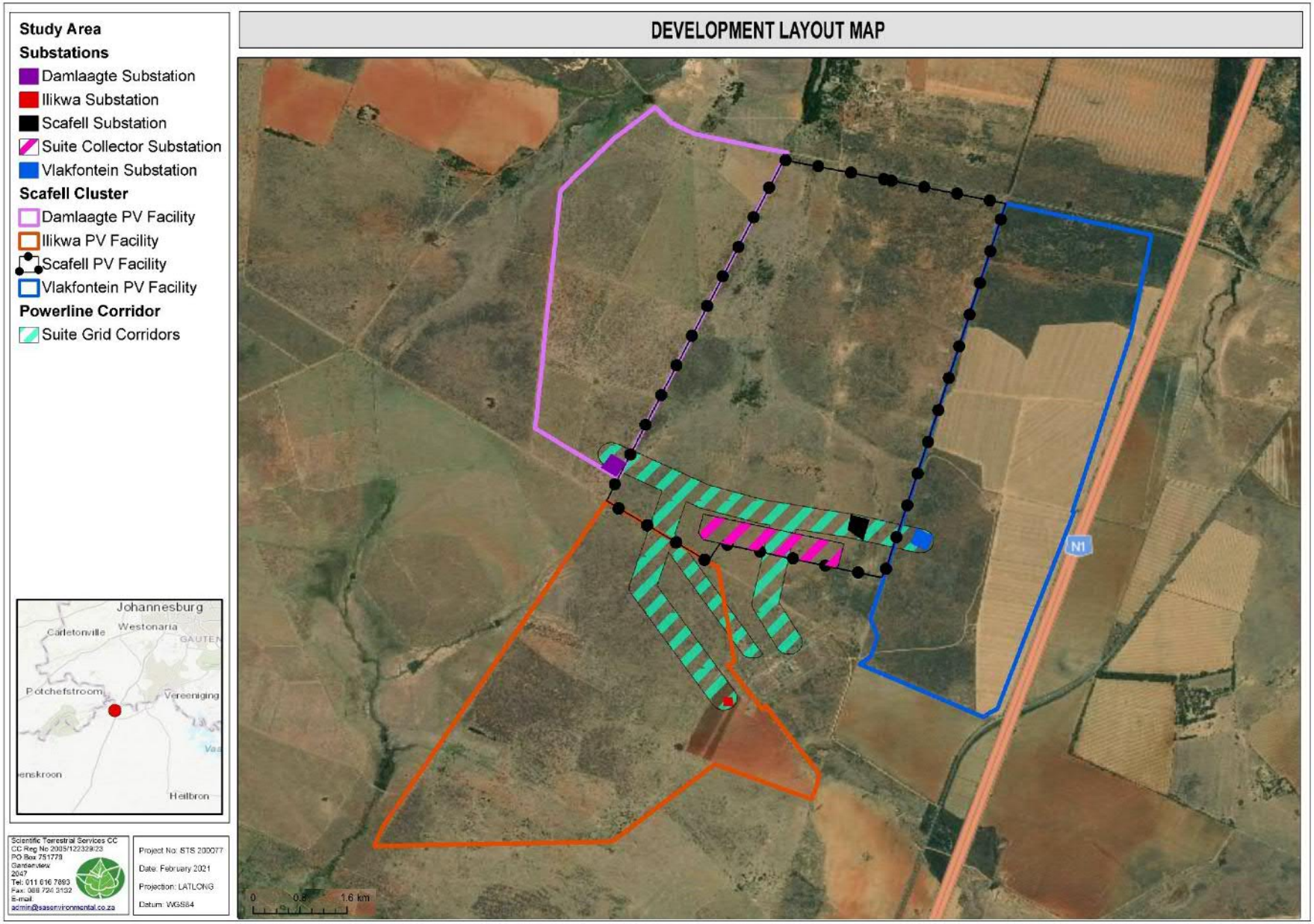


Figure 3: Initial proposed Scafell Cluster development layout within the study area.

1.2 Scope of Work

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

- To compile a desktop assessment with all relevant information as presented by the South African National Biodiversity Institute (SANBI) Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org) and the 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 study area;
- 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 will be applied in the floral and faunal assessments upon receipt of the final proposed layouts (Part B and Part C).

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The biodiversity desktop assessment is confined to the study area and does not include detailed results of the adjacent properties, although ecological important or sensitive areas according to the desktop databases of surrounding areas have been included on the relevant maps;
- This report presents the results of the biodiversity desktop assessment.
    - The floral assessments for the entire study area; and the impact assessment, for each of the Solar PV facility are presented separately in:
        - STS 200077. 2021a. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B1: Floral Impact Assessment for the Scafell Solar PV Facility**.
        - STS 200077. 2021b. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar

Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B2: Floral Impact Assessment for the Damlaagte Solar PV Facility**.

- STS 200077. 2021c. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B3: Floral Impact Assessment for the Vlakfonetin Solar PV Facility**.
- STS 200077. 2021d. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B4: Floral Impact Assessment for the Ilikwa Solar PV Facility**.

- The faunal assessments for the entire study area; and the impact assessment, for each of the Solar PV facility are presented separately in:
  - STS 200077. 2021a Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021a. **Part C1: Faunal Impact Assessment for the Scafell Solar PV Facility**.
  - STS 200077. 2021b. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021b. **Part C2: Faunal Impact Assessment for the Damlaagte Solar PV Facility**.
  - STS 200077. 2021c. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021c. **Part C3: Faunal Impact Assessment for the Vlakfonetin Solar PV Facility**.
  - STS 200077. 2021d. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell

Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021d. **Part C4: Faunal Impact Assessment for the Ilikwa Solar PV Facility**.

- 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 actual site characteristics within the study area at the scale required to inform an environmental process. However, this information is useful as background information to the study and, based on the desktop results, sufficient decision making can take place with regards to the proposed infrastructure development; and
- The field assessment was undertaken during summer (5^{th} – 8^{th} January 2021). The field assessment aimed to determine the ecological status of the study area, and to "ground-truth" the results of the desktop assessment.

1.4 Legislative Requirements

The following legislative requirements were considered during the assessment:

- The Constitution of the Republic of South Africa, 1996[3];
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
- Government Notice R598 Alien and Invasive Species Regulations as published in the Government Gazette 37885 dated 1 September 2014[4] as it relates to the National Environmental Management Biodiversity Act, 1998 (Act No. 107 of 1998);
- The National Forest Act, 1998 (Act No. 84 of 1998) (NFA);
- The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA);
- Government Notice 536 List of Protected Tree Species as published in the Government Gazette 41887 dated 7 September 2018 as it relates to the National Forest Act, 1998 (Act No. 84 of 1998);
- 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;
- Government Notice No. 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant and Terrestrial Animal Species as published in Government Gazette 43855 dated 30 October 2020; and
- The Free State Nature Conservation Ordinance, 1969 (Ordinance No. 8 of 1969) (FSNCO).

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 in order to determine broad habitats, vegetation types and potentially sensitive sites. The biodiversity

[3] 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.

[4] From 1st March 2021, the new regulations will come into force, i.e., Government Notice number R.1020: Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25 September 2020 as it relates to the NEMBA.

desktop assessment is confined to the study area 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 study area includes [5]:

- The National Protected Areas Expansion Strategy (NPAES) focus areas for Protected Area Expansion, 2010 (Formally and Informally Protected Areas):
- The South African Conservation Areas Database, Quarter 2 (SACAD, 2020);
- The South African Protected Areas Database, Quarter 2 (SAPAD, 2020);
- 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland:
  - Biomes, Bioregions and Vegetation Type(s);
- The National Threatened Ecosystems (2011);
- The National Biodiversity Assessment (NBA, 2018);
- Important Bird and Biodiversity Areas (IBAs) (2015), in conjunction with the South African Bird Atlas Project (SABAP2);
- The International Union for Conservation of Nature (IUCN); and
- The 2015 Free State Terrestrial CBAs.

The field assessment took place during summer (5th - 9th January 2020) to determine the ecological status of the study area and to "ground-truth" the results of the desktop assessment. Results of the field assessment is presented in Parts B and C.

3 RESULTS OF THE DESKTOP ANALYSIS

3.1 Conservation Characteristics of the Study Area 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 1). The dashboard report aims to present concise summaries of the data on as few pages as possible in order to allow for improved assimilation of results by the reader to take place. Where required, further discussion and interpretation are provided.

[5] Datasets obtained from:
- SANBI BGIS. The South African National Biodiversity Institute - Biodiversity GIS (BGIS) [online]. URL: http://bgis.sanbi.org as retrieved in 2019; and
- uEnvironmental Geographical Information Systems (E-GIS) website. URL: https://egis.environment.gov.za/

Table 1: Summary of the biodiversity characteristics associated with the study area [Quarter Degree Squares (QDS) 2328DD].

<table>
<tr><th colspan="2">DETAILS OF THE STUDY AREA IN TERMS OF MUCINA & RUTHERFORD (SANBI, 2018c)</th><th colspan="6">DESCRIPTION OF THE VEGETATION TYPE RELEVANT TO THE STUDY AREA (MUCINA & RUTHERFORD 2006)</th></tr>
<tr><td>Biome</td><td>The study area is situated within the Grassland Biome.</td><td rowspan="2">Distribution</td><td colspan="5" rowspan="2">Mpumalanga, Gauteng (and to a very small extent also in neighbouring Free State and North-West) Provinces.</td></tr>
<tr><td>Bioregion</td><td>The proposed study area is situated within the Mesic Highveld Grassland Bioregion.</td></tr>
<tr><td>Vegetation Type</td><td>The proposed study area falls within the Soweto Highveld Grassland vegetation type.</td><td rowspan="3">Climate</td><td colspan="5">Summer-rainfall region. Cool-temperate climate with high extremes between maximum summer and minimum winter temperatures, and frequent occurrence of frost.</td></tr>
<tr><td colspan="2">CONSERVATION DETAILS PERTAINING TO THE STUDY AREA (VARIOUS DATABASES)</td><td>MAP (mm)</td><td>MAT (°C)</td><td>MFD (days)</td><td>MAPE (mm)</td><td>MASMS (%)</td></tr>
<tr><td rowspan="2">National Threatened Ecosystems (2011)</td><td rowspan="2">According to the National Threatened Ecosystem Dataset, the study area is situated within the Soweto Highveld Grassland, which is considered a Vulnerable (VU) ecosystem and is currently Not Protected.

Listed under Criterion A1: Irreversible loss of natural habitat.

For EIAs, the 2011 National list of Threatened Ecosystems remains the trigger for a Basic Assessment in terms of Listing Notice 3 of the EIA Regulations 2014, as amended published under the National Environmental Management Act, 1998 (Act No. 107 of 1998). However, the updated 2018 ecosystem threat status have been considered in the assessment of impact significance in EIAs.

VU ecosystems have lost majority of their original extent in good ecological condition but have lost some structure and functioning.</td><td>662</td><td>14.8</td><td>41</td><td>2060</td><td>75</td></tr>
<tr><td>Altitude (m)</td><td colspan="5">1 420–1 760</td></tr>
<tr><td>National Biodiversity Assessment (2018) Figure 4</td><td>The study area, area falls within the remaining extent of the Soweto Highveld Grassland (VU), which is currently not protected.

Ecosystem types are categorised 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</td><td>Conservation</td><td colspan="5">Endangered as per Mucina and Rutherford (2006); however, according to the updated 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland the status has been changed to Vulnerable. 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, Leeukuil, Trichardtsfontein, Vaal, Willem Brummer). Erosion is generally very low (93%).</td></tr>
<tr><td></td><td></td><td>Geology & Soils</td><td colspan="5">Shale, sandstone or mudstone of the Madzaringwe Formation (Karoo Supergroup) or the intrusive Karoo Suite dolerites which feature prominently in the area. In the south, the Volksrust Formation (Karoo Supergroup) is found and in the west, the rocks of the older Transvaal, Ventersdorp and Witwatersrand Supergroups are most significant. Soils are deep, reddish on flat plains and are typically Ea, Ba and Bb land types.</td></tr>
</table>

	the Protected Areas Act, 2003 (Act No. 57 of 2003), and compared with the biodiversity target for that ecosystem type. 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 it as Moderately Protected; iii. If less than 50% of the biodiversity target is met, it is classified it as Poorly Protected; and iv. If less than 5% it is Hardly Protected.	**Vegetation & landscape features (Dominant Floral Taxa in Appendix B)**	Gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus*, *Eragrostis racemosa*, *Heteropogon contortus* and *Tristachya leucothrix*. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.
SAPAD (2020, Q2); SACAD (2020, Q2); NPAES (2009) Figure 5	According to the National Protected Areas Expansion Strategy (NPAES, 2009) database, the South African Protected Area Database (SAPAD, 2020_Q2) and the South African Conservation Areas Database (SACAD, 2020_Q2) the study area is located within 10 km of the following protected areas: Carry Blaire Bird Sanctuary and Nature Reserve, Cloudy Creek Bird Sanctuary and Nature Reserve, Klein Paradys Bird Sanctuary, and Savannah Game Ranch.		
IBA (2015)	The study area is not situated within an Important Bird and Biodiversity Area (IBA, 2015), nor is it located within 10 km of an IBA.		
NATIONAL WEB-BASED ENVIRONMENTAL SCREENING TOOL (2020)		**Plant Species**	For the Plant Species theme, the entire study area is within an area that has a **medium sensitivity**. Sensitive species identified by the Screening tool include: Sensitive species 691 and Sensitive species 1252.
The Screening Tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas.		**Animal Species**	For the Animal Species theme, a **medium sensitivity** was reported for the study area. Sensitive species identified by the Screening tool include: *Lepidochrysops procera* (Potchefstroom Blue).
		Terrestrial Sensitivity	The Terrestrial Sensitivity for the study area has a **very high sensitivity**. Triggered features include: Critical Biodiversity Area 2, Ecological Support Area 1, Ecological Support Area 2, and a vulnerable ecosystem

2015 FREE STATE TERRESTRIAL CBAs (FIGURE 6)			
Critical Biodiversity Areas (CBAs)	Sections located within the northern and southern parts of the Scafell PV Facility as well as a small section within the northeast of the Vlakfontein PV Facility are located within an area identified as a **CBA2**. Critical Biodiversity Areas (CBAs) are divided into two sub-categories: CBA1 and CBA2. CBA1s are irreplaceable, which means there are no other places in the landscape where the conservation and ecological objectives associated with those CBAs can be met. In CBA2s, there may be some options for meeting the conservation and ecological objectives associated with those CBAs in other parts of the landscape. However, this can only be done at the cost of losing some of the spatial efficiency of the network of CBAs. If a CBA2 is lost and an alternative natural area elsewhere is identified to become part of the CBA network, the alternative area is likely to be larger, increasing the size of the CBA-network. CBAs account for approximately 12% of the provinces land area.		
Ecological Support Areas (ESAs)	All potential PV facility Areas were in areas identified as both **ESA1** and **ESA2** areas. ESAs are areas of land that are considered important to ensure the long-term persistence of species or functioning of other important ecosystems. Areas identified as ESAs should be kept in at least semi-natural condition, i.e., with their basic ecological functioning still intact. ESAs account for approximately 53% of the provinces land area.		
Other Areas	A small section within the central western section of the Ilikwa PV Facility is located within an area identified as "**Other Areas**". Areas idented as "Other Areas" account for approximately 16% of the provinces land area.		
Degraded Areas	Small sections within the south west of the Vlakfontein PV Facility and the north east of the Damlaagte PV Facility are located within areas identified as Degraded. Areas classified as degraded are considered to no longer represent functioning ecosystems with intact or near-intact ecological and evolutionary processes. These areas are not in climax condition due to factors other than physical disturbance. Degraded Areas account for approximately 18% of the province's land area.		
STRATEGIC WATER SOURCE AREAS (SWSA) FOR SURFACE WATER (2017)			
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.	**Name & Criteria**	The study area is not within 10 km of a Strategic Water Source Area.	

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 Areas.

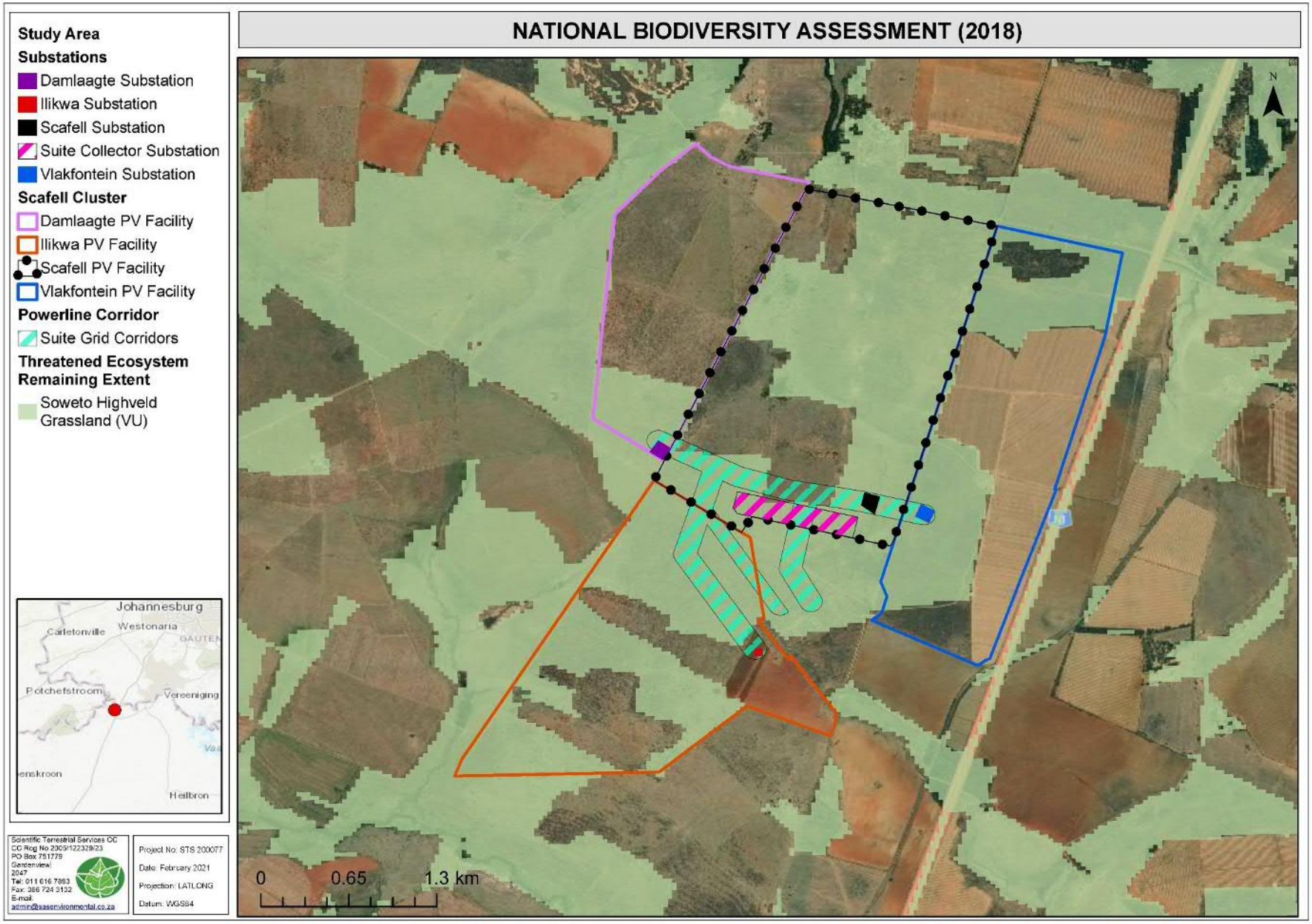


Figure 4: The remaining extent of the Soweto Highveld Grassland (VU), according to the National Biodiversity Assessment (NBA, 2018).

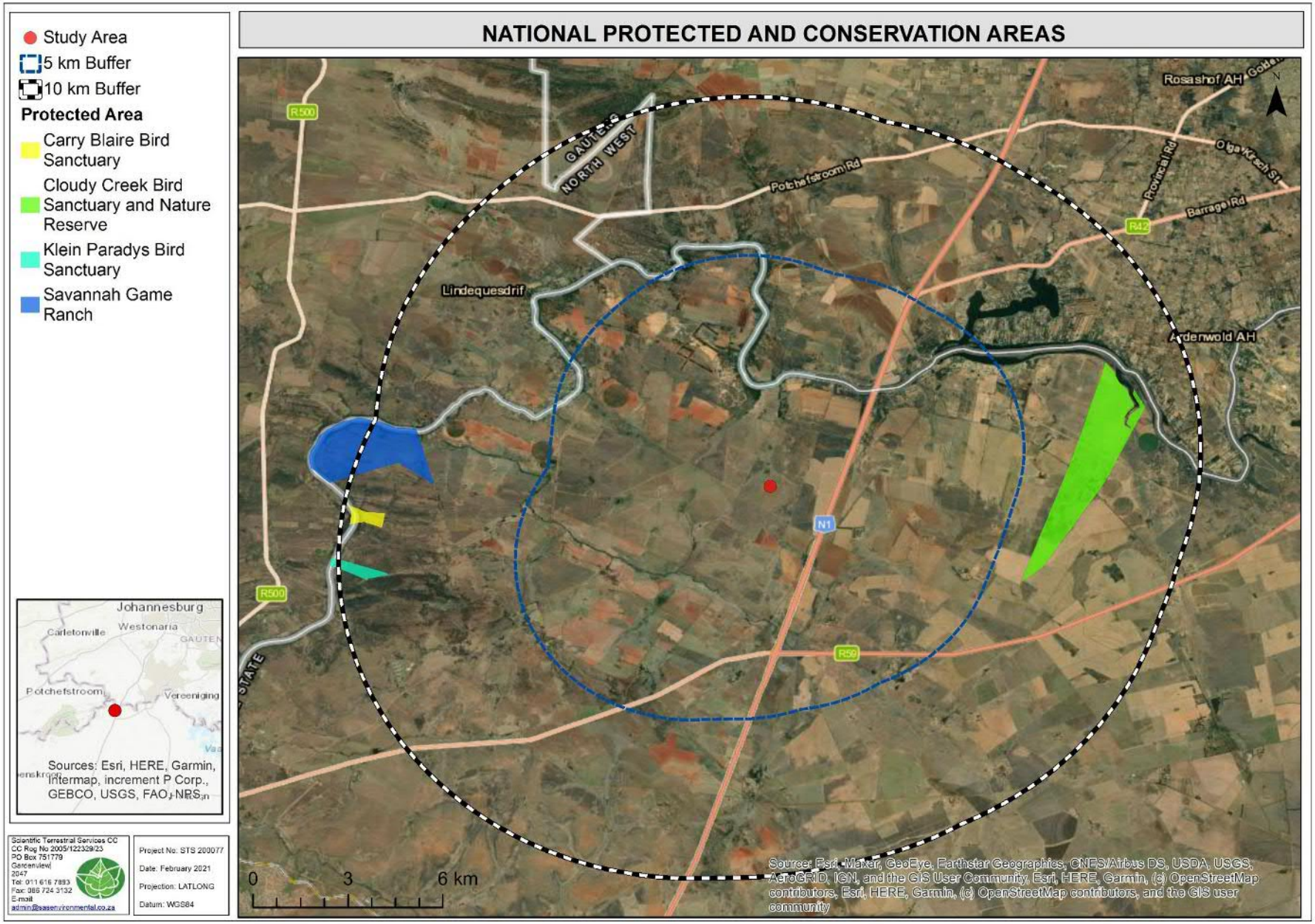


Figure 5: Protected Areas within 10 km of the study area (SAPAD, Q2, 2020).

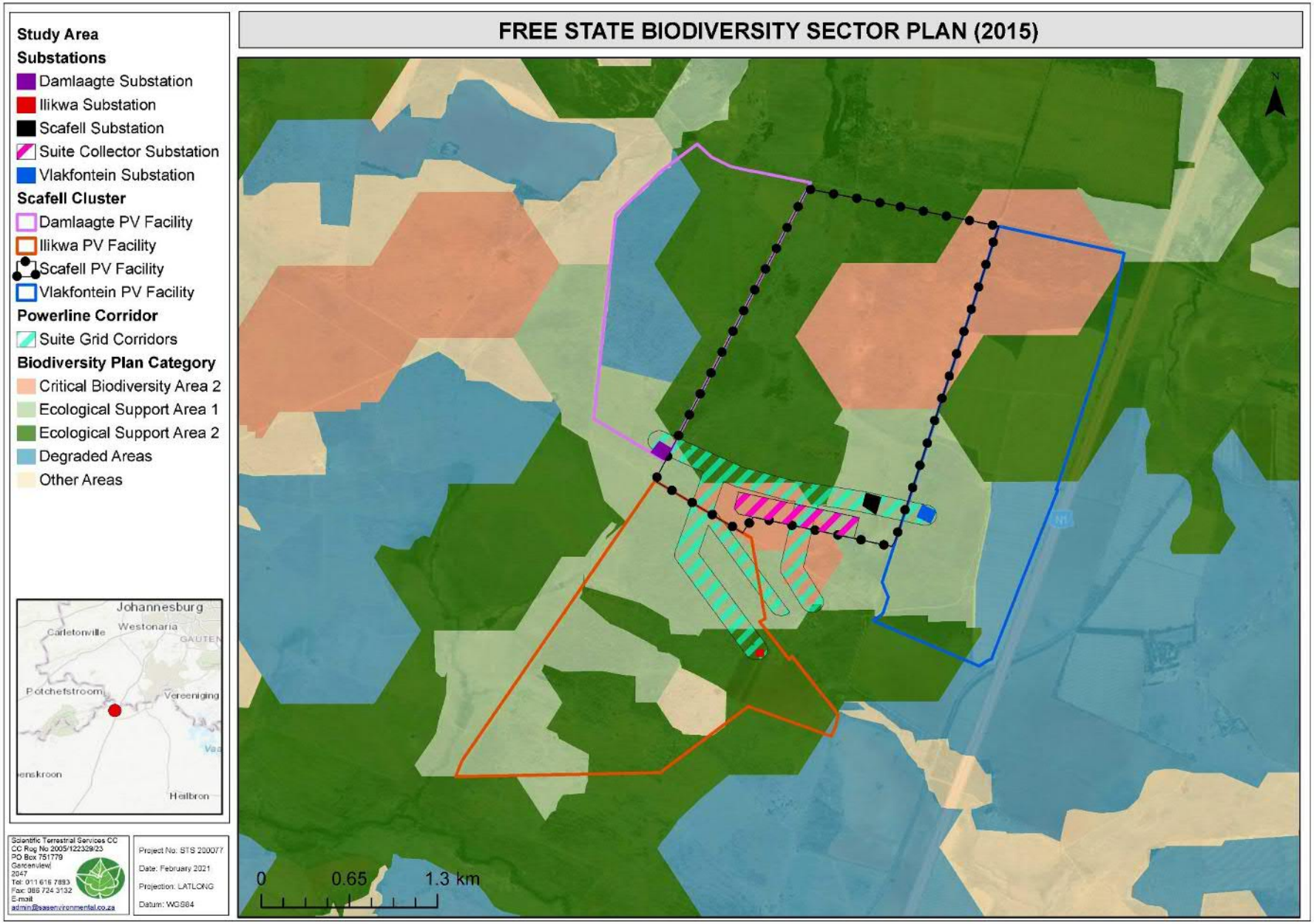


Figure 6: Importance of the study area according to the Free State Terrestrial CBAs (2015).

4 STRUCTURE OF THE BIODIVERSITY REPORT

Part A of this report served to introduce the study area, 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.

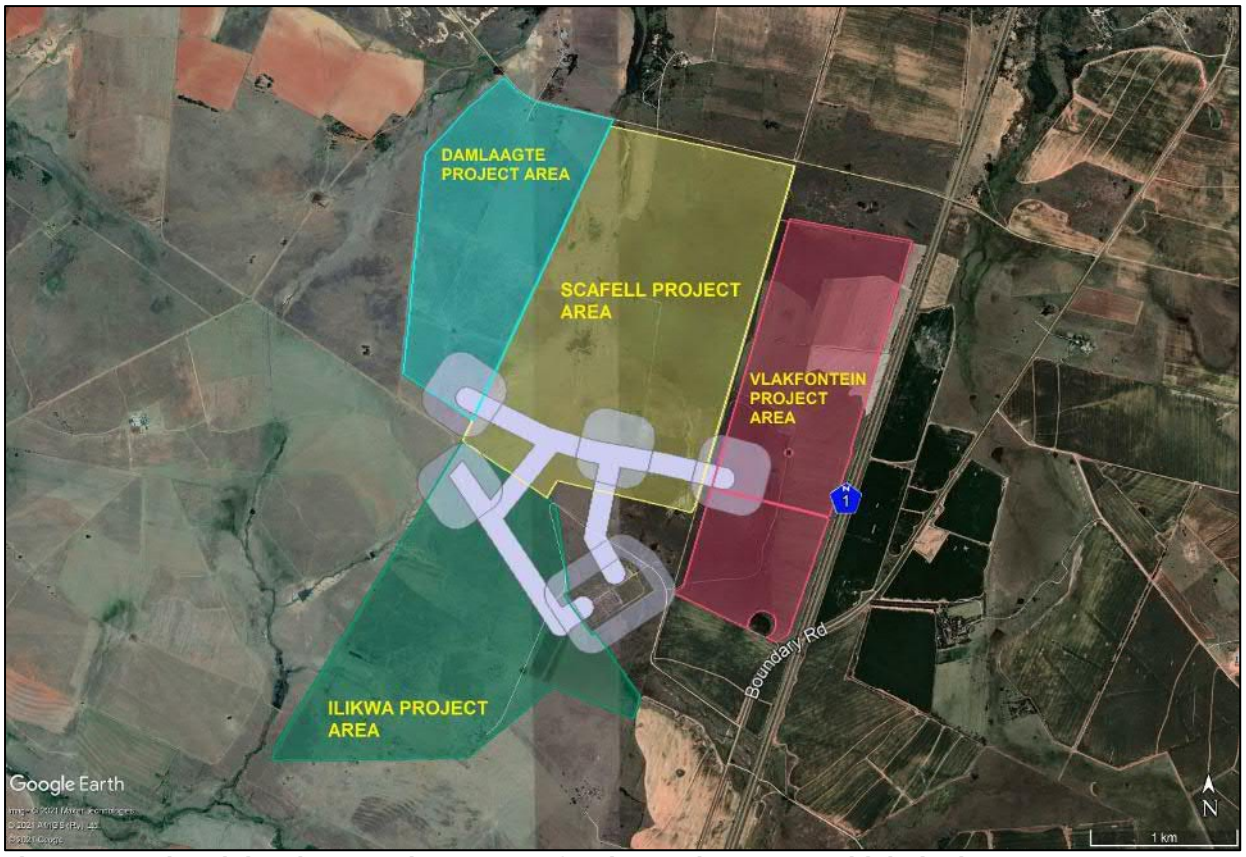


Figure 7: Updated development layout map for the study area on which the impact assessment is based.

The baseline assessments (as presented in Parts A - C) for the floral and faunal assessments are based on the initial proposed layout (Figure 3); however, the impact assessments (as presented in Parts B (1-4) – C (1-4)) are based on the updated development layout (Figure 7).

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.

5 REFERENCES

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

Constitution of the Republic of South Africa, 1996

Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA). 2015 Free State Terrestrial CBAs [Vector] 2015. Available from the Biodiversity GIS website

FSNCO, 1969. Free State Nature Conservation Ordinance (Ordinance 8 of 1969). [NB. The administration of the whole of this Ordinance has under Proclamation 113 of 1994, published in Government Gazette 15813 of 17 June 1994, been assigned to Free State Province with effect from 17 June 1994.]

Government Notice R598 Alien and Invasive Species Regulations as published in the Government Gazette 37885 dated 1 September 2014 as it relates to the National Environmental Management Biodiversity Act, 1998 (Act No. 107 of 1998)

Hui C, Richardson DM (2017) Invasion dynamics. Oxford University Press, Oxford. https://doi.org/10.1093/acprof:oso/9780198745334.001.0001

IBA: Marnewick MD, Retief EF, Theron NT, Wright DR, Anderson TA. (2015). Important Bird and Biodiversity Areas of South Africa. Johannesburg: BirdLife South Africa. Online available: http://bgis.sanbi.org/IBA/project.asp

Mucina, L. and Rutherford, M.C. (2006). The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19.,(South African National Biodiversity Institute: Pretoria, South Africa). Memoirs of the Botanical Survey of South Africa

Mucina, L. & Rutherford, M.C. (Eds). (2012). *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria, RSA

NPAES Protected Areas - Informal 2010 SANParks/SANBI. NPAES Protected Areas - Informal 2010 [vector geospatial dataset] 2012. Available from the Biodiversity GIS website

NPAES Formal SANParks/SANBI. NPAES Formal [vector geospatial dataset] 2013. Available from the Biodiversity GIS website

NPAES Focus Areas 2010 South African National Parks. NPAES Focus Areas 2010 [vector geospatial dataset] 2010. Available from the Biodiversity GIS website

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

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA)

The National Web Based Environmental Screening Tool (2020). Accessible online: https://screening.environment.gov.za/screeningtool/#/pages/welcome

Richardson DM, Pyšek P, Carlton JT (2011) A compendium of essential concepts and terminology in invasion ecology. In: Richardson DM (ed) Fifty years of invasion ecology. The legacy of Charles Elton. Wiley-Blackwell, Oxford, pp 409–420. https://doi.org/10.1002/9781444329988. ch30

SAS 220184., Freshwater Ecological Assessment as Part of the Environmental Impact Assessment (EIA) and Authorisation Process for the Proposed Four Solar Energy Facilities, Collectively Referred to as the Scaffel Cluster Near Sasolburg, Free State Province.

STS 200077. 2021a. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B1: Floral Impact Assessment for the Scafell Solar PV Facility**.

STS 200077. 2021b. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B2: Floral Impact Assessment for the Damlaagte Solar PV Facility**.

STS 200077. 2021c. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B3: Floral Impact Assessment for the Vlakfontein Solar PV Facility**.

STS 200077. 2021d. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B4: Floral Impact Assessment for the Ilikwa Solar PV Facility**.

STS 200077. 2021e. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part C1: Faunal Impact Assessment for the Scafell Solar PV Facility**.

STS 200077. 2021f. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part C2: Faunal Impact Assessment for the Damlaagte Solar PV Facility**.

STS 200077. 2021g. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part C3: Faunal Impact Assessment for the Vlakfontein Solar PV Facility**.

STS 200077. 2021h. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part C4: Faunal Impact Assessment for the Ilikwa Solar PV Facility**.

SABAP2, 2014. The South Africa Bird Atlas Project 2 database

SACAD: Department of Environmental Affairs. (2020). *South Africa Conservation Areas Database* (SACAD_OR_2020_Q2). Online available: [http://egis.environment.gov.za]

SANBI (2009). PRECIS Information Database. The South African National Biodiversity Institute is thanked for the use of data from the National Herbarium, Pretoria (PRE) Computerised Information System (PRECIS). Online available: http://posa.sanbi.org/intro_precis.php

SANBI. 2018a. Terrestrial ecosystem threat status and protection level - remaining extent [Vector] 2018. URL: http://bgis.sanbi.org

SANBI. 2018b. Terrestrial ecosystem threat status and protection level layer [Vector] 2018. URL: http://bgis.sanbi.org

SANBI BGIS (2019). The South African National Biodiversity Institute - Biodiversity GIS (BGIS) [online]. URL: http://bgis.sanbi.org

SANBI. 2018c. Final Vegetation Map of South Africa, Lesotho and Swaziland [Vector] 2018. Available from the Biodiversity GIS website

SAPAD: Department of Environmental Affairs. (2020). *South Africa Protected Areas Database* (SAPAD_OR_2020_Q2). Online available: [http://egis.environment.gov.za]

Wilson JRU, Gaertner M, Richardson DM et al (2017) Contributions to the national status report on biological invasions in South Africa. Bothalia 47:a2207. https://doi.org/10.4102/abc.v47i2.2207

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 seasonality, time and budgetary constraints relevant to the type and level of investigation undertaken as well as the project program and STS CC and its staff, at their sole discretion, reserve the right to 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.

Although STS CC exercises due care and diligence in rendering services and preparing documents, STS CC accepts no liability and the client, by receiving this document, indemnifies STS CC and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by STS CC and by the use of the information contained in this document.

This report must not be altered or added to without the prior written consent of the author. 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 refer 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. This act in terms of alien and invasive species aims to:

- Prevent the unauthorised 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 NEMBA 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.

The National Forest Act, 1998 (Act No. 10 of 1998) (NFA)

According to the department of Department of Environment, Forestry and Fisheries (DEFF) (previously the Department of Agriculture, Forestry and Fisheries (DAFF)) ©2019 website (https://www.daff.gov.za/daffweb3/):
"In terms of the National Forests Act, 1998 (Act No. 10 of 1998) certain tree species (types of trees) can be identified and declared as protected. The Department of Water Affairs and Forestry followed an objective, scientific and participative process to arrive at the new list of protected tree species, enacted in 2004. All trees occurring in natural forests are also protected in terms of the Act. Protective actions take place within the framework of the Act as well as national policy and guidelines. Trees are protected for a variety of reasons, and some species require strict protection while others require control over harvesting and utilization."

Applicable sections of the NFA pertaining to the proposed project include the below:

Section 12:

Declaration of trees as protected

1) The Minister may declare-
    a. particular tree,
    b. a particular group of trees,
    c. a particular woodland; or
    d. trees belonging to a particular species,
    to be a protected tree, group of trees, woodland or species.
2) The Minister may make such a declaration only if he or she is of the opinion that the tree, group of trees, woodland or species is not already adequately protected in terms of other legislation.
3) In exercising a discretion in terms of this section, the Minister must consider the principles set out in section 3(3) of the NFA.

Section 15(1):

No person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected

tree or any forest product derived from a protected tree, except under a licence granted by the Minister or in terms of an exemption from the provisions of this subsection published by the Minister in the Gazette.

Contravention of this declaration is regarded as a first category offence that may result in a person who is found guilty of being sentenced to a fine or imprisonment for a period up to three years, or both a fine and imprisonment.

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.

Free State Nature Conservation Ordinance, 1969 (Ordinance 8 of 1969) (FSNCO)

The objectives of this Act are to provide for the conservation of fauna and flora and the hunting of animals causing damage and for matters incidental thereto.

This Act must be interpreted and applied in accordance with the national environmental management principles set out in Section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

APPENDIX C: Impact Methodology

Method for Impact Identification and Evaluation (as provided by SLR)
The identification and assessment of environmental impacts is a multi-faceted process, using a combination of quantitative and qualitative descriptions and evaluations. It involves applying scientific measurements and professional judgement to determine the significance of environmental impacts associated with the proposed project. The process involves consideration of, *inter alia*: the purpose and need for the project; views and concerns of interested and affected parties (I&APs); social and political norms, and general public interest.

1. Identification and Description of Impacts Identified impacts are described in terms of the nature of the impact, compliance with legislation and accepted standards, receptor sensitivity and the significance of the predicted environmental change (before and after mitigation). Mitigation measures may be existing measures or additional measures that were identified through the impact assessment and associated specialist input. The impact rating system considers the confidence level that can be placed on the successful implementation of mitigation.

2. Evaluation of Impacts and Mitigation Measures

2.1 INTRODUCTION
Impacts are assessed using SLR's standard convention for assessing the significance of impacts, a summary of which is provided below.
In assigning significance ratings to potential impacts before and after mitigation the approach presented below is to be followed.

Determine the impact consequence rating: This is a function of the "intensity", "duration" and "extent" of the impact (see Section 0). The consequence ratings for combinations of these three criteria are given in Section 0.

Determine impact significance rating: The significance of an impact is a function of the consequence of the impact occurring and the probability of occurrence (see Section 0). Significance is determined using the table in Section 0.

Modify significance rating (if necessary): Significance ratings are based on largely professional judgement and transparent defined criteria. In some instances, therefore, whilst the significance rating of potential impacts might be "low", the importance of these impacts to local communities or individuals might be extremely high. The importance/value which interested and affected parties attach to impacts will be highlighted, and recommendations should be made as to ways of avoiding or minimising these perceived negative impacts through project design, selection of appropriate alternatives and / or management.

Determine degree of confidence of the significance assessment: Once the significance of the impact has been determined, the degree of confidence in the assessment will be qualified (see Section 0). Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact.

2.2 CRITERIA FOR IMPACT ASSESSMENT

The criteria for impact assessment are provided below.

Criteria	Rating	Description
Criteria for ranking of the INTENSITY (SEVERITY) of environmental impacts	**ZERO TO VERY LOW**	Negligible change, disturbance or nuisance. The impact affects the environment in such a way that natural functions and processes are not affected. People / communities are able to adapt with relative ease and maintain pre-impact livelihoods.
	LOW	Minor (Slight) change, disturbance or nuisance. The impact on the environment is not detectable or there is no perceptible change to people's livelihood.

Criteria	Rating	Description
	MEDIUM	Moderate change, disturbance or discomfort. Where the affected environment is altered, but natural functions and processes continue, albeit in a modified way. People/communities are able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support.
	HIGH	Prominent change, disturbance or degradation. Where natural functions or processes are altered to the extent that they will temporarily or permanently cease. Affected people/communities will not be able to adapt to changes or continue to maintain-pre impact livelihoods.
Criteria for ranking the DURATION of impacts	**SHORT TERM**	< 5 years.
	MEDIUM TERM	5 to < 15 years.
	LONG TERM	> 15 years, but where the impact will eventually cease either because of natural processes or by human intervention.
	PERMANENT	Where mitigation either by natural processes or by human intervention will not occur in such a way or in such time span that the impact can be considered transient.
Criteria for ranking the EXTENT / SPATIAL SCALE of impacts	**LOCAL**	Impact is confined to project or study area or part thereof, e.g. limited to the area of interest and its immediate surroundings.
	REGIONAL	Impact is confined to the region, e.g. catchment, municipal region, etc.
	NATIONAL	Impact is confined to the country as a whole, e.g. South Africa, etc.
	INTERNATIONAL	Impact extends beyond the national scale.
Criteria for determining the PROBABILITY of impacts	**IMPROBABLE**	Where the possibility of the impact to materialise is very low either because of design or historic experience, i.e. ≤ 30% chance of occurring.
	POSSIBLE	Where there is a distinct possibility that the impact would occur, i.e. > 30 to ≤ 60% chance of occurring.
	PROBABLE	Where it is most likely that the impact would occur, i.e. > 60 to ≤ 80% chance of occurring.
	DEFINITE	Where the impact would occur regardless of any prevention measures, i.e. > 80% chance of occurring.
Criteria for determining the DEGREE OF CONFIDENCE of the assessment	**LOW**	≤ 35% sure of impact prediction.
	MEDIUM	> 35% and ≤ 70% sure of impact prediction.
	HIGH	> 70% sure of impact prediction.
Criteria for the DEGREE TO WHICH IMPACT CAN BE MITIGATED - the degree to which an impact can be reduced / enhanced	**NONE**	No change in impact after mitigation.
	VERY LOW	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact.
	LOW	Where the significance rating drops by one level, after mitigation.
	MEDIUM	Where the significance rating drops by two to three levels, after mitigation.

Criteria	Rating	Description
	HIGH	Where the significance rating drops by more than three levels, after mitigation.
Criteria for LOSS OF RESOURCES - the degree to which a resource is permanently affected by the activity, i.e. the degree to which a resource is irreplaceable	**LOW**	Where the activity results in a loss of a particular resource but where the natural, cultural and social functions and processes are not affected.
	MEDIUM	Where the loss of a resource occurs, but natural, cultural and social functions and processes continue, albeit in a modified way.
	HIGH	Where the activity results in an irreplaceable loss of a resource.
Criteria for REVERSIBILITY - the degree to which an impact can be reversed	**IRREVERSIBLE**	Where the impact is permanent.
	PARTIALLY REVERSIBLE	Where the impact can be partially reversed.
	FULLY REVERSIBLE	Where the impact can be completely reversed.

2.3 DETERMINING CONSEQUENCE

Consequence attempts to evaluate the importance of a particular impact, and in doing so incorporates extent, duration and intensity. The ratings and description for determining consequence are provided below.

Rating	Description *
VERY HIGH	Impacts could be EITHER: of ***high intensity*** at a ***regional level*** and endure in the ***long term***; OR of ***high intensity*** at a ***national level*** in the ***medium term***; OR of ***medium intensity*** at a ***national level*** in the ***long term.***
HIGH	Impacts could be EITHER: of ***high intensity*** at a ***regional level*** and endure in the ***medium term***; OR of ***high intensity*** at a ***national level*** in the ***short term***; OR of ***medium intensity*** at a ***national level*** in the ***medium term;*** OR of ***low intensity*** at a ***national level*** in the ***long term***; OR of ***high intensity*** at a ***local level*** in the ***long term***; OR of ***medium intensity*** at a ***regional level*** in the ***long term.***
MEDIUM	Impacts could be EITHER: of ***high intensity*** at a ***local level*** and endure in the ***medium term***; OR of ***medium intensity*** at a ***regional level*** in the ***medium term***; OR of ***high intensity*** at a ***regional level*** in the ***short term***; OR of ***medium intensity*** at a ***national level*** in the ***short term***; OR of ***medium intensity*** at a ***local level*** in the ***long term***; OR of ***low intensity*** at a ***national level*** in the ***medium term;*** OR of ***low intensity*** at a ***regional level*** in the ***long term.***
LOW	Impacts could be EITHER of ***low intensity*** at a ***regional level*** and endure in the ***medium term***; OR of ***low intensity*** at a ***national level*** in the ***short term***; OR of ***high intensity*** at a ***local level*** and endure in the ***short term***; OR of ***medium intensity*** at a ***regional level*** in the ***short term***; OR of ***low intensity*** at a ***local level*** in the ***long term***; OR of ***medium intensity*** at a ***local level*** and endure in the ***medium term.***
VERY LOW	Impacts could be EITHER of ***low intensity*** at a ***local level*** and endure in the ***medium term***; OR of ***low intensity*** at a ***regional level*** and endure in the ***short term***; OR of ***low to medium intensity*** at a ***local level*** and endure in the ***short term.***

Rating	Description *
	OR **Zero to very low intensity** with any combination of extent and duration.

* Note: For any impact that is considered to be “Permanent” or “International” apply the “Long-Term” and “National” ratings, respectively.

2.4 DETERMINING SIGNIFICANCE

The consequence rating is considered together with the probability of occurrence in order to determine the overall significance using the table below.

		PROBABILITY			
		IMPROBABLE	POSSIBLE	PROBABLE	DEFINITE
CONSEQUENCE	VERY LOW	INSIGNIFICANT	INSIGNIFICANT	VERY LOW	VERY LOW
	LOW	VERY LOW	VERY LOW	LOW	LOW
	MEDIUM	LOW	LOW	MEDIUM	MEDIUM
	HIGH	MEDIUM	MEDIUM	HIGH	HIGH
	VERY HIGH	HIGH	HIGH	VERY HIGH	VERY HIGH

In certain cases it may not be possible to determine the significance of an impact. In these instances the significance is **UNKNOWN**.

APPENDIX D: Vegetation Types

Soweto Highveld Grassland (Gm 8)

Figure E1: Gm 8 Soweto Highveld Grassland: Typical mesic highveld grassland with *Themeda triandra* and several *Egrostis* species still found in some parts of southern Gauteng in natural condition. Image by D.B. Hoare.

Table E1: Floristic species of the *Soweto Highveld Grassland* (Mucina & Rutherford, 2012).

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

APPENDIX E: Details, Expertise And Curriculum Vitae of Specialists

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

Samantha-Leigh Daniels	PhD Candidate Plant Science (University of Pretoria)
Daryl van Der Merwe	MSc Conservation Biology (University of Cape Town)
Christien Steyn	MSc Plant Science (University of Pretoria)
Christopher Hooton	BTech Nature Conservation (Tshwane University of Technology)
Kim Marais	BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)
Nelanie Cloete	MSc Botany and Environmental Management (University of Johannesburg)
Stephan 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		
Name / Contact person:	Nelanie Cloete		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047	Cell:	084 311 4878
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	Nelanie@sasenvgroup.co.za		
Qualifications	MSc Environmental Management (University of Johannesburg) MSc Botany (University of Johannesburg) BSc (Hons) Botany (University of Johannesburg) BSc (Botany and Zoology) (Rand Afrikaans University)		
Registration / Associations	Professional member of the South African Council for Natural Scientific Professions (SACNASP) Member of the South African Association of Botanists (SAAB) Member of the International Affiliation for Impact Assessments (IAIAsa) South Africa group Member of the Grassland Society of South Africa (GSSA)		

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Kim Marais		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047	Cell:	071 413 2245
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	kim@sasenvgroup.co.za		
Qualifications	BSc (Hons) Zoology (University of the Witwatersrand) BSc (Zoology and Conservation) (University of the Witwatersrand)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Member of South African Wetland Forum		

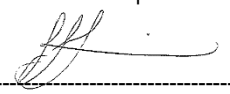
Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	1401	Cell:	083 415 2356
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	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 Natural 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

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

I, Samantha-Leigh Daniels, declare that -

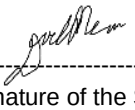
- I act as the **independent specialist** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity 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, Daryl van der Merwe, 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, 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

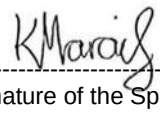
I, Christopher Hooton, declare that -

- 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.

Specialist Signature

I, Kim Marais, 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, Nelanie Cloete, 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 SAMANTHA-LEIGH DANIELS

PERSONAL DETAILS

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

EDUCATION

Qualifications

PhD (Plant Science) (University of Pretoria)	Present
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, KwaZulu-Natal, North West

KEY SPECIALIST DISCIPLINES

Experience

- Desktop Delineations
- Invertebrate and plant surveys along the Sani Pass as part of an ongoing research project
- Bush encroachment surveys within Mpumalanga
- Grassland Surveys at Rietvlei Nature Reserve

Training

- Plant species identification
- Herbarium usage and protocols

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF DARYL VAN DER MERWE

PERSONAL DETAILS

Position in Company	Field Biologist
Joined SAS Environmental Group of Companies	2019

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Environmental Observation Network (SAEON)

EDUCATION

Qualifications

MSc (Conservation Biology) (University of Cape Town)	2019
BSc (Hons) Plant Science (Ecology) (University of Pretoria)	2014
BSc Environmental Science (University of Pretoria)	2013

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, Western Cape, Northern Cape

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Faunal assessments
- Invertebrate assessments
- Invertebrate monitoring
- Avifaunal Assessments
- Alien and Invasive Control Plan (AICP)
- Ecological Scans
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting

Legislative Requirements, Processes and Assessments

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

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

Member of the South African Association of Botanists (SAAB)
Member of the Botanical Society of South Africa (BotSoc)
Professional member of the South African Council for Natural Scientific Professions (SACNASP)

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

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 Control Plan (AICP)
- Alien and Invasive Plant Identification and awareness training
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting
- Desktop Studies, Mapping and Background Information Research

Training

- 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
- 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
-

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTOPHER HOOTON

PERSONAL DETAILS

Position in Company	Senior Scientist, Member Biodiversity Specialist
Joined SAS Environmental Group of Companies	2013

EDUCATION

Qualifications

BTech Nature Conservation (Tshwane University of Technology)	2013
National Diploma Nature Conservation (Tshwane University of Technology)	2008

Short Courses

Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA)	2009
Introduction to Project Management - Online course by the University of Adelaide	2016
Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Eastern Cape, Western Cape, Northern Cape, Free State
Africa - Zimbabwe, Sierra Leone

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Faunal 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
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF KIM MARAIS

PERSONAL DETAILS

Position in Company	Senior Scientist Water Resource Manager
Joined SAS Environmental Group of Companies	2015

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 117137/17)
Member of the Western Cape Wetland Forum (WCWF)

EDUCATION

Qualifications

BSc (Hons) Zoology (University of the Witwatersrand)	2012
BSc (Zoology and Conservation) (University of the Witwatersrand)	2011

Short Courses

Aquatic and Wetland Plant Identification (Cripsis Environment)	2019
Tools for Wetland Assessment (Rhodes University)	2018
Certificate in Environmental Law for Environmental Managers (CEM)	2014
Certificate for Introduction to Environmental Management (CEM)	2013

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Biodiversity Action Plans (BAP)
- Alien and Invasive Control Plans (AICP)
- Faunal Eco Scans
- Faunal Impact Assessments

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Watercourse Maintenance and Management Plans
- Freshwater Offset Plan

Aquatic Ecological Assessment and Water Quality Studies

- Riparian Vegetation Integrity (VEGRAI)
- Water quality Monitoring
- Riverine Rehabilitation Plans

Legislative Requirements, Processes and Assessments

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

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF NELANIE CLOETE

PERSONAL DETAILS

Position in Company	Senior Scientist, Member Botanical Science and Terrestrial Ecology
Joined SAS Environmental Group of Companies	2011

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 400503/14)
Member of the South African Association of Botanists (SAAB)
Member of the International Affiliation for Impact Assessments (IAIAsa) South Africa group
Member of the Grassland Society of South Africa (GSSA)
Member of the Botanical Society of South Africa (BotSoc)
Member of the Gauteng Wetland Forum (GWF)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2013
MSc Botany (University of Johannesburg)	2007
BSc (Hons) Botany (University of Johannesburg)	2005
BSc (Botany and Zoology) (Rand Afrikaans University)	2004

Short Courses

Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA)	2009
Introduction to Project Management - Online course by the University of Adelaide	2016
Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Northern Cape, Eastern Cape, Free State
Africa - Democratic Republic of the Congo (DRC)

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

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

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Plant species and Landscape Plan

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

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

SCIENTIFIC TERRESTRIAL SERVICES

Reg No. 2005/122/329/23
VAT Reg No. 4150274472
PO Box 751779
Gardenview
2047
Tel: 011 616 7893
Fax: 086 724 3132
Email: admin@sasenvgroup.co.za
www.sasenvironmental.co.za

BIODIVERSITY ASSESSMENT AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE DEVELOPMENT OF THE SCAFELL SOLAR PV FACILITY WHICH FORMS PART OF THE SCAFELL CLUSTER, SOLAR PHOTOVOLTAIC FACILITY, FREE STATE PROVINCE

Prepared for

SLR Consulting (Pty) Ltd.

June 2021

Part B1: Floral Assessment

Prepared by: Scientific Terrestrial Services CC
Report author: S. L Daniels
Report reviewers: C. Steyn (Pr.Sci.Nat)
N. Cloete (Pr.Sci. Nat)
Report reference: STS 200077

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

AICP	Alien and Invasive Control Plans
BESS	Battery Energy Storage System
BGIS	Biodiversity Geographic Information Systems
BotSoc	Botanical Society of South Africa
CARA	Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
DESTEA	Department of Economic Development, Tourism and Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
E-GIS	Environmental Geographical Information Systems
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
ESA	Ecological Support Area
FSNCO	Free State Nature Conservation Ordinance, 1969 (Ordinance No. 8 of 1969)
GIS	Geographic Information System
GPS	Global Positioning System
GSSA	Grassland Society of South Africa
Ha	Hectare
IAIAsa	International Affiliation for Impact Assessments South Africa Group
IBA	Important Bird Area
IEM	Integrated Environmental Management
IUCN	International Union for the Conservation of Nature
MAMSL	Meters Above Mean Sea Level
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential for Evaporation
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004)
NPAES	National Protected Areas Expansion Strategy
PRECIS	Pretoria Computer Information Systems
PV	Photovoltaic
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
SAAB	South Africa Association of Botanists
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
STS	Scientific Terrestrial Services CC
TOPS	Threatened or Protected species (in terms of NEMBA)

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) and Skowno *et al.* (2019), 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), and the associated Alien and Invasive Species Regulations, 2020].

Alien species (syn. exotic species; non-native)	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.
Biodiversity Management Plan	A plan aimed at ensuring the long-term survival in nature of an indigenous species, a migratory species, or an ecosystem, published in terms of the Biodiversity Act. Norms and standards to guide the development of Biodiversity Management Plans for Species have been developed. At the time of writing, norms and standards for Biodiversity Management Plans for Ecosystems were in the process of being developed.
Biodiversity priority areas	Features in the landscape or seascape that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services. They include the following categories, most of which are identified based on systematic biodiversity planning principles and methods: protected areas, Critically Endangered and Endangered ecosystems, Critical Biodiversity Areas and Ecological Support Areas, Freshwater Ecosystem Priority Areas, high water yield areas, flagship free-flowing rivers, priority estuaries, focus areas for land-based protected area expansion, and focus areas for offshore protection. Marine ecosystem priority areas and coastal ecosystem priority areas have yet to be identified but will be included in future. The different categories are not mutually exclusive and, in some cases, overlap, often because a particular area or site is important for more than one reason. They should be seen as complementary, with overlaps reinforcing the importance of an area.
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 also 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;
Casual species	Those alien species that do not form self-replacing populations in the invaded region and whose persistence depends on repeated introductions of propagules (Richardson *et al.* 2000; Pyšek *et al.* 2004). The term is generally used for plants.
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.
Critically Endangered (CR) (IUCN Red List category)	**Applied to both species/taxa and ecosystems**: A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction. Critically Endangered ecosystem types are considered to be at an extremely high risk of collapse. Most of the ecosystem type has been severely or

	moderately modified from its natural state. The ecosystem type is likely to have lost much of its natural structure and functioning, and species associated with the ecosystem may have been lost. Critically endangered species are those considered to be at extremely high risk of extinction.
Degradation	The many human-caused processes that drive the decline or loss in biodiversity, ecosystem functions or ecosystem services in any terrestrial and associated aquatic ecosystems.
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.
Driver (ecological)	A driver is any natural or human-induced factor that directly or indirectly causes a change in ecosystem. A direct driver clearly influences ecosystem processes, where indirect driver influences ecosystem processes through altering one or more direct drivers.
Endangered (EN) (Red List category)	**Applied to both species/taxa and ecosystems**: A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction. Endangered ecosystem types are at a very high risk of collapse. Endangered species are those considered to be at very high risk of extinction.
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 is therefore important in terms of habitat conservation.
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).
Red Data List (RDL) 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. These are species and subspecies that are important for South Africa's conservation decision-making processes.
Threatened ecosystem	An ecosystem that has been classified as Critically Endangered, Endangered or Vulnerable, based on an analysis of ecosystem threat status. A threatened ecosystem has lost or is losing vital aspects of its structure, function or composition. The Biodiversity Act allows the Minister of Environmental Affairs or a provincial MEC for Environmental Affairs to publish a list of threatened ecosystems. To date, threatened ecosystems have been listed only in the terrestrial environment. In cases where no list has yet been published by the Minister, such as for all aquatic ecosystems, the ecosystem threat status assessment in the NBA can be used as an interim list in planning and decision making. Also see Ecosystem threat status.
Threatened species	A species that has been classified as Critically Endangered, Endangered or Vulnerable, based on a conservation assessment (Red List), using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.
Vulnerable (VU) (Red List category)	Applied to both species/taxa and ecosystems: A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction. An ecosystem type is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for VU and is then considered to be at a high risk of collapse.
Weeds	A plant is a weed '*if, in any specified geographical area, its populations grow entirely or predominantly in situations markedly disturbed by man (without, of course, being deliberately cultivated plants*)' (Baker 1965); in cultural terms, weeds are plants (**not necessarily alien**) that grow in sites where they are not wanted and that have detectable economic or environmental impacts (Pyšek *et al.* 2004).

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.

No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
Theme-Specific Requirements as per Government Notice No. 320 Terrestrial Biodiversity Theme – Very High Sensitivity Rating as per Screening Tool Output		
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 B1-4**: 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 B1-4**: 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 B1-4**: 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 B1-4:** Section 3.1 – 3.4 (flora) **Part C:** Section 3.2 – 3.7 (fauna)
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;	**Part A**: Section 3 (desktop analysis) **Part B1-4**: 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 as identified by the screening tool tend to correlate with habitat units (as identified in this report) of lower floral sensitivity.
2.3.7	**The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:**	
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: *a) the reasons why an area has been identified as a CBA;* *b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;*	**Part A**: Section 3 **Part B1-4**: Section 3; Section 5.3.3 **Part C:** Section 3

No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
	c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s); *d) the impact on ecosystem threat status;* *e) the impact on explicit subtypes in the vegetation;* *f) the impact on overall species and ecosystem diversity of the site; and* g) *the impact on any changes to threat status of populations of species of conservation concern in the CBA;*	
2.3.7.2	Terrestrial Ecological Support Areas (ESAs), including: *a) the impact on the ecological processes that operate within or across the site;* *b) the extent the proposed development will impact on the functionality of the ESA; and* c) *loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;*	
2.3.7.3	Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- *a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;*	**Part A**: Section 3 (desktop analysis) **Part B1-4**: Not applicable **Part C:** Not applicable
2.3.7.4	Priority areas for protected area expansion, including- *a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;*	**Part A**: Section 3 (desktop analysis)
2.3.7.5	SWSAs including: *a) the impact(s) on the terrestrial habitat of a SWSA; and* b) *the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);*	Not Applicable
2.3.7.6	FEPA sub catchments, including- *a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;*	Not Applicable
2.3.7.7	Indigenous forests, including: *a) impact on the ecological integrity of the forest; and* b) *percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.*	Not Applicable
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 B1-4:** Section 1.4 (flora) **Part C:** Section 1.3 (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 B1-4:** Section 2 (flora) **Part B1-4:** Appendix A (flora) **Part C:** Section 2 (fauna) **Part C**: Appendix A (fauna)

No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
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 B1-4:** Section 1.4 (flora) **Part C:** Section 1.3 (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 B1-4:** Section 4 (flora) **Part C:** Section 4 (fauna)
	Impact Assessment Requirements 3.1.7 Additional environmental impacts expected from the proposed development; 3.1.8 Any direct, indirect and cumulative impacts of the proposed development; 3.1.9 The degree to which impacts and risks can be mitigated; 3.1.10 The degree to which the impacts and risks can be reversed; 3.1.11 The degree to which the impacts and risks can cause loss of irreplaceable resources; 3.1.12 Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	**Part B1-4:** Section 5 (flora) **Part C:** Section 5 (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 to this report**
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 B1-4:** Section 5 (flora) **Part C:** Section 5 (fauna)
3.1.15	Any conditions to which this statement is subjected.	**Part B1-4:** Section 5.4 (flora) **Part C:** Section 5 (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.	**Not Applicable to this report**
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	**Not Applicable to this report**

1 INTRODUCTION

1.1 Background

Scientific Terrestrial Services (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) and Environmental Authorisation (EA) process for the development of the Scafell Cluster, which consists of four solar photovoltaic (PV) facilities, namely Damlaagte Solar PV Facility, Scafell Solar PV Facility, Vlakfontein Solar PV Facility, and Ilikwa Solar PV Facility. The assessment also includes the development of associated Grid Corridors Infrastructure (e.g., substations and powerline corridors). The Scafell Cluster and associated infrastructure are located approximately 19 km west of the town of Sasolburg, Free State Province and is henceforth referred to as the "**study area**" unless specifically referring to individual PV Facilities or specific infrastructure.

The study area is in the Ngwathe Local Municipality which is an administrative area in the Fezile Dabi District Municipality of the Free State Province. The R59 run approximately 3.5 km south of the study area, and the N1 run immediately adjacent to the study area in the east. The proposed Scafell Cluster and associated infrastructure will cover an area of approximately 839 ha. For a detailed project description of all proposed development activities, please refer to Section 1.2 below.

The purpose of this section of the report is to define the floral ecology of the study area, to identify areas of increased Ecological Importance and Sensitivity (EIS), as well as the mapping of such areas, and to describe the Present Ecological State (PES) of the study area. The primary objective of the floral assessment is not to compile an exhaustive species list but rather to ensure that sufficient data are collected to describe all the vegetation communities present within the study area, to optimise the detection of Species of Conservation Concern (SCC) and to assess habitat suitability for other potentially occurring SCC.

1.2 Project description

The proposed Scafell Cluster development entails the construction and operation of four solar PV facilities located within the Ngwathe Local Municipality of the Free State Province. The proposed Solar PV projects (referred to above as the Scafell Cluster) consist of the following (Figure 1):

- Scafell Solar PV facility located on Portion 3 of the Farm Will Grange 246;

- Damlaagte Solar PV facility located on the remaining extent of the Farm Damlaagte 229;
- Vlakfontein Solar PV facility located on portion 6 of the Farm Vlakfontein 161; and
- Ilikwa Solar facility located on portion 5 of the farm Proceederfontein 100.

Each Solar PV project will require a Battery Energy Storage System (BESS) and grid connection infrastructure (as listed below) to facilitate grid connection between each solar PV facility and the existing Scafell Substation. The following alternatives have been proposed for each Project (the mapping and impact assessment presented in the report corresponds to the Alternative 1 (Preferred) layout):

Project	Alternative 1 (Preferred)	Alternative 2
Damlaagte	This corridor is 150 m wide and is approximately 2.0 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Damlaagte Solar Facility located on Damlaagte RE/229 and extends for about 1 km in an easterly direction across Willow Grange 3/246 before turning about 90° south for 0.6km across Scafell RE/448, then turning slightly southeast for 0.3km before terminating at the Scafell Eskom MTS. This is the shortest most direct route to connect to the Scafell Eskom MTS.	This corridor is 150 m wide and is also approximately 2.5 km in length. This proposed grid connection starts at the on-site substation (Switching Station) of the proposed Damlaagte Solar Facility located on Damlaagte RE/229 and extends for about 0.6 km in an easterly direction across Willow Grange 3/246, then turns about 90° southwest for 0.7km and then southeast for 0.9km onto Procedeerfontein 5/100, and then turns northeast for 0.2km before terminating at the Scafell Eskom MTS located on Scafell RE/448.
Vlakfontein	This corridor is 150 m wide and is approximately 2.0 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Vlakfontein Solar Facility located on Vlakfontein 6/161 and extends for about 0.8 km in a westerly direction across Willow Grange 3/246 before turning about 90° south for 0.6km across Scafell RE/448, then turning slightly southeast for 0.3km, terminating at the Scafell Eskom MTS. This is the shortest most direct route to connect to the Scafell Eskom MTS.	This corridor is 150 m wide and is approximately 3.0 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Vlakfontein Solar Facility located on Vlakfontein 6/161 and extends for about 1.2km in a westerly direction across Willow Grange 3/246, then 0.7km in a south-westerly direction across Procedeerfontein 5/100, a further 0.9km in a south-easterly direction and then turns northeast for 0.2km before terminating at the Scafell Eskom MTS located on Scafell RE/448.
Ilikwa	This corridor is 150 m wide and is approximately 2.3 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Ilikwa Solar Facility located on Procedeerfontein 5/100 and extends for about 0.3 km in a south-easterly direction before moving north-easterly for 0.7km across Willow Grange 3/246, then turning east for 0.4km then directly south for 0.6km crossing Scafell RE/448, then a further 0.3km in a south easterly direction, before terminating at the Scafell Eskom MTS.	This corridor is 150 m wide and is approximately 1.4 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Ilikwa Solar Facility located on Procedeerfontein 5/100 and extends for about 1.2 km in a south-easterly direction before at 90° northeast for 0.2km into the Scafell Eskom MTS located on Scafell RE/448.
Scafell	This corridor is 150 m wide and is approximately 0.9 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Scafell Solar Facility located on Willow Grange 3/246 and extends for about 0.6 km south across Scafell RE/448, then turning slightly southeast	This corridor is 150 m wide and is also approximately 2.2 km in length. This proposed grid connection starts at the on-site substation (Switching Station) of the proposed Scafell Solar Facility located on Willow Grange 3/246 and extends for about 0.4 km in a westerly direction across Willow Grange 3/246, then

	for 0.3km, terminating at the Scafell Eskom MTS. This is the shortest most direct route to connect to the Scafell Eskom MTS.	turns southwest for 0.7km and then southeast for 0.9km onto Procedeerfontein 5/100, and then turns northeast for 0.2km before terminating at the Scafell Eskom MTS located on Scafell RE/448.

Report Layout

- Section 1 – 4: Baseline Assessment Results. The baseline results of the floral assessment (description of the floral habitat units, floral species of conservation concern assessment and habitat sensitivity analysis) are based on the initial layout provided by the proponent (i.e., Figure 1).
    - NOTE: The baseline results are provided for the entire study area (i.e., for all four of the proposed PV Facilities).
- Section 5 – 6: Floral Impact Assessment and Reasoned Opinion. After the completion of the baseline assessment, small changes to the proposed project layout were made by the proponent (refer to Section 5; Figure 2 & 5). The impacts associated with the development of the PV facilities are based on the updated project layout and not on the original layout presented in the baseline results.
    - NOTE: The impact assessment is presented separately for each of the four PV Facilities (namely Damlaagte Solar PV Facility, Scafell Solar PV Facility, Vlakfontein Solar PV Facility, and Ilikwa Solar PV Facility). Within this report, an impact discussion and assessment are presented of all potential pre-construction, construction, operational and decommissioning phase impacts associated with the development of the **Scafell Solar PV facility**.

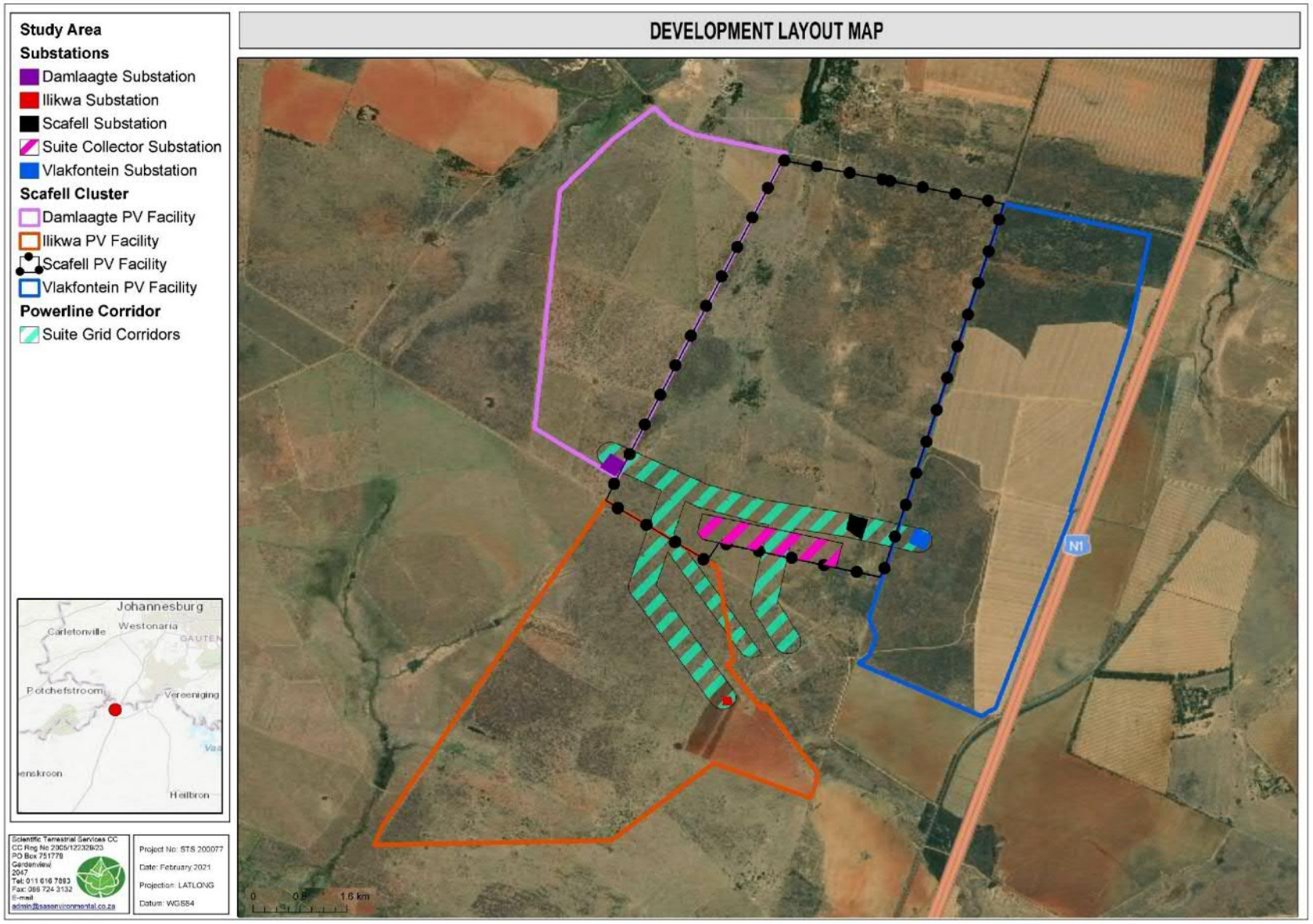


Figure 1: Initial proposed infrastructure development layout within the study area (See Figure 2 for the updated concept layout used for the floral impact assessment).

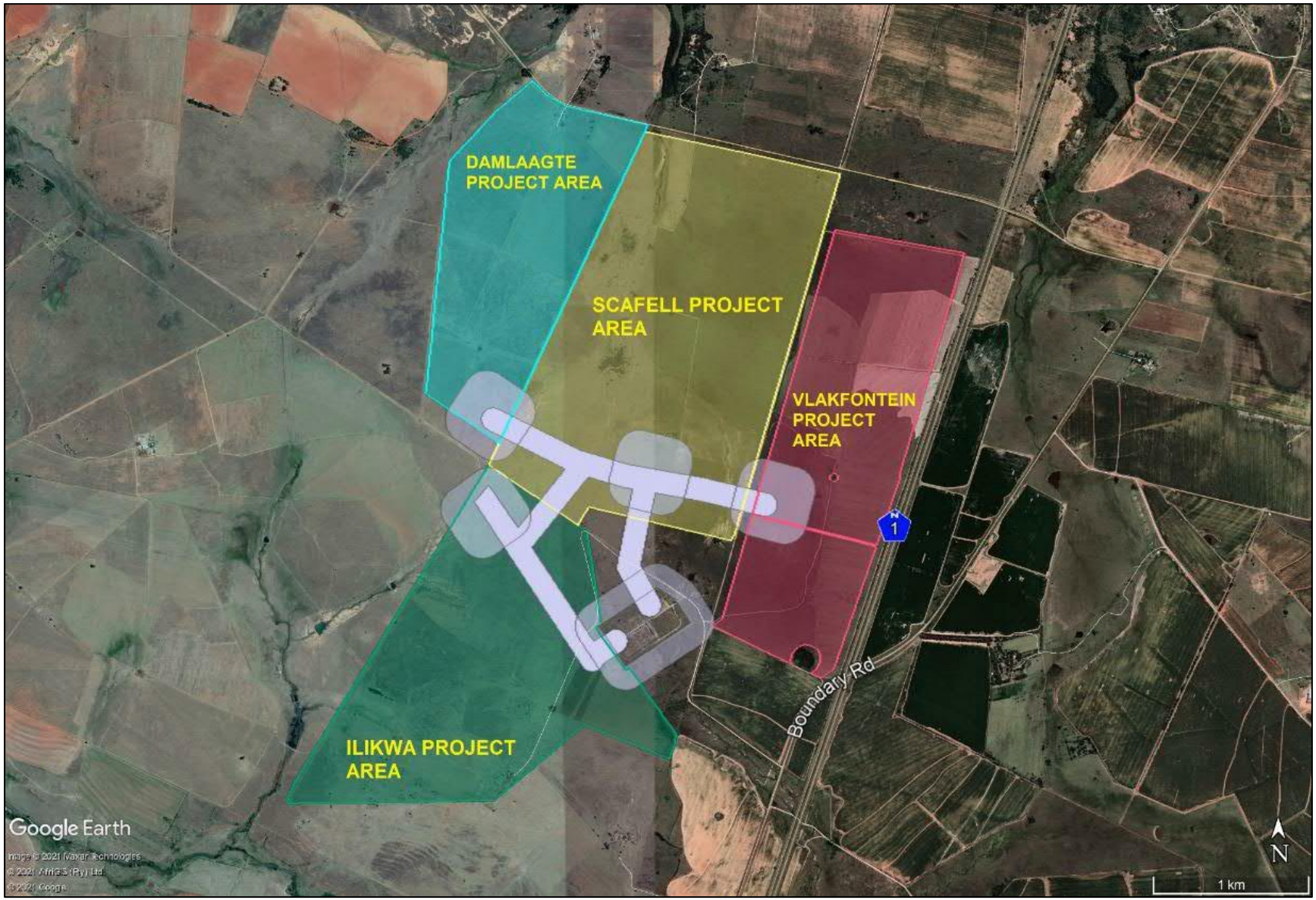


Figure 2: Updated concept development layout map for the study area on which the impact assessment is based.

1.3 Scope of Work

Specific outcomes in terms of the report are as follows:

- To determine and describe habitat types, communities and the ecological state of the study area and to rank each habitat type based on conservation importance and ecological sensitivity;
- To provide inventories of floral species as encountered within the study area;
- To identify and consider all sensitive landscapes such as indigenous forests, rocky ridges, wetlands and/ or any other special features such as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs);
- To conduct a Red Data Listed (RDL) floral species assessment as well as an assessment of other SCC, including the potential for such species to occur within the study area;
- To align the report with 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;
- To provide detailed information to guide the activities associated with the proposed development within the study area; and
- To ensure the ongoing functioning of the ecosystem in such a way as to support local and regional conservation requirements, to allow regional and national biodiversity targets to be met, and the provision of ecological services in the local area is sustained.

1.4 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The floral baseline assessment is confined to the study area (as depicted in Figure 1) and does not include the neighbouring and adjacent properties. The entire study area and immediate surroundings were, however, included in the desktop analysis of which the results are presented in Part A: Section 3;
- This report presents the baseline results of the floral assessment for the entire study area; however, for the impact assessment, this report only includes an impact assessment of the Scafell Solar PV Facility (STS 200077, 2021a). Impact assessments for the remaining footprint of the study area are presented in:
    - STS 200077. 2021b. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty)

Ltd. June 2021. **Part B2: Floral Impact Assessment for the Damlaagte Solar PV Facility**.

- STS 200077. 2021c. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B3: Floral Impact Assessment for the Vlakfontein Solar PV Facility**.
- STS 200077. 2021d. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B4: Floral Impact Assessment for the Ilikwa Solar PV Facility**.

- The Department of Environmental Affairs screening tool provides names of sensitive species likely to be present within the study area and its surrounds. Within the screening tool outcome, the names of some species are not provided, and these species are rather assigned a number keeping them unidentifiable (e.g., Sensitive species 1). This procedure is attributed to the vulnerability of the species to threats such as illegal harvesting and overexploitation. According to the best practise guidelines provided by South African National Biodiversity Institute (SANBI), the name of sensitive species **may not appear** in the final EIA report **nor any of the specialist reports** released into the public domain. The names of the sensitive species as identified by the screening tool were provided to STS by SANBI. The name of the species has however not been provided within the report, instead the conservation threat status of the species has been provided;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most floral communities have been accurately assessed and considered. Relevant online sources and background information were further assessed to improve on the overall understanding of the study area's ecology;
- Sampling by its nature means that not all individuals are assessed and identified. With ecology being dynamic and complex, some aspects (some of which may be important (for example: i) seasonality – not all species flower in the summer season. Identification of species during their flowering periods is often useful for identification purposes especially with reference to cryptic and/or similar looking species and ii) duration of fieldwork: a positive relationship exists between survey time and recorded species richness) may have been overlooked. The field assessment took place between the 5th and 8th of January 2021 (summer season). A more comprehensive assessment

would require that assessments take place in all seasons of the year. However, on-site data was augmented with all available desktop data. Together with project experience in the area, the findings of this assessment are considered an accurate reflection of the ecological characteristics of the study area.

2 Approach and Methodology

2.1 General Approach

An on-site visual investigation of the study area was conducted between the 5th and 8th of January 2021 to confirm the assumptions made during the consultation of the background maps and to determine whether the sensitivity of the terrestrial and floral biodiversity associated with the study area confirms the results of the online National Web-based Environmental Screening Tool.

The vegetation survey is based on the subjective sampling method which is a technique where the specialist chooses specific sample sites within the area of interest, based on their professional experience in the area and background research done prior to the site visit. This allows representative recordings of floral communities and optimal detection of SCC (refer to the methodology description in Appendix A).

The below list includes the steps followed during the preparation for, and the conduction of, the field assessments:

- To guide the selection of appropriate sample sites, background data and digital satellite images were consulted before going to site, during which broad habitats, vegetation types and potentially sensitive sites were identified. The results of these analyses were then used to focus the fieldwork on specific areas of concern and to identify areas where targeted investigations were required (e.g., for SCC detection and within the direct footprint of the proposed PV Facility);
- All relevant resources and datasets as presented by the SANBI's Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org) and the Environmental Geographical Information Systems (E-GIS) website (https://egis.environment.gov.za/), including the 2015 Free State Biodiversity Plan and the online National Web-based Environmental Screening Tool, were consulted to gain background information on the physical habitat and potential floral diversity associated with the study area;

- Based on the broad habitat units delineated before going to site and the pre-identified points of interest, which is updated based on on-site observations and access constraints, the selected sample areas were surveyed on foot, following subjectively selected sample sites, to identify the occurrence of the dominant plant species and habitat diversities, but also to detect SCC which tend to be sparsely distributed; and
- Photographs were taken of each vegetation community that is representative of typical vegetation structure of that community, as well as photos of all encountered SCC.

Additional information on the method of assessment is provided in **Appendix A** of this report.

2.2 Definitions, descriptions, and taxon nomenclature

Scientific nomenclature for plant species in this report follows that of the SANBI's Red List of South African Plants Online, as it relates to the Botanical Database of Southern Africa (BODATSA). For alien species, the definitions of Richardson *et al.* (2011) are used. Vegetation structure is described as per Edwards (1983) (refer to Figure A1).

2.3 Sensitivity Mapping

All the ecological features of the study area were considered, and sensitive areas were delineated with the use of a Global Positioning System (GPS) and projected onto satellite imagery. A Geographic Information System (GIS) was used to project these features onto satellite imagery. The sensitivity map should assist the Environmental Assessment Practitioner (EAP) / proponent as to the suitability of the proposed development within the study area.

3 RESULTS OF FLORAL ASSESSMENT

3.1 Broad-scale vegetation characteristics

The study area falls within the Soweto Highveld Grassland vegetation type (listed as vulnerable in both Mucina and Rutherford (2006) and the updated 2018 Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI, 2018a)), – i.e., the reference state. Mucina and Rutherford (2006) describe the Soweto Highveld Grassland as having "gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus*, *Eragrostis racemosa*, *Heteropogon contortus* and *Tristachya leucothrix*. In undisturbed places, only scattered small wetlands, narrow stream

alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover".

3.2 Ground-truthed vegetation characteristics

Overall, the habitat within the study area ranged from areas of good condition to highly transformed areas in which vegetation was dominated by alien and invasive plant (AIP) species. The biodiversity of the study area can thus be defined under three broad habitat units as described below (Figure 2). These habitat units were distinguished based on species composition, vegetation structure, ecological function, physical nature of the environment and habitat condition.

The three broad habitat and land cover units include:

1) **Transformed Veld Habitat**: this habitat unit included areas that have experienced severe anthropogenic disturbances (e.g., areas of recent and current cultivation and infrastructure development). Natural vegetation was scarce throughout the habitat unit. However, the proliferation of AIP species, such as *Verbena bonariensis* (Tall verbena), *Datura stramonium* (Thorn apple), *Conyza bonariensis* (Hairy fleabean) and *Xanthium strumarium* (Large cocklebur) was evident throughout the habitat unit;
2) **Grassland Habitat**: this habitat unit was characterised by a dominance of grass species and consisted of three subunits. Subunits were differentiated largely based on species composition and level of disturbance experienced.
    - Degraded Grassland: this subunit comprised the smallest extent of the Grassland Habitat Unit. Overall, this habitat subunit was largely homogeneous and was species poor. This subunit supported few indigenous species and was dominated by the highest number of AIP species of all the Grassland Subunits, comprising species like *Conyza bonariensis* (Hairy fleabean), *Tragopogon dubis* (yellow salsify), *Cirsium vulgare* (Spear thistle) and *Campuloclinium macrocephalum* (pom pom weed; some of which are listed invasive species). This habitat subunit was located within all four of the potential PV facility areas;
    - *Seriphium*-dominated Grassland: this habitat subunit comprised the largest extent of the Grassland Habitat Unit and was moderately species rich, with a well-developed grass layer. Dominant herb species included *Scabiosa columbaria, Geigeiria burkei,* and *Senecio inornatus*. The habitat subunit was easily distinguished from the other subunits by the presence of dense stands of *Hyparrhenia hirta* and *Seriphium plumosum*. Overall fewer AIP species were supported within this habitat subunit than that of the Degraded Grassland

Subunit. Dominant AIP species found within the habitat subunit included *Verbena bonariensis* and *Tagetes minuta*. This Habitat Subunit was located within all four of the potential PV Facility areas; and

- *Themeda*-rich Grassland: this subunit supported a moderate to moderately high species diversity with a well-developed forb and herb layer (dominant species included *Peucedanum magalismontanum, Kyllinga alba* and *Delosperma herbeum).* The diversity of grass species was higher than that of the other two subunits and included species such as *Themeda triandra, Aristida congesta* subsp. *congesta, Eragrostis gummiflua.* Scattered, occasional woody thickets, consisting of mainly of indigenous woody species, were located within this habitat Subunit (located within the central east sections of the Scafell Farm Boundary). These woody thickets fall within the *Themeda*-dominated Grassland owing to their shared forb and grass layers. Dominant woody species within the thickets included *Celtis africana* (White stinkwood) and *Ziziphus mucronata* (Buffalo thorn). This habitat subunit was located within three of the potential Solar PV Facility areas, namely the Vlakfontein Solar PV Facility, the Scafell Solar PV Facility, and the Ilikwa Solar PV Facility.

3) **Freshwater Habitat**: This habitat unit was located within the Scafell, Ilikwa and Vlakfontein Solar PV Facility areas. This habitat unit consisted of Unchanneled Valley Bottom Wetland (UVB) systems within the Scafell Solar PV Facility Area, a tributary of a UVB within the Ilikwa Solar PV Facility and a Depression Wetland within the Vlakfontein Solar PV Facility. Refer to the SAS 220184 report for further detail on the wetlands found on site. Species composition was similar for both wetland types and is thus discussed under one habitat unit. Dominant species included *Cyperus esculentus, Juncus effusus*, and *Eragrostis lehmanniana.* This Habitat Unit was not extensively proliferated by AIP species, although a few individuals of *Cirsium vulgare* and *Argemone ochroleuca* were recorded. The wetlands are, nevertheless, considered to provide important ecological functions in the area.

The following represents the habitat units associated with the four different PV facility projects

Habitat unit / PV facility	Transformed Veld Habitat	Grassland Habitat			Freshwater Habitat
		Degraded Grassland	*Seriphium*-dominated Grassland	*Themeda*-rich Grassland	
Scafell PV Facility		X	X	X	X
Ilikwa PV Facility		X	X	X	X
Vlakfontein PV Facility	X		X	X	X
Damlaagte PV Facility		X	X		

The following represents the area (ha) of each habitat unit associated with the four different PV Project Areas:

Habitat unit / PV facility	Transformed Veld Habitat	Grassland Habitat			Freshwater Habitat
		Degraded Grassland	*Seriphium*-dominated Grassland	*Themeda*-rich Grassland	
Scafell PV facility	NA	29 ha	97 ha	224 ha	11 ha
Ilikwa PV facility	NA	51 ha	162 ha	60 ha	1 ha
Vlakfontein PV Facility	131 ha	NA	122 ha	24 ha	2 ha
Damlaagte PV Facility	5 ha	60 ha	119 ha	NA	NA

Of the habitat units identified within the study area, only the Grassland and Freshwater Habitat Units were recorded within the Scafell Solar PV Facility.

The following block illustrates the area (given as ha and %) of vegetation and conservation characteristics associated with the **Scafell PV Facility**. In total, the remaining extent of the Soweto Highveld Grassland within the study area (including all 4 Project Areas) is approximately 566 ha (NBA, 2018). Please note that the total area of the Scafell PV Facility is approximately 363 ha.

Category	Total Area of Category across Scafell PV Facility (ha)	Total Area of Category within Scafell PV Facility (%)
Remaining extent of Vulnerable Soweto Highveld Grassland (as per the 2018 NBA)	258	71
CBA 2	133	37
ESA 1	59	16
ESA 2	171	47
Transformed Veld Habitat	0	0
Degraded Grassland	29	8
***Seriphium*-dominated Grassland**	97	27
***Themeda*-rich Grassland**	224	62
Freshwater Habitat	11	3

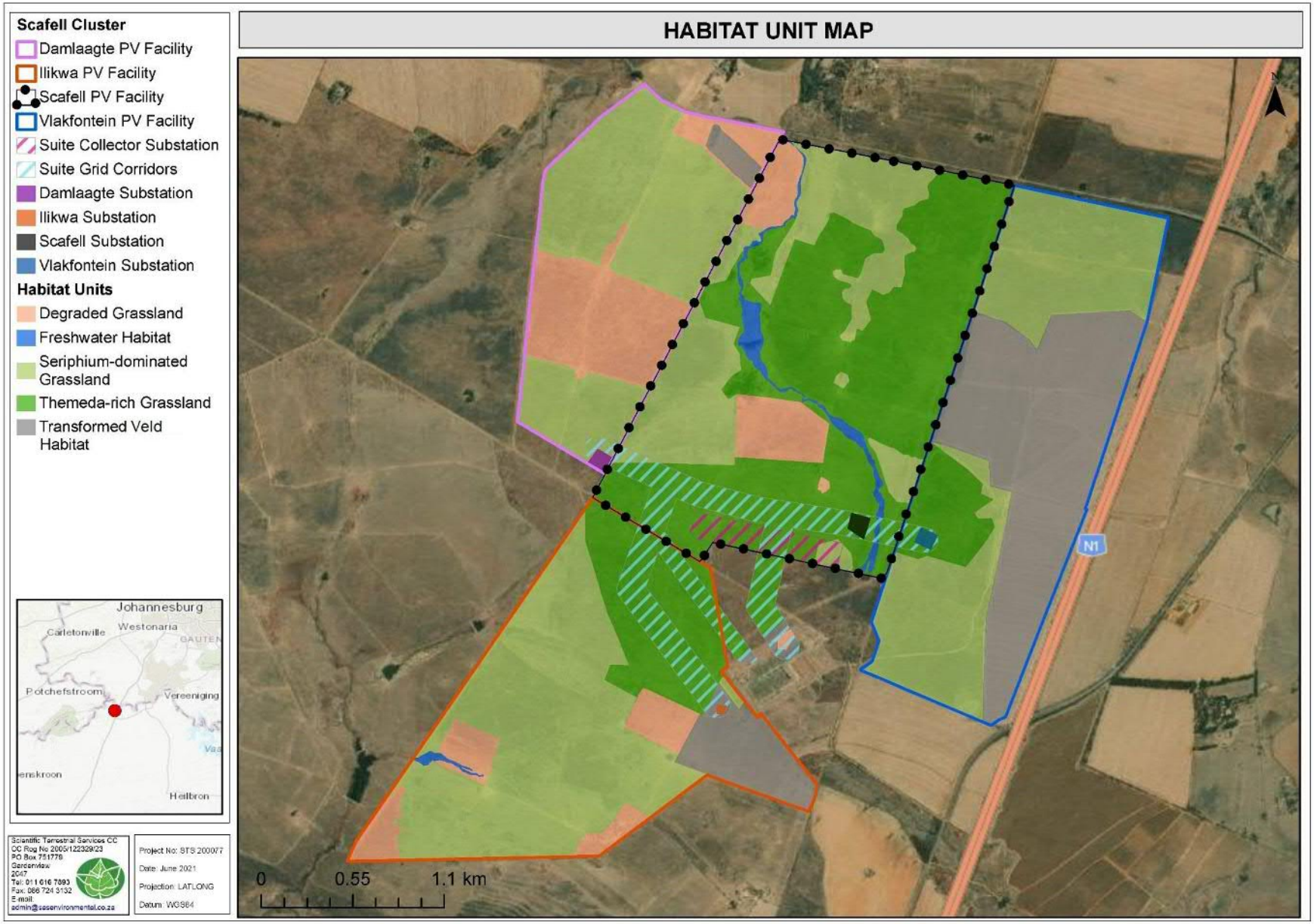


Figure 3: Conceptual illustration of the habitat units associated with the study area as identified during the field assessment. For the current report focus should be placed on the Scafell Solar PV Facility.

3.3 Floral Ecological Discussion

To present a more complete overview of the ecological condition of the vegetation communities associated with the study area, the below section addresses the ecological drivers, functions and corridors that contribute to the current species composition and veld condition. Specific details pertaining to habitat integrity, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity, are provided in more detail in sections 3.4 – 3.6.

3.3.1 Corridors on site

Dispersal corridors within the study area, particularly within the *Seriphium*-dominated Grassland and *Themeda*-rich Grassland subunits and the Freshwater Habitat Unit, are considered intact and functional – together these habitats comprise 92% of the Scafell Farm Boundary. Given that the habitat across the study area is still moderately intact in places, the capacity of the study area to provide intact dispersal corridors with the surrounding habitat is moderately high. Within the Transformed Veld Habitat and the Degraded Grassland subunit, the capacity for intact dispersal corridors is low. A combination of agricultural practices and building infrastructure within these areas contribute to the lack of connective corridors within the Transformed Veld Habitat and the Degraded Grassland subunit. However, given that these units comprise a small extent (i.e., 11 %) of the study area, most of the dispersal corridors across the study area are thus considered intact.

3.3.2 Species composition and vegetation structure

The proposed development will impact on the overall species diversity of the study area. As much of the area will be transformed by the proposed development, species diversity as well as habitat will be lost within the proposed footprint. With a loss of diversity and suitable habitat, there will be an associated change in vegetation structure.

3.3.3 Ecological drivers / processes / functioning

Fire and herbivory are recognised as some of the most important drivers of the grassland biome (O'Connor *et al.* 2014), with climate especially important in mesic grasslands (SANBI, 2013). However, due to the location of the study area in proximity to surrounding agricultural fields, as well as the presence of cattle throughout the study area, these important ecological drivers (especially fire) are largely absent from the area, especially within the Transformed Veld Habitat Unit. Naturally occurring herbivores are absent from the study area; however, herbivory is still present within the system (except for within the Transformed Veld Habitat),

albeit herbivory from domestic animals (e.g., cattle) resulting in parts of the veld being overgrazed (particularly within the *Seriphium*-dominated Grassland). This has resulted in an increase of *Seriphium plumosum*, i.e., bankrupt bush, an indigenous species that easily proliferates in disturbed and overgrazed areas (as evident with the *Seriphium*-dominated Grassland subunit). This species is particularly prominent within the *Seriphium*-dominated Grassland subunit. Although recorded within the *Themeda*-rich Grassland subunit, its abundance and capacity are less within the *Themeda*-rich Grassland habitat than the surrounding *Seriphium*-dominated Grassland. However, the potential of this species to proliferate if left unchecked is high. This is attributed to the fact that the species is fast-growing, easily displaces grass species and is unpalatable (thus not kept in check by grazing livestock). Another factor that leads to increased densities of this species includes mismanagement (e.g., a lack of controlled burning) (Snyman 2012).

Management and control of the species is of particular interest in South Africa, with inexpensive control methods having failed the test of time. Mechanical control has previously been used. However, this method of control is labour intensive and requires extensive follow up to remove coppiced and germinated individuals that come about because of seed dispersal during the mechanical control (Snyman 2009). The main stem of *S. plumosum* will need to be cut beneath the soil surface to avoid coppicing if mechanical control is used as a management tool. Chemical control (in granular or suspension form) can be effective in controlling the proliferation of the species, however this method of control is expensive.

Primary Grassland[1] was not recorded within the study area. However, Secondary Grassland[2] was present within the study area. For an indication of what constitutes primary and secondary grassland, please refer to the block below:

[1] Primary grasslands are those that have not been significantly modified from their original state; even though they may no longer have their full complement of naturally occurring species, they have not undergone significant or irreversible modification and still retain their essential ecological characteristics.

[2] Secondary grasslands are those that have undergone extensive modification and a fundamental shift from their original state (e.g., to cultivated areas), but have then been allowed to return to a 'grassland' state (e.g., when old, cultivated lands are re-colonised by a few grass species). Although secondary grasslands may superficially look like primary grasslands, they differ markedly with respect to species composition, vegetation structure, ecological functioning, and the ecosystem services they deliver.

According to the Grasslands Ecosystem Guidelines: landscape interpretation for planners and managers (SANBI, 2013) "*primary grasslands are those that have not been significantly modified from their original state; even though they may no longer have their full complement of naturally-occurring species, they have not undergone significant or irreversible modification and still retain their* ***essential ecological characteristics***".

Accordingly, the **essential ecological characteristics** of grasslands include (SANBI, 2013):

- Climate: the interplay of rainfall, frost, temperature, and altitudinal effects and how these factors influence the length of the growing season and the build-up of biomass within the grassland system;
    a. Given the nature of climate it will not be discussed further below.
- Life–history characteristics: the ability of grassland species to respond to disturbance is determined by their life-history strategies. For example, whether a species re-sprouts, vegetatively reproduces or sexually reproduces (through seed) after a disturbance (e.g., fire) is important within grassland ecosystems. Changes in disturbances within grassland ecosystems can alter the ratios (and potentially composition) of species of different life-history strategies (Simpson *et al*. 2021);
- Fire: grasslands are fire-driven ecosystems and require fire to maintain both their biodiversity patterns and ecological processes (O'Connor et al. 2014); and
- Grazing: grazing is an important driver maintaining the ecological character of grassland ecosystems. It is important to note that the effects of fire and grazing cannot be separated out from each other and their impacts interpreted together as these factors often work closely together. The particular combination of these abiotic factors determines the species richness and life history traits of the vegetation and defines the ecological characteristics of the landscape.

In contrast, "*secondary grasslands are those that have undergone extensive modification and a fundamental shift from their original state (e.g., to cultivated areas), but have then been allowed to return to a 'grassland' state (e.g., when old, cultivated lands are re-colonised by a few grass species). Although secondary grasslands may superficially look like primary grasslands, they differ markedly with respect to species composition, vegetation structure, ecological functioning and the ecosystem services they deliver*."

The secondary grassland identified within the study area was considered *secondary* because it is no longer subject to several of the essential ecological characteristics that define grasslands (as above). In particular, the study area is subject to altered fire and herbivory regimes, which in turn has impacted on the species composition and thus overall plant life-history characteristics.

Given that the study area has not been subjected to natural or sufficiently managed fire and herbivory regimes (which in turn affect the life-history strategies of species and thus overall species composition) for extended periods of time, it should be noted that three of the important ecological characteristics that define the grassland community within the study area

have significantly changed. Given the definitions of primary[3] and secondary[4] grasslands, as defined by SANBI (2013), and the degree of change experienced in the fire and herbivory regimes and how this impacts species composition through life-history strategies, sections of the habitat within the study area were defined as secondary vegetation. The study area has undergone a fundamental shift from its original state. The combination of altered fire and herbivory regimes has resulted in a species composition that is not truly representative of the original vegetation state, although a shared affinity with the reference vegetation type is present (as is often the case within Secondary Grassland vegetation).

It should be noted that Secondary Grasslands still have important ecological roles within the landscape – they provide corridors of dispersal, maintain some ecological processes and functions, and provide habitat for a variety of species (that are also present with Primary Grasslands).

In particular, the *Themeda*-rich Grassland Subunit was identified as being secondary grassland. Although this subunit may superficially look like primary Soweto Highveld Grassland, the subunit does differ with respect to species composition (e.g., in terms of grass species), vegetation structure, and thus overall ecological functioning. Primary vegetation was thus not recorded within the study area. The remaining grassland habitat within the study area, i.e., the *Seriphium*-dominated Grassland and the Degraded Grassland subunits, were not considered to be secondary or primary grassland owing to their modified state because of historic and current impacts such as cultivation and agricultural practices. Indigenous vegetation[5] dominated within the Degraded Grassland (although species-poor), and the *Seriphium*-dominated Grassland (moderate species diversity) and the *Themeda*-rich Grassland Subunit (moderately high species diversity). The Transformed Veld Habitat is not considered to represent indigenous vegetation as the unit has undergone significant disturbance within the last 10 years.

[3] Primary grasslands are those that have not been significantly modified from their original state; even though they may no longer have their full complement of naturally-occurring species, they have not undergone significant or irreversible modification and still retain their essential ecological characteristics

[4] Secondary grasslands are those that have undergone extensive modification and a fundamental shift from their original state (e.g., to cultivated areas), but have then been allowed to return to a 'grassland' state (e.g., when old, cultivated lands are re-colonised by a few grass species). Although secondary grasslands may superficially look like primary grasslands, they differ markedly with respect to species composition, vegetation structure, ecological functioning, and the ecosystem services they deliver.

[5] Indigenous vegetation refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding 10 years. Definition as defined by the Regulations set out in the National Environmental Management Act, 1998 (Act No. 107 of 1998).

3.3.4 Important conservation features

The study area is located within a threatened ecosystem (i.e., the vulnerable Soweto Highveld Grassland), within a CBA2 and within ESA1 and ESA2.

The proposed development will negatively impact an already threatened, i.e., vulnerable, vegetation unit. According to Mucina & Rutherford (2012), half of the remaining extent of the vegetation unit has already been transformed by cultivation, mining, urban sprawl etc. (Mucina & Rutherford, 2006). As such the 258 ha of the remaining Soweto Highveld Grassland located within the Scafell PV Facility are threatened by the proposed development.

CBA maps have been developed to promote long term ecological sustainability. CBAs are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole. It is generally encouraged that CBAs be assigned to land-use categories or zones that will keep the area in a natural state (SANBI, 2017).

CBAs are often selected on several criteria. Some selection criteria include PES (i.e., good ecological condition), presence of freshwater systems (e.g., rivers), presence of threatened vegetation type, presence of suitable habitat for SCC (provincial and national), presence of focus areas for expansion of protected areas from the National Protected Area Expansion Strategy 2009, areas identified as irreplaceable corridors and ability to maintain ecological processes (i.e., corridors including both terrestrial and aquatic) (SANBI, 2017).

CBA1 and CBA2 areas are separated as follows (SANBI, 2017):

- CBA1 (sometimes called CBA Irreplaceable) are areas that are irreplaceable or near irreplaceable (i.e., high selection frequency) for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with these areas; and
- CBA2 (sometimes called CBA Optimal) are areas that have been selected as the best option for meeting biodiversity targets, based on complementarity, efficiency, connectivity and/or avoidance of conflict with other land or resources uses.

The area within the Scafell PV Facility was identified as CBA2. The likely criteria driving this classification includes: the presence of freshwater systems (e.g., rivers), presence of a threatened vegetation type (i.e., the vulnerable Soweto Highveld Grassland), and presence of suitable habitat for SCC (provincial and national).

ESAs have been selected in order to retain ecological processes, which often requires the presence at least semi-natural ecological conditions. ESAs aim to ensure the long-term ecological functioning of the landscape as a whole (SANBI, 2017).

ESAs are often selected on several criteria. Some selection criteria include areas in PES (i.e., good ecological condition) that were not selected as CBAs, presence of freshwater systems (e.g., rivers and wetlands) that were not selected as CBAs, specific sites important for persistence or management of species of special concern and not selected as CBAs, unique or special habitats or features not selected as CBAs, and other areas important for ecological processes (e.g., riparian zones) not selected as CBAs, among other reasons (SANBI, 2017).

ESA1 and ESA2 habitats are distinguished as follows (SANBI, 2017):

- ESA1: These are ESAs that are currently in either good or fair ecological condition, for which the objective is to retain them in at least fair ecological condition.
- ESA2: These are ESAs that are currently in severely modified ecological condition (e.g., cultivated areas in riparian zones) but that nevertheless retain sufficient ecological functioning to fulfil the purpose for which the ESA was selected. The objective is to prevent further deterioration in ecological condition.

3.4 Transformed Veld Habitat

VARIOUS VEGETATION COMMUNITIES AND THE DIFFERENT VEGETATION STRUCTURES ASSOCIATED WITH THE TRANSFORMED VELD HABITAT UNIT
Proposed infrastructure located within this habitat unit: This habitat is not located within the Scafell PV Facility, however, three of the potential PV Facility areas, namely the Damlaagte PV Facility, the Vlakfontein PV Facility, and the Ilikwa PV Facility areas, are located within this habitat unit. The Ilikwa substation is also situated within this habitat unit. A small section of the Suite Grid Corridor (in the west) is located within this habitat unit. This habitat unit included areas that have experienced acute anthropogenic disturbances (e.g., areas of recent and current cultivation and infrastructure development) which has resulted in subpar habitat conditions, decreased habitat integrity and a low species diversity. Natural vegetation was scarce throughout the habitat unit. The proliferation of AIP species, such as *Verbena bonariensis, Datura stramonium*, *Conyza bonariensis* and *Xanthium strumarium* was evident throughout the habitat unit. As the habitat unit is transformed, the remaining vegetation is not representative of the reference vegetation type for the area. Very little habitat is provided for native floral species diversity or community structure within this habitat unit.
Vegetation Structure and Dominant Species
  Left: stands of *Conyza bonariensis* (NEMBA Category 1b); Right: Stands of *Tagetes minuta* (Not Listed; NL) within the Transformed Veld Habitat
The vegetation structure of the Transformed Veld Habitat can be described as **disturbed and invaded habitat with a low diversity of indigenous species.** The low species diversity recorded within the habitat unit is attributed to the disturbed and transformed nature of the area. Indigenous species were poorly represented throughout the habitat unit. Dominant indigenous species included those that are often indicative of disturbed places such as *Gomphocarpus fruticosus* and *Plantago lanceolata*. AIPs were abundant within the habitat unit, making up the bulk of the vegetation present (as evident in the photographs above). Common AIP species found within the habitat unit included *Solanum sisymbriifolium*, *Cirsium vulgare, Verbena bonariensis*, *Campuloclinium macrocephalum* and *Datura stramonium.* Refer to **Appendix C** for a list of species recorded within this habitat unit.

<table>
<tr><th colspan="2">Selected examples of flora recorded within the Transformed Veld Habitat</th></tr>
<tr><td colspan="2">   
From left to right: Gomphocarpus fruticosus, stands of Conyza bonariensis and Cirsium vulgare</td></tr>
<tr><td>Species of Conservation Concern</td><td>No threatened SCC (i.e., Red Data Listed plants), as defined in Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), were recorded during the site assessment.

No provincially protected species as listed in Schedule 6 (Protected Plants) of the Free State Nature Conservation Ordinance, 1969 (Ordinance No. 8 of 1969) (FSNCO) were observed in this habitat unit. The habitat unit does not provide suitable conditions to support species protected under the National Forest Act, 1998 (Act No. 84 of 1998) (NFA) protected species.

Activities associated with the development of the surrounding infrastructure, cultivation and long-term fragmentation from surrounding species sources have destroyed suitable habitat for the establishment and persistence of SCC on the site. The absence of suitable dispersal corridors because of the location of the site near the existing Scafell Substation, and its proximity to cultivated fields together with a decrease in many dispersal agents, has further reduced the potential of SCC re-establishment and persistence. Habitat for floral species within the anthropogenically modified and degraded landscape has been altered to the extent where the likelihood of SCC establishment is low.

Refer to Appendix B for a list of species assessed as part of the SCC assessment.</td></tr>
</table>

Concluding Remarks

Impact summary:

This habitat was not recorded within the Scafell Solar PV Facility.

This habitat unit has a low habitat sensitivity from a floral ecological and resource management perspective. The low sensitivity of the unit is attributed to the disturbed nature of the area which has led to a decrease in habitat integrity and ecological functionality.

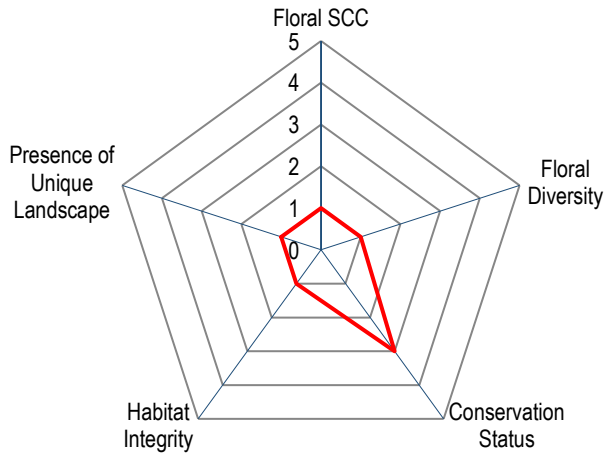
According to the 2015 Free State Biodiversity Plan, this habitat unit is situated within areas classified as Degraded Areas and ESA 2 Areas. Areas identified as Degraded included small sections within the west of the Vlakfontein PV Facility and the north east of the Damlaagte PV Facility. These areas are currently being utilised for agricultural purposes. Sections of this habitat unit that fall within an ESA 2 include sections of the south west of the Vlakfontein PV Facility and a small section within the west of the Ilikwa PV Facility. These areas no longer represent functioning ecosystems with intact or near-intact ecological and evolutionary processes owing to the transformed nature of the habitat and its associated low capacity to support SSC.

Although the National Web Based Online Screening Tool denotes that the plant theme for the study area is of medium sensitivity, this habitat unit is unlikely to provide suitable habitat[6] for the Sensitive species identified by the Screening tool include, namely Sensitive species 691[7] (VU) and Sensitive species 1252 (VU). The habitat further is unlikely to provide suitable habitat to support a diversity of other floral species and further for SCC. As such, the combination of a lack of suitable habitat for floral SCC and the presence of AIPs within the habitat unit denotes that the proposed development within the already disturbed habitat unit is unlikely to have a significant impact on the floral communities present.

Overall, the impact on floral communities due to infrastructure development within this habitat unit will be small to insignificant.

During the i) construction and ii) operational & decommissioning phases it is recommended that AIPs be monitored and controlled. Removal of AIP species to a registered waste facility as well as the implementation of AIP control and maintenance measures at the onset of construction will limit the spread of AIP species to surrounding natural habitat, and subsequently, limit the footprint area for which AIP control management will have to be implemented during the operational & decommissioning activities.

Low Habitat Sensitivity



[6] In depth habitat requirements of the sensitive species identified by the screening tool have been excluded from the report so as not to allude to the identification of the sensitive species.
[7] 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.

3.5 Grassland Habitat

VARIOUS VEGETATION COMMUNITIES AND THE DIFFERENT VEGETATION STRUCTURES ASSOCIATED WITH THE GRASSLAND HABITAT UNIT
This habitat unit was characterised by a dominance of grass species and consists of three subunits, namely: 1. **Degraded Grassland**, 2. ***Seriphium*-dominated Grassland**, and 3. ***Themeda*-rich Grassland**. } All three subunits were recorded in the Scafell PV Facility. Subunits were differentiated largely based on species composition and level of disturbance experienced. The overall species richness of this habitat unit was moderate and was characterised by indigenous floral species, although AIP species are evident within all subunits. Overall, the *Seriphium*-dominated Grassland and the Degraded Grassland Subunits are not representative of the Soweto Highveld Grassland (reference vegetation type) as described in Mucina and Rutherford (2006). Although not fully representative of the reference vegetation type, the *Themeda*-rich Grassland Subunit does share an affinity (in terms of structure and composition, particularly grass and forb species) with the reference vegetation type. However, given that the Subunit has historically been utilised for cattle grazing purposes, and the subsequent presence of *Seriphium plumosum* within the Subunit, it is not considered to be representative of the reference vegetation.

Vegetation Structure and Dominant Species within the Grassland Habitat subunits

Degraded Grassland

Proposed infrastructure located within habitat unit: located within three of the proposed PV facilities, namely Damlaagte, **Scafell** and Ilikwa**.**

The vegetation structure can be described as **degraded, species-poor grassland.** The low species diversity recorded within the habitat unit is attributed to the disturbed nature of the area.

Graminoids were dominant with representative species including *Cynodon dactylon, Andropogon appendiculatus, Hyparrhenia hirta* and *Melinis repens*. Representative forb and herb species included *Commilena africana, Hilliardiella elaeagnoides*, and *Gomphocarpus fruticosus*. The woody layer was poorly represented and supported very few woody species and individuals. However, *Searsia pyroides* and *Vachellia karroo* were infrequently recorded throughout the subunit. AIPs were prominent within the habitat subunit, and included *Verbena bonariensis*, *Verbena b*rasiliensis*, Tagetes minuta, Conyza bonariensis,* and *Campuloclinium macrocephalum*.

Refer to **Appendix C** for a list of species recorded within this habitat subunit.

***Seriphium*-dominated Grassland**

Proposed infrastructure located within habitat unit: located within all four PV facilities**.** The Damlaagte Substation, a small section in the west of the Suite Grid Corridor and a small section in the west of the Suite Collector is located within this subunit. **T**he Damlaagte substation and the Ilikwa Substation are also located within this subunit.

The vegetation structure can be described as ***Seriphium*-rich grassland that supported a moderate species richness.** This subunit supported the highest densities of *Seriphium plumosum* of all the Grassland Habitat subunits. Despite the higher densities of *S. plumosum* within the subunit, a moderate species diversity was evident in which a variety of both forb and grass species were represented.

Graminoids were dominant with representative species including *Digitaria eriantha*, *Hyparrhenia hirta, Themeda triandra* and *Melinis repens*. Representative forb and herb species included *Kyllinga alba*, *Helichrysum chionosphaerum, Polygala hottentotta*, and *Hibiscus microcarpus*. The woody layer was poorly represented and supported very few woody species and individuals. However, *Ziziphus zeyheriana, Vachellia karroo* and *Searsia pyroides* were infrequently recorded throughout the subunit. AIPs were recorded within the habitat subunit although not prolifically. AIP species recorded within the subunit included *Verbena bonariensis*, *Verbena b*rasiliensis*, Conyza bonariensis,* and *Campuloclinium macrocephalum*.

Refer to **Appendix C** for a list of species recorded within this habitat subunit.

***Themeda-dominated* Grassland**

Proposed infrastructure located within habitat unit: located within three of the potential PV facilities, namely the Scafell PV area, the Vlakfontein PV Area, and the Ilikwa PV Area**.** The Scafell and Vlakfontein Substations, and majority of the Suite Grid Corridor and the Suite Collector is located within this subunit.

The vegetation structure can be described as ***Themeda triandra* dominated grassland that supported a moderate to moderately high species richness.** This subunit supported the highest species richness of all the Grassland Habitat subunits and supported species that were not recorded within any of the other Grassland Habitat subunits (e.g., *Hypoxis hemerocallidea* and *Peucedanum magalismontana*).

Graminoids were dominant with representative species including *Aristida congesta* subsp. *congesta, Eragrostis gummiflua, Themeda triandra* and *Melinis repens*. Representative forb and herb species included *Asclepias eminens, Dipcadi longifolium, Delosperma herbeum, Trifolium africanum* and *Pelargonium luridum*. The woody layer was represented by occasional woody clumps in which *Celtis Africana*, *Searsia pyroides* and *Ziziphus mucronata* dominated. AIPs were recorded within the habitat subunit although not prolifically. AIP species recorded within the subunit included *Tagetes minuta, Bidens Pilosa* and *Tragopogon dubis*.

Refer to **Appendix C** for a list of species recorded within this habitat subunit.

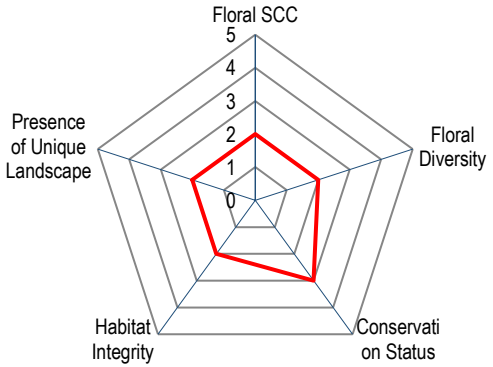
Selected examples of flora recorded within the Grassland Habitat	
    **From left to right**: *Peucedanum magalismontana, Pachycarpus schinzianus, Cyanotis speciosa,* and *Boophone disticha*	

Species of Conservation Concern	No nationally threatened SCC (i.e. Red Data Listed plants), as defined in NEMBA Section 56(1), were recorded during the site assessment.
	
	Several provincially protected species, namely *Aloe davyana, Crinum bulbispermum Helichrysum chionosphaerum*, *Helichrysum acutatum* and *Boophone disticha,* were identified within the Grassland Habitat. These species were recorded within the *Themeda*-rich Grassland, whereas all SCC with the exception of *Aloe davyana.,* were recorded within the *Seriphium*-dominated Grassland Subunit. All species within the *Aloe, Crinum, Helichrysum and Boophone* genera are listed as protected in Schedule 6 (Protected Plants) of the FSNCO. The habitat unit does not provide suitable conditions to support the single NFA protected species, namely *Boscia albitrunca*, that has the potential to be located within the region.
	
	Results of the Probability of Occurrence (POC) assessment for SCC identified by the national Red list and the National Web Based Online Screening Tool are provided below. These results refer particularly to the *Seriphium*-dominated and the *Themeda*-rich Grassland Subunits as the POC assessment for the Degraded Grassland subunit rendered a "'Low" score for all species:
	• *Seriphium*-dominated Grassland Subunit:
	  ○ *Crinum bulbispermum* (POC = potentially Confirmed; Status = LC);
	  ○ *Aloe davyana* (POC = High; Status = LC);
	  ○ ***Helichrysum chionosphaerum* (POC = Confirmed; Status = LC);**
	  ○ ***Helichrysum acutatum* (POC = Confirmed; Status = LC);**
	  ○ ***Boophone disticha* (POC = Confirmed; Status = LC);** and
	  ○ *Kniphofia typhoides* (POC = Medium; Status = VU).
	• *Themeda*-rich Grassland Subunit:
	  ○ *Crinum bulbispermum* (POC = potentially Confirmed; Status = LC);
	  ○ ***Aloe davyana* (POC = Confirmed; Status = LC);**
	  ○ ***Helichrysum chionosphaerum* (POC = Confirmed; Status = LC);**
	  ○ ***Helichrysum acutatum* (POC = Confirmed; Status = LC);**
	  ○ ***Boophone disticha* (POC = Confirmed; Status = LC);**
	  ○ *Brachystelma incanum* (POC = Medium; Status = VU); and
	  ○ *Kniphofia typhoides* (POC = High; Status = VU).

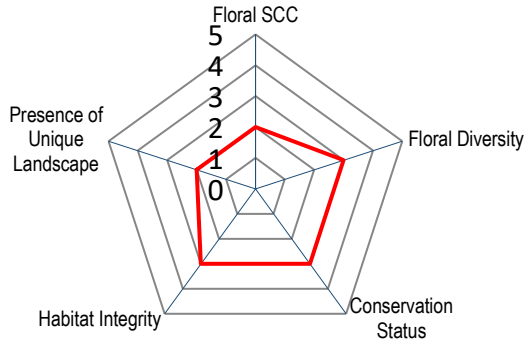
	It is recommended that a walkthrough of the site is conducted prior to the commencement of any construction and that all encountered floral SCC are marked. Permits will be required from the relevant authorities such as the Free State Department of Economic Development, Tourism and Environmental Affairs (DESTEA) (for provincially protected species) or the Department Forestry, Fisheries and the Environment (DFFE) (for nationally threatened species) to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place. Refer to Appendix B for a list of species assessed as part of the SCC assessment.

Concluding Remarks

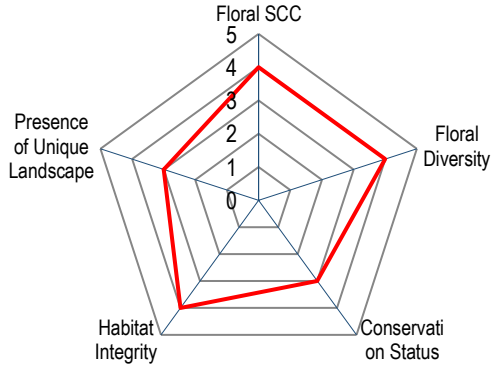
Degraded Grassland Subunit: Moderately Low Habitat Sensitivity



***Seriphium*-dominated Grassland Subunit: Intermediate Habitat Sensitivity**



***Themeda*-rich Grassland Subunit: Moderately High Habitat Sensitivity**



Impact Summary:

This habitat unit ranges from a moderately low sensitivity to a moderately high sensitivity from a floral ecological and resource management perspective. Overall, the vegetation unit within the Degraded and *Seriphium*-dominated Grassland Subunits is not representative of the reference vegetation type. However, although not fully representative of the reference vegetation type, the *Themeda*-rich Grassland Subunit does share an affinity in terms of structure and composition with the reference vegetation type. Floral diversity ranges from low to moderate depending on each habitat subunit.

Primary Grassland[8] was not recorded within the study area. However, Secondary Grassland[9] was present within the study area. In particular, the *Themda*-rich Grassland Subunit was identified as being secondary grassland given that this subunit shares an affinity with the Soweto Highveld Grassland in terms of forb and grass species composition. Although this subunit may superficially look like primary Soweto Highveld Grassland, the subunit does differ with respect to species composition (e.g., in terms of grass species), vegetation structure, and thus overall ecological

[8] Primary grasslands are those that have not been significantly modified from their original state. Generally, they have not undergone significant or irreversible modification and still retain their essential ecological characteristics. Definition as provided by SANBI (2013) Grasslands Ecosystem Guidelines: landscape interpretation for planners and managers.

[9] Secondary grasslands are those that have undergone extensive modification and a fundamental shift from their original state (e.g., to cultivated areas), but have then been allowed to return to a 'grassland' state (e.g. when old cultivated lands are re-colonized by a few grass species). SANBI (2013) Grasslands Ecosystem Guidelines: landscape interpretation for planners and managers.

functioning. The remaining subunit were not considered to be secondary grassland owing to their modified state because of historic and current impacts such as cultivation and agricultural practices. Indigenous vegetation[10] dominated within the Degraded Grassland, and the *Seriphium*-dominated Grassland Subunits.

Floral SCC, namely *Aloe davyana, Crinum bulbispermum, Helichrysum chionosphaerum*, *Helichrysum acutatum and Boophone disticha,* must be rescued and relocated during development within the *Seriphium*-dominated and *Themeda*-rich Grassland subunits during the proposed development. As such the development footprint should be minimised to what is essential. Genera, including *Aloe davyana*, *Crinum, Helichrysum and Boophone,* are all protected under FSNCO and will require permits from DESTEA to be removed/ destroyed prior to the commencement of construction. Once designs have been finalised, a floral walkdown will need to be undertaken in the summer season and all protected individuals marked. Prior to any ground clearing activities, the relevant permits will have to be obtained from DESTEA for the removal of these individuals. Although the National Web Based Online Screening Tool denotes that the plant theme for the study area is of medium sensitivity, this habitat unit is unlikely to provide suitable habitat for the Sensitive species identified by the Screening tool include, namely Sensitive species 691[11] (VU) and Sensitive species 1252 (VU).

The Degraded Grassland and *Seriphium*-dominated Grassland Subunits are not unique in the landscape. The intermediate *Seriphium*-dominated Grassland Subunit is well represented in the surrounding areas and neither this subunit nor the Degraded Grassland Subunit are considered representative of the Soweto Highveld Grassland (i.e., the reference vegetation type). However, the *Themeda*-rich Grassland Subunit, which of a moderately high sensitivity from a floral perspective, shares an affinity with the reference vegetation type in terms of grass and forb species. However, given that the *Themeda*-rich Grassland Subunit has historically been subjected to anthropogenic activities (e.g., grazing) it is not fully representative of the reference vegetation type. The Soweto Highveld Grassland is listed as a threatened ecosystem (National Threatened Ecosystems, 2011, and NBA, 2018), and is classified as **vulnerable**. According to the 2015 Free State Biodiversity Plan, most of the Grassland habitat unit, and particularly the *Seriphium*-dominated and *Themeda*-rich Grassland Subunits, are largely located within CBA2, ESA1, ESA2 areas. Much of the CBA2 area is located within the *Themeda*-rich Grassland Subunit (moderately high sensitivity) while a small area of the *Seriphium*-dominated Grassland Subunit is located within a CBA 2. Given the importance of these habitat units (especially where they are in CBA and ESAs) within the ecosystem (e.g., maintaining dispersal corridors and other ecological functions) and the moderate to moderately high species richness that is associated with these subunits, their classification within both CBA2 and ESA1 & ESA 2 areas can be confirmed. Small sections of the Grassland Habitat unit within the Ilikwa PV Facility and Damlaagte PV Facility areas are located within an area classified as “Degraded Areas” or “Other Areas”. This is supported as these areas were located within the Degraded Grassland Habitat (moderately low sensitivity) and small section of the *Seriphium*-dominated Grassland Subunit (intermediate sensitivity).

The proposed development, which will entail development of most of the associated study area, which is not consistent with maintaining the condition of the CBA2 areas in a natural or near natural state as much of the area within the CBA2 will be transformed. The goal of the proposed development will also not achieve any form of rehabilitation of the CBA2 area if authorised to develop the entire study area.

Given the lower impacts associated with the potential powerline servitudes, the associated *Themeda*-rich Grassland subunit within these areas will serve to maintain dispersal corridors across the study area (provided that *S. plumosum* is controlled and managed within these areas). Furthermore, provided that mitigation measures are implemented, these corridors can act to ensure connectivity across the southern section of the Scafell PV Facility

According to the 2015 Free State Biodiversity Plan, CBA2 Area, may have some options for meeting the conservation and ecological objectives associated with nearby CBAs in other parts of the landscape. However, this can only be done at the cost of losing some of the spatial efficiency of the network of CBAs. If a CBA2 is lost and an alternative natural area elsewhere is identified to become part of the CBA network, the alternative area is likely to be larger, increasing the size of the CBA-network. Areas identified as ESAs should be kept in at least semi-natural condition, i.e., with their basic ecological functioning still intact. Development within these areas should thus be minimised. The classification of the areas identified as CBA2, ESA1, and ESA2 areas within

[10] Indigenous vegetation refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding 10 years. Definition as defined by the Regulations set out in the National Environmental Management Act, 1998 (Act No. 107 of 1998).

[11] 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.

the study area, and particularly within the *Themeda*-rich Grassland Subunit was confirmed during the field assessment. Given the importance of these areas within the ecosystem, development within these areas should be avoided as much as is possible.

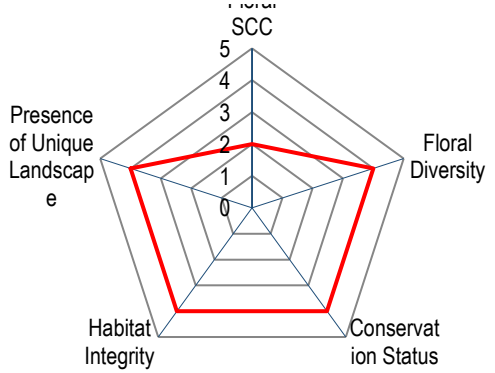
Although the proposed development is not deemed likely to have significant negative impacts on the Degraded Grassland Subunit, both the *Seriphium*-dominated and the *Themeda*-rich Grassland Subunits are expected to receive negative impacts on their floral assemblages because of the proposed development. Although AIP infestation was not prolific within the grassland Habitat, it is advised that during and post-construction activities, procedures to reduce and control the proliferation of AIP species within the surrounding area (and particularly within the Degraded Grassland Subunit) be implemented.

Seriphium plumosum, although a naturally occurring species can pose a threat to indigenous vegetation when allowed to proliferate. Within the *Seriphium*-dominated Grassland Subunit, this species was particularly evident, although it was recorded in low densities within the other two Grassland Subunits. It is recommended that a control and management plan be implemented to control the encroachment of this shrub throughout the Grassland Habitat Unit.

3.6 Freshwater Habitat

VARIOUS VEGETATION COMMUNITIES AND THE DIFFERENT VEGETATION STRUCTURES ASSOCIATED WITH THE FRESHWATER HABITAT UNIT
Proposed infrastructure located within the habitat unit: This habitat unit is located mostly within the Scafell PV Facility, while small areas of this unit are located within the Ilikwa PV Facility and the Vlakfontein PV Facility areas. A small section of this habitat unit also transverses the Suite Grid Corridors in the east. This habitat unit consisted of UVB systems within the Scafell Solar PV Facility Area, a tributary of a UVB within the Ilikwa Solar PV Facility and a Depression Wetland within the Vlakfontein Solar PV Facility. Refer to the SAS 220184 report for further detail on the wetlands found on site. The vegetation of the Freshwater Habitat is typical of saturated areas and is moderately intact; however, several alien and invasive plant (AIP) species have encroached into sections of the habitat unit.
Vegetation Structure and Dominant Species
This Habitat unit consisted of unchanneled valley bottom wetland and a depression wetland system. The vegetation present within the Freshwater Habitat Unit was indicative of wetland conditions, with a moderate species richness.       **Left:** UVB wetland (picture from the UVB wetland identified within the Scafell PV Facility); and **Right:** Depression wetland identified during the field assessment Dominant species within this habitat included *Typha capensis, Eragrostis lehmanniana, Miscanthus junceus, Aristida congesta* subsp. *congesta, Cyperus congestus*, *Juncus effusus, Cyperus marginatus*, and *Cyperus esculentus.* Forb and herb species were scarce and occasional species, especially within the seasonal zones of the subunit, were recorded and included *Wahlenbergia caledonia, Gomphocarpus fruticosus* and *Nemesia fruticans*, *Haplocarpha lyrata.* Woody species were infrequent, however, the occasional *Searsia pyroides* was recorded within the Habitat Unit. Several AIP species were recorded within this habitat subunit, including *Cosmos bipinnatus*, *Cirsium vulgare, Campuloclinium macrocephalum*, *Persicaria limbata* and *Verbena bonariensis*. Despite several AIP species within the subunit, the Freshwater Habitat is, nevertheless, considered to provide important ecological functions in the area. Refer to Appendix C for a list of species recorded within this habitat subunit.

Selected examples of flora recorded within the Freshwater Habitat	
   **From left to right:** *Campuloclinium macrocephalum, Persicaria limbata, Polygala hottentotta*	
Species of Conservation Concern	No threatened SCC (i.e. Red Data Listed plants), as defined in Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), were recorded during the site assessment. Two provincially protected species, namely *Crinum bulbispermum* and *Boophone disticha,* as listed in Schedule 6 (Protected Plants) of the FSNCO were observed within this habitat unit. The habitat unit does not provide suitable conditions to support species protected under NFA. In particular, the Freshwater habitat does provide suitable corridors for dispersal across the study area, and thus the larger region. As such, there is potential for SCC establishment and persistence within the subunit (as indicated in the POC assessment below). Results of the POC assessment for SCC identified by the national Red list, the FSNCO and the National Web Based Online Screening Tool. - *Kniphofia typhoides* (POC = High, Status = NT); and - *Alepidea attenuate* (POC = Medium; Status = NT). Refer to **Appendix B** for a list of species assessed as part of the SCC assessment.

Business case	
Impact Summary: This habitat unit scored a sensitivity of moderately high from a floral ecological and resource management perspective. Overall, the vegetation unit still provides important ecological functions within the greater landscape. Floral diversity within the habitat unit was moderate. Overall, the Freshwater Habitat unit is considered an important feature in the landscape, serving as an ecological corridor benefiting both fauna and flora within the region, and allowing ecological processes to persist. According to the 2015 Free State Biodiversity Plan, the Freshwater Habitat Unit is located largely within areas classified as ESA1 and ESA2 and provides unique habitat within the greater landscape. Given the important functions that this habitat unit provides within the ecosystem and the moderate species richness that is associated with this habitat, its classification within an ESA area can be confirmed. Two provincially protected species, namely *Crinum bulbispermum* and *Boophone disticha,* as listed in Schedule 6 (Protected Plants) of the FSNCO were observed within this habitat unit. Although only two SCC species were recorded it is not entirely unexpected that other SCC will occur within the habitat. SCC from surrounding areas can potentially disperse and establish within the Freshwater Habitat unit. As such, it is recommended that a walkdown of the footprint within this habitat be conducted to ensure that no floral SCC have established since the time of the field assessment. If any SCC are recorded during the walkdown, the relevant permits will have to be obtained from DESTEA (for provincially protected species) and DFFE (for nationally threated species) for the removal of these individuals prior to the commencement of any development. For nationally threatened species that will be lost due to the proposed activities, species must be replaced following the guideline for biodiversity offsets proposed in the draft National Biodiversity Guidelines[12]: e.g., species with a Vulnerable threat status to be replaced at a ratio of 1:5. It is advised that the Freshwater Habitat within the Scafell PV Facility be excluded from the proposed layout and that recommendations made within the Freshwater assessment (SAS 220184, 2021) be adhered to. If the Freshwater Habiatt is excluded within the PV Facility, corridors between the top and bottom of the PV Facility will be maintained, provided that strict mitigation measures are implemented (e.g., AIP control and soil erosion). Although not prolific, several AIP species were recorded within this habitat unit. It is thus recommended that ongoing alien control be implemented throughout the construction and post-construction phases of the development. Removal of AIP species to a registered waste facility as well as implementation of AIP control and maintenance measures at the onset of construction as well as after construction will limit the spread of AIP species to surrounding natural habitat, especially Wetland Habitat further downstream. Negative impacts on the Freshwater Habitat floral assemblages are deemed likely if development were to transverse this habitat or be within a close enough proximity to result in edge effects that will ultimately impact on this habitat unit. Significant impacts are particularly associated with the largest wetland portion within the Scafell PV Facility. This wetland section, of	**Freshwater Habitat Sensitivity: Moderately High Habitat** 

[12] DEA, 2017. Draft National Biodiversity Offset Policy. Government Gazette No. 40733.

moderately high sensitivity, transverses the length of the Scafell PV Facility and is largely situated within an ESA. As such, it is recommended that where possible, development within the Freshwater Habitat (and particularly parts of the Freshwater Habitat within the Scafell PV Facility Area) should be avoided. Development of the Proposed PV Facilities should avoid the Freshwater Habitat areas. It is recommended that edge effects are strictly managed to limit the impact on the surrounding natural area.	

3.7 Sources of Habitat Degradation

Human activities and/ or climatic variation can gradually, or rapidly, lead to the deterioration of the conditions of the land, which impacts habitat integrity and tends to reduce floral diversity. The cost and effort it will take to restore habitat integrity of an area is positively correlated with the extent to which the veld has been degraded. Determining whether the vegetation of an area has been degraded includes the evaluation of three main indicators (Van Oudtshoorn, 2015), including:

- Lack of vegetation and/or diversity;
- Bush encroachment; and
- Alien and invasive plant species.

The above-listed indicators of habitat degradation are discussed in the below sections. Within the study area, the primary causes of habitat degradation include historic earth-moving activities and grazing pressures.

3.7.1 Lack of vegetation and/or diversity

A lack of indigenous vegetation and diversity is evident within the Transformed Veld Habitat and within the Degraded Grassland Subunit, where anthropogenic activities (e.g., cultivation) have left the area in a disturbed and heavily invaded condition. Such areas are ideal for the proliferation of AIP species and as such, this area currently provides suitable habitat for prolific infestation of several AIP species.

Within the Degraded Grassland Subunit, a lack of indigenous plant diversity is also apparent. This lack of diversity is attributed to historic anthropogenic activities, including historic cultivation, housing, and excavation activities. Although several indigenous species were present within this habitat unit, AIP species were prolific, and this subunit supported the highest density and diversity of AIP species of all the Grassland Habitat Subunits.

3.7.2 Bush encroachment

According to the Department of Environmental Affairs (DEA's) 2019 report on indigenous bush encroachment[13] (now the Department Forestry, Fisheries and the Environment, DFFE), "Bush encroachment entails increases in the abundance of indigenous woody vegetation in the grassland and savanna biomes…". The result of bush encroachment includes alterations to

[13] Towards a policy on indigenous bush encroachment in South Africa (2019), Department of Environmental Affairs, Pretoria, South Africa.

the structure and functioning of ecosystems, with these changes becoming increasingly irreversible as the fundamental nature of the ecosystems change. As such, bush encroachment also negatively impacts on the value of ecosystems delivered.

Bush encroachment was observed within the study area, particularly with the *Seriphium*-dominated Grassland Subunit. Within this habitat subunit, the main bush encroacher species included *Seriphium plumosum* (Figure 3). This species is identified as a problematic encroacher species within the Grassland Biome (Mucina and Rutherford 2006). Over the last decade, increasing densities of this species have become severely problematic within parts of the Gauteng, Eastern Cape, Free State, North West and Mpumalanga Provinces to such an extent that the Conservation of Agricultural Resource Act, 1983 (Act No. 43 of 1983) (CARA) legislation (Regulation 16 of the CARA Act No. 43) listed it as a proclaimed encroacher plant (Jordaan and Jordaan, 2007). This species reduces habitat for other indigenous species and greatly reduces the grazing capacity of grasslands. This species was also recorded within the *Themeda*-rich Grassland Subunit, however, was present in a much lower abundance than that of the *Seriphium*-dominated Grassland subunit. As such, the integrity of the *Themeda*-rich Grassland subunit has not been as impacted as the *Seriphium*-dominated Grassland in which *S. plumosum* has started outcompeting other indigenous flora. If left unchecked this species poses a threat to integrity of the habitat units across the study area.

Avoiding or reversing bush encroachment is possible with rangeland management; however, in cases where bush encroachment has passed the tipping point where the encroacher species account for more than 40% - 50% of vegetation cover, it is recommended that bush encroachment be cleared or thinned manually or mechanically. The guidance of a suitably qualified person should be sought.

Figure 4: Bush encroachment evident within the *Seriphium*-dominated Grassland Subunit. *Seriphium plumosum*, an encroaching shrub, was evident in increased densities within the subunit.

Current policy and legislation do not deal specifically with bush encroachment. CARA encourages the maintenance of rangelands, but if clearing occurs within an important biodiversity area (e.g., within a CBA or ESA) or if it will affect listed species, it can require authorisation under NEMBA or the NFA.

3.7.3 Alien and Invasive Plant (AIP) Species

South Africa is home to an estimated 759 naturalised or invasive terrestrial plant species (Richardson *et al.*, 2020), with 327 plant species, most of which are invasive, listed in national legislation[14]. Many introduced species are beneficial, e.g. almost all agriculture and forestry production are based on alien species, with alien species also widely used in industries such as horticulture. However, some of these species manage to "escape" from their original locations, spread and become invasive. Although only a small proportion of introduced species become invasive (~0.1–10%), those that do proceed to impact negatively on biodiversity and the services that South Africa's diverse natural ecosystems provide (from ecotourism to harvesting food, cut flowers, and medicinal products) (van Wilgen and Wilson, 2018).

Legal Context

South Africa has released several Acts legislating the control of alien species. Currently, invasive species are controlled by the NEMBA – Alien and Invasive Species Regulations, which were gazetted on 1 August 2014 and became law on 1 October 2014[15]. AIPs defined in terms of NEMBA are assigned a category and listed within the NEMBA List of Alien and Invasive Species (2016) in accordance with Section 70(1)(a) of the NEMBA:

- **Category 1a** species are those targeted for national eradication;
- **Category 1b** species must be controlled as part of a national management programme, and cannot be traded or otherwise allowed to spread;
- **Category 2** species are the same as category 1b species, except that permits can be issued for their usage (e.g. invasive tree species can still be used in commercial forestry providing a permit is issued that specifies where they may be grown and that

[14] Government Notice 864 Alien Invasive Species List as published in the Government Gazette 40166 of 2016, as it relates to the National Environmental Management Biodiversity Act, 2004 (Act No 10 of 2004).

From 1 March 2021, the new legislation will come into effect: Government Notice number 1003: Alien and Invasive Species Lists, 2020, in Government Gazette 43726 dated 18 September 2020

[15] From 1 March 2021, the new legislation will come into effect: • Government Notice number R.1020: Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25 September 2020 as it relates to the NEMBA

permit holders "*must ensure that the specimens of the species do not spread outside of the land or the area specified in the permit*"); and

- **Category 3** are listed invasive species that can be kept without permits, although they may not be traded or further propagated, and must be controlled if they occur in protected areas or riparian zones.

Duty of care related to listed invasive species are referred to in NEMBA Section 73[16]. The motivation for this duty of care is both environmentally and economically driven. Management of alien species in South Africa is estimated to cost at least ZAR 2 billion (US$142 million) each year - this being the amount currently spent by the national government's DFFE - i.e. the Working for Water programme (van Wilgen, 2020). Managing AIPs early on will reduce clearing costs in the long run.

Site Results

Of the AIPs recorded during the field assessment, six are listed under NEMBA Category 1b, four are listed under NEMBA Category 2, and the remaining ten species are not listed (Table 2). It is advised that an Alien and Invasive Species Management and Control Plan be implemented throughout all phases of construction within all habitat units, particularly within the Transformed and Freshwater Habitat Units, to limit the spread of AIP species into the surrounding habitat.

[16] Section 73(2): A person who is the owner of land on which a listed invasive species occurs must-

a) notify any relevant competent authority, in writing, of the listed invasive species occurring on that land;
b) take steps to control and eradicate the listed invasive species and to prevent it from spreading; and
c) take all the required steps to prevent or minimise harm to biodiversity.

Table 1: A summary of the Alien & Invasive (AIP) species and their associated NEMBA Category recorded in each habitat unit within the study area.

			Transformed Veld Habitat	Grassland Habitat Subunits			Freshwater Habitat
Scientific Name	**Common Name**	**NEMBA Category**	**Transformed Veld Habitat**	**Degraded Grassland**	**Secondary Grassland**	***Themeda-Seriphium* Grassland**	**Freshwater Habitat**
TREES							
Acacia mearnsii	Black wattle	2			x		x
Eucalyptus grandis	Saligna gum	NL			x		x
Pinus sp.	Pine						x
Populus x canescens	Grey Poplar	2					x
HERBS & SHRUBS							
Argemone ochroleuca	Yellow pricky poppy	2	x	x			
Bidens pilosa	Common blackjack	NL	x	x	x	x	x
Campuloclinium macrocephalum	Pompom weed	1b		x			x
Cirsium vulgare	Spear thistle	1b	x	x	x	x	x
Conyza bonariensis	Flax-leaved horseweed	NL	x	x	x	x	x
Cosmos bipinnatus	Cosmos	NL		x	x		
Datura stramonium	Large-thorn apple	1b	x	x	x	x	x
Oenothera rosea	Evening primrose	NL		x	x	x	x
Persicaria limbata	Knot weed	NL					x
Ricinus communis	Castor oil plant	2	x	x	x	x	x
Solanum sisymbriifolium	Sticky nightshade	1b	x	x	x	x	x
Sonchus oleraceus	Common sow thistle	NL	x	x	x	x	x
Tagetes minuta	Wild Marigold	NL	x	x	x	x	
Verbena bonariensis	Wild Verbena	1b	x	x	x	x	
Verbena tenuisecta	Fine-leaved Verbena	NL		x	x		
CREEPERS & FLAT-GROWING HERBS							
Araujia Sericifera	Moth catcher	1b					x
Gomphrena celosioides	Prostate globe amaranth	NL	x	x	x	x	

4 SENSITIVITY MAPPING

The National Web-based Environmental Screening Tool identified the study area to be in a **medium sensitivity** area for the Plant Species Theme and **very high sensitivity** for the Terrestrial Biodiversity Theme. Based on the ground-truthed results of the site visit, Table 2 below presents the sensitivity of each identified habitat unit along with an associated conservation objective and implications for development.

Figure 4 conceptually illustrates the sensitivity of the habitat units, from a floral perspective and how they will be impacted by the proposed infrastructure development. The areas are depicted according to their sensitivity in terms of the presence or potential for floral SCC, 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).

Table 2: A summary of the sensitivity of each habitat unit and implications for development.

Sensitivity	Habitat Unit	Development Implications
Low Sensitivity	Transformed Veld Habitat	Conservation Objective for areas of Low Sensitivity: Optimise development potential. This habitat unit is of low ecological importance and sensitivity and development related activities are unlikely to have any significant impact on the floral community. The Transformed Veld Habitat has experienced large degrees of modification and provides little habitat for indigenous floral species. Much of the habitat unit is represented by a lack of vegetation but where vegetation is present, AIP species dominate. As such, AIP control must take place to improve possible function of the area and to control edge effects. **Development options:** The habitat within the Transformed Veld Habitat unit has been notably degraded from a floral species perspective. Anthropogenic activities (e.g., historic infrastructure development and agricultural practices) have led to a decreased habitat integrity and low species diversity. The proposed development activities are unlikely to have a significant impact on the ecological functioning and provisioning of the floral ecology associated with this habitat unit. Human disturbance and presence within this unit has have led to the proliferation of AIPs and the subsequent loss of floral diversity. It is highly recommended that an AIP control and management plan be implemented during all phases of construction of the proposed development to limit the spread of AIP species to the surrounding areas.

Moderately Low Sensitivity	**Degraded Grassland Subunit (within the Grassland Habitat Unit)**	Conservation Objective for areas of Moderately Low Sensitivity**:** Optimise the development potential while improving the biodiversity integrity of the surrounding natural habitat and managing edge effects. These floral communities are of moderately low importance and significance from a floral resource management perspective. This is due to historic anthropogenic activities which have altered the floral species composition significantly from the reference state (i.e., the Soweto Highveld Grassland). **Development options:** In its current modified state, this habitat subunit is not deemed important to support indigenous floral communities; however, where these areas fall outside of the approved development footprint they should be managed as ecological support areas to reach a functioning ecological condition, e.g., control AIP proliferation should be implemented throughout the subunit. Development within these areas can be optimised, but edge effects should be managed. Although no SCC were recorded during the field assessment, such species can disperse into this habitat from neighbouring areas. Thus, a walkdown of the site is recommended prior to the commencement of any construction activities, and all SCC marked, and the appropriate permits applied for.
Intermediate Sensitivity	***Seriphium*-dominated Grassland Subunit (within the Grassland Habitat Unit)**	Conservation Objective for areas of Intermediate Sensitivity**:** Preserve and enhance the biodiversity of the habitat unit and the surrounds while optimising development potential. Areas of intermediate sensitivity include those that have been exposed to anthropogenic disturbances and a degree of fragmentation yet have not been altered extensively and still provide suitable habitat for a variety of floral species. Although the floral communities are no longer fully representative of the reference vegetation type, an intermediate floral diversity was noted for the *Seriphium*-dominated Grassland Subunit. Suitable habitat for provincially protected SCC species, *Aloe davyana, Crinum bulbispermum Helichrysum chionosphaerum*, *Helichrysum acutatum and Boophone disticha,* as identified by FSNCO was recorded within the *Seriphium*-dominated Grassland Subunit. **Development options:** The proposed development within the *Seriphium*-dominated Grassland Subunit will result in the loss of floral diversity, habitat, and SCC. Development of the Grid connection infrastructure is associated with lower impacts. Furthermore, such infrastructure should not impede strongly on connectiveness, thus allowing for dispersal corridors etc to be maintained (provided that mitigation measures (e.g., AIP control etc. are implemented). As far as is feasible, development should be limited to areas of intermediate sensitivity that do not link to areas of high sensitivity. For example: • Damlaagte: The *Seriphium*-dominated Grassland Subunit does not necessarily connect corridors to more sensitive habitat (e.g., *Themeda*-rich Grassland subunit) expect along the eastern boundary where it connects to the Freshwater Habitat (modestly high sensitivity). Development can be considered within the areas in which the *Seriphium*-dominated Grassland does not link to sensitive habitat; • Scafell: this PV facility supported large areas of the intermediately sensitive *Seriphium*-dominated Grassland habitat. It is recommended that development can occur within this habitat, however strict mitigation measures (as stated in 5.3) should be implemented throughout all stage of the development, if authorised; • Vlakfontein: The *Seriphium*-dominated Grassland (of intermediate sensitivity) surrounds the Transformed Veld Habitat (low sensitivity). As the *Seriphium*-dominated Grassland does not link with areas of higher sensitivity within this PV facility, development can be optimised; and • Ilikwa: within this area the *Seriphium*-dominated Grassland does link to more sensitive habitat in the north of the facility while it is surrounded by less sensitive habitat in the southern areas. It is recommended that development be limited in the areas in which the *Seriphium*-Grassland links with the more sensitive habitat in the north. However, development can be optimised in the southern areas where the *Seriphium*-dominated Grassland links with less sensitive habitat.

		Where possible, disturbances within the study area that fall outside of the direct footprint, e.g., areas where AIP and *Seriphium plumosum* proliferation has become an issue, should be managed to increase/return diversity and ecological functioning. Permits will be required from DESTEA for the removal of provincially protected species and from DFFE for nationally threatened species. Thus, a walkdown of the site is recommended prior to the commencement of any construction activities, and all SCC marked, and the appropriate permits applied for. Given the higher densities of *S. plumosum* within this Subunit, and its ability to easily proliferate, it is recommended that a management plan to control the encroachment of *S. plumosum* into the surrounding areas should be implemented.
Moderately High Sensitivity	***Themeda*-rich Grassland Subunit (within the Grassland Habitat Unit) & Freshwater Habitat Unit**	Conservation Objective for areas of Moderately High Sensitivity**:** Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance. Areas of moderately high sensitivity include the Freshwater Habitat unit, where the floral diversity was intermediate to moderately high, the habitat was fairly intact and where features of conservation significance were present, including an area that was confirmed to be an ESA, particularly within the Scafell PV Facility Area. This habitat subunit provides unique habitat within the ecosystem, serving as an ecological corridor benefiting both fauna and flora within the region. Suitable habitat for provincially protected SCC species, *Crinum bulbispermum* and *Boophone disticha,* as identified by FSNCO were recorded within the Habitat Unit. Areas of moderately high sensitivity also include the *Themeda*-rich Grassland Subunit, which supported a moderate species diversity and shared an affinity, in terms of species composition and structure, with the reference vegetation type. Suitable habitat for provincially protected SCC species, *Aloe davyana, Crinum bulbispermum Helichrysum chionosphaerum*, *Helichrysum acutatum* and *Boophone disticha,* as identified by FSNCO was recorded within the *Themeda*-rich Grassland Subunit. **Development options:** Development within these habitats will result in the loss of floral habitat, species diversity, and ecological function. Development of the Grid connection infrastructure is associated with lower impacts, given the nature of the infrastructure development. As such the Grid Corridor Infrastructure is not anticipated to greatly impede on connectiveness, thus allowing for dispersal corridors etc to be maintained (provided that mitigation measures (e.g., AIP control etc. are implemented). Much of the Freshwater Habitat, particularly within the Scafell PV Facility Area was identified as an ESA. Although invaded by several AIP species, the importance of this habitat within the ecosystem confirms its classification as an ESA. As far as is possible, development should be avoided within both the *Themeda*-rich Grassland Subunit and the Freshwater Habitat. The *Themeda*-rich Grassland Subunit was located within areas conformed to be a CBA and ESA area. Given the importance of these categories within the ecosystem, the impacts associated with the proposed development are deemed to be significantly negative within the Subunit. Where possible, development should be avoided within in habitat Subunit. Permits will be required from DESTEA for the removal of provincially protected species and from DFFE for nationally threatened species. Thus, a walkdown of the site is recommended prior to the commencement of any construction activities, and all SCC marked, and the appropriate permits applied for. An AIP management plan will need to be implemented if development is approved as AIP species can easily spread and impact on habitat outside of the development footprint. Furthermore, edge effects of the associated Freshwater Habitat and the *Themeda*-rich Grassland Subunit should be managed. Further, given the proximity of the *Themeda*-rich Grassland Subunit to the *Seriphium*-dominated Grassland Subunit, it is recommended that a management plan to control the encroachment of *S. plumosum* into the subunit should be implemented.

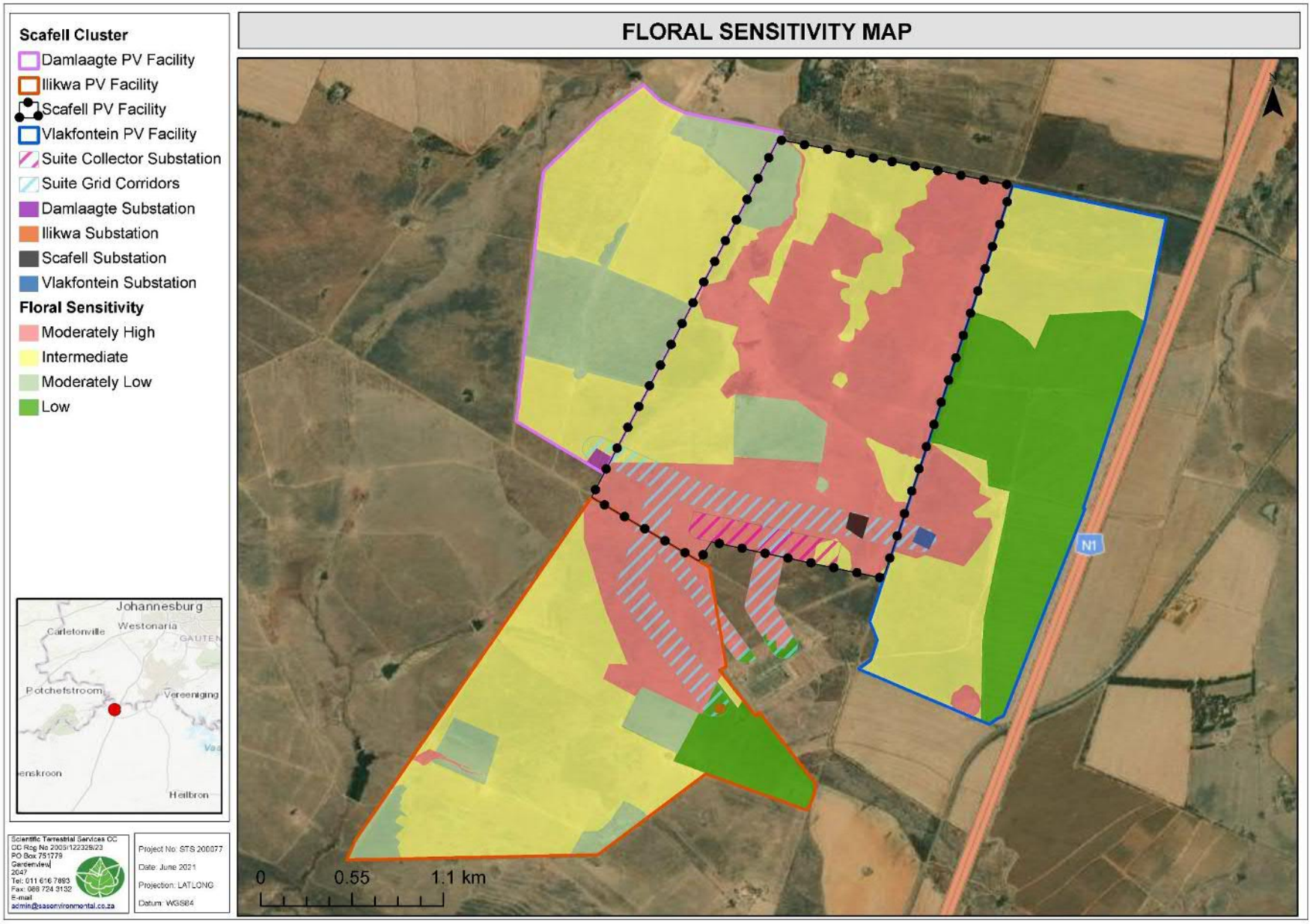


Figure 5: Sensitivity map for the western section of the study area.

5 IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts arising from the proposed development for the **Scafell Solar PV Facility**.

An impact discussion and assessment of all potential i) Planning Phase (Pre-construction and Planning), ii) Construction, and iii) Operational & Decommissioning Phase impacts are provided in Section 5.2 and 5.3. All mitigatory measures required to minimise the perceived impacts are presented in Section 5.4.

Proposed Activity Description:

The proposed infrastructure development will entail development as per the concept layout (Figure 6):

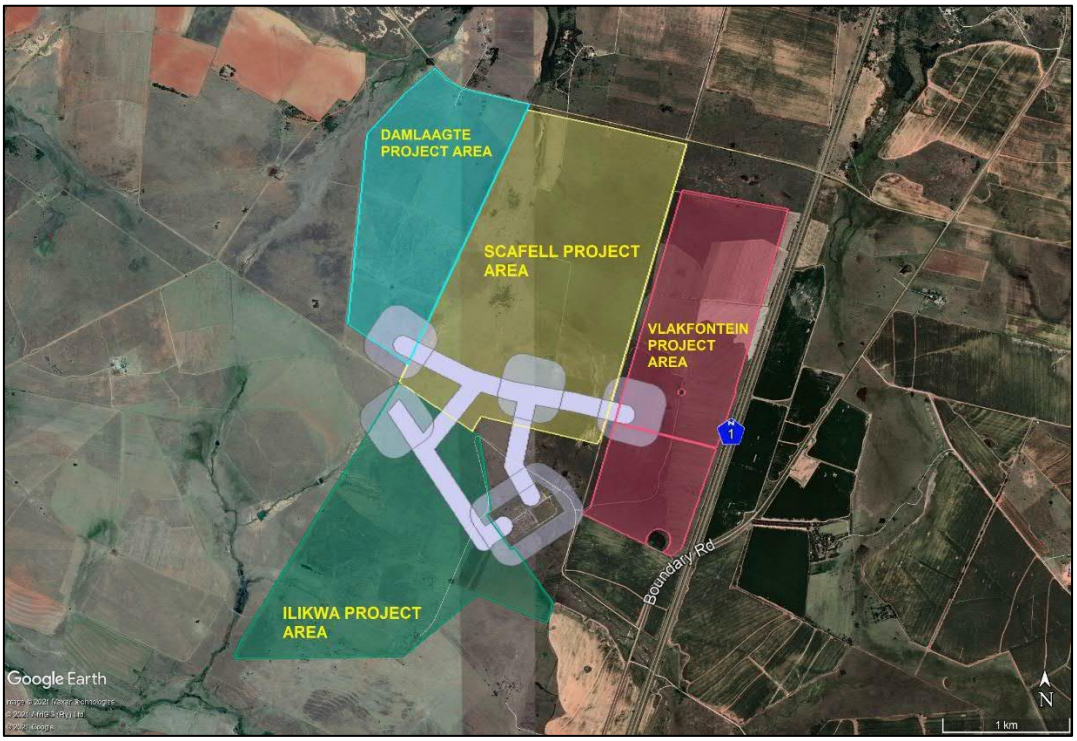


Figure 6: Updated development layout map for the study area on which the impact assessment is based.

Activities and Aspect Register

The table below indicates the perceived risks to floral species associated with the activities pertaining to the proposed infrastructure development at the Scafell Solar PV Facility, including the associated Grid Corridors (Figure 5).

Table 3: Activities and Aspects likely to impact on the floral resources of the study area.

ACTIVITIES AND ASPECTS REGISTER	Solar PV Facility	Grid Corridors
Planning Phase (Pre-Construction and Planning)	**Applicable**	**Applicable**
- Potential failure to relocate, where feasible, all floral SCC, i.e., protected species according to the FSNCO, to suitable habitat outside the development footprint (i.e., in the Grassland Habitat and the Freshwater Habitat). - **Impact**: Loss of floral SCC, protected species as per FSNCO within the development footprint areas in the study area.	X	X
- Potential inadequate design of stormwater management and erosion control, resulting in increased risk of erosion and loss of topsoil; - **Impact**: Loss of favourable floral habitat beyond the authorised footprint, leading to a decline in floral diversity.	X	X
- Inconsiderate planning, infrastructure placement and design, within areas of moderately high sensitivity leading to the loss of potential sensitive floral species and/or habitat for such species, as well as unnecessary edge effect impacts on areas outside of the proposed development footprint. The appropriate provincial authorities will need to determine whether or not the proposed development within CBA2 and ESA habitat is considered an acceptable land use type. It should be noted that transformation within areas identified as having a moderately high sensitivity (i.e., the *Themeda*-rich Grassland and Freshwater Habitat Unit) may be deemed unacceptable by the relevant competent authorities as development within CBAs, and ESAs may potentially be considered an unacceptable land use. - **Impact:** Degradation and modification of the receiving environment, loss of floral habitat.	X	X
- Potential failure to design and implement an Alien and Invasive Plant (AIP) Management/Control plan before the commencement of construction activities, resulting in the spread of AIPs from the development footprint to surrounding natural habitat. - **Impact:** Spreads of AIPs, leading to potential loss of floral species diversity from surrounding natural habitat.	X	X
Construction Phase	**Applicable**	**Applicable**
- Site clearing and the removal of vegetation. - **Impact:** Loss of floral habitat, diversity and potentially occurring floral SCC.	X	X
- Potential failure to monitor the success of relocated floral SCC. - **Impact:** Loss of SCC individuals.	X	X
- Proliferation of AIP species that colonise in areas of increased disturbances and that outcompete native species, including the further transformation of adjacent natural habitat such as existing grasslands that surround the greater study area. - **Impact:** Loss of favourable floral habitat outside of the direct development footprint, including a decrease in species diversity and a potential loss of floral SCC.	X	X
- Dumping of construction material within areas where no construction is planned, thereby leading to further habitat disturbance - allowing the establishment and spread of AIPs. - **Impact:** Loss of favourable floral habitat, diversity and SCC as AIPs outcome and replace these species.	X	X

ACTIVITIES AND ASPECTS REGISTER	Solar PV Facility	Grid Corridors
- Failure to rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increased erosion risks and/or the proliferation of AIPs. - **Impact:** Long-term loss of favourable habitat for the establishment of floral species. Loss of floral diversity and SCC.	X	X
- Overexploitation through the removal and/or collection of important or sensitive floral SCC beyond the direct footprint area due to increased presence of workers on site. The study area supports provincially protected species, including *Aloe davyana, Helichrysum chionosphaerum, Helichrysum acutatum, Boophone disticha*, that are not anticipated to be restricted to the footprint area. - **Impact:** Local loss of floral SCC individuals beyond the footprint areas.	X	X
- Additional pressure on floral habitat by increased human movement associated with the proposed construction activities, including increased vehicular movement, contributing to: • Increased introduction and spread of AIPs; and • Increased risk of fire frequency. - **Impact:** Loss of sensitive floral habitat and the potential loss of floral SCC.	X	X
- Potentially poorly managed edge effects: • Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to ongoing proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the floral habitat; and • Compaction of soils outside of the study area due to indiscriminate driving of construction vehicles through natural vegetation. - **Impact:** Loss of floral habitat, diversity, and SCC within the direct footprint of the proposed development. Loss of surrounding floral diversity and floral SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas.	X	X
- Potential failure to • Implement a Biodiversity Management Plan (BMP); and • Initiate the rehabilitation plan and monitoring of alien floral communities during the operational phase. - **Impact:** Permanent transformation of floral habitat and long-term degradation of floral habitat within the region.	X	X
- Excavation and compaction of soils leading to increased runoff and sedimentation of surrounding Freshwater Habitat. - **Impact:** Loss of favourable floral habitat and decline in diversity.	X	X
- Dust generated during construction and operational activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants[17] and potentially further decreasing optimal growing/re-establishing conditions. - **Impact:** Declines in plant functioning leading to loss of floral species and habitat for optimal growth.	X	X
- Decreased ecoservice provision & decreased ability to support biodiversity by ESA due to vegetation and soil disturbance. - **Impact:** Loss or alteration of ESA Habitat and associated ecological functionality.	X	X
Operational & Maintenance Phases		

[17] Sett, R. (2017). Responses in plants exposed to dust pollution. Horticulture International Journal, 1(2), 00010.).

ACTIVITIES AND ASPECTS REGISTER	Solar PV Facility	Grid Corridors
- Increased introduction and proliferation of alien plant species due to a lack of maintenance activities, or poorly implemented and monitored AIP Management programme, leading to ongoing displacement of natural vegetation outside of the footprint area. - **Impact:** Ongoing or permanent **l**oss of floral habitat, diversity and potentially occurring SCC.	X	X
- Potentially ineffective rehabilitation of exposed and impacted areas potentially leading to a shift in vegetation type. - **Impact:** Permanent loss of floral habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity (such as the Freshwater Habitat as well as neighbouring ESA and CBAs).	X	X
- Potential poor management and failure to monitor rehabilitation efforts, leading to: • Compacted soils leading to increased runoff and erosion, as well as increased AIP cover limiting the re-establishment of natural vegetation both outside of the authorised footprint but also within the maintenance servitudes within the Ilikwa Solar PV Facility; • Increased risk of erosion in areas left disturbed. - **Impact:** Long-term (or permanent) loss of floral habitat, diversity, and SCC.		X

5.1 Floral Impact Assessment Results

The below table indicates the perceived risks to the floral ecology associated with all phases of the proposed Scafell Solar PV Facility. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. Refer to Appendix D in Part A for Impact Assessment Methodology. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

Table 4: Impact on the floral habitat, diversity, and SCC from the proposed Scafell PV Facility during the pre-construction phase, the construction phase, and the operational and maintenance phase of the proposed development.

Development Activity	UNMANAGED						MANAGED									
	Intensity	Duration	Extent	Consequence	Probability	Significance	Intensity	Duration	Extent	Consequence	Probability	Significance	Degree of confidence	Degree to which impact can be mitigated	Loss of Resource	Reversibility
PRE-CONSTRUCTION PHASE																
Impact on floral Habitat and Diversity																
PV Facility	High	Long Term	Regional	Very High	Definite	**Very High**	Medium	Medium Term	Local	Medium	Probable	**Medium**	High	Low	High	Partially irreversible
Grid Corridors	Medium	Medium Term	Local	Medium	Probable	**Medium**	Low	Short Term	Local	Low	Possible	**Very Low**	Medium	Medium	Low	Fully reversible
Impact on Floral SCC																
PV Facility	High	Long Term	Local	Very High	Definite	**Very High**	Medium	Medium Term	Local	Medium	Probable	**Medium**	High	Low	High	Partially irreversible
Grid Corridors	Low	Medium Term	Local	Low	Probable	**Low**	Low	Short Term	Local	Low	Possible	**Very Low**	Low	Low	Low	Reversible
CONSTRUCTION PHASE																
Impact of floral Habitat and Diversity																
PV Facility	High	Long Term	Regional	Very High	Definite	**Very High**	High	Long Term	Regional	Very High	Definite	**Very High**	High	Low	High	Partially irreversible
Grid Corridors	Medium	Medium Term	Local	Medium	Probable	**Medium**	Medium	Medium Term	Local	Medium	Probable	**Medium**	Medium	Medium	Low	Fully reversible
Impact on Floral SCC																
PV Facility	High		Local		Definite				Local				High	Low	High	

Development Activity	UNMANAGED						MANAGED									
	Intensity	Duration	Extent	Consequence	Probability	Significance	Intensity	Duration	Extent	Consequence	Probability	Significance	Degree of confidence	Degree to which impact can be mitigated	Loss of Resource	Reversibility
		Long Term		Very High		**Very High**	Medium	Medium Term		Medium	Probable	**Medium**				Partially irreversible
Grid Corridors	Medium	Medium Term	Local	Medium	Probable	**Medium**	Medium	Medium Term	Local	Medium	Probable	**Medium**	Low	Low	Low	Reversible
OPERATIONAL AND MAINTENANCE PHASE																
Impact of floral Habitat and Diversity																
PV Facility	Medium	Medium Term	Local	Medium	Probable	**Medium**	Medium	Short term	Local	Low	Probable	**Low**	Medium	Medium	Medium	Partially irreversible
Grid Corridors	Medium	Medium Term	Local	Medium	Probable	**Medium**	Low	Short Term	Local	Low	Possible	**Very Low**	Medium	Medium	Low	Reversible
Impact on Floral SCC																
PV Facility	Medium	Medium Term	Local	Medium	Probable	**Medium**	Low	Short Term	Local	Low	Possible	**Very Low**	Medium	Medium	Medium	Partially irreversible
Grid Corridors	Medium	Short term	Local	Low	Probable	**Low**	Low	Short Term	Local	Low	Possible	**Very Low**	Medium	Medium	Low	Reversible

5.2 Impact Discussion

The sections below provide the significance of perceived impacts arising from the proposed development of the Scafell Solar PV Facility and associated infrastructure.

5.2.1 Impact on Floral Habitat and Diversity

The impact assessment was undertaken on all aspects of floral ecology deemed likely to be affected by the proposed Scafell Solar PV Facility and the Grid Corridors within its extent. The proposed Scafell Solar PV Facility requires the clearance of vegetation, which will result in a loss of floral habitat and diversity within the Scafell Solar PV Facility. A key driver resulting in the very high impact associated with the Preconstruction and construction phase is that clearing of vegetation is definite. Furthermore, the vegetation is anticipated to be cleared within moderately high sensitivity vegetation (i.e., *Themeda*-rich grassland) and CBA2 habitat. These factors have thus resulted in the high impacts associated with the development in the Scafell PV facility.

Placement of infrastructure and development activities within intact floral habitat in areas such as the Freshwater Habitat (comprising 3% of the Scafell Project area) and sections of the Grassland Habitat (particularly the *Themeda*-rich Grassland subunit which comprises 62% of the Scafell Project Area) will have a detrimental, irreversible impact on local and regional floral habitat conservation as it will result in the loss of CBA2 (133 ha of the 361 ha (i.e., 37%)), the loss of ESA (16 ha and 47 ha out of 361 ha (i.e., 17 %)), as well as loss of sections within the remaining extent of the vulnerable Soweto Highveld Grassland vegetation (an estimated 71% of the remaining vegetation (as identified by the NBA, 2018) across all four Project Areas is located within the Scafell Solar Project Area.) There are further potential indirect impacts associated with the proposed development activities on nearby grassland systems. The impacts associated with the proposed development will have an irreversible, negative impact on the floral community and associated ecological systems both within the study area and the greater surrounding area (particularly as loss of CBA habitat results in impacts on biodiversity planning on a provincial level).

The development of the proposed Scafell Solar PV Facility will result in the greatest impact in terms of size of the habitat impacted during construction. The proposed Scafell Solar PV Facility will result in the loss of the greatest extent of the *Themeda*-rich Grassland (i.e., secondary grassland of moderately high sensitivity comprising app. 62% of the Project Area). A significant loss of floral communities is also anticipated with the specified development (i.e., 62% (224 ha) and 3 % (11 ha) of the Project Area is associated with the *Themeda*-rich Grassland Habitat and the Freshwater Habitat respectively, and it is it likely to impact floral

communities, especially those associated with the already fragmented and vulnerable Soweto Highveld Grassland, at a larger local and regional (provincial) level.This is particularly evident as the reference vegetation type is of value at a regional and national level.

The Degraded Grassland and *Seriphium*-dominated Grassland Subunits are not unique in the landscape. The intermediate *Seriphium*-dominated Grassland Subunit is well represented in the surrounding areas and neither this subunit nor the Degraded Grassland Subunit are considered representative of the Soweto Highveld Grassland (i.e., the reference vegetation type). Given that these subunits are well represented within the greater landscape, a significant loss of floral communities is not anticipated with the specified development, and it is thus not likely to impact floral communities, especially those associated with the already fragmented Soweto Highveld Grassland (VU), at a larger local and regional (provincial) level.

The proposed development of the Grid Connection Infrastructure is anticipated to have a lower impact on the floral communities present and will potentially be associated with the smallest impact in terms of size of the habitat lost. The development of the Grid connection Infrastructure is mostly associated with the *Themeda*-rich Grassland Subunit. However, if mitigation measures are strictly implemented, the negative effects thereof within the floral communities of moderately high sensitivity can be minimised.

5.2.2 Impacts on Floral SCC

Placement of the infrastructure, particularly the Scafell Solar PV Facility, will have an unfavourable impact on protected floral species (FSNCO), namely *Aloe davyana* (LC)*, Crinum bulbispermum* (LC)*, Helichrysum chionosphaerum* (LC), *Helichrysum acutatum* (LC) *and Boophone disticha* (LC) (which were recorded within the *Seriphium*-dominated and *Themeda*-rich Grassland subunits).

Activities which are likely to negatively affect the flora of conservation concern within and around the study area include, but are not limited to, the following:

- Placement of infrastructure (i.e., Scafell Solar PV Facility) within sensitive floral habitat (particularly within the *Themeda*-rich Grassland Subunit and the Freshwater Habitat Unit) or habitat favoured by the recorded protected floral species (i.e., the *Seriphium*-dominated Grassland Subunit);
- Irreversible destruction of favourable floral habitat, particularly of habitat that shares an affinity with the vulnerable Soweto Highveld Grassland vegetation type (i.e., the *Themeda*-rich Grassland Subunit), during construction and operational activities; and
- Poorly managed AIP proliferation with subsequent displacement of floral SCC.

No habitat to support RDL species was identified within the Scafell PV Facility. However, if the proposed development is authorised, a walkdown of the footprint area prior to construction activities will need to be conducted. Should floral SCC species as per the FSNCO (or any RDL species be recorded) be encountered during any phase of the proposed development, these species should be rescued and relocated by a suitably qualified specialist. Relocation of these species should be to suitable habitat within the study area outside of the development footprint or moved to registered nurseries such as the Agricultural Research Council (ARC) or the South African National Biodiversity Institute (SANBI). Any other floral SCC encountered during the construction phase of the proposed development should also be relocated by a suitably qualified specialist and, where required, the necessary permits should be applied for. Prior to any ground clearing activities, the relevant permits will have to be obtained from DESTEA for the removal of these individuals. If RDL species are encountered during the walkdown then rescue and relocation practices will not be a feasible mitigation measure and rescue and relocation must only take place as a last resort and in accordance with a Floral SCC Management Plan. The floral SCC walkdown will also be used to inform of the position of SCC within the Grid Connection Infrastructure footprint areas so to inform on the placement of the respective pylons.

Described below is an indication of how easily relocatable or rescuable the abovementioned species are. It is recommended that a suitably trained horticulturist be consulted before any removal of these species are performed. *Aloe davyana* should be easily transplantable given that damage to the roots is minimised. This species can easily be germinated but overwatering of seeds should be avoided as this can result in germination failure (Jeppe 1969). This species can also be propagated by cutting from the parent plant (Jeppe 1969). *Crinum bulbisermum* is transplantable however, should ideally be left in their original places as they are sensitive to disturbance (Du plessis & Duncan 1989; Oliver 1990). Although easily propagatable from seed, seeds need to be germinated soon after harvesting as seed viability is short-lived. Once established, young bulbs are susceptible to attack by Amaryllis caterpillars which can result in damage or even loss of the plant (Du plessis & Duncan 1989; Oliver 1990). No specific information is available for *Helichrysum chionosphaerum*, *Helichrysum acutatum.* Information on suitable rescue and relocation practices of these species should be sought from a suitably trained horticulturist. Transplants and cuttings have been successful for other species within the genus (Eliovson 1984). *Boophone disticha* does not transplant well and is very slow from seed (Arnold *et al.* 2002). Mature bulbs can as old as 100 years. If transplantation is successful it takes a long time to flower after being moved (Arnold *et al.* 2002). Sensitive species 691 (VU) is easily grown from seed, although fresh seed is needed for successful germination. Transplantation of this species is a possibility given that a suitably trained horticulturist informs

on the process. Sensitive species 1252 (VU) is propagatable by seed although it is sensitive to disturbance and is thus better left undisturbed.

5.2.3 Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas

The proposed development will occur within the Soweto Highveld Grassland which is listed as a threatened ecosystem (National Threatened Ecosystems, 2011, and NBA, 2018), and is classified as **vulnerable**. The proposed development will thus lead to the loss of the threatened ecosystem in within the PV Facility is located. According to the 2015 Free State Biodiversity Plan, most of the Grassland habitat unit, and particularly the *Seriphium*-dominated and *Themeda*-rich Grassland Subunits (which were both recorded in the Scafell boundary), are largely located within CBA2, ESA1, ESA2 areas. Within the Scafell PV Project Area, much of the CBA2 area (approx. 121 ha) is located within the *Themeda*-rich Grassland Subunit (moderately high sensitivity) while a small area (approx. 12 ha) of the *Seriphium*-dominated Grassland Subunit is located within a CBA2. Given the importance of these habitat units (especially where they are in CBA and ESAs) within the ecosystem (e.g., for achieving provincial biodiversity targets as well as maintaining dispersal corridors and other ecological functions) and the moderate to moderately high species richness, presence of moderately intact secondary grassland (particularly within the *Themeda*-rich Grassland) that is associated with these subunits, their classification within both CBA and ESA areas can be confirmed.

According to the 2015 Free State Biodiversity Plan, CBA2 Area, may have some options for meeting the conservation and ecological objectives associated with nearby CBAs in other parts of the landscape (i.e., Biodiversity offset measures need to be investigated to mitigate the impacts associated with the loss of the CBA). However, this can only be done at the cost of losing some of the spatial efficiency of the network of CBAs. If a CBA2 is lost and an alternative natural area elsewhere (i.e., biodiversity offsets) is identified to become part of the CBA network, the alternative area will likely need to be larger (as per offset policy), increasing the size of the CBA-network. Areas identified as ESAs should be kept in at least semi-natural condition, i.e., with their basic ecological functioning still intact. Development within these areas should thus be minimised. The classification of the areas identified as CBA2, ESA1, and ESA2 areas within the Scafell Solar PV Facility, and particularly within the *Themeda*-rich Grassland Subunit was confirmed during the field assessment. It should be noted that the absence of sensitive species as identified by the screening tool does not solely inform on the presence of CBA habitat. Although species are a key component of the CBA habitat, CBAs are selected based on other features including ecosystem function (e.g., connectivity, dispersal) and ecological processes (its role in nutrient cycling, food webs etc). Thus, although sensitive species as per the screening tool were not found within the study area, the high

species richness, moderately intact ecosystem that is provided within the *Themeda*-rich Grassland habitat was confirmed to be representative of CBA habitat. Given the likelihood that significant residual impacts will occur due to nature of the impacts associated with the proposed development the area will no longer constitute a CBA. For this reason, the most appropriate method of impact mitigation is to exclude areas of high sensitivity (i.e., the Freshwater Habitat and the *Themeda*-rich Grassland). However, if the Scafell Solar PV Facility is granted authorisation despite the loss of CBAs, ESAs and Freshwater Habitat, it is recommended that this be done on the premise that the proponent has engaged with the relevant competent authorities with regards to implementing appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent.

5.2.4 Probable Latent Impacts

Even with extensive mitigation, residual impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key residual impacts that have been identified:

- Permanent loss of and altered floral species diversity associated with areas identified as secondary grassland (i.e., the *Themeda*-rich Grassland);
- Destruction of ecologically intact, irreplaceable floral habitat (CBA2, ESA and threatened ecosystem);
- Permeant loss of CBA and ESA habitat and their associated ecological functions that can impact on regional conservation targets;
- Edge effects such as further habitat fragmentation and AIP proliferation;
- Permanent loss of protected floral species (as per the FSNCO) and suitable habitat for such species; and
- Ongoing bush encroachment, particularly from *Seriphium plumosum*, in the adjacent natural vegetation communities in response to increased grazing pressures as grazers now move to neighbouring habitat.

5.2.5 Cumulative Impacts

The proposed project could further impact on the floral habitat and diversity as well as floral SCC through fragmentation of habitat of increased biodiversity importance and sensitivity – i.e., the *Themeda*-rich Grassland Subunit, and the Freshwater Habitat. Biodiversity and freshwater offsets would need to be investigated to compensate for residual impacts on CBA2

areas and threatened ecosystems. An important consideration will be the potential non-feasibility of offsets for CBA2 areas, which will be directly impacted.

The impacts associated with the development of the other PV Facilities (including the Scafell PV Facility, the Vlakfontein PV Facility, and the Ilikwa PV Facility and the associated Grid Corridor Infrastructure) and the removal of floral habitat and associated CBA and ESA habitat will contribute to the cumulative impacts associated with the development. The PV Facilities, as a whole, are all situated within the middle of a large ESA. If development on all the PV facilities get authorised, there will be significant cumulative impacts associated with ESAs.

Within the surrounding areas, the current greatest threat to the floral ecology that are likely to contribute to cumulative impacts include i) the continued loss of the vulnerable Soweto Highveld Grassland that could impact on the remaining extent of the vegetation type (seeing as it is not protected) thereby also increasing the threat status of the vegetation type, ii) the continued proliferation of AIP species, resulting in the overall loss of native floral communities within the local area, and iii) the continued encroachment of *Seriphium plumosum* into the surrounding habitats especially with grazers now forced to move to neighbouring habitat.

5.3 Integrated Impact Mitigation

The table below highlights the key general integrated mitigation measures that are applicable to the proposed Scafell Solar PV Facility in order to suitably manage and mitigate the ecological impacts that are associated with all phases of the proposed development. Provided that all management and mitigation measures are implemented, as stipulated in this report, the overall risk to floral diversity, habitat and SCC can be mitigated and minimised.

Table 5: A summary of the mitigatory requirements for floral resources.

Project phase	Planning Phase
Impact Summary	Loss of floral habitat, species, and SCC
Proposed mitigation and management measures:	
Floral Habitat and Diversity - Minimise loss of indigenous vegetation where possible through adequate planning and, where necessary, by incorporating the sensitivity of the biodiversity report as well as other specialist studies; and - Prior to the commencement of construction activities, an AIP Management/Control Plan should be compiled for implementation: - Removal of AIPs should preferably commence during the pre-construction phase and continue throughout the construction and operational phases. AIPs should be cleared within the study area before any vegetation clearing activities commence, thereby ensuring that no AIP propagules are spread with construction rubble, or soils contaminated with AIP seeds during the construction phase; and - An AIP Management/Control Plan should be implemented by a qualified professional. No use of uncertified chemicals may be used for chemical control of AIPs. Only trained personnel are to use chemical and mechanical control methods of AIPs. Chemical control may not be used within the Freshwater Habitat.	

- Authorities should be consulted with regards to implementing appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent, particularly for sections of the study area that are within CBA2 areas and areas associated with the threated ecosystem that is associated with the study area (i.e., Soweto Highveld Grassland) that will be affected by the proposed development activities. \
- For this reason, an appropriate mitigation measure would be to consider an alternative site for the location of the Scafell Solar PV Facility. However, it is understood that the client wishes to proceed with this site. As a result, there are two options for the way forward:
  - OPTION 1: Proceed with the full development footprint (see Figure 1) as assessed in this document. For this option, it is recommended that development should proceed only on the premise that the proponent has engaged with the relevant competent authorities with regards to implementing appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent i.e., an off-site biodiversity offset; or
  - OPTION 2: If an off-site biodiversity offset is not feasible, it is recommended that a smaller site be selected that would avoid the need for an off-site biodiversity offset - see Figure 7 that provides for 110 ha within the Scafell Solar PV Facility site boundaries. For this option, a smaller portion of *Seriphium*-dominated Grassland and *Themeda*-rich Grassland habitat types of which 16 ha lies within CBA2 would be impacted. However, the residual loss of these habitats can be offset with implementing the following, among other mitigation to improve the condition of remaining natural vegetation to a more intact status: removal and management (including follow-up control) of the encroacher, shrub species *Seriphium plumosum* to restore the *Seriphium*-dominated Grassland to a similar manner of that of the *Themeda*-dominated grassland; implement appropriate fire management procedures, implement an erosion control plan, implement an AIP management and control plan and control the intensity of grazing throughout the PV Facility.

Floral SCC

- Species protected under the Free State Nature Conservation Ordinance, 1969 (Ordinance No. 8 of 1969) (FSNCO) were recorded on site. Suitable habitat for such species is present, especially in the within the Grassland Habitat Unit. A walkdown of the footprint area is required before construction activities commence where anticipated floral SCC/protected species are searched and marked (if encountered); and
- If SCC/protected species are encountered and will be affected by the construction activities, these species must be marked and where possible, relocated to suitable habitat surrounding the disturbance footprint. Suitable habitat is available in nearby surrounding locations. For the removal, destruction, or relocation of protected flora in terms of the FSNCO, a license is required from the Free State Department of Economic Development, Tourism and Environmental Affairs (DESTEA).

Project phase	Construction Phase
Impact Summary	Loss of floral habitat, species and SCC

Proposed mitigation and management measures:

Development footprint

- The construction footprint must be kept as small as possible in order to minimise impact on the surrounding environment (edge effect management);
- Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved development footprint.
- Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal;
- No collection of indigenous floral species must be allowed by construction personnel, especially with regards to floral SCC (if encountered);
- Care should be taken during the construction and operation of the proposed development to limit edge effects to surrounding natural habitat. This can be achieved by:
  - Demarcating all footprint areas during construction activities;
  - No construction rubble or cleared alien invasive species are to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility;
  - All soils compacted as a result of construction activities should be ripped and profiled and reseeded;
  - Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. Specific mention in this regard is made to Category 1b and 2 species identified within the development footprint areas (refer to section 2.7.3 of this report); and
  - No dumping of litter, rubble or cleared vegetation on site should be allowed. Infrastructure and rubble removed as a result of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump

sites should be allowed in areas with natural vegetation. Waste disposal containers and bins should be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility.

- If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and
- Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area.

Alien Vegetation

- Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b and 2 AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020) (section 3.5.3 of this report);
- Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the construction and operational phase of the development, and a 30 m buffer surrounding the study area should be regularly checked for AIP proliferation and to prevent spread into surrounding natural areas; and
- Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.

Floral SCC

- No collection of floral SCC must be allowed by construction personnel; and
- Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC outside of the proposed development footprint area.

Fire

- No illicit fires must be allowed during the construction of the proposed development.

Rehabilitation

- Any natural areas beyond the direct authorised footprint, which have been affected by the construction or operational activities, must be rehabilitated using indigenous species; and
- All soils compacted because of construction activities falling outside of the project area should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas.

Project phase	Operational & Maintenance Phase
Impact Summary	Loss of floral habitat, species, and SCC

Proposed mitigation and management measures:

Development footprint

- No additional habitat is to be disturbed during the operational phase of the development;
- No vehicles are allowed to indiscriminately drive through sensitive habitat and natural areas; and
- No dumping of litter must be allowed on-site.

Alien Vegetation

- Edge effects arising from the proposed Scafell Solar PV Facility, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b and 2 AIP species (as listed in the NEMBA Alien species lists, 2020), in line with the NEMBA Alien and Invasive Species Regulations (2020) (section 3.5.33 of this report);
- Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the operational and maintenance phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas; and
- Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which complies with legal standards.

Floral SCC

- As far as possible, no collection of floral SCC within the Scafell Solar PV Facility or adjacent natural habitat must be allowed during the operational and maintenance phase of the proposed development; and
- Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC/protected species or suitable habitat for such species outside of the proposed development footprint.

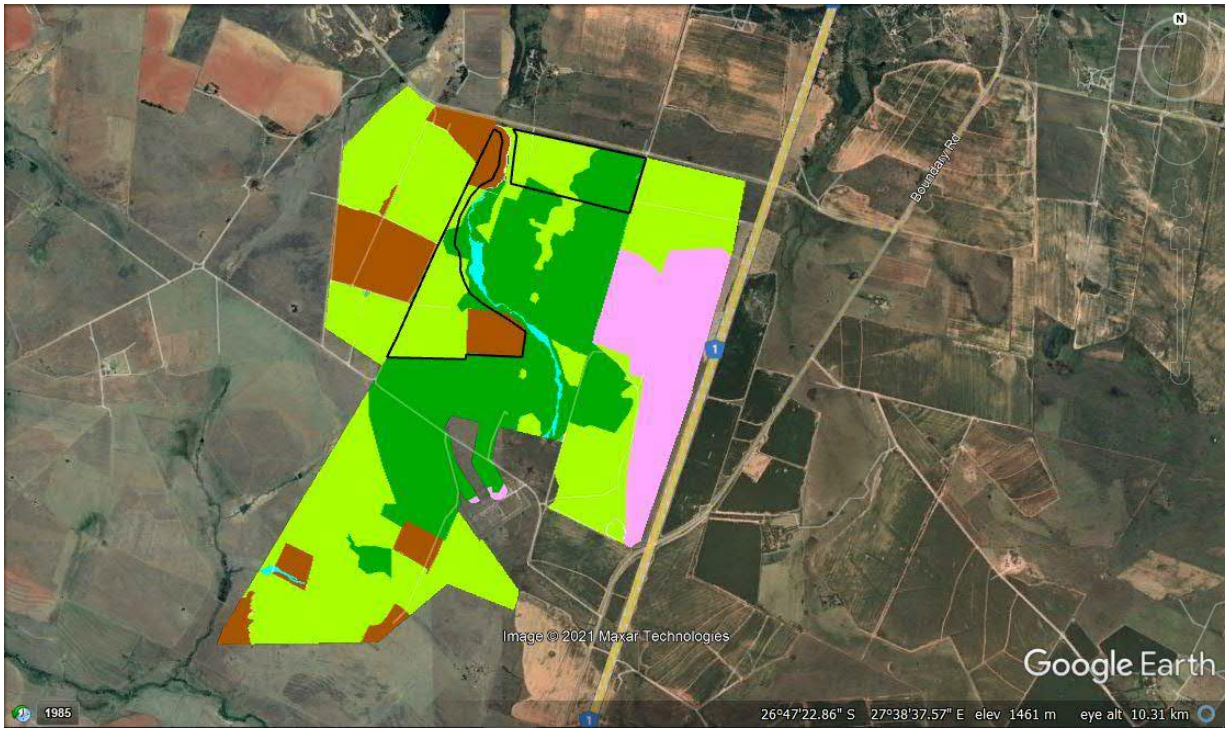


Figure 7: The proposed layout recommended for the Scafell PV Facility in order to best mitigate the impacts of the proposed development on the floral habitat. The black polygon areas within the Scafell Boundary Area depict areas recommended for development (approx. 110 ha). It is suggested that the remaining areas within the Scafell boundary be excluded from the proposed development footprint

6 CONCLUSION

STS was appointed to conduct a Biodiversity Assessment as part of the EIA and EA process for the development of four solar photovoltaic (PV) facilities, namely Damlaagte Solar PV Facility, Scafell Solar PV Facility, Vlakfontein Solar PV Facility, and Ilikwa Solar PV Facility. The assessment also includes development of associated infrastructure - substations and powerline corridors. The Scafell Cluster is located approximately 19 km west of the town of Sasolburg, Free State Province, and is henceforth referred to as the “study area”. This report focuses on the impacts associated with the development of the **Scafell Solar PV facility**.

During the field assessment, three broad habitat units were identified within the study area, namely Transformed Veld Habitat, Grassland Habitat (which comprised of three subunits: Degraded Grassland, *Seriphium*-dominated Grassland, and *Themeda*-rich Grassland), and Freshwater Habitat. Of these habitats, only the Grassland Habitat and Freshwater Habitat Units were identified within the Scafell Solar PV Facility.

The Degraded Grassland subunit was of a **moderately low sensitivity**, which is attributed to the degraded nature of the habitat, lower species richness and level of AIP proliferation within the subunit. The *Seriphium*-dominated Grassland Subunit was of **intermediate sensitivity**. Although *Seriphium plumosum* was abundant, the subunit still provided suitable habitat for several forb and grass species. Lastly, the Freshwater Habitat and the *Themeda*-rich Grassland Subunit scored a **moderately high sensitivity**.

No SANBI RDL species were observed during the field assessment, and it is unlikely that they will occur within the Scafell PV Facility. However, several provincially protected species, including *Aloe davyana, Crinum bulbispermum, Helichrysum chionosphaerum*, *Helichrysum acutatum* and *Boophone disticha* as per Schedule 6 of the FSNCO were identified within the Scafell boundary.

It is recommended that a walkdown be undertaken, preferably in all seasons as the protected species flower at different times, and all potentially occurring protected floral species within the final development footprint be marked by means of GPS. Permits from DESTEA and the DFFE (in the case that any NFA listed tree species are recorded) should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place.

Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between **very high** and **medium**. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity for the study area (particularly within the Scafell boundary) can mostly be reduced to **very high and very low** significance. Impact on

floral SCC varies significantly between the habitat units Prior to mitigation measures implemented, impact significance on floral SCC varies between **very high** and **low**. With mitigation measures implemented, the impact significance can be reduced to **medium** and **very low**.

According to the 2015 Free State Biodiversity Plan, CBA2 Area, may have some options for meeting the conservation and ecological objectives associated with nearby CBAs in other parts of the landscape (i.e., Biodiversity offset measures need to be investigated to mitigate the impacts associated with the loss of the CBA). However, this can only be done at the cost of losing some of the spatial efficiency of the network of CBAs. If a CBA2 is lost and an alternative natural area elsewhere (i.e., biodiversity offsets) are identified to become part of the CBA network, the alternative area will likely need to be larger, increasing the size of the CBA-network. Areas identified as ESAs should be kept in at least semi-natural condition, i.e., with their basic ecological functioning still intact. Development within these areas should thus be minimised. The classification of the areas identified as CBA2, ESA1, and ESA2 areas within the study area, and particularly within the *Themeda*-rich Grassland Subunit was confirmed during the field assessment. Given the likelihood that significant residual impacts will occur due to nature of the impacts associated with the proposed development the area will no longer constitute a CBA. For this reason, an appropriate mitigation measure would be to consider an alternative site for the location of the Scafell Solar PV Facility. However, it is understood that the client wishes to proceed with this site. As a result, there are two options for the way forward:

- OPTION 1: Proceed with the full development footprint (see Figure 1) as assessed in this document. For this option, it is recommended that development should proceed only on the premise that the proponent has engaged with the relevant competent authorities with regards to implementing appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent i.e., an off-site biodiversity offset; or
- OPTION 2: If an off-site biodiversity offset is not feasible, it is recommended that a smaller site be selected that would avoid the need for an off-site biodiversity offset - see Figure 7 that provides for 110 ha within the Scafell Solar PV Facility site boundaries. For this option, a smaller portion of *Seriphium*-dominated Grassland and *Themeda*-rich Grassland habitat types of which 16 ha lies within CBA2 would be impacted. However, the residual loss of these habitats can be offset with implementing the following mitigation to improve the condition of remaining natural vegetation to a more intact status: removal and management (including follow-up control) of the encroacher, shrub species *Seriphium plumosum* to restore the *Seriphium*-dominated

Grassland to a similar manner of that of the *Themeda*-dominated grassland; implement appropriate fire management procedures, implement an erosion control plan, implement an AIP management and control plan and control the intensity of grazing throughout the PV Facility.

However, if the Scafell Solar PV Facility is granted authorisation despite the loss of CBAs, ESAs, and Freshwater Habitat, it is recommended that this be done on the premise that the proponent has engaged with the relevant competent authorities with regards to implementing appropriate management measures in line with the mitigation hierarchy which are deemed acceptable to both the competent authorities and the proponent.

Development opportunities within the Scafell PV Facilities are possible and can be optimised in areas of low to moderately low sensitivity (although there are not many of these areas within the Scafell PV Facility), which are associated with the Degraded Grassland Habitat. Development of areas of intermediate sensitivity can be optimised depending on the surrounding habitat: where links between habitats of intermediate sensitivity and moderately high sensitivity occur (e.g., within the Scafell PV Facilities), development should be avoided. In areas in which in habitat of intermediate sensitivity link with less sensitive habitat, particularly the Degraded Grassland habitat, development can be optimised.

It is the opinion of the ecologists that this study provides the relevant information required to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources for the proposed development will be made in support of the principle of sustainable development.

7 REFERENCES

Arnold. T.H., Prentice, C.A., Hawker, L.C., Snyman, E.E., Tomalin, M., Crouch, N.R. and Pottas-Bircher, C. (2002). Medicinal and magical plants of southern Africa: an annotated checklist. Strelitzia 13. South African National Biodiversity Institute, Pretoria.

BRAHMS Online Copyright © 1985 - 2020 Department of Plant Sciences, University of Oxford. Online available: http://posa.sanbi.org/sanbi/Websites.

Bromilow, C. 2001. Problem Plants of South Africa Revised Edition, First Impression. Briza Publications, Pretoria, RSA.

Du plessis, N. & Duncan, G. 1989. Bulbous Plants of southern Africa. Tafelberg; Capetown.

Edwards, E., 1983. A broad-scale structural classification of vegetation for practical purposes. Bothalia, 14(3/4), pp.705-712.

Eliovson, S. 1984. Wild Flowers of Southern Africa: How to grow and identify them. 7th Edition.

Gunamani T, Gurusamy R, Swamynathan K. 1991. Effect of dust pollution on the dermal appendages and anatomy of leaves in some herbaceous plants. J Swamy Boli Club. 1991;8(3–4):79–85.

Henderson, L. 2001. Alien Weeds and Invasive plants – A Complete Guide to Declared Weeds and Invaders in South Africa. Plant Protection Research Institute, Agricultural Research Council Handbook No 12. Pretoria.

Hui C, Richardson DM. 2017. Invasion dynamics. Oxford University Press, Oxford. https://doi.org/10.1093/acprof:oso/9780198745334.001.0001

IUCN. 2020. http://www.iucnredlist.org/.

Jeppe, B. 1969. South African aloes. Purnell, Cape Town.

Jordaan, D. and Jordaan, F.P., 2007. Probleemplante in the Suidwesgebied. *Ons Eie*, *42*(1), pp.38-40.

Low, A.B. and Rebelo, A.G. (eds). 1998. Vegetation of South Africa, Lesotho and Swaziland. Department of Environmental Affairs & Tourism, Pretoria

Mucina, L. & Rutherford, M.C. (Eds). 2012. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria, RSA

O'Connor, T. G., Puttick, J. R., and Hoffman, T. M. 2014. Bush encroachment in southern Africa: changes and causes. African Journal of Range and Forage Science. 31:2, 67-88, DOI: 10.2989/10220119.2014.939996

Oliver, I.B. 1990. *Crinum bulbispermum* in Veld & Flora Vol 76 p.57.

Pooley, E. 2005. A field guide to wildflowers: KwaZulu-Natal and the eastern region. Second Edition. Natal Flora Publ. Trust.

Raimondo, D., von Staden, L., Foden, W., Victor, J.E, Helme, NA., Turner, R.C, Kamundi, DA. & Manyama, PA. (eds). 2009. Red List of South African Plants Strelitzia 25. South African National Biodiversity Institute, Pretoria. Version 2014.1.

Richardson DM, Pyšek P, Carlton JT. 2011. A compendium of essential concepts and terminology in invasion ecology. In: Richardson DM (ed) Fifty years of invasion ecology. The legacy of Charles Elton. Wiley-Blackwell, Oxford, pp 409–420. https://doi.org/10.1002/9781444329988. ch30.

SANBI. 2018. The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, http://bgis.sanbi.org/Projects/Detail/186, Version 2018.

SANBI. 2013. Grasslands Ecosystem Guidelines: landscape interpretation for planners and managers. Compiled by Cadman, M., de Villiers, C., Lechmere-Oertel, R. and D. McCulloch. South African National Biodiversity Institute, Pretoria. 139 pages. ISBN: 978-1-919976-88-4

SANBI. 2017. Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning. First Edition (Beta Version), June 2017. Compiled by Driver, A., Holness, S. & Daniels, F. South African National Biodiversity Institute, Pretoria.

SANBI BGIS. 2021. The South African National Biodiversity Institute - Biodiversity GIS (BGIS) [online]. URL: http://bgis.sanbi.org as retrieved in 2020.

SAS 220184., Freshwater Ecological Assessment as Part of the Environmental Impact Assessment (EIA) and Authorisation Process for the Proposed Four Solar Energy Facilities, Collectively Referred to as the Scaffel Cluster Near Sasolburg, Free State Province.

Sett, R. 2017. Responses in plants exposed to dust pollution. Horticulture International Journal, 1(2), 00010.).

Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds.). 2019. South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.500.12143/6370

Snyman, H. A., (2009). Germination potential of *Seriphium plumosum* (bankrupt bush, slangbos or vaalbos). *Grassroots*, 9(1): 43–48. [Google Scholar]

Snyman, H. A., (2012). Control measures for the encroacher shrub *Seriphium plumosum*, South African Journal of Plant and Soil, 29:3-4, 157-163, DOI: 10.1080/02571862.2012.745905

STS 200077. 2021a. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B1: Floral Impact Assessment for the Scafell Solar PV Facility**.

STS 200077. 2021b. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B1: Floral Impact Assessment for the Damlaagte Solar PV Facility**.

STS 200077. 2021c. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B1: Floral Impact Assessment for the Vlakfontein Solar PV Facility**.

STS 200077. 2021d. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. **Part B1: Floral Impact Assessment for the Ilikwa Solar PV Facility**.

The National Environmental Management Act, 1998 (Act No. 107 of 1998).

The National Environmental Management: Biodiversity, 2004 (Act No. 10 of 2004).

Threatened Ecosystems: National Environmental Management Biodiversity Act: National list of ecosystems that are threatened and in need of protection (G 34809, GoN 1002). 2011. Department of Environmental Affairs. Online available: http://bgis.sanbi.org/ecosystems/project.asp.

Van Ginkel, C.E., Glen, R.P., Gordon-Gray, K.D., Cilliers, C.J., Muasya, M. and van Deventer, P.P., 2011. Easy identification of some South African Wetland Plants (Grasses, Restios, Sedges, Rushes, Bulrushes, Eriocaulons and Yellow-eyed grasses). WRC Report No TT 479/10. Water Research Commission, Pretoria.

Van Oudtshoorn, F. (1999). Guide to Grasses of Southern Africa. 2nd Ed. Briza Publications, Pretoria.

Van Wyk, B. and Malan, S. (1998). Field Guide to the Wild Flowers of the Highveld. Struik Publishers, Cape Town.

Vicente, J., Pereira, H., Randin, C., Gonçalves, J., Lomba, A., Alves, P., Metzger, J., Cezar, M., Guisan, A. & Honrado, J. 2013. Environment and dispersal paths override life strategies and residence

time in determining regional patterns of invasion by alien plants. Perspectives in Plant Ecology, Evolution and Systematics 16: 1-10.

Wilson JRU, Gaertner M, Richardson DM et al (2017) Contributions to the national status report on biological invasions in South Africa. Bothalia 47: a2207. https://doi.org/10.4102/abc.v47i2.2207.

APPENDIX A: Floral Method of Assessment

Floral Species of Conservational Concern Assessment

Prior to the site visit, a record of floral SCC and their habitat requirements was developed for the study area, which includes consulting the National Web-based Environmental Screening Tool. Because not all SCC have been included in the Screening Tool layers (e.g. NT and DD taxa), it remains important for the specialist to be on the lookout for additional SCC. For this study, two primary sources were consulted and are described below.

The National Web-Based Environmental Screening Tool

The Screening Tool was accessed to obtain a list of potentially occurring species of conservation concern for the study area. Each of the themes in the Screening Tool consists of theme-specific spatial datasets which have been assigned a sensitivity level namely, "*low*", "*medium*", "*high*" and "*very high*" sensitivity. The four levels of sensitivity are derived and identified in different ways, e.g. for **confirmed** areas of occupied habitat for SCC a Very High and High Sensitivity is assigned and for areas of suitable habitat where SCC may occur based on spatial models only, a Medium Sensitivity is assigned. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below[18]:

- **Very High**: Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km^2 are considered Critical Habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under Critically Endangered (CR), Endangered (EN), or Vulnerable (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.
- **High**: Recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level. Spatial polygons of suitable habitat have been produced for each species by intersecting recently collected occurrence records (those collected since the year 2000) that have a spatial confidence level of less than 250 m with segments of remaining natural habitat.
- **Medium**: Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. Two types of spatial models have been included. The first is a simple rule-based habitat suitability model where habitat attributes such as vegetation type and altitude are selected for all areas where a species has been recorded to occur. The second is a species distribution model which uses species occurrence records combined with multiple environmental variables to quantify and predict areas of suitable habitat. The models provide a probability-based distribution indicating a continuous range of habitat suitability across areas that have not been previously surveyed. A probability threshold of 75% for suitable habitat has been used to convert the modelled probability surface and reduce it into a single spatial area which defines areas that fall within the medium sensitivity level.
- **Low**: Areas where no SCC are known or expected to occur.

BRAHMS Online Website

The Botanical Database of Southern Africa (BODATSA) is accessed to obtain plant names and floristic details (http://posa.sanbi.org/) for species of conservation concern within a selected boundary;

[18] More details on the use of the Screening Tool for Species of Conservation Concern can be found in the below resources:

- South African National Biodiversity Institute (SANBI). 2020. Draft Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.0.
- The National Web based Environmental Screening Tool website: https://screening.environment.gov.za/screeningtool/#/pages/welcome

- This website provides access to South African plant names (taxa), specimens (herbarium sheets) and observations of plants made in the field (botanical records). Data is obtained from the BODATSA, which contains records from the National Herbarium in Pretoria (PRE), the Compton Herbarium in Cape Town (NBG & SAM) and the KwaZulu-Natal Herbarium in Durban (NH).
- Information on habitat requirements etc. is obtained from the SANBI Red List of South African Plants website (http://redlist.sanbi.org/).
- Typically, data is extracted for the Quarter Degree Square (QDS) in which the study area is situated but where it is deemed appropriate, a larger area can be included.

NEMBA TOPS Species

The Threatened or Protected Species (TOPS) Regulations (R 152 of 2007) under Section 56(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), were taken into consideration.

Protected Species

The Free State Nature Conservation Ordinance, 1969 (Ordinance No. 8 of 1969) (FSNCO) provides a list of Protected Plants (Schedule 6) for the Free State Province. These species formed part of the SCC assessment.

Throughout the floral assessment, special attention was paid to the identification of any of these SCC as well as the identification of suitable habitat that could potentially support these species.

The Probability of Occurrence (POC) for each floral SCC is described:

- "**Confirmed'**: if observed during the survey;
- "**High**": if within the species' known distribution range and suitable habitat is available;
- "**Medium**": if either within the known distribution range of the species or if suitable habitat is present; or
- "**Low**": if the habitat is not suitable and falls outside the distribution range of the species.

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Vegetation Surveys

When planning the timing of a floristic survey, it is important to remember that the primary objective is not an exhaustive species list but rather to ensure that sufficient data are collected to describe all the vegetation communities present in the area of interest, to optimise the detection of SCC and to assess habitat suitability for other potentially occurring SCC (SANBI, 2020).

The vegetation survey incorporates the subjective (or stratified) sampling method. Subjective sampling is a sampling technique in which the specialist relies on his or her own professional experience when choosing sample sites within the study area. This allows representative recordings of floral communities and optimal detection of SCC. Subjective sampling is used to consider different areas (or habitat units) which are identified within the main body of a habitat/study area.

One of the problems with random sampling, another popular sampling method, is that random samples may not cover all areas of a study area equally and thus increase the potential to miss floral SCC. Random sampling methods also tend to require more time in the field to locate the amount of SCC that can be detected using subjective sampling methods - In the context of an EIA where time constraints are often restrictive, priority needs to be given to collecting data in the shortest time possible without compromising the efficiency of locating SCC (SANBI, 2020).

Vegetation structure has been described following the guideline in Edwards (1983). Refer to Figure A1 below:

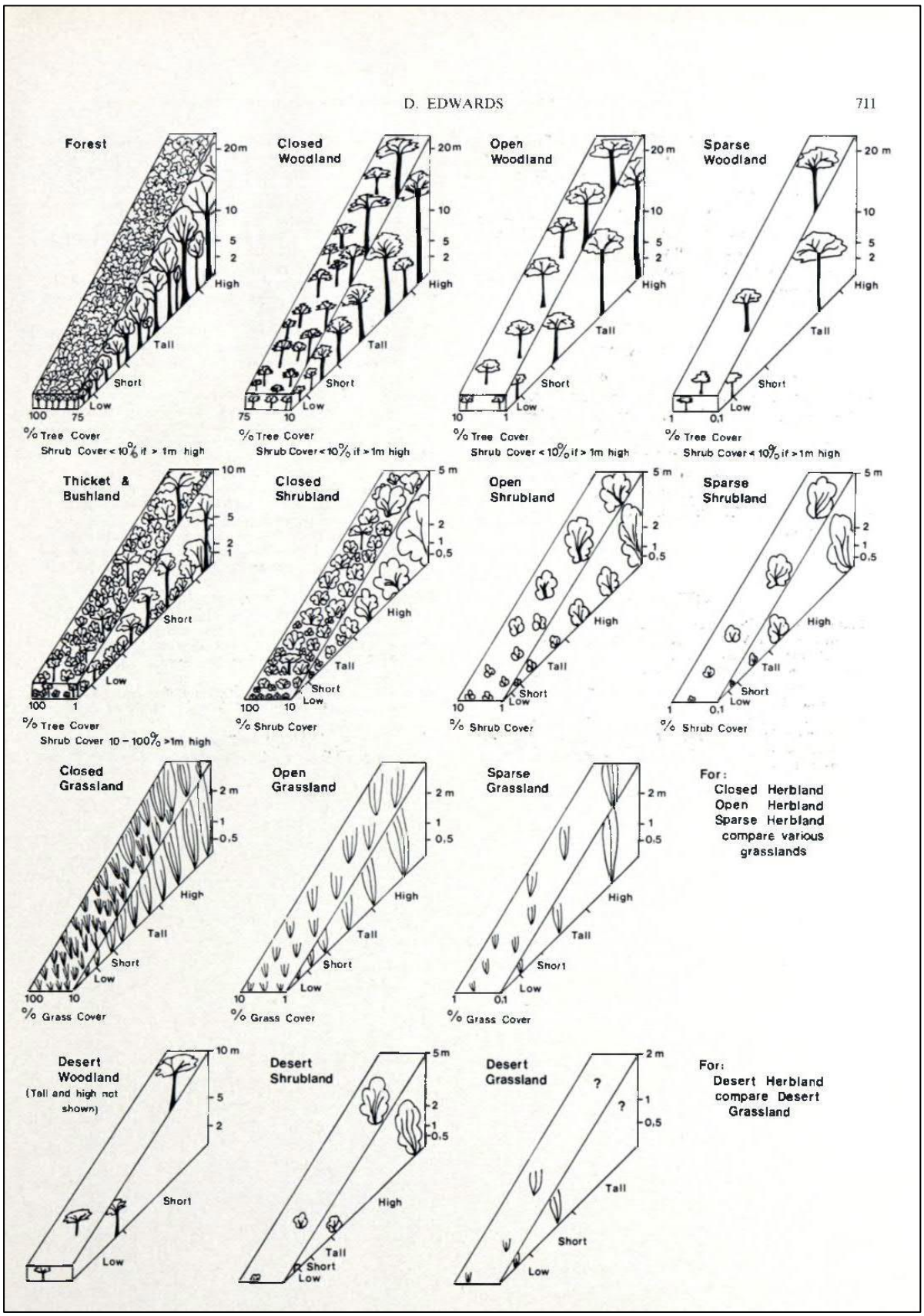


Figure A1: Diagrammatic representation of structural groups and formation classes. Only dominant growth forms are shown.

Floral Habitat Sensitivity

The floral habitat sensitivity of each habitat unit was determined by calculating the mean of five different parameters which influence floral communities and provide an indication of the overall floristic ecological integrity, importance, and sensitivity of the habitat unit. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Floral SCC:** The confirmed presence or potential for floral SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Unique Landscapes:** The presence of unique landscapes or the presence of an ecologically intact habitat unit in a transformed region;
- **Conservation Status:** The conservation status of the ecosystem or vegetation type in which the habitat unit is situated based on local, regional and national databases. Whether the habitat is representative of a Critical Biodiversity Area or forms part of an Ecological Support Area is also taken into consideration;
- **Floral Diversity:** The recorded floral diversity compared to a suitable reference condition such as surrounding natural areas or available floristic databases; and
- **Habitat Integrity:** The degree to which the habitat unit is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the floral habitat sensitivity class in which each habitat unit falls. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the habitat unit in question. To present the results use is made of spider diagrams to depict the significance of each aspect of floral ecology for each vegetation type. The different classes and land-use objectives are presented in the table below:

Table A1: Floral habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1 < 1.5	Low	Optimise development potential.
≥1.5 <2.5	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
≥2.5 <3.5	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimizing development potential.
≥3.5<4.5	Moderately high	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.
≥4.5 ≤5.0	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.

APPENDIX B: Floral SCC

South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. This scientific system is designed to measure species' risk of extinction. The purpose of this system is to highlight those species that are most urgently in need of conservation action. Due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction but may nonetheless be of high conservation importance. Because the Red List of South African plants is used widely in South African conservation practices such as systematic conservation planning or protected area expansion, we use an amended system of categories designed to highlight those species that are at low risk of extinction but of conservation concern.

Definitions of the national Red List categories

Categories marked with ^{N} are non-IUCN, national Red List categories for species not in danger of extinction but considered of conservation concern. The IUCN equivalent of these categories is Least Concern (LC).

- **Extinct (EX)** A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
- **Extinct in the Wild (EW)** A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
- **Regionally Extinct (RE)** A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
- **Critically Endangered, Possibly Extinct (CR PE)** Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
- **Critically Endangered (CR)** A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
- **Endangered (EN)** A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
- **Vulnerable (VU)** A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
- **Near Threatened (NT)** A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable and is therefore likely to become at risk of extinction in the near future.
- ^{N}**Critically Rare** A species is Critically Rare when it is known to occur at a single site but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
- ^{N}**Rare** A species is Rare when it meets at least one of four South African criteria for rarity but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows:
  - Restricted range: Extent of Occurrence (EOO) <500 km^2, OR
  - Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km^2, OR
  - Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR
  - Small global population: Less than 10 000 mature individuals.
- **Least Concern** A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.

- **Data Deficient - Insufficient Information (DDD)** A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required, and that future research could show that a threatened classification is appropriate.
- **Data Deficient - Taxonomically Problematic (DDT)** A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
- **Not Evaluated (NE)** A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in Plants of southern Africa: an online checklist are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

Table B1: Floral SCC (POSA plant list, SANBI, http://posa.sanbi.org/sanbi/Explore) expected to occur within the QDS 2328DD in which the study area is located. Additional information on species threat status as defined in The Red List of South African Plants (http://redlist.sanbi.org/index.php) is presented.

Family	Species and Habitat Description	IUCN	Growth Form	POC
AIZOACEAE	*Lithops lesliei* Habitat: Primarily in arid grasslands, usually in rocky places, growing under the protection of forbs and grasses.	NT	Succulent	Low
APIACEAE	*Alepidea attenuate* Habitat: Wetlands in grassland up to 2200 m.	NT	Herb	Medium
APOCYNACEAE	*Brachystelma incanum* Habitat: Sandy loam soils in thornveld and *Themeda*-grassland.	VU	Succulent; geophyte	Medium
APOCYNACEAE	*Miraglossum leave* Habitat: Hills in Gold Reef Mountain Bushveld and possibly Gauteng Shale Mountain Bushveld.	CR	Succulent; herb	Low
APOCYNACEAE	*Stenostelma umbelluliferum* Habitat: Deep black turf in open woodland mainly in the vicinity of drainage lines.	NT	Succulent; geophyte; herb	Low
ASPHODELACEAE	*Kniphofia typhoides* Habitat: Low lying wetlands and seasonally wet areas in climax *Themeda triandra* grasslands on heavy black clay soils, tends to disappear from degraded grasslands.	NT	Succulent; herb	High
CRASSULACEAE	*Adromischus umbraticola* Habitat: South-facing rock crevices on ridges, restricted to Gold Reef Mountain Bushveld in the northern parts of its range, and Andesite Mountain Bushveld in the south.	NT	Lithophyte; succulent; dwarf shrub	Low
FABACEAE	*Indigofera hybrida* Habitat: Dry highveld grassland.	VU	Herb	Low

CR = Critically Endangered; NT = Near Threatened, VU = Vulnerable; POC = Probability of Occurrence

Table B2: Schedule 6 - PROTECTED PLANTS of the Free State Nature Conservation Ordinance, 1969 (Ordinance No. 8 of 1969) (FSNCO). Genus/species reorded during the site visit are indicated in bold.

Common Name	Scientific Name
Tree-fern	*Alsophila dregei* (=*Cyathea dregei*)
All species of Cycads	Genus *Encephalartos*
All species of yellowwoods	Genus *Podocarpus*
All species of arum lilies	Genus *Zantedeschia*
All species of red-hot pokers	Genus *Kniphofia*
All species of aloes	**Genus *Aloe***
kleinkanniedood	*Haworthia nervosa* subsp. *recurva* (= *Haworthia tessellata*)

Common Name	Scientific Name
All species of agapanthus	Genus *Agapanthus*
All species of berg lilies	Genus *Galtonia*
All species of wild squill	Genus *Scilla*
All species of pineapple flower	Genus *Eucomis*
All species of paint brushes and blood flowers	Genus *Haemanthus*
All species of poison bulbs or century plants	**Genus *Boophone***
All species of nerines	Genus *Nerine*
All species of brunsvigia	Genus *Brunsvigia*
All species of kukumakrankas	Genus *Gethyllis*
All species of crinum	**Genus *Crinum***
ground lily	*Ammocharis coranica*
All species of fire lilies	Genus *Cyrtanthus*
All species of elephant's foot or wild yam	Genus *Dioscorea*
river lily, vlei lily	*Schizostylis coccinea*
All species of fairy-bells, hair-bells or flowering grass	Genus *Dierama*
All species of tritonia	Genus *Tritonia*
All species of gladioli	Genus *Gladiolus*
All species of watsonias	Genus *Watsonia*
All species of freesias	Genus *Freesia*
All species of orchids	Family Orchidaceae
the protea species of the O.F.S	*Protea caffra, P. roupelliae* and *P. subvestita*
All species of stone faces or stone plants	Genus *Lithops*
Neohenricia vygie	*Neohenricia sibbettii*
All species of pleiospilos	Genus *Plesiopilos*
sheep's tongue	*Titanopsis calcarea*
All species of anacampseros	Genus *Anacampseros*
All species of sundew	Genus *Drosera*
"ploegbreker" or "tamboekwiewortel"	*Erythrina zeyheri*
All species of "vingerpol, voetangel, noorsdoring, melkbol" or "melkpol"	Genus *Euphorbia*
wild begonia	*Begonia sutherlandii*
All species of Cabbage trees	Genus *Cussonia*
All species of heath	Genus *Erica*
wild olive tree	*Olea europaea* subsp. *africana*
All species of pachypodiums	**Genus *Pachypodium***
All species of the stapeliae, ceropegias and trichocaulons	Family Asclepiadaceae
All species of everlastings	**Genus *Helichrysum***

Table B3: List of protected tree species under the National Forest Act, 1998 (Act No. 84 of 1998) that have the potential to be located within the study area[19].

Scientific Name (common name)	Habitat Description	National Red List Status	POC
Boscia albitrunca (White-stem Shepard's-tree)	Distribution: Western Cape, Northern Cape, Eastern Cape, Free State, Kwazulu-Natal, Northwest, Gauteng, Mpumalanga, and Limpopo Provinces. Habitat: Found in dry, open woodland and bushveld, mostly in hot, arid, semi-desert areas, often on Termitaria and in rocky areas.	LC	**Low**

LC = Least Concern; **POC** = Probability of Occurrence.

[19] https://www.thetreeapp.co.za/

APPENDIX C: Floral Species List

Table C1: Dominant floral species encountered during the field assessment. Alien species identified during the field assessment are indicated with an asterisk (*).

	Transformed Veld Habitat	Grassland Habitat Subunits			Freshwater Habitat
Scientific Name	Transformed Veld Habitat	Degraded Grassland	*Seriphium*-Dominated Grassland	*Themeda*-rich Grassland	Freshwater Habitat
TREES					
Acacia mearnsii			x		
Eucalyptus grandis			x		
Pinus sp.	x				
Populus x canescens					x
Searsia pyroides		x	x	x	x
Seriphium plumosum			x	x	
Vachellia karroo	x	x	x	x	
Ziziphus mucronata			x	x	
Ziziphus zeyheri			x		
HERBS & SHRUBS					
**Argemone ochroleuca*	x	x			
**Bidens pilosa*	x	x	x	x	x
**Campuloclinium macrocephalum*		x			x
**Cirsium vulgare*	x	x	x	x	x
**Conyza bonariensis*	x	x	x	x	x
**Cosmos bipinnatus*		x	x		
**Datura stramonium*	x	x	x	x	x
**Oenothera rosea*		x	x	x	x
**Ricinus communis*	x	x	x	x	x
**Solanum sisymbriifolium*	x	x	x	x	x
**Sonchus oleraceus*	x	x	x	x	x
*Tagetes minuta	x	x	x	x	
*Verbena bonariensis	x	x	x	x	
**Verbena tenuisecta*		x	x		
Acrotome hispida	x	x	x	x	
Asclepias eminens			x	x	
Becium obovatum		x	x	x	
Berkheya seminivea		x	x	x	x
Boophone disticha			x	x	
Commelina africana	x	x	x	x	
Commelina erecta	x	x	x	x	
Commelina livingstonii	x	x	x	x	
Cucumus zeyheri		x	x		
Cyanotis speciosa		x	x	x	
Cyperus obtusiflorus var. flavissimus			x	x	
Delosperma herbeum			x	x	
Dipcadi rigidifolium			x	x	
Felicia mossamedensis		x	x	x	
Geigeria burkei		x	x	x	
Gomphocarpus fruticosus	x	x	x		x
Gomphrena celosiodes	x	x	x		
Haplocarpa lyrata					x

	Transformed Veld Habitat	Grassland Habitat Subunits			Freshwater Habitat
Scientific Name	Transformed Veld Habitat	Degraded Grassland	*Seriphium*-Dominated Grassland	*Themeda*-rich Grassland	Freshwater Habitat
Haplocarpa scaposa		x	x	x	x
Helichrysum chionsphaerum			x	x	
Helichrysum epapposum			x	x	
Hibiscus microcarpus		x	x	x	
Hilliardiella oligocephala		x	x	x	
Hypoxis argentea			x	x	
Hypoxis hemerocallidea				x	
Hypoxis iridifolia			x	x	
Hypoxis rigida			x	x	
Kyllinga alba			x	x	
Ledebouria ovatifolia		x	x	x	
Ledebouria spp.			x	x	
Nemesia fruticans	x	x	x	x	x
Ocimum americanum			x	x	
Ocimum obovatum			x	x	
Oxalis corniculata		x	x	x	
Oxalis obliquifolia		x	x	x	
Pachycarpus schinianus				x	
Pelagonium luridum			x	x	
Peucedanum magaliesmontanum			x	x	
Plantago lanceolata	x	x	x	x	
Polygala hottentotta		x	x	x	
Persicaria limbata					x
Scabiosa columbaria		x	x	x	
Senecio glanduloso-pilosus		x	x	x	
Senecio inornatus			x	x	
Striga elegans			x	x	
Tephrosia capensis		x	x	x	
Trifolium africanum		x	x	x	
Wahlenbergia caledonia		x	x	x	x
SUCCULENTS					
Aloe davyana				x	
CREEPERS & FLAT-GROWING HERBS					
*Araujia Sericifera					x
*Gomphrena celosioides	x	x	x	x	
GRAMINOIDS					
Andropogon appendiculatus	x	x	x	x	
Andropogon schirensis		x	x	x	
Aristida junciformis subsp. galpinii,		x	x	x	
Aristida congesta subsp. Congesta	x	x	x	x	x
Cymbopogon caesius	x	x	x	x	
Cynodon dactylon	x	x	x	x	
Cyperus congestus					x
Cyperus esculentus					x
Cyperus esculentus					x
Cyperus marginatus					x
Cyperus rupestris					x
Diheteropogon amplectens		x	x	x	

	Transformed Veld Habitat	Grassland Habitat Subunits			Freshwater Habitat
Scientific Name	**Transformed Veld Habitat**	**Degraded Grassland**	***Seriphium*-Dominated Grassland**	***Themeda*-rich Grassland**	**Freshwater Habitat**
Eragrostis lehmanniana					x
Eragrostis capensis	x	x	x	x	
Eragrostis curvula	x	x	x	x	
Heteropogon contortus	x	x	x	x	
Hyparrhenia hirta		x	x	x	
Juncus effusus					x
Panicum maximum	x				
Setaria sphacelata	x	x	x	x	
Themeda triandra			x	x	
Typha capensis					x

SCIENTIFIC TERRESTRIAL SERVICES

Reg No. 2005/122/329/23
VAT Reg No. 4150274472
PO Box 751779
Gardenview
2047
Tel: 011 616 7893
Fax: 086 724 3132
Email: admin@sasenvgroup.co.za
www.sasenvironmental.co.za

BASELINE BIODIVERSITY ASSESSMENT AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE DEVELOPMENT OF THE SCAFELL CLUSTER, SOLAR PHOTOVOLTAIC FACILITY, FREE STATE PROVINCE

Scafell Solar PV facility

Prepared for

SLR Consulting (Pty) Ltd.

June 2021

Part C1: Faunal Assessment

Prepared by: Scientific Terrestrial Services CC
Report author: D. van der Merwe
Report reviewers: C. Hooton
S. van Staden (Pr. Sci. Nat)
Report reference: STS 200077

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.

No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
Theme-Specific Requirements as per Government Notice No. 320 Terrestrial Biodiversity Theme – Very High Sensitivity Rating as per Screening Tool Output		
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 B1-4**: 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 B1-4**: Section 3 (flora) **Part C1-4:** 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 B1-4**: Section 3 (flora) **Part C1-4:** 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 B1-4:** Section 3.1 – 3.4 (flora) **Part C1-4:** Section 3.2 – 3.5 (fauna)
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;	**Part A**: Section 3 (desktop analysis) **Part B1-4**: Section 3 (flora) **Part C1-4:** 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	Not Applicable.
2.3.7	**The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:**	
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: *a) the reasons why an area has been identified as a CBA;* *b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;*	**Part A**: Section 3 **Part B1-4**: Section 3; Section 5.3.3 **Part C1-4:** Section 3

No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
	c) *the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);* d) *the impact on ecosystem threat status;* e) *the impact on explicit subtypes in the vegetation;* f) *the impact on overall species and ecosystem diversity of the site; and* g) *the impact on any changes to threat status of populations of species of conservation concern in the CBA;*	
2.3.7.2	Terrestrial Ecological Support Areas (ESAs), including: a) *the impact on the ecological processes that operate within or across the site;* b) *the extent the proposed development will impact on the functionality of the ESA; and* c) *loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;*	
2.3.7.3	Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- a) *an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;*	**Part A**: Section 3 (desktop analysis) **Part B1-4**: Not applicable **Part C1-4:** Not applicable
2.3.7.4	Priority areas for protected area expansion, including- a) *the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;*	**Part A**: Section 3 (desktop analysis)
2.3.7.5	SWSAs including: a) *the impact(s) on the terrestrial habitat of a SWSA; and* b) *the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);*	Not Applicable
2.3.7.6	FEPA sub catchments, including- a) *the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;*	Not Applicable
2.3.7.7	Indigenous forests, including: a) *impact on the ecological integrity of the forest; and* b) *percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.*	Not Applicable
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 B1-4:** Section 1.4 (flora) **Part C1-4:** Section 1.3 (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 B1-4:** Section 2 (flora) **Part B1-4:** Appendix A (flora) **Part C1-4:** Section 2 (fauna) **Part C1-4**: Appendix A (fauna)

No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
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 B1-4:** Section 1.4 (flora) **Part C1-4:** Section 1.3 (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 B1-4:** Section 4 (flora) **Part C1-4:** Section 4 (fauna)
	Impact Assessment Requirements *3.1.7 Additional environmental impacts expected from the proposed development;* *3.1.8 Any direct, indirect and cumulative impacts of the proposed development;* *3.1.9 The degree to which impacts and risks can be mitigated;* *3.1.10 The degree to which the impacts and risks can be reversed;* *3.1.11 The degree to which the impacts and risks can cause loss of irreplaceable resources;* 3.1.12 *Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);*	**Part B1-4:** Section 5 (flora) **Part C1-4:** Section 5 (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 to this report**
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 B1-4:** Section 5 (flora) **Part C1-4:** Section 5 (fauna)
3.1.15	Any conditions to which this statement is subjected.	**Part B1-4:** Section 5.4 (flora) **Part C1-4:** Section 5 (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.	**Not Applicable to this report**
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	**Not Applicable to this report**

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

BGIS	Biodiversity Geographic Information Systems
CR	Critically Endangered
DFFE	Department: Forestry, Fisheries and the Environment
EAP	Environmental Assessment Practitioner
EIS	Ecological Importance and Sensitivity
EN	Endangered
EW	Extinct in the Wild
GIS	Geographic Information System
GPS	Global Positioning System
IBA	Important Bird Area
IEM	Integrated Environmental Management
IIE	Independent Institute of Education (Pty) Ltd
IUCN	International Union for Conservation of Nature and Natural Resources
LC	Least Concern
NT	Near Threatened
NYBA	Not yet been assessed
MAMSL	Meters Above Mean Sea Level
P	Protected
PES	Present Ecological State
POC	Probability of Occurrence
PRECIS	Pretoria Computerised Information System
PV	Photovoltaic
QDS	Quarter Degree Square
RDL	Red Data Listed
RE	Regionally Extinct
SABAP 2	Southern African Bird Atlas Project 2
SANBI	South Africa National Biodiversity Institute
SP	Specially Protected
STS	Scientific Terrestrial Services
SCC	Species of Conservation Concern
TOPS	Threatened or Protected Species
VU	Vulnerable

GLOSSARY OF TERMS

Alien and Invasive species	A species that is not an indigenous species; or 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.
CBA (Critical Biodiversity Area)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation and ridges.
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.
ESA (Ecological Support Area)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Least Threatened	Least threatened ecosystems are still largely intact.
RDL (Red Data listed) species	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
SCC (Species of Conservation Concern)	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.

1. INTRODUCTION

1.1 Background

Scientific Terrestrial Services (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) and Environmental Authorisation (EA) process for the development of four solar photovoltaic (PV) facilities, namely Damlaagte Solar PV Facility, Scafell Solar PV Facility, Vlakfontein Solar PV Facility, and Ilikwa Solar PV Facility, which are collectively referred to as the "Scafell Cluster". The Scafell Cluster is located approximately 19 km west of the town of Sasolburg, Free State Province. This report considers the Scafell Solar PV Facility and is henceforth referred to as the "study area" (Figure 1).

The study area is in the Ngwathe Local Municipality which is an administrative area in the Fezile Dabi District Municipality of the Free State Province. The R59 runs approximately 3.5 km south of the study area, and the N1 run immediately adjacent to the study area in the east. The proposed Scafell Cluster and associated infrastructure, will cover an area of approximately 839 ha. For a detailed Project description of all proposed development activities, please refer to Section 1.2 below.

The baseline results of the faunal assessment (description of the floral habitat units, faunal species of conservation concern assessment and habitat sensitivity analysis) are based on the initial layout provided by the proponent (i.e., Figure 1). After the completion of the baseline assessment, small changes to the proposed study area layout were made (refer to Figure 2 below). The impacts associated with the development of the PV facilities (including batteries) and grid connection infrastructure are based on the updated layout and will be presented separately for each of the four PV Facilities. Within this report, an impact discussion and assessment is presented of all potential pre-construction, construction, operational and maintenance and decommission phase impacts associated with the development of the Scafell Solar PV facility.

The purpose of this report is to define the faunal ecology of the study area as well as mapping and defining areas of increased Ecological Importance and Sensitivity (EIS) and to define the Present Ecological State (PES) of the study area. This report does not include an impact assessment at this stage as no definite footprint for the solar PV facilities has been decided upon. Once footprints have been decided upon, the report will be updated accordingly with an impact assessment. The impact assessment will cover all potential pre-construction, construction, operational and maintenance phase impacts of the proposed development activities once received.

The objective of this study is:

- To provide inventories of faunal species as encountered within the study area;
- To determine and describe habitat types, communities and the ecological state of the study area and to rank each habitat type based on conservation importance and ecological sensitivity;
- To identify and consider all sensitive landscapes including rocky ridges, wetlands and/ or any other special features;
- To conduct a Red Data Listed (RDL) species assessment as well as an assessment of other Species of Conservation Concern (SCC), including potential for such species to occur within the study area;
- To provide detailed information to guide the activities associated with the proposed development activities associated within the study area; and
- To ensure the ongoing functioning of the ecosystem in such a way as to support local and regional conservation requirements and the provision of ecological services in the local area.

1.2 Project Description

The proposed Scafell Cluster development entails the construction and operation of four solar PV facilities and associated grip connection infrastructure located within the Ngwathe Local Municipality of the Free State Province. The proposed solar energy projects consist of the following:

- Scafell solar PV facility located on Portion 3 of the Farm Willow Grange 246;
- Damlaagte solar PV facility located on the Remaining Extent of the Farm Damlaagte 229;
- Vlakfontein solar PV facility located on Portion 6 of the Farm Vlakfontein 161; and
- Ilikwa solar facility located on Portion 5 of the farm Proceederfontein 100.

Each Solar PV project will require a Battery Energy Storage System (BESS) and grid connection infrastructure (as listed below) to facilitate grid connection between each solar PV facility and the existing Scafell Substation. The following alternatives have been proposed for each Project (the mapping and impact assessment presented in the report corresponds to the Alternative 1 (Preferred) layout):

Project	Alternative 1 (Preferred)	Alternative 2
Damlaagte	This corridor is 150 m wide and is approximately 2.0 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Damlaagte Solar Facility located on Damlaagte RE/229 and extends for about 1 km in an easterly direction across Willow Grange 3/246 before	This corridor is 150 m wide and is also approximately 2.5 km in length. This proposed grid connection starts at the on-site substation (Switching Station) of the proposed Damlaagte Solar Facility located on Damlaagte RE/229 and extends for about 0.6 km in an easterly direction across Willow Grange 3/246, then

	turning about 90° south for 0.6km across Scafell RE/448, then turning slightly southeast for 0.3km before terminating at the Scafell Eskom MTS. This is the shortest most direct route to connect to the Scafell Eskom MTS.	turns about 90° southwest for 0.7km and then southeast for 0.9km onto Procedeerfontein 5/100, and then turns northeast for 0.2km before terminating at the Scafell Eskom MTS located on Scafell RE/448.
Vlakfontein	This corridor is 150 m wide and is approximately 2.0 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Vlakfontein Solar Facility located on Vlakfontein 6/161 and extends for about 0.8 km in a westerly direction across Willow Grange 3/246 before turning about 90° south for 0.6km across Scafell RE/448, then turning slightly southeast for 0.3km, terminating at the Scafell Eskom MTS. This is the shortest most direct route to connect to the Scafell Eskom MTS.	This corridor is 150 m wide and is approximately 3.0 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Vlakfontein Solar Facility located on Vlakfontein 6/161 and extends for about 1.2km in a westerly direction across Willow Grange 3/246, then 0.7km in a south-westerly direction across Procedeerfontein 5/100, a further 0.9km in a south-easterly direction and then turns northeast for 0.2km before terminating at the Scafell Eskom MTS located on Scafell RE/448.
Ilikwa	This corridor is 150 m wide and is approximately 2.3 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Ilikwa Solar Facility located on Procedeerfontein 5/100 and extends for about 0.3 km in a south-easterly direction before moving north-easterly for 0.7km across Willow Grange 3/246, then turning east for 0.4km then directly south for 0.6km crossing Scafell RE/448, then a further 0.3km in a south easterly direction, before terminating at the Scafell Eskom MTS.	This corridor is 150 m wide and is approximately 1.4 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Ilikwa Solar Facility located on Procedeerfontein 5/100 and extends for about 1.2 km in a south-easterly direction before at 90° northeast for 0.2km into the Scafell Eskom MTS located on Scafell RE/448.
Scafell	This corridor is 150 m wide and is approximately 0.9 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Scafell Solar Facility located on Willow Grange 3/246 and extends for about 0.6 km south across Scafell RE/448, then turning slightly southeast for 0.3km, terminating at the Scafell Eskom MTS. This is the shortest most direct route to connect to the Scafell Eskom MTS.	This corridor is 150 m wide and is also approximately 2.2 km in length. This proposed grid connection starts at the on-site substation (Switching Station) of the proposed Scafell Solar Facility located on Willow Grange 3/246 and extends for about 0.4 km in a westerly direction across Willow Grange 3/246, then turns southwest for 0.7km and then southeast for 0.9km onto Procedeerfontein 5/100, and then turns northeast for 0.2km before terminating at the Scafell Eskom MTS located on Scafell RE/448.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most faunal communities have been accurately assessed and considered and the information provided is considered sufficient to allow informed decision making to take place and facilitate integrated environmental management;
- Due to the nature and habits of most faunal taxa, the high level of anthropogenic activities, it is unlikely that all species would have been observed during a field

assessment of limited duration. Therefore, site observations were compared with literature studies where necessary;

- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa within the footprint area may therefore have been missed during the assessment;
- A field assessment was undertaken from the 5th to the 8th of January 2021 (summer season), to determine the faunal ecological status of the study area, and to "ground-truth" the results of the desktop assessment (presented in Section A). Seasonal surveys would allow better saturation of the study with potentially improved species lists. However, on-site data was significantly augmented with all available desktop data and specialist experience in the area, and the findings of this assessment are considered to be an accurate reflection of the ecological characteristics of the study area; and
- This report presents the baseline results of the faunal assessment for the entire study area; however, for the impact assessment, this report only includes an impact assessment of the Scafell Solar PV facility (STS 200077, 2021a). Impact assessments for the remaining footprint of the study area are presented in:
    - STS 200077. 2021c. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. Part C1: Faunal Impact Assessment for the Vlakfontein Solar PV Facility.
    - STS 200077. 2021b. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. Part C3: Faunal Impact Assessment for the Daamlagte Solar PV Facility.
    - STS 200077. 2021d. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. Part C4: Faunal Impact Assessment for the Ilikwa Solar PV Facility.

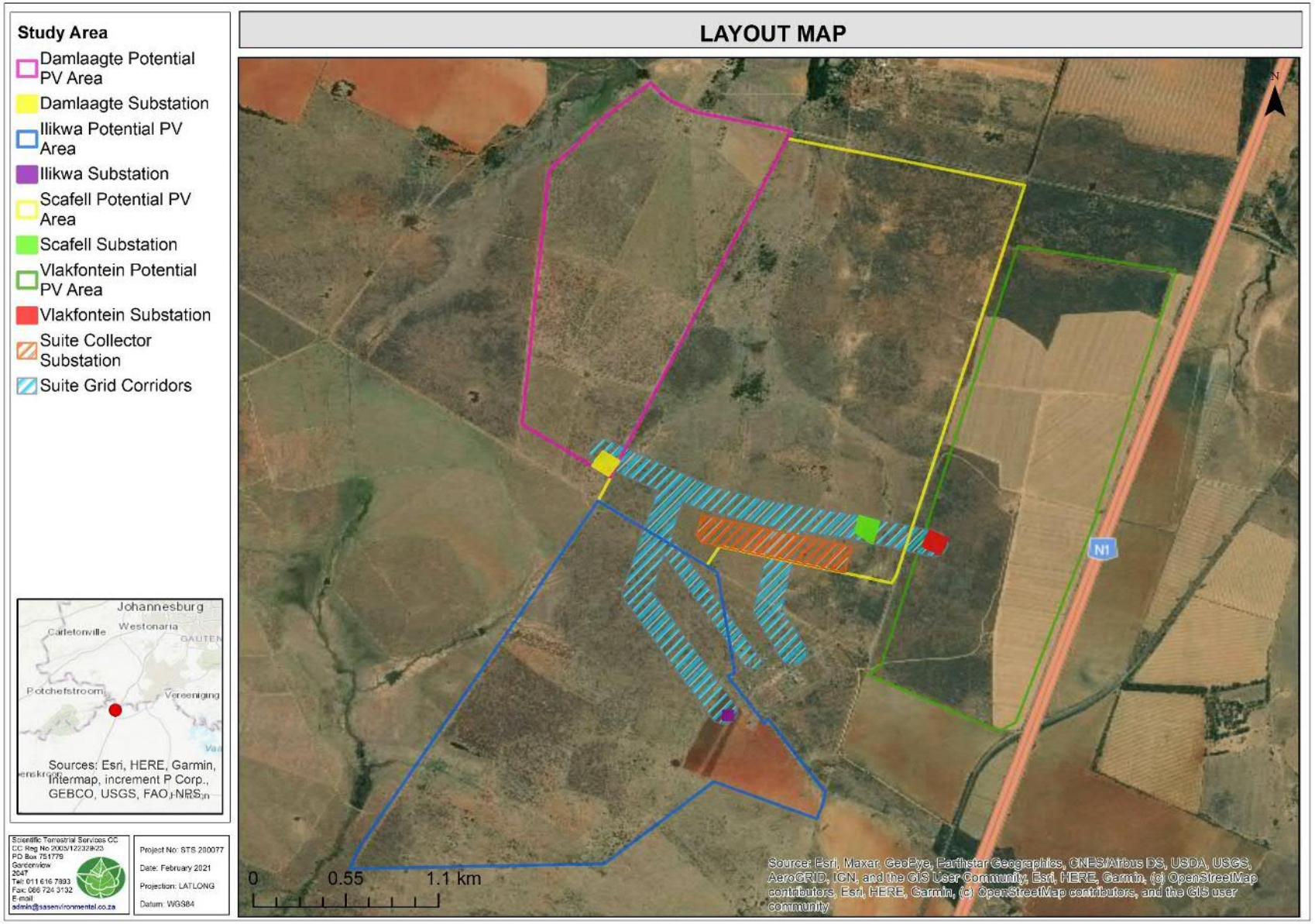


Figure 1: Conceptual illustration of the proposed solar PV facilities within the study area in relation to the surrounding areas (see figure 2 for an updated concept map for the faunal assessment).

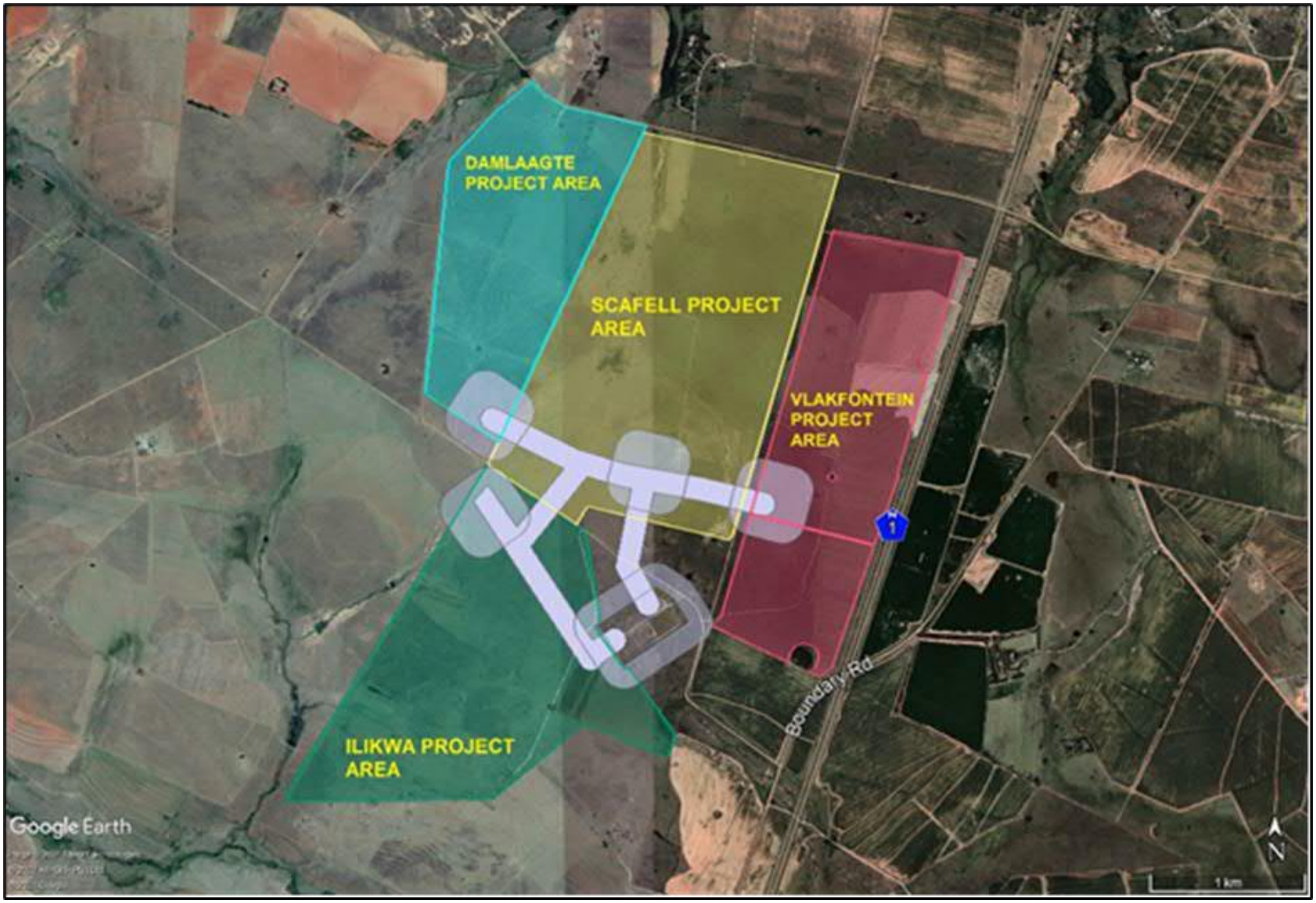


Figure 2: Updated concept layout of the proposed grid corridor infrastructure for the study area.

2. ASSESSMENT APPROACH

The field assessment was undertaken on the 5th to 8th of January 2021 (summer season), to determine the faunal ecological status of the study area. A reconnaissance 'walkabout' was initially undertaken to determine the general habitat types found throughout the study area, following this, specific study sites were selected that were considered to be representative of the habitats found within the study area, with special emphasis being placed on areas that may potentially support faunal SCC. Sites were investigated on foot in order to identify the occurrence of fauna within the study area. Sherman and camera traps were used to increase the likelihood of capturing and observing mammal species, notably nocturnal and reclusive mammals.

A detailed explanation of the method of assessment is provided in Appendix A of this report. The faunal categories covered in this assessment are mammals, avifauna, reptiles, amphibians, general invertebrates and arachnids. For the methodologies relating to the impact assessment and development of the mitigation measures, please refer to Appendix C of Part A of the study.

2.1 General approach

To accurately determine the PES of the study area and capture comprehensive data with respect to faunal taxa, the following methodology were applied:

- Maps and digital satellite images were consulted prior to the field assessment in order to determine broad habitats, vegetation types and potentially sensitive sites. A site assessment of the study area was undertaken to confirm the assumptions made during consultation of the digital satellite imagery;
- A literature review with respect to habitats, vegetation types and species distribution was conducted;
- Relevant databases considered during the assessment of the study area included the Important Bird and Biodiversity Areas (IBA, 2015), South African Bird Atlas Project 2 (SABAP2), International Union for Conservation of Nature (IUCN), the Free State Province Biodiversity Plan (V1, 2016) and the National Biodiversity Assessment (NBA, 2018);
- Specific methodologies for the assessment, in terms of field work and data analysis of faunal ecological assemblages are presented in Appendix A of this report; and
- For the methodologies relating to the impact assessment and development of the mitigation measures, please refer to Appendix C of Part A.

2.2 Sensitivity Mapping

All the ecological features associated with the study area were considered, and sensitive areas were assessed. In addition, identified locations of protected species were marked by means of Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto satellite imagery and/or topographic maps. The sensitivity map should guide the final design and layout of the proposed development activities. Please refer to Section 4 of this report for further details.

3. FAUNAL ASSESSMENT RESULTS

3.1 Faunal Habitat

The study area falls within the Soweto Highveld Grassland vegetation type (listed as endangered in Mucina and Rutherford, 2006 – i.e., the reference state. Mucina and Rutherford (2006) describe the Soweto Highveld Grassland as having gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus, Eragrostis racemosa, Heteropogon contortus* and *Tristachya leucothrix*. In undisturbed places, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.

Overall, the habitat within the study area ranged from well-vegetated areas to highly transformed areas in which vegetation was dominated by alien and invasive plant (AIP) species. The biodiversity of the study area has thus been defined under three broad habitat units as described below (Figure 2). These habitat units were distinguished based on species composition, vegetation structure, ecological function, physical nature of the environment and habitat condition.

The three broad habitat units include (Transformed, Grassland and Freshwater habitat):

Transformed Habitat: this habitat unit included areas that have experienced acute anthropogenic disturbances (e.g., areas of recent and current cultivation and infrastructure development). Natural vegetation has been entirely replaced by various crops and the unit no longer retains a natural floristic composition. This unit comprised of a low faunal species assemblage and offered very little habitat for most faunal classes. This habitat provided no areas of niche habitat for fauna and no varying habitat structure due to the lack of woody

species. Common faunal species may periodically forage within this site, but this will likely be *ad hoc* foraging whilst moving between more suitable areas. This habitat has been completely transformed from the reference vegetation type and no longer warrants further consideration in terms of faunal species habitation.

Grassland Habitat: this habitat unit was characterised by a dominance of grass species and consisted of three subunits. Subunits were differentiated largely based on floristic species composition and the level of disturbance experienced.

Degraded Grassland: this subunit comprised the smallest extent of the Grassland Habitat Unit. Overall, this habitat subunit was largely homogeneous in structure with a poor floral species representation, providing limited forage or niche habitat for many fauna, particularly invertebrates. This subunit supported few indigenous species and was dominated by the highest number of AIP species of all the Grassland Subunits, including *Conyza bonariensis, Tragopogon dubis, Circium vulgare* and *Campuloclinium macrocephalum*, which can decrease available forage for larger mammal species. Common species are anticipated to utilize this habitat as no niche habitat, which are often preferred by sensitive SCC were available;

***Seriphium*-dominated Grassland**: this habitat subunit comprised the largest extent of the Grassland Habitat Unit and was moderately species rich from a floral perspective, with a well-developed grass layer providing valuable supporting habitat for most fauna. The habitat Subunit was easily distinguished from the other subunits by the presence of dense stands of *hyparrhenia hirta* and *Seriphium plumosum* which may have resulted from increased fire occurrence or as a result of high-density cattle grazing which has reduced the floral species richness and subsequently the faunal habitat suitability. This subunit has the potential to host both common and SCC species as both increased forage and suitability was noted. The homogenous grassland structure with limited wooded or other habitat suitable for shelter does detract from the possibility of sustained larger mammal presence and limits the potential of the unit to host a diverse assemblage of fauna.

***Themeda*-rich Grassland**: this subunit supported a moderate to moderately high floral species diversity with a well-developed forb and herb layer. In turn this unit provided the most variable and valuable grassland habitat for fauna. This unit included wooded bush clumps of variable structure, increasing habitat availability and shelter, particularly for mammals, avifauna and invertebrates. The increased diversity of flora translates to increased opportunities for specialist species as well as for SCC.

Freshwater Habitat: This habitat unit was located within the Scafell and Ilikwa farm portions. This habitat unit consisted of unchanneled valley bottom wetland systems. The vegetation present within the wetlands were indicative of wetland conditions. These habitats are valuable as sources of drinking water for fauna and provide water dependant fauna (mostly invertebrate, amphibian, avian SCC and mammal assemblages) with habitat within the study area. Furthermore, the wetlands provide important ecological functions and movement corridors for faunal species within the area.

For a more detailed description and discussion of these habitat units please refer to the Part B: Floral Report.

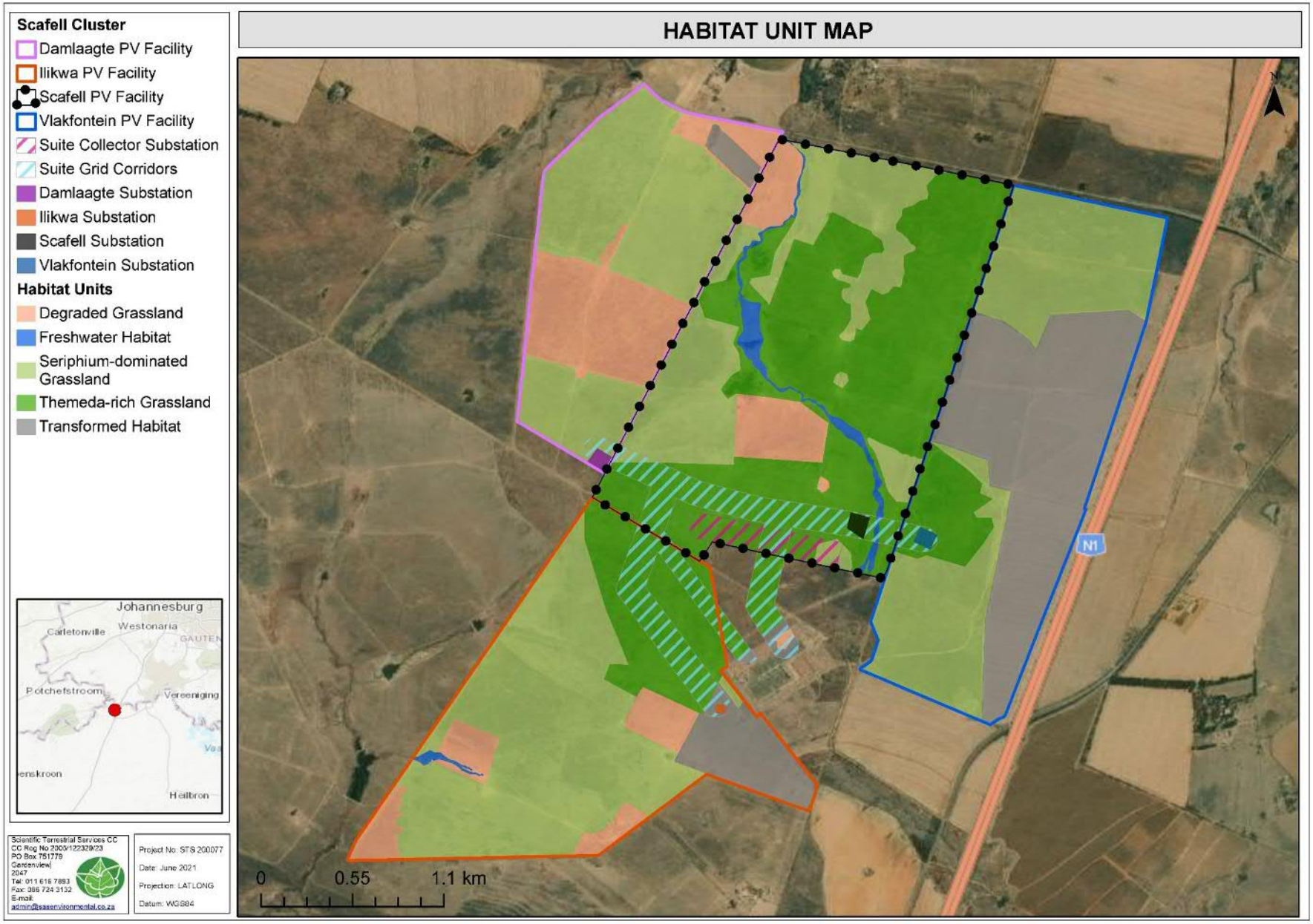
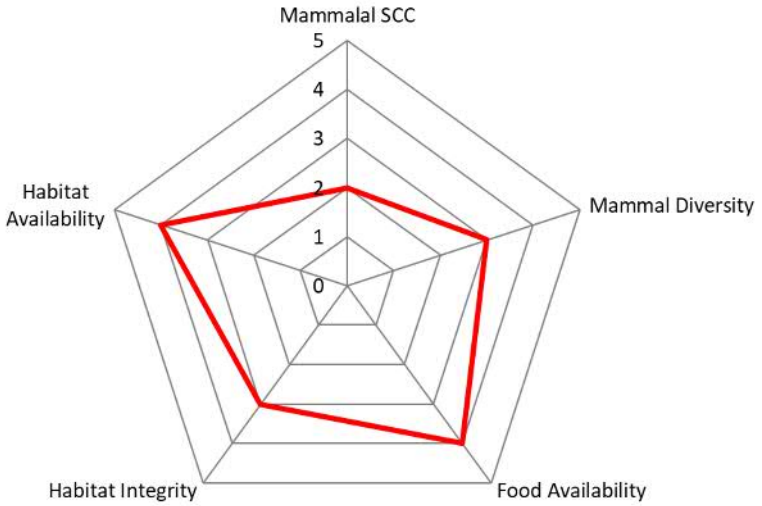


Figure 3: Habitat units associated with the study area as identified during the 2021 assessment.

3.2 Mammals

Table 1: Field assessment results pertaining to mammal species within the study area.

Mammal Habitat Sensitivity	Intermediate	Photographs:
Photograph Notes: **Top:** Left – Spoor of a Black-backed Jackal (*Canis mesomelas*). Right – A Porcupine (*Hystrix africaeaustralis*) quill. **Bottom:** Left – Evidence of Aardvark (*Orycteropus afer*) burrowing activity. Right – Spoor of Warthog (*Phacochoerus africanus*) observed on several occasions on farm roads throughout the study area. **Mammal Sensitivity Graph:**  		
Mammal SCC	During the field assessment signs of Aardvark (*Orycteropus afer, P*) were noted on the Scafell, Ilikwa and Damlaagte portions of the study area. No other SCC were observed nor are any anticipated to occur within the area. The current utilization of the study area for grazing, the constant human presence, homogenous nature of the landscape and limited cover provided within the study area reduce the suitability of the study area for most mammal SCC.	

Mammal Discussion	Although most of the study area is not currently being cultivated, large portions were historically cultivated which has notably altered the floral composition and thus forage and opportunity for primary consumer mammals. These areas, although of reduced diversity, have re-established with native floral species to varying degrees and provide sufficient forage for the reduced mammal assemblage noted. Most of the study area (Damlaagte, Scafell and Ilikwa) it is now utilized for the grazing of domestic animals (cattle and in some portions goats), increasing competition for resources. It is anticipated that no large carnivores will forage within the area as persecution of these species will be high due to the potential of stock predation. Other larger species, e.g., Kudu (*Tragelaphus strepsiceros*) where not observed yet their spoor was noted within the study area. This species is expected to occur throughout at low densities. Long term utilisation for grazing and the accompanying human presence has led to a notable decrease in mammal species diversity and abundance. Larger native mammals are almost completely absent while an intermediate diversity of smaller mammals can be expected. As the study area provides habitat for several, mostly common species and a SCC, it is important that corridors for movement between the more intact and important habitats as well as the surrounding grasslands are maintained within the landscape to preserve ecoservices and maintain ecological functions. Mostly common mammal species adept at surviving in landscapes that have historically been modified with a moderate degree of human presence were observed, species such as *Lepus saxatilis* (Scrub Hare), *Xerus inauris* (Ground Squirrel) and *Canis mesomelas* (Black-backed Jackal). Given the large area over which the various infrastructure developments are proposed, the surrounding agricultural , existing grazing and the proximity of the area to the N1 highway, it is unlikely that in the long term these areas will serve as suitable habitats or areas of refuge or importance for mammal species.
Business Case and Conclusion	The overall mammal species diversity for the proposed development sites is considered intermediate. The proposed project will lead to a large reduction in habitat and forage for mammals species resulting in the loss of species abundance and diversity throughout much of the area. Although the assemblage is not considered sensitive, the remaining species do promote important landscape processes and service (even if to a much-lowered degree), and their movement between sites should, as far as possible, not be completely restricted. Sensitive habitat within the Freshwater and *Themeda* rich grassland should retain corridors for the movement of mammals.

3.3 Avifauna

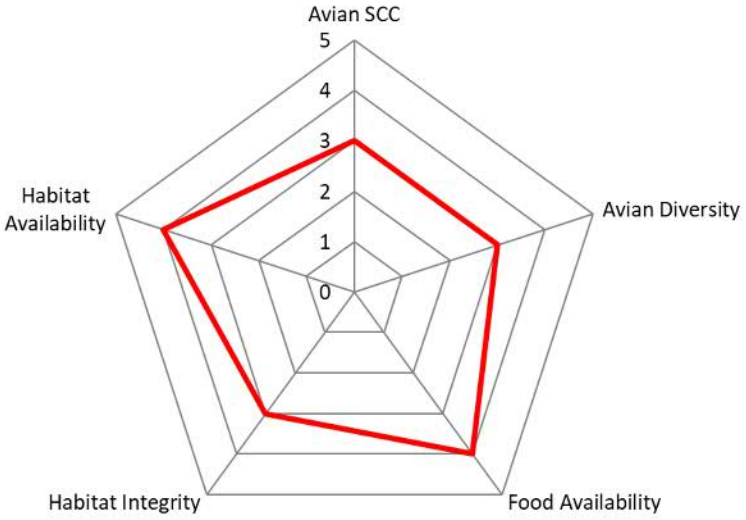
Table 2: Field assessment results pertaining to avifaunal species within the study area.

Avifaunal Habitat Sensitivity	Intermediate

Photograph Notes:

Images Top: Left – Spur-winged Geese noted within an artificial impoundment on the Scafell PV Area. Right – Black-chested Snake Eagle with a snake seen flying over the proposed Scafell PV area. **Bottom:** Right - Owl pellets seen on the Ilikwa farm portion of the study area. Left – An abandoned nest within the artificial impoundment located on Scafell (likely a Red-knobbed Coot (*Fulica cristata*)).

Avifaunal Sensitivity Graph:



Photographs:

Avifaunal SCC	During the field assessment no avifaunal SCC were encountered. African Marsh Harrier (*Circus ranivorus,* EN), Lanner Falcon (*Falco biarmicus*, VU), African Grass Owl (*Tyto capensis,* VU), Secretarybird (*Sigattarius serpentarius,* VU) and Black-winged Pratincole (*Glareola nordmanni*, VU) do have suitable foraging habitat within the study area. Only the African Marsh Harrier (*Circus ranivorus,* EN) and African Grass Owl (*Tyto capensis,* VU) have marginal breeding habitat within the Freshwater Habitat as this habitat is not so extensive and several more permanent and larger wetlands which will be more favourable occur to the south, east and west of the study area. As limited breeding habitat is expected within the study area it reduces the Avian SCC sensitivity score.
Avifaunal Discussion	For avifauna, vegetation structure as opposed to actual floral species composition is considered a primary determinant of bird assemblages. As the study area comprises largely of "Grassland" with few alternative broad habitats, the composition of birds is expected to be relatively narrow. Avian diversity within the grassland is considered intermediate, largely restricted to small common granivorous and insectivorous species, with a notable absence of frugivores. Few larger raptors were observed (Black-chested Snake-eagle and a Harrier/Honey-buzzard) during the field investigation. A wetland traversing the Scafell farm portion provides valuable habitat to several SCC,

	although few are expected to occur permanently within the area, it is anticipated that valuable foraging habitat for these species occurs here. As the wetland is an unchanneled valley bottom system with limited impounded water opportunities, wading bird presence was limited. Due to the homogenous nature of the grassland and limited woody structure, limited areas of refuge and roosting are available for avifaunal species.
Business Case and Conclusion	The overall avifaunal species diversity for the proposed infrastructure development sites is deemed to be intermediate. Historic habitat transformation alongside landscapes which have been modified to agricultural areas and locations which have been utilized for grazing has impacted upon avifaunal species abundance and diversity within the proposed development areas. The proposed infrastructure developments are likely to contribute to reductions in avifaunal species diversity and abundance due to the large areas which are proposed to be developed. Provided the infrastructure be excluded from the most sensitive areas (Freshwater habitat) and maintain corridors with the Themeda rich grassland it is anticipated that degradation to habitat for SCC will be reduced as most of the SCC anticipated to occur within the study area favour this unit. The development will not impact upon important migration routes and important breeding or roosting sites.

3.4 Herpetofauna

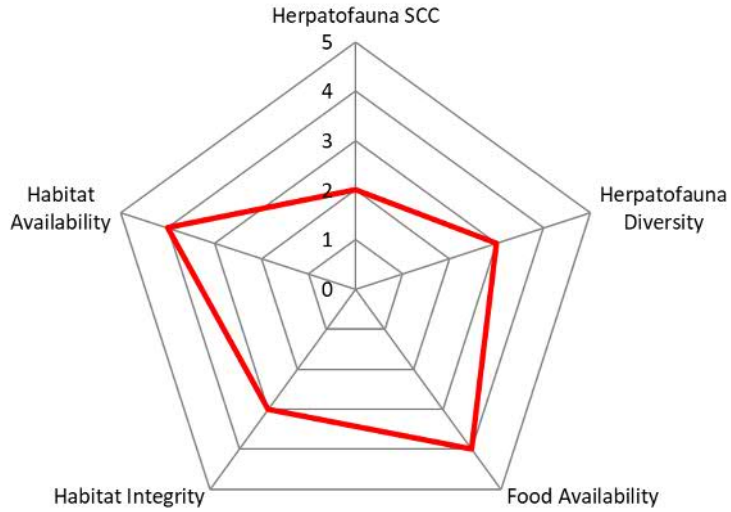
Table 3: Field assessment results pertaining to reptile and amphibian species within the study area.

Herpetofauna Habitat Sensitivity	Intermediate

Photograph Notes:

Image: A recently metamorphosised juvenile African Bullfrog (*Pyxicephalus adspersus*, P) which was observed within the artificial dam in the image on the right. **Bottom:** Left – A juvenile Marsh Terrapin (*Pelomedusa subrufa*) noted within the Freshwater Habitat on Scafell. Right – A Bubbling Kassina (*Kassina senegalensis*) observed within the Themeda rich grassland.

Herpetofauna Sensitivity Graph:



Photographs:

Herpetofauna SCC	During the field assessment several juvenile African Bullfrog (*Pyxicephalus adspersus*, P) were seen within a small artificial impoundment in the south western area of the Ilikwa portion of the study area. No other amphibian SCC were observed during the assessment. The only reptile SCC which may inhabit the study area is *Cordylus vittifer* (Common Girdled Lizard, P), however, it is considered that habitat characteristics do not provide enough rocky habitat / structure for the species persistence. No other reptile SCC are anticipated to occur within the study area.
Herpetofauna Discussion	Herpetofauna diversity and abundances appeared moderately low during the field assessment which is mostly due to the fact that reptile and amphibian species are notoriously hard to detect, owing to their secretive nature. The Freshwater Habitats did appear to be favoured by both Reptiles and Amphibians and was the only habitat in which these

	classes were observed. Only a single snake was noted within the clutches of a Black-chested Snake-eagle, this raptors presence within the study area indicates that reptile, specifically snake, abundances must be suitably high enough in order to support this avian species. Few amphibians are expected to occur permanently within the grassland habitats, owing to the lack of surface water or areas of increased soil moisture needed to maintain amphibian respiration, but these locations will be important foraging habitat. Food abundances are anticipated to be moderately high for insectivorous reptiles and amphibians. Though this will go through temporal variations the change is not expected to be significant enough to lead to notable increases in reptilian or amphibian diversity and abundances during the summer periods. Prey abundances for larger snakes preferring small mammals is considered to be intermediate owing to the low abundances of rodents. Smaller reptile species may permanently inhabit the proposed sites, however larger predatory snakes and species that require more niche habitat (rocky outcrops, contiguous wetlands – besides Scafell etc) are unlikely to permanently reside herein. If they are observed, it will likely be as they are passing through to other more suitable areas of habitat or whilst foraging.
Business Case and Conclusion	Overall, the herpetofauna sensitivity is considered intermediate, owing to the historic disturbances and the large degree of habitat transformation in the general area in which the proposed infrastructure is situated. An Amphibian SCC (African Bullfrog (*Pyxicephalus adspersus*, P)) does occur within the Freshwater Habitat and thus these habitats should be avoided for development. The African Bullfrog is known to forage up to 8km away from a freshwater resource and thus sufficient corridors for movement and suitable foraging areas adjacent freshwater habitat should be considered. No other amphibian SCC are expected to utilise the study area. Only common and widely occurring reptiles will likely utilise the habitats. The proposed infrastructure developments will contribute to the reduction of reptiles and amphibians preferring Grassland Habitat should extensive areas be developed without providing corridors for habitation and movement. Species favouring the Freshwater Habitat within the study area should face limited disturbances provided this habitat is left untransformed as it plays an important role in the channelling and filtering of water but is an important and sensitive corridor for the movement of all faunal classes.

3.5 Invertebrates

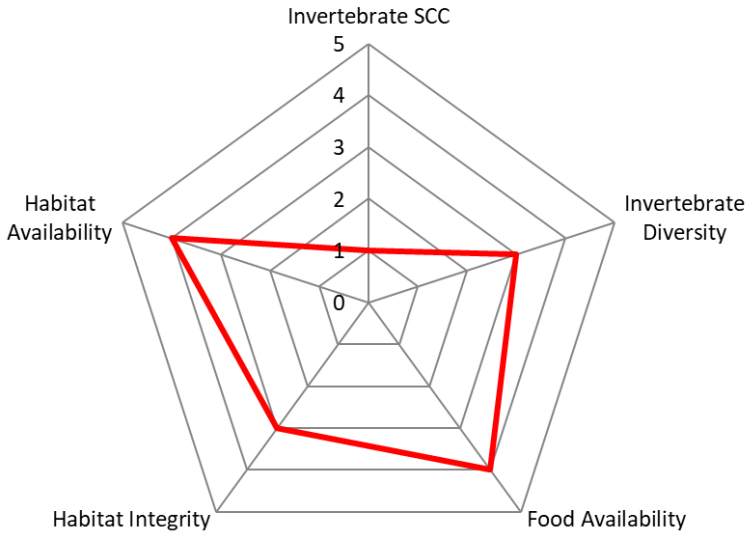
Table 4: Field assessment results pertaining to invertebrate species within the study area.

Invertebrate Habitat Sensitivity	Moderately Low

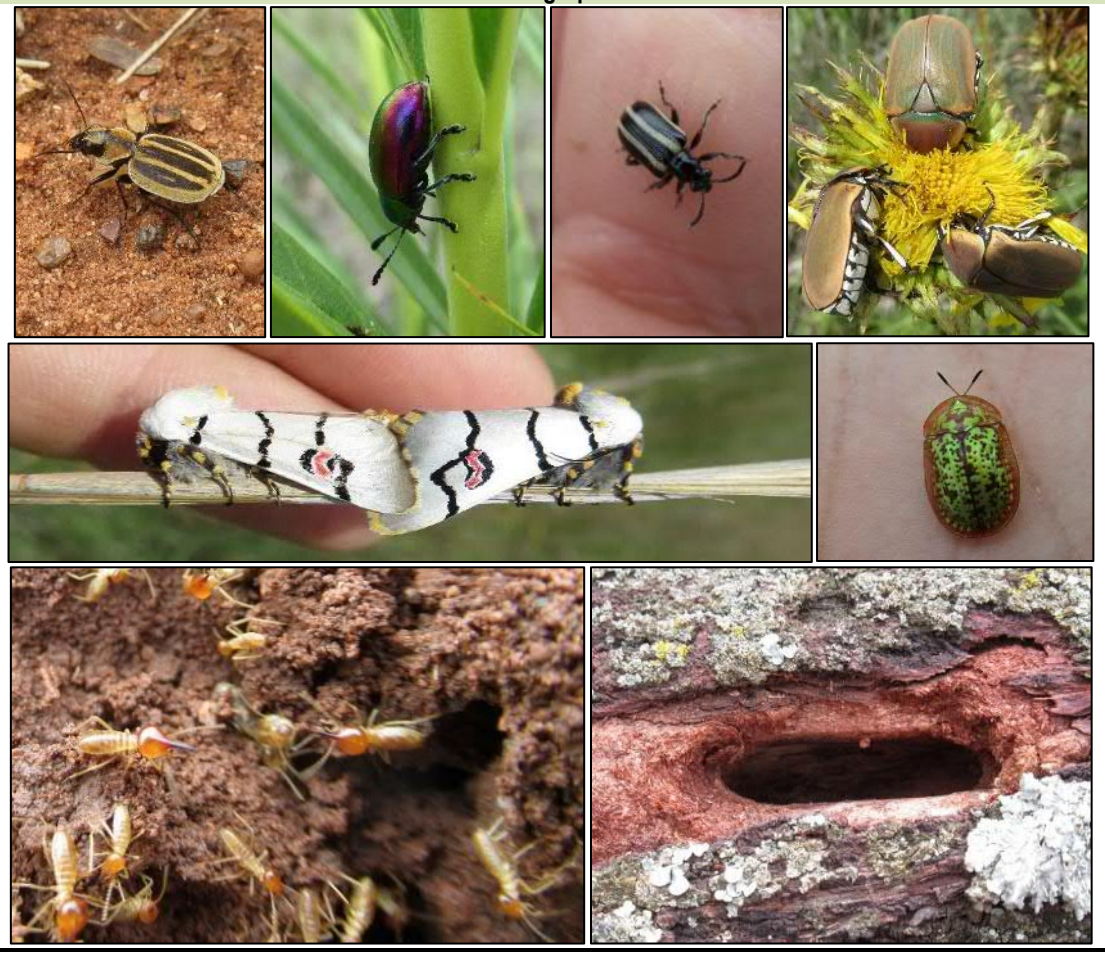
Photograph Notes:

Image: Left to Right – *Graphipterus Isp trilineatus* (Three-lined Velvet Ground Beetle), *Platycorynus dejeani* (Milkweed Leaf Beetle), *Lema bilineata* (Tabacco Slug Beetle) and *Dischista rufa* (Savanna Fruit Chafer). **Middle:** Left - Diaphone eumela (Cherry Spot Moth) noted within the *Seriphium* dominated. Right – *Conchyloctenia hybrida* (Tortoise Beetle). **Bottom:** Left – *Trinervitermes* sp. (Snouted harvester termites) were common throughout the study area. **Bottom Right** – A scorpion burrow within a tree (likely belonging to a scorpion within the genus *Uroplectes*).

Insect Sensitivity Graph:



Photographs:



Invertebrate SCC	During the field assessment no invertebrate SCC were observed within the study area. Only *Harpactira hamiltoni* (Golden Starburst Baboon Spider, P), a common and widely distributed Baboon Spider is anticipated to occur within the study area. It must be noted that the Free State Nature Conservation Ordinance (1969) makes no provision for invertebrate species within its protected species lists thus the Threatened Or Protected Species Regulations (2007) was utilized. The National Screening tool lists *Lepidochrysops procera* (Potchefstroom Giant Cupid). As the species is threatened by overgrazing it is anticipated that the species will not occur within the study area due to the high density grazing which is and has historically occurred within this area.

Invertebrate Discussion	Invertebrate diversity and abundance across the various project development areas was considered intermediate. Some portions, particularly the Freshwater habitat and the *Themeda* rich grassland habitat did appear to be richer in species, however, this is anticipated as different niche habitats with greater floral species richness occur within these areas. The small size of invertebrates allows them to inhabit a small area and thus niche habitat is described at a different scale. Most of the insects observed during the field investigation were common species with broad habitat requirements. Insects belonging to the orders Coleoptera, Hemiptera and Orthoptera were the most commonly observed. Habitat transformation and grazing are considered to be the major factors contributing to the lowered diversity through habitat transformation, degradation and direct competition for resources. A reduced floral diversity and high density or moribund material reduces the possible opportunities and niche habitat for invertebrate species (notably insects), while, the reduced availability of rocky habitats limited the often preferred habitat for scorpions. Spiders were also noted in lower diversities and abundances, and in part suggest that their prey abundances were correspondingly low. The adjacent highway is another major factor impacting on invertebrates within the broader area through direct collisions and constant disturbance.
Business Case and Conclusion	Overall, the invertebrate sensitivity is considered intermediate. The degraded habitats and the lowered floral diversity compounded by competition for resources from domestic animals combined with reduced niche habitat within the study area and the adjacent National Highway are not conducive to supporting an increased diversity of invertebrate species. Given the low degree of alternative habitats with limited niche habitat the corresponding invertebrate assemblage is anticipated to be intermediate. Should the proposed infrastructure developments lead to a loss of habitat connectivity between Freshwater niche areas and of large areas of Themeda rich grassland impacts to the invertebrate assemblage in terms of abundance and diversity will occur.

3.6 Faunal Species of Conservational Concern Assessment

During field assessments, it is not always feasible to identify or observe all species within an area, largely due to the secretive nature of many faunal species, possible low population numbers or varying habits of species. As such, and to specifically assess an area for faunal SCC, a Probability of Occurrence (POC) estimation is used, considering several factors to determine the probability of faunal SCC occurrence within the study area. Species listed in Appendix B whose known distribution ranges and habitat preferences include the proposed infrastructure development sites were taken into consideration. Those determined to have a High probability of occurrence will be discussed further in the table below.

Several listed SCC, which include, Antbear (*Orycteropus afer, P*), African Marsh Harrier (*Circus ranivorus,* EN), Lanner Falcon (*Falco biarmicus*, VU), African Grass Owl (*Tyto capensis,* VU), Secretarybird (*Sigattarius serpentarius,* VU) and Black-winged Pratincole (*Glareola nordmanni*, VU) do have suitable foraging habitat within the study area. Only the African Marsh Harrier (*Circus ranivorus,* EN), African Grass Owl (*Tyto capensis,* VU), African Bullfrog (*Pyxicephalus adspersus*, P) and *Harpactira hamiltoni* (Golden Starburst Baboon Spider, P) are likely to breed within the study area. Of these species, Antbear (*Orycteropus afer, P*) and African Bullfrog (*Pyxicephalus adspersus*, P) were confirmed on site. Should and Aardvark (*Orycteropus afer, P*) be encountered work should be halted until the individual or individuals move off. Should an Aardvark burrow be encountered within the future development areas a specialist should be consulted and permits for the animals removal will need to be attained prior to the animals removal. This step could be undertaken prior to the development during a walk down of the development areas, but as this species is not sessile it may re-inhabit old burrows following any walkthroughs. Should an African Bullfrog (*Pyxicephalus adspersus*, P) be encountered within the future proposed expansion areas it should be relocated into the nearest freshwater habitat and released.

Due to the habitat units associated with the study area the likelihood for faunal SCCs occurring within the study area is deemed to be high. Should any faunal SCC as listed above and in Appendix C of this report, be encountered during the course of the proposed development activities, all operations must be stopped immediately, and a biodiversity specialist must be consulted, in order to advise on the best way forward.

Table 5: Faunal SCC that may occur within the subject property due to suitable habitat..

Scientific and Common Name	Habitat Description	Red List (Global) Status	Regional Status	POC
MAMMALS				
Orycteropus afer (Aardvark)	**Range**: Sub-Saharan Africa (including areas of the Sahel)	LC	P	**H**
	Major habitats: Forest, Savanna, Shrubland and Grassland.			
	Description: Occurs in a wide variety of habitats where they feed almost exclusively on termites and ants. Only absent from hyper arid, marshy and very rocky habitats.			
	Food: Ants and termites			
	Available habitat with the Subject Property: *Themeda* rich and *Seriphium* dominated, avoiding the Freshwater Areas			
AVIFAUNA				
African Marsh Harrier (Circus ranivorus, EN)	**Range**: Near endemic to the regions occurring in the more arid regions of South Africa, Namibia and the Southern edge of Angola.	LC	EN	**H**
	Major habitats: Wetlands and adjacent habitat.			
	Description: Inhabits inland and coastal wetlands, and adjacent grassland habitat.			
	Food: Rodents, birds, frogs and fish.			
	Available habitat with the Subject Property: Freshwater Habitats and adjacent grassland units.			
African Grass Owl (Tyto capensis, VU))	**Range**: Fragmented range within central and southern Africa. Within the region it predominantly occurs within high rainfall areas in the eastern half of the country.	LC	VU	**H**
	Major habitats: Wetlands, grassland and arable lands.			
	Description: The species breeds in wetlands and forages over reeds and adjacent tall grassland.			
	Food: Rodents (predominantly large Vlei rats), birds and insects.			
	Available habitat with the Subject Property: Freshwater Habitat and adjacent habitats.			
Black-winged Pratincole (Glareola nordmanni, VU	**Range**: Breeding primarily occurs within Russia, Ukraine and Kazakhstan after which most migrate to southern Africa (Botswana, Zimbabwe, Namibia and South Africa.	NT	NT	**M**
	Major habitats: Wetlands, grassland and arable lands.			
	Description: The species is gregarious and commonly occurs in flocks of 100 or more. The species responds quickly to insect outbreaks feeding in the early morning and in the evening. Can be attracted to agricultural activities which disturb insects.			
	Food: Wide variety of flying and epigeic insects.			
	Available habitat with the Subject Property: The species may utilize the entire study area, avoiding the Freshwater habitat.			
Falco biarmicus (Lanner Falcon)	**Range**: Southern Europe and the Arabian Peninsula with most of its range within Africa. **Major habitats**: Forest, Savanna, shrubland, Grassland, Rocky areas (inland cliffs and mountains) and desert. Favours open grassland, agricultural areas or cleared woodland near cliffs. **Description**: Inhabits a wide variety of habitats and may illustrate crepuscular behaviour. Mostly residents, with some birds migrating to west Africa. **Food:** Birds, small mammals, insects and reptiles. **Available habitat with the study area:** Entire Study Area.	LC	VU	**H**
Sagittarius serpentarius (Secretarybird)	**Range**: Widespread throughout Sub-Saharan Africa and this highly mobile species is broadly distributed throughout much of South Africa. **Major habitats**: Grassland, shrubland and Savanna. May utilise agricultural fields. **Description**: Prefers open grassland and scrub shorter than 50 cm with scattered trees available in which it can nest. **Food:** Feeds on insects, reptiles, birds and their eggs and small mammals. **Available habitat with the study area:** Entire study area	EN	VU	**M**
INVERTEBRATES				
Pyxicephalus adspersus (Giant Bullfrog)	**Range**: Occurs from eastern Africa (Kenya) through Zambia to southern Angola to the Southern African interior.	LC	P	**H**

Scientific and Common Name	Habitat Description	Red List (Global) Status	Regional Status	POC
	Major habitats: Savanna, Shrubland and most forms of inland impoundments or wetlands. **Description**: Generally only active after the rains in drier savanna's. Remains buried for most of the year only emerging to breed in pools, pans and ditches. **Food:** Mostly invertebrates but will consume anything it can swallow. **Available habitat with the study area:** Freshwater Habitat and adjacent habitat. Several juvenile Bullfrogs were observed in the Freshwater Habitat of the Ilikwa farm portion.			
INVERTEBRATES				
Harpactira hamiltoni (Golden Stardust Baboon Spider)	**Range**: Wide range within South Africa. **Major habitats**: Predominantly found on the Highveld. **Description**: Fossorial species living in deep burrows modified from a crevice between rocks or at the base of a tree stump. **Food:** Invertebrates. **Available habitat with the study area:** *Themeda* rich and *Seriphium* Dominated Grassland.	N/A	P	**H**

4. SENSITIVITY MAPPING

Figure 3 below illustrates the faunal ecological sensitivity for the various areas. The areas are depicted according to their sensitivity in terms of the presence or potential for faunal SCC, habitat integrity, levels of disturbance and overall levels of diversity. Table 6 below presents the sensitivity of each habitat along with an associated conservation objective and implications for the proposed activities.

Table 6: A summary of the sensitivity of each habitat unit and implications for the proposed activities.

Habitat Sensitivity	Habitat Unit / Floral Communities	Development Implications
Moderately High Sensitivity Conservation Objective: Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance	Freshwater Habitat	These areas are of moderately high sensitivity from a faunal perspective. The sensitivity generally reflects the absence of any large-scale human disturbances ensuring that these systems have moderately high integrity where ecosystem functions and services have been maintained. These habitats offer enough forage and breeding locations for their respective faunal communities and only show minor disturbances by alien species invasion. Several SCC, particularly avifauna and amphibians, will utilise this unit. The current ecological state should be maintained, and AIP and degraded areas should be actively managed and rehabilitated. Development in these areas is not recommended and should be avoided as far as possible. This unit provides valuable shelter for most fauna and remains a suitable corridor for movement within the landscape. All relevant zones of regulation around the rivers as defined by the National Water Act, 1998 (Act No. 36 of 1998) must also be considered.
Intermediate Sensitivity Conservation Objective: Preserve and enhance the biodiversity of the habitat unit and the surrounds while optimising development potential	*Seriphium*-dominated Grassland and *Themeda*-rich Grassland	Areas of intermediate sensitivity include such areas that have been affected by historic agriculture or high intensity grazing and are in various stages or recovery. Poor management, AIP proliferation and anthropogenic disturbances have degraded the units to a small degree and encouraged the establishment of AIP/problem plant species in the unit which have the potential to outcompete the natural herbaceous species that currently offer better quality forage. From a faunal perspective it is likely that SCC, especially large wide-ranging species, will utilize this habitat, yet mostly common species who have broad habitat requirements are likely to utilize these habitats on a more permanent basis and for breeding. Most fauna within the vicinity will forage here and these units will be favoured by the intermediate invertebrate assemblage. The relatively homogenous structure and composition of the vegetation reduces its appeal to SCC who will readily favour large areas of intact habitats that have greater forage breadth and have been exposed to less disturbance. Unique habitats and sensitive niche habitats do occur here however they are not considered abundant and the ecological importance and sensitivity of these are therefore considered of an intermediate level. To maintain ecological functions and processes corridors for the movement of fauna should be maintained within this unit. Future development within these areas is less likely to have significant impacts on faunal communities in it its current state. However, should large tracts of the *Themeda*-rich Grassland be developed, especially in areas adjacent to the wetlands or in areas used as movement corridors (northern portion of Ilikwa and southern portion of Scafell), high impacts are likely to result. Regional/ provincial conservation targets, i.e. CBAs need to be considered during future development/ expansion planning.
Moderately Low Sensitivity Conservation Objective: Optimise the development potential while improving the biodiversity integrity of the surrounding natural habitat and managing edge effects	Degraded Grassland	This habitat unit has been subjected to agricultural activities in the recent past and is considered to be of moderately low ecological importance and sensitivity. No unique habitat is located in this unit. Portions of good grazing exist which will supplement the more sensitive habitat units improving the carrying capacity of the area. The landscape is open with limited shelter or roosting locations creating large homogenous portions with limited structural variability, reducing the faunal diversity and abundance and thus the sensitivity. Decreased habitat integrity and the presence of AIPs have further decreased its potential to host SCC yet they will likely forage here. This habitat unit poses far fewer developmental constraints from a faunal perspective (when considering all faunal classes collectively) than the abovementioned habitat units.

Habitat Sensitivity	Habitat Unit / Floral Communities	Development Implications
Low Sensitivity Conservation Objective: Optimise the development potential	Transformed Habitat	This unit includes areas where agricultural production is currently occurring. These locations which are either invaded by AIPs or comprise of homogenous stands of vegetation that offer minimal habitat for fauna and are not suitable for habitation by most fauna. SCC which favour disturbed habitat like the Lanner Falcon will utilize the agricultural fields for foraging, however, the majority of SCC are unlikely to inhabit these areas. Even for more commonly occurring species this unit has limited potential habitat giving it a low ecological sensitivity in terms of fauna. Ecological functioning and habitat integrity are significantly compromised, and these areas should be optimized for development.

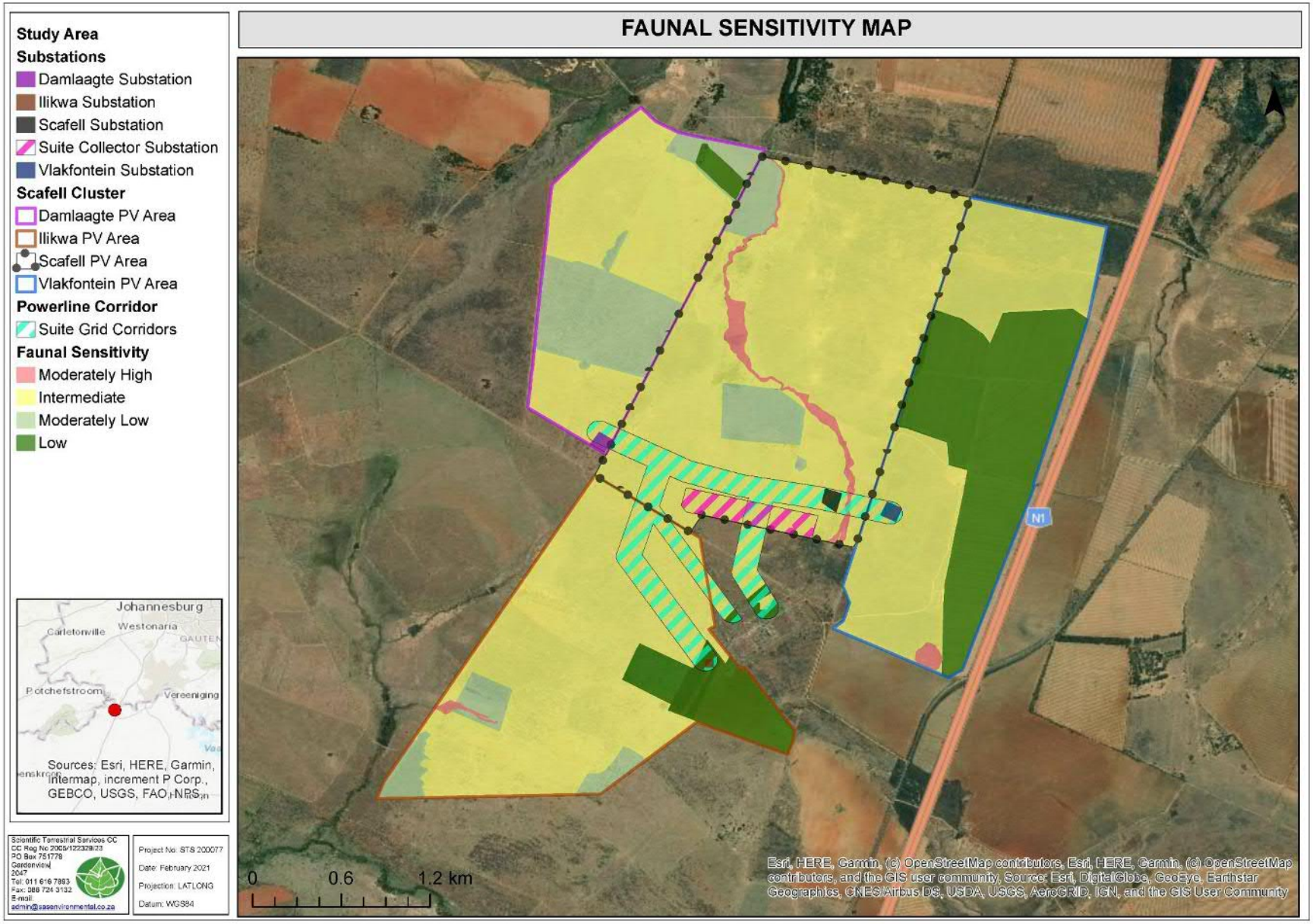


Figure 4: Habitat sensitivity map for the study area.

5. IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts arising from the proposed PV facility and grid connection infrastructure development for the study area. It should be noted that at the time of this assessment exact layouts of the PV infrastructure was not provided and thus they are based on the layout provided in Figure 2. Please refer to Section 5.2 below for a discussion on the project specific aspects considered.

An impact discussion and assessment of all potential pre-construction and planning, construction and operational and maintenance phase impacts are provided in Section 5.2 and 5.3. All mitigatory measures required to minimise the perceived impacts are presented in Section 5.4.

Proposed Activity Description**:**

The proposed infrastructure development will entail the development of the following concept layout (Figure 5):

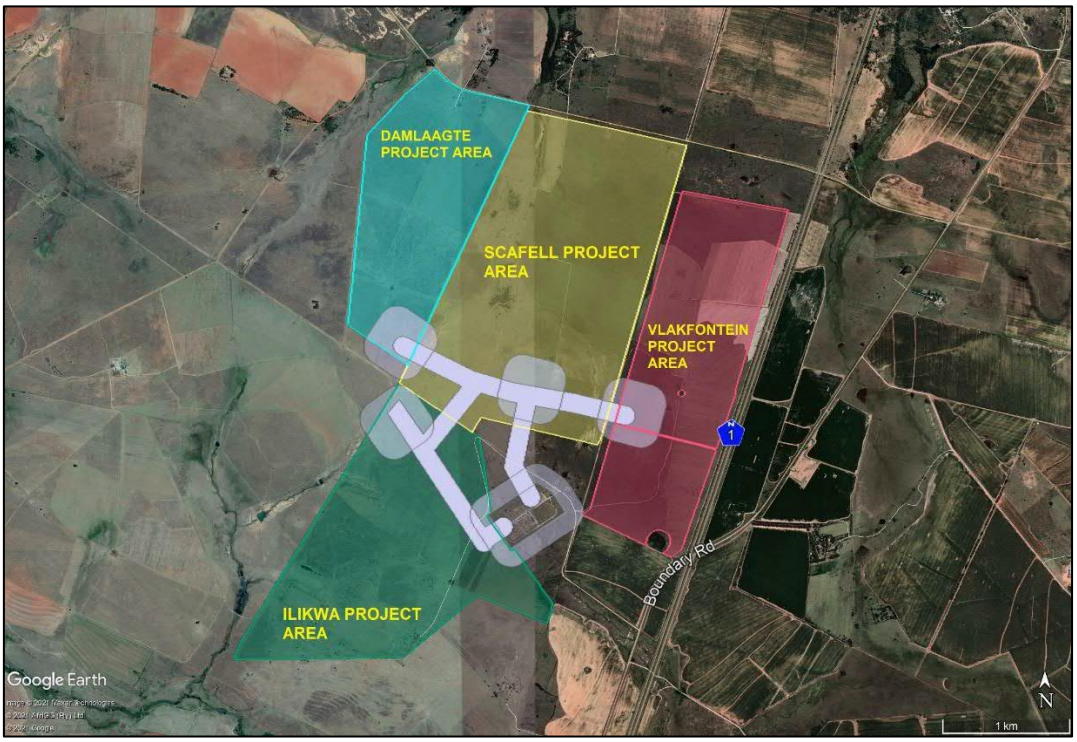


Figure 5: Updated development layout map for the study area on which the impact assessment is based.

5.1 Activities and Aspect Register

The table below indicates the perceived risks to faunal species associated with the activities pertaining to the proposed infrastructure developments listed in section 1.2.

Table 7. Aspects and activities register considering faunal resources during the pre-construction and planning phases.

ACTIVITIES AND ASPECTS REGISTER
Planning Phase
- Inconsiderate planning of infrastructure placement and design, leading to the loss of potential sensitive floral and faunal species and/or habitat for such species, as well as unnecessary edge effect impacts on areas outside of the proposed development footprint. - **Impact:** Degradation and modification of the receiving environment, loss of faunal and floral habitat.
- Potential failure to implement the required mitigation measures before and at the commencement of construction activities: • Potential failure to obtain the necessary permits for the removal of protected faunal species should they be needed resulting in delays to the construction activities. - **Impact**: Long-term or permanent degradation and modification of the receiving environment and displacement or loss of faunal SCC.
- Potential failure to design and implement an Alien and Invasive Plant (AIP) Management/Control plan before the commencement of construction activities, resulting in the spread of AIPs from the development footprint to surrounding natural habitat. - **Impact:** Spreads of AIPs, leading to potential loss of floral species diversity from surrounding natural habitat.
- Potential inadequate design of lighting within the PV facility leading to invertebrates being attracted to lights and the resulting attracting of insect predators, increasing the potential for fauna, particularly bats, to be collide with, be electrocuted by or start fires. - **Impact:** Long-term collision and electrocution risks or destruction of habitat could lead leading to a reduction in diversity.
- Potential inadequate design of PV infrastructure, electricity pylons and powerlines increasing the possibility of birds being electrocuted or colliding with infrastructure. - **Impact:** Long-term collision and electrocution risks to SCC species leading to a reduction in SCC diversity.
- Potential inadequate fencing utilization reducing the potential for smaller fauna to move through the study area leading to a reduction in faunal species movement. - **Impact:** Degradation of the existing faunal assemblage within the proposed project area.
Construction Phase
- Inadequate layout optimisation, resulting in extensive site clearing and the removal of indigenous vegetation. - **Impact:** Loss of important faunal habitat and the potential loss of faunal SCC.
- Site clearing and the removal of vegetation. - **Impact:** Loss of faunal and floral habitat, diversity, and the possible loss of floral SCC.
- Uncontrolled and unplanned site clearing and the removal of vegetation and destruction of faunal habitat and forage. - **Impact:** Loss of sensitive faunal habitat and faunal species reliant on this specific habitat for survival.
- Proliferation of AIP species that colonise areas of increased disturbances and may outcompete indigenous plant species, including further transformation of adjacent, undeveloped habitat. - **Impact:** Degradation of favourable faunal habitat outside of the direct construction footprint, leading to a decrease in faunal diversity at a local scale and loss of land to meet biodiversity targets.
- Potential dumping of excavated and construction material outside of designated areas, promoting the establishment of AIPs. - **Impact:** Loss of faunal habitat, diversity and SCC.
- Potential failure to implement a rehabilitation and an alien floral control plan after the construction phase. - **Impact:** Potentially leading to permanent transformation of faunal habitat and long-term degradation of important faunal habitat within the region.
- Increased risk of faunal collisions with construction vehicles. - **Impact:** Local loss of faunal SCC abundance and diversity.

ACTIVITIES AND ASPECTS REGISTER
- Additional pressure on faunal habitat as a result of an increased human presence associated with the proposed development, contributing to: • Potential hunting/trapping/removal/collection of faunal species or potential SCC; and • Increased human activity will lead to the displacement and/or loss of potential faunal SCC. - **Impact:** Loss of sensitive faunal habitat and the potential loss of faunal SCC.
- Excavation and compaction of soils leading to increased runoff and sedimentation of downslope habitat during times of high rainfall. - **Impact:** Loss of favourable faunal habitat and decline in faunal species diversity due to sedimentation and potential pollution of the watercourses.
- Potential failure to implement a rehabilitation and an alien floral control plan after the construction phase. - **Impact:** Potentially leading to permanent transformation of faunal habitat and long-term degradation of important faunal habitat within the region, i.e. faunal SCC associated with Eastern Highveld Grassland and Wetland Habitat.
- Impaired water quality and altered flow of water within watercourses due to the proposed activities. - **Impact:** Loss of ecologically important faunal habitat and consequently a further loss of diversity and species reliant on the Wetland habitat Habitats. Potential loss of the habitat for faunal SCC such as *Pyxicephalus adspersus (Giant Bullfrog)* and *Metisella meninx (Marsh Sylph)*. Desiccation and/or pollution of the freshwater habitat will have a detrimental impact to the faunal assemblages utilising this habitat.
- Potential failure to concurrently rehabilitate bare or disturbed sites as soon as the construction activities have occurred will potentially result in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs. - **Impact:** Long-term loss of favourable habitat for historically recorded faunal species. Loss of faunal diversity and potential SCC which will disperse into the surrounding area in search of favourable habitat.
- Additional pressure on faunal habitat as a result of an increased human presence associated with the proposed development, contributing to: - Potential hunting/trapping/removal/collection of faunal species or potential SCC. - Increased human activity will lead to the displacement and/or loss of potential faunal SCC. - **Impact:** Loss of sensitive faunal habitat and the potential loss of faunal SCC.
Operational and Maintenance Phase
- Ineffective rehabilitation of exposed and impacted areas potentially leading to vegetation succession and a possible reduction of faunal diversity and occurrence of potential faunal SCC over the long-term. - **Impact:** Permanent loss of faunal habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural faunal habitat of increased sensitivity. Further reduction of available habitat in the long-term, compounding the limiting factors to faunal assemblages.
- Potential poor management and failure to monitor rehabilitation efforts, leading to: • Landscapes being left fragmented, resulting in reduced migration capabilities of faunal species, isolation of faunal populations and a decrease in faunal diversity; • Compacted soils limiting the re-establishment of natural vegetation; and • Increased risk of erosion in areas left disturbed. - **Impact:** Long-term (or permanent) loss of faunal habitat, diversity and SCC.
- Poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species. - **Impact:** Permanent loss of surrounding faunal niche habitat, diversity and SCC.
- Increased risk of collisions with the project infrastructure and/or electrocution while perching on the pylons or powerlines. - **Impact:** Local loss of avifaunal SCC abundance and diversity.
- Potential overexploitation through the removal and/or collection of important or sensitive faunal SCC on the property. - **Impact:** Local loss of faunal SCC abundance and diversity.
- Potentially poorly managed edge effects. - Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to a continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the faunal habitat. - Potential erosion stemming from soil left bare leading to sedimentation of downslope faunal habitat. - **Impact:** Loss of faunal habitat, diversity and SCC within the direct expansion development footprint of the PV facility. Loss of surrounding faunal diversity and faunal SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas.

5.2 Faunal Impact Assessment Results

The below table indicates the perceived risks to the faunal ecology associated with all phases of the proposed development. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

The impact assessment focusses on the following activities:

- Scafell PV Facility and associated infrastructure; and
- Grid connection infrastructure.

Table 8: Summary of the Impact Assessment of the Planning, Construction, Operational and Maintenance Phases of the proposed project footprint for fauna.

Habitat Unit	UNMANAGED						MANAGED									
	Intensity	Duration	Extent	Consequence	Probability	Significance	Intensity	Duration	Extent	Consequence	Probability	Significance	Degree of confidence	Degree to which impact can be mitigated	Loss of Resource	Reversibility
PRE-CONSTRUCTION PHASE																
Impact of faunal Habitat and Diversity																
PV Facility	Low	Short term	Local	**Very Low**	Definite	**Very Low**	Low	Short term	Local	**Very Low**	Probable	**Very Low**	Medium	Very Low	Low	Partially Reversible
Grid Corridors	Low	Short term	Local	**Very Low**	Definite	**Very Low**	Low	Short term	Local	**Very Low**	Probable	**Very Low**	Medium	Very Low	Low	Partially Reversible
Impact on Faunal SCC																
PV Facility	Low	Short term	Local	**Very Low**	Definite	**Very Low**	Low	Short term	Local	**Very Low**	Probable	**Very Low**	Medium	Very Low	Low	Partially Reversible
Grid Corridors	Low	Short term	Local	**Very Low**	Definite	**Very Low**	Low	Short term	Local	**Very Low**	Probable	**Very Low**	Medium	Very Low	Low	Partially Reversible
CONSTRUCTION PHASE																
Impact of faunal Habitat and Diversity																
PV Facility	High	Long term	Regional	**Very High**	Definite	**Very High**	High	Medium Term	Regional	**High**	Probable	**High**	High	Low	High	Irreversible
Grid Corridors	Medium	Long term	Regional	**High**	Definite	**High**	Medium	Medium Term	Local	**Low**	Probable	**Low**	High	Medium	Medium	Irreversible
Impact on Faunal SCC																
PV Facility	High	Long term	Regional		Definite		High		Regional	**High**	Probable	**High**	High	Low	High	Irreversible

				Very High		**Very High**		Medium Term								
Grid Corridors	Medium	Long term	Regional	**High**	Definite	**High**	Medium	Medium Term	Local	**Low**	Probable	**Low**	High	Medium	Medium	Irreversible
OPERATIONAL AND MAINTENANCE PHASE																
Impact of faunal Habitat and Diversity																
PV Facility	High	Long term	Regional	**Very High**	Definite	**Very High**	Medium	Long term	Regional	**High**	Probable	**High**	High	Low	High	Irreversible
Grid Corridors	Medium	Long term	Regional	**High**	Definite	**High**	Low	Long term	Local	**Low**	Probable	**Low**	High	Medium	Medium	Irreversible
Impact on Faunal SCC																
PV Facility	High	Long term	Regional	**Very High**	Definite	**Very High**	Medium	Long term	Regional	**High**	Probable	**High**	High	Low	High	Irreversible
Grid Corridors	Medium	Long term	Regional	**High**	Definite	**High**	Low	Long term	Local	**Low**	Probable	**Low**	High	Medium	Medium	Irreversible

5.3 Impact Discussion

The perceived impact significance of the proposed infrastructure development (prior to mitigation) on faunal habitat, diversity and SCC ranges from very low to very high due to the largely natural habitat characteristics and the increased likelihood of SCC occupancy. These impact scores were influenced by the varying degrees of impact that possible activities within each stage of development of certain infrastructure would have on the faunal assemblage identified. Should the relevant mitigation proposed within this report be undertaken impacts can be reduced to high and low levels during the more impactful construction and operational and maintenance phases. The development of PV facility will result in the highest impact score as a result of the proposed development within the Freshwater habitat, large portions of *Seriphium*-dominated Grassland and the *Themeda*-rich Grassland.

Large portions of the study area remain in a natural state and although surrounded by agricultural activities which do reduce the faunal suitability, varying habitat is available that provides suitable forage and breeding locations for a modest assemblage of fauna. Furthermore, habitat connectivity is still maintained for the most part, and as such movement corridors for faunal species should be maintained along the Freshwater Habitat and beneath the grid connection infrastructure. As part of the rehabilitation actions, disturbed areas not within the development footprint must be rehabilitated appropriately and AIP establishment controlled within such areas.

5.3.1 Impact on Faunal Habitat and Diversity

The proposed development will result in a loss of faunal habitat from the area which are anticipated to result in very high to very low level impacts should mitigation measures not be implemented. With mitigation impacts can be reduced to high and low levels in most cases for the construction, operational and maintenance phases. Despite portions of degraded *Seriphium*-dominated Grassland and fragmentation through agriculture and road development, the study area still provides habitat for several SCC and for common and widespread faunal species.

Development within the Freshwater and *Themeda*-rich Grassland will lead to a permanent loss of primary grassland and Freshwater habitat which provides valuable niche habitat for a wide variety of fauna. The impacts from the proposed PV facility are anticipated to be very high to high and will lead to a reduction in habitat and species diversity, especially within the sensitive Freshwater and *Themeda*-rich Grassland. These impacts will result in a decrease in

available forage and niche habitat for water dependant fauna. The development of large portions of *Seriphium*-dominated Grassland without consideration for faunal movement will also result in reduced functions and service provision within the landscape.

Mitigation efforts should be aimed at limiting edge effects from construction activities to the surrounding area and implementing an AIP management plan. The implementation of an AIP, in the long run, ensures that the habitat potential of the remaining portions of the study area increases and AIP proliferation does not spread into the adjacent landscape, marginally compensating for the loss of Freshwater and *Themeda*-rich Grassland and large portions of *Seriphium*-dominated Grassland Habitat in the larger study area.

5.3.2 Impacts on Faunal SCC

No faunal SCC were observed during the site visit. Habitat for eight SCC was observed within the study area, they include; *Orycteropus afer* (Aardvark), *Circus ranivorus* (African Marsh Harrier), *Tyto capensis* (African Grass Owl), *Glareola nordmanni* (Black-winged Pratincole), *Falco biarmicus* (Lanner Falcon), *Sagittarius serpentarius* (Secretarybird), *Pyxicephalus adspersus* (Giant Bullfrog) and *Harpactira hamiltoni* (Golden Stardust Baboon Spider). These faunal SCC are mostly associated with the extensive and sensitive Freshwater Habitat and *Themeda*-rich Grassland and the large portions of *Seriphium*-dominated Grassland. Some species, such as *Glareola nordmanni* (Black-winged Pratincole), *Falco biarmicus* (Lanner Falcon), *Orycteropus afer* (Aardvark) and the *Sagittarius serpentarius* (Secretarybird) are not heavily reliant on Freshwater Habitats and may find more suitable habitat within the *Themeda*-rich Grassland and *Seriphium*-dominated Grassland. These species are not anticipated to lose important breeding, foraging or roosting locations but foraging habitat will likely be lost. Valuable habitat for breeding, foraging and/or roosting for the remaining species, which include; *Circus ranivorus* (African Marsh-Harrier), *Tyto capensis* (African Grass Owl), *Pyxicephalus adspersus* (Giant Bullfrog) and *Harpactira hamiltoni* (Golden Stardust Baboon Spider) will be lost as a result of the proposed activities, furthermore, the potential for edge effects (water pollution and AIP establishment) is considered high due to the scale of the proposed project.

Very high to high impact significances are expected should mitigatory measures not be implemented. The highest impacts to SCC will result from the construction and permanent alteration of Freshwater and *Themeda*-rich Grassland and large portions of *Seriphium*-dominated Grassland Habitat for the proposed PV facility. It is therefore recommended that good construction and operation practices be employed alongside the recommended mitigation measures in Table 8 to ensure no further habitat degradation occurs.

5.3.3 Probable Residual Impacts

Even with extensive mitigation, residual impacts on the receiving faunal ecological environment are likely. The following points highlight the key residual impacts that have been identified:

- Potential loss of natural habitat adjacent to the proposed sites as a result of edge effects;
- Potential continued loss or altered faunal species diversity and abundance in the local area;
- Potential continued loss or altered faunal species diversity and abundance in the local area;
- Continued loss of faunal habitat through disturbances;
- Potential loss of faunal SCC; and
- Further alien floral invasion.

5.3.4 Cumulative Impacts

The study area, although degraded in portions is considered to be largely natural and has not been subjected to extensive impacts as a result of historic anthropogenic activities, preserving a rich diversity of fauna while maintaining valuable ecological services and functions. Impacts from the proposed developments within lower sensitivity areas (intermediate – low) are not concerning from an ecological perspective as long as corridors for faunal movement are maintained. Activities within moderately high sensitive habitat have a high importance to faunal communities and ecological functions and will accrue damaging impacts to the hydrological system and its functions (Freshwater habitat), habitat availability, potential alteration of important corridors and dispersal areas for fauna and flora. The proposed development will lead to common faunal and SCC species being displaced from the proposed sites into the adjacent habitats increasing competition for space and food resources. As such the development will contribute to habitat loss and available foraging areas for these species.

The loss of the more sensitive Freshwater habitat is more concerning than edge effects and AIP proliferation yet these need to be managed otherwise further loss of habitat and damaging impacts to the environment are likely. The impact on sensitive Freshwater habitat will further threaten faunal SCC populations that, unlike common species, are often more restricted to a particular habitat type. AIP proliferation and insufficient rehabilitation will ultimately lead to loss of viable habitat in the surrounding areas, displacing faunal species further as indigenous floral species (faunal habitat and food resources) are displaced and lost. Moreover, there is likely to be a knock-on dispersal affect, leading to increased resource competition and possible

increased mortality rates, resulting in a decreased species abundance and diversity and SCC habitat.

5.4. Integrated Impact Mitigation

The table below highlights the additional general mitigation measures that are applicable to the project, to suitably manage and mitigate the ecological impacts that are associated with the proposed PV facility infrastructure development.

Table 9. A summary of the mitigatory requirements for faunal resources

Project phase	*Planning Phase*
Impact Summary	*Loss of faunal habitat and species diversity*
Management Measures	***Proposed mitigation and management measures:***
	Faunal Habitat and Diversity - At all times, ensure that sound environmental management is in place during the planning phase; - Minimise loss of indigenous vegetation where possible through refining the final development footprint, optimising the design within habitat of lowered ecological importance and sensitivity; - A suitably qualified biodiversity specialist must review the final layout and provide any additional mitigations (if required); - Design of infrastructure should be environmentally sound and all construction equipment to be utilised must be a good working condition, and all possible precautions taken to prevent potential spills and /or leaks; and - An Alien and Invasive Control Plan must be compiled by a suitably qualified specialist and it must be ensured that sufficient funding is made available for the long term management and monitoring of AIPs.
Project phase	*Construction Phase*
Impact Summary	*Loss of faunal habitat and species diversity*
Management Measures	***Proposed mitigation and management measures:***
	Development footprint - Alien vegetation must be removed and controlled within the study area, in line with the National Environmental Management: Biodiversity Act: 2004 (NEMBA) Alien and Invasive Species Regulations (2020); - The development footprint should be demarcated, and it should be ensured that no development related activities take place outside of the demarcated footprint; - The construction footprint must be kept as small as possible in order to minimise the impact on the surrounding environment; - Any structures (i.e. overhead powerline pylons or internal light poles) which may act as perching sites for birds should be installed with anti-perching spikes; - Should any lights be installed they should face downwards to reduce the abundance of insects attracted to the night lights, this prey source may attract birds to the study area and may increase avian collisions or electrocutions (applicable to powerlines); - Avifaunal monitoring within the proposed PV facilities and along the proposed power line should be undertaken and reported monthly to monitor or record avifauna and collect any birds which have collided with or been electrocuted by the proposed infrastructure, these must be reported by the ECO to the department and further mitigation measures should be investigated in how to minimise the mortalities; - Anti-collision devices should be installed along the entire length of the powerline. These must be Eskom approved anti-collision devices that are durable as the area is prone to strong winds. Anti-collision devices must be installed as soon as the powerline wires are strung. The devices must be installed 5 m apart and alternate between a light and dark colour in order to increase the visibility of the earth wires. - Faunal habitat beyond the demarcated area should not be altered or disturbed; - Construction equipment should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal;

	- No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIP) to be carefully collected and disposed of at a separate waste facility; - Where spills or soil contamination occurs as a result of maintenance activities (specifically associated with maintenance vehicles), the contaminated soil needs to be excavated and removed to an approved waste disposal site. New soil is then to be used to replace the removed soil and the area appropriately revegetated; - No fires are allowed by construction personnel as this will increase the risk of the surrounding veld catching fire and burning down not only the immediate faunal habitat but also that of the larger local areas; - Following heavy rains, access roads and areas adjacent to the development footprints are to be inspected for signs of erosion, which if found must be immediately rectified through appropriate erosion control measures. Erosion can cause alteration to the adjacent habitat which in turn may impact faunal species; - During the site-pegging phase of surface infrastructure, should any faunal SCC (albeit considered unlikely) be observed, all activities should be halted and a suitably qualified specialist is to be contacted to advise on the best way forward; - Should any other faunal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Free State Nature Conservation Ordinance (1969) be encountered, a suitably qualified specialist should be consulted. Should it be deemed necessary to move the taxa authorisation to relocate such species must be obtained from the Free State Department of Economic Development, Tourism and Environmental Affairs (FSDEDTE) or the Department of Forestry, Fisheries and the Environment (DFFE); - Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal habitat outside of the proposed project footprint areas occurs; - Smaller species such as scorpions and reptiles are likely to be less mobile during the colder periods of the year, as such should any be observed in the footprint sites during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or staff member. For larger venomous snakes, a suitably trained official or specialist should be contacted to affect the relocation of the species, should it not move off on its own; - All rescue and relocation plans for SCC should be overseen by a suitably qualified specialist; - Disturbed and cleared areas need to be revegetated with indigenous grass species to help stabilise the soil surface. Where bare soils are left exposed because of construction activities, they should be immediately rehabilitated; and - It is recommended that construction activities take place in a phased manner, so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities; **Alien Vegetation** - Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed, according to regulations specified in the floral report (refer to Report in Part B). - Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the construction and operational phase of the development, and a 30 m buffer surrounding the study area should be regularly checked for AIP proliferation and to prevent spread into surrounding natural areas. This is especially important for linear developments as they serve as corridors along which alien species can spread more rapidly; and - Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. - All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards. **Faunal SCC** - No collection of avifaunal SCC within the study area may be allowed by construction personnel; - Should any other avifaunal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Free State Nature Conservation Ordinance, 8 of 1969 (FSNC), be encountered, construction should be halted and authorisation to relocate such species must be obtained from FSDEDTE or DFFE; and

	- Where feasible, effective relocation of individuals to suitable similar habitat in the vicinity of the proposed PV facility.
Project phase	*Operational and Maintenance Phase*
Impact Summary	*Loss of faunal habitat and species diversity*
Management Measures	**Development footprint** - All vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities; - No litter or cleared plant material should be dumped or allowed to remain on-site. As such it is advised that alien vegetation cuttings be carefully collected and disposed of at a separate waste facility; - Bird nests on powerlines or the PV infrastructure are potential fire hazards and should be removed from structures regularly by a suitably qualified person. Should any SCC nests be identified, a suitably qualified faunal specialist must be consulted for the way forward; - Continuous monitoring (monthly) should be undertaken and a record of potential bird strikes or collisions should be kept and reported to the to or by the ECO for the first 6 months of operations. Mitigation measures should be updated thereafter and biannual monitoring should commence. - No hunting/trapping or collecting of any faunal species is allowed; and - No fires are allowed by personnel as this will increase the risk of the surrounding veld catching fire and burning down not only the immediate faunal habitat but also that of the larger local areas; **Alien Vegetation** - Alien vegetation must be removed from the proposed study area during both the construction and operational phases, in line with the NEMBA Alien and Invasive Species Regulations (2016). **Faunal SCC** - No collection or persecution of faunal SCC within the study area is allowed; - Any faunal SCC that are observed should be logged (with a GPS position) and uploaded to the iNaturalist site. Such data can also be used as part of the biodiversity and conservation awareness of the area over the long term.

6. CONCLUSION

Scientific Terrestrial Services (STS) was appointed to conduct a Biodiversity Assessment as part of the Environmental Impact Assessment (EIA) and Environmental Authorisation (EA) process for the development of the Scafell Solar PV Facility and associated grid connection infrastructure located approximately 19 km west of the town of Sasolburg, Free State Province.

During the field assessment, five broad faunal habitats within the study area were identified, namely the Transformed Habitat, *Seriphium*-dominated Grassland, *Themeda*-rich Grassland, Degraded Grassland Habitat and Freshwater Habitat. The impacts from the proposed infrastructure are largely high or low and are anticipated to impact on fauna diversity and abundance within the study area due to the sensitive nature of the *Themeda*-rich Grassland and Freshwater Habitat. It is recommended that this activities in these habitats be reconsidered from a faunal perspective to limit impacts on fauna habitat, diversity and SCC.

This farm portion is the most structurally diverse and floristically rich and thus offers the highest habitat variability and availability for fauna. A relatively large wetland system meanders

diagonally through the farm portion, not only providing freshwater and wetland habitat, but also an important movement corridor and habitat for the existing faunal assemblage and particularly avifaunal SCC. This also maintains important hydrological functions through water channelling and moisture rich niche habitat. It is important that a corridor for the movement of larger and smaller mammal fauna be maintained throughout this freshwater system and portions adjacent to it to maintain ecological processes and functions. Southern portions of this farm are currently partially protected due to existing High Voltage Powerlines, under which a suitable movement corridor with high floristic richness, faunal forage and habitat availability persists. Limited opportunities for large contiguous PV arrays are presented within this property due to the more sensitive nature of the wetland and adjacent habitat which traverses the farm portion diagonally.

The objective of this study was to provide sufficient information on the faunal ecology of the area, together with other studies on the physical and socio-cultural environment, in order for the EAP and the relevant authorities to apply the principles of Integrated Environmental Management (IEM) and the concept of sustainable development. It is the opinion of the ecologist that this study provides the relevant information required in order to implement IEM and to ensure that the best long-term use of the ecological resources in the study area will be made in support of the principle of sustainable development.

6. CONCLUDING STATEMENT

From a faunal biodiversity perspective, the farm portions Ilikwa and Scafell retain the highest conservation potential in moderate sections of the farms' due to the increased faunal diversity and the increased presence and opportunities for SCC (directly associated with the largely natural habitat therein). The homogenous nature of Damlaagte and Vlakfontein, resulting from historic and current disturbances have resulted in lowered faunal species richness and SCC presence within these farm portions. Should the entire study area be utilised as a PV facility habitat for several SCC will be transformed resulting in a loss of habitat for these threatened species, furthermore, important ecological functions and services will be degraded. The design of the grid connection corridor should be reconsidered in a way to limit disturbance to the vegetation. If designed correctly limited impact on fauna can be anticipated as they may utilise the habitat underneath these structures which will also play an important role as a corridor for movement.

Retaining suitable corridors for faunal movement is recommended as it maintains important ecological processes, functions and services such as: habitat, grazing, nutrient cycling, nutrient retention, erosion mitigation, soil retention, biological control and pollination. In order

to maintain some of these important processes, functions and services, corridors between more sensitive portions of the study area should be retained and Freshwater habitat must be avoided. This may ensure the continued presence of SCC within the study area reducing local and regional impacts to conservation targets. The map below depicts what is considered to be sufficient corridors to enable the movement of fauna and maintain important ecological processes and services. From a faunal perspective significant impacts are likely to occur should large portions of *Themeda*-rich grassland and Freshwater habitat be transformed. It is the opinion of the ecologist that an offset will be required to reduce the residual impacts of the proposed project should the entire study area be developed.

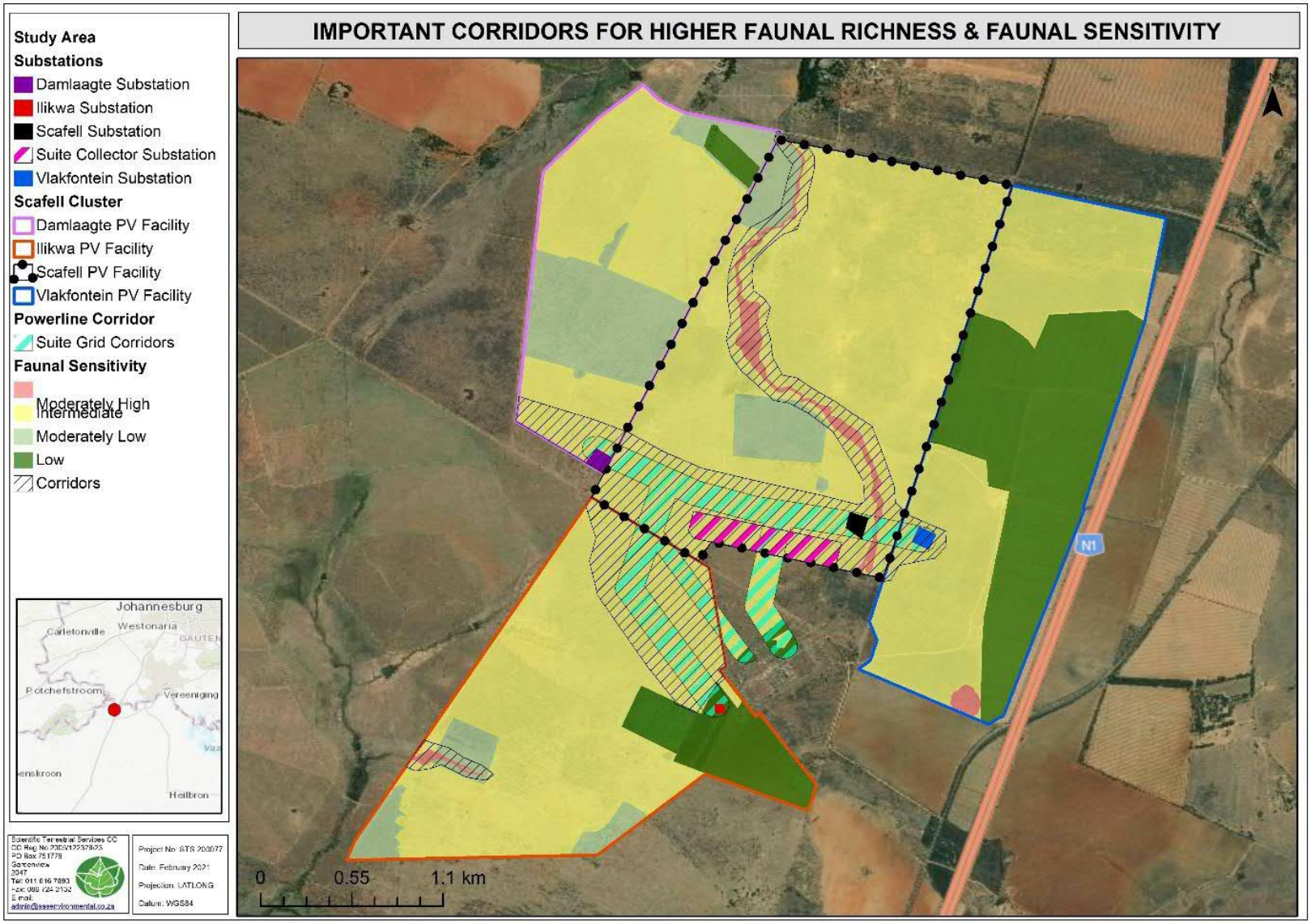


Figure 6: Map with recommendations on corridors necessary for maintaining important ecological processes and functions.

7. REFERENCES

Alexander, G and Marais, J 2008 Second Edition. A guide to the reptiles of Southern Africa. Struik Publishers, Cape Town.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. and De Villiers, M.S. (eds). 2014. Atlas and Red List of the Reptiles of South African, Lesotho and Swaziland. Suricata 1. South African National Biodiversity Institute, Pretoria.

Barnes, K.N. (Ed). 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Birdlife South Africa, Johannesburg, RSA.

Branch, B. 1998. Third Edition. Field Guide to Snakes and other Reptiles in Southern Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. and De Villiers, M.S. (eds). 2014. Atlas and Red List of the Reptiles of South African, Lesotho and Swaziland. Suricata 1. South African National Biodiversity Institute, Pretoria.

Carruthers, V. 2001. Frogs and frogging in Southern Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA.

Endangered Wildlife Trust (Conservation Breeding Specialist Group). 2004. Red Data Book of the Mammals of South Africa: A conservation Assessment.

Henning, G.A & Henning, S.F. 1989*. South African Red Data Book of Butterflies. South African National Scientific Programmes Report No. 158.

Leeming, J. 2003. Scorpions of Southern Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA

Leroy, A. & Leroy, J. Second Edition. 2003. Spiders of Southern Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA.

Marais, J. 2004. A complete guide to the Snakes of Southern Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA.

Minter, L.R., Burger, M., Harrison, J.A., Braack, H.H., Bishop, P.J., & Kloepfer, D. (Eds). 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MAB Series #9. Smithsonian Institute, Washington, DC, USA.

Picker. M., Griffiths. C. & Weaving. A. 2004. New Edition. Field Guide to Insects of South Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA.

Sinclair, I., Hockey, P. & Tarboton, W. 2002. Third Edition. Sasol Birds of Southern Africa. Struik Publishers, Cape Town, RSA.

Smithers, R. H. N. 2000. Third Edition. Edited by Peter Apps. The Mammals of the Southern African. A Field Guide. Struik Publishers, Cape Town, RSA.

Southern African Bird Atlas Project (SABAP) 2. 2015. Online available: http://sabap2.adu.org.za/.

STS 200077. 2021a. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. Part C1: Faunal Impact Assessment for the Scafell Solar PV Facility.

STS 200077. 2021b. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. Part C2: Faunl Impact Assessment for the Damlaagte Solar PV Facility.

STS 200077. 2021c. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. Part C3: Faunl Impact Assessment for the Vlakfontein Solar PV Facility.

STS 200077. 2021d. Biodiversity assessment as part of the Environmental Authorisation process for the development of the Scafell Solar PV Facility which forms part of the Scafell Cluster, Solar Photovoltaic Facility, Free State Province. Prepared for SLR Consulting (Pty) Ltd. June 2021. Part C4: Faunl Impact Assessment for the Ilikwa Solar PV Facility.

Walker, C. 1988. Fourth Edition. Signs of the Wild. Struik Publishers (Pty) Ltd, Cape Town, RSA

Woodhall, S. 2005. Field Guide to Butterflies of South Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA.

APPENDIX A: Faunal Method of Assessment

It is important to note that due to the nature and habits of fauna, varied stages of life cycles, seasonal and temporal fluctuations along with other external factors, it is unlikely that all faunal species will have been recorded during the site assessment. The presence of anthropogenic activities adjacent to the sites will have an impact on faunal behaviour and in turn the rate of observations.

Mammals

Mammal species were recorded during the field assessment with the use of visual identification, spoor, calls, dung and other notable field signs. Due to the short duration, limited size and disturbed nature of the environment, camera and Sherman traps were not employed. Specific attention was paid to mammal SCC as listed by the International Union for the Conservation of Nature (IUCN), the Limpopo province and NEMBA.

Avifauna

The Southern African Bird Atlas Project 2 database (http://sabap2.adu.org.za/) was compared with the recent field survey of avifaunal species identified in the study area. Field surveys were undertaken utilising direct observation and bird call identification techniques in order to accurately identify avifaunal species. Specific attention was given to avifaunal SCC listed on a regional and national level, as well as those identified by the IUCN.

Reptiles

Reptiles were identified during the field survey. Suitable applicable habitat areas (rocky outcrops and fallen dead trees) were inspected and all reptiles encountered were identified. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which reptile species are likely to occur on the study area. Specific attention was given to reptile SCC listed on a regional and national level, as well as those identified by the IUCN.

Amphibians

Identifying amphibian species is done by the use of direct visual identification along with call identification technique. Amphibian species flourish in and around wetland, riparian and moist grassland areas. It is unlikely that all amphibian species will have been recorded during the site assessment, due to their cryptic nature and habits, varied stages of life cycles and seasonal and temporal fluctuations within the environment. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which amphibian species are likely to occur within the study area as well as the surrounding area. Specific attention was given to amphibian SCC listed on a regional and national level, as well as those identified by the IUCN.

Invertebrates

Whilst conducting transects through the study area, all insect species visually observed were identified, and where possible photographs taken. It must be noted, however that due to the cryptic nature and habits of insects, varied stages of life cycles and seasonal and temporal fluctuations within the environment, it is unlikely that all insect species will have been recorded during the site assessment period. Nevertheless, the data gathered during the assessment along with the habitat analysis provided an accurate indication of which species are likely to occur in the study area at the time of the survey. Specific attention was given to insect SCC listed on a regional and national level, as well as those identified by the IUCN.

Arachnids

Suitable applicable habitat areas (rocky outcrops, sandy areas and fallen dead trees) where spiders and scorpions are likely to reside were searched. Rocks were overturned and inspected for signs of these species. Specific attention was paid to searching for Mygalomorphae arachnids (Trapdoor and Baboon spiders) as well as potential SCC scorpions.

Faunal Species of Conservation Concern Assessment

The Probability of Occurrence (POC) for each faunal SCC was determined using the following four parameters:

- Species distribution;
- Habitat availability;
- Food availability; and
- Habitat disturbance.

The Probability of Occurrence (POC) for each faunal SCC is described:

- "**Confirmed'**: if observed during the survey;
- "**High**": if within the species' known distribution range and suitable habitat is available;
- "**Medium**": if either within the known distribution range of the species or if suitable habitat is present; or
- "**Low**": if the habitat is not suitable and falls outside the distribution range of the species.

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Faunal Habitat Sensitivity

The sensitivity of the study area for each faunal class (i.e. mammals, birds, reptiles, amphibians and invertebrates) was determined by calculating the mean of five different parameters which influence each faunal class and provide an indication of the overall faunal ecological integrity, importance and sensitivity of the study area for each class. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Faunal SCC:** The confirmed presence or potential for faunal SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Habitat Availability:** The presence of suitable habitat for each class;
- **Food Availability:** The availability of food within the study area for each faunal class;
- **Faunal Diversity:** The recorded faunal diversity compared to a suitable reference condition such as surrounding natural areas or available faunal databases; and
- **Habitat Integrity:** The degree to which the habitat is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the suitability and sensitivity of the study area for each faunal class. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the study area in relation to each faunal class. The different classes and land-use objectives are presented in the table below:

Table A1: Faunal habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1.0 < 1.5	Low	Optimise development potential.
≥1.5 <2.5	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
≥2.5 <3.5	Intermediate	Preserve and enhance biodiversity of the habitat unit ar surrounds while optimising development potential.
≥3.5<4.5	Moderately high	Preserve and enhance the biodiversity of the habitat un limit development and disturbance.
≥4.5 ≤ 5.0	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.

APPENDIX B: Faunal SCC

Faunal Species of Conservation Concern

Table B1: Wild animal species listed in Schedule 1 of the Free State Nature Conservation Ordinance, 1969 are hereby declared protected game.

Common Name	Scientific Name
All species of land tortoises	Family Testudinidae
Girdled lizards	Family Cordylidae
Hedgehog	*Erinaceus frontalis.*
Pangolin	*Manis temminckii*
Antbear	*Orycteropus afer*
Aardwolf	*Proteles cristatus*
Bat-eared fox	*Orocyon megalotis*
All species of chameleons	Family Chamaeleonidae
Python	*Python sebae*
Elephant	*Loxodonta africana*
Hippopotamus	*Hippopotamus amphibius*
Sable antelope	*Hippotragus niger*
Black rhinoceros	*Diceros bicornis*
White rhinoceros	*Ceratotherium simum*
Roan antelope	*Hippotragus equinus*
Oribi	*Ourebia ourebi*

Table B2: All birds which are wild animals except those which are ordinary game and except the following are protected under Schedule 1 of the Free State Nature Conservation Ordinance, 1969:

Common Name	Scientific Name
All species of mousebirds	Family Coliidae
All species of bulbuls	Family Pycnonotidae
Red-winged Starling	*Onychognathus morio*
Pied Starling	*Spreo bicolor*
Common Myna	*Acridotheres tristis*
House Sparrow	*Passer domesticus*
Cape Sparrow	*Passer melanurus*
All species of crows and ravens	Family Corvidae
All species of weavers, queleas, widow-birds and bishop-birds	Subfamily Ploceinae
Rock Pigeon	*Columba guinea*
Cape Turtle Dove	*Streptopelia capicola*
Ostrich	*Struthio camelus*
Laughing Dove	*Stigmatopelia senegalensis*
Reed Cormorant	*africanus africanus*
White-breasted Cormorant	*Phalacrocorax carbo lucidus*

Table B3: TOPS animal list for the Free State Province with a Medium POC for the study area.

Scientific name	Common Name	IUCN Red List Status
Baerica regulorum	Grey Crowned Crane	EN
Eupodotis caerulescens	Blue Korhaan	NT
Lepailurus serval	Serval	LC

LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, P = Peripheral. NYBA = Not yet been assessed by the IUCN.

South African Bird Atlas Project 2 list

Table B6: Avifaunal Species for the pentads 2645_2735 within the QDS 2627DC.

Pentads	Link to pentad summary on the South African Bird Atlas Project 2 web page
2645_2735	http://sabap2.adu.org.za/coverage/pentad/2645_2735

APPENDIX C: Faunal Species List

Table C1: Mammal species recorded (*) or expected to occur in site.

Scientific Name	Common Name	Threat Status
**Lepus saxatilis*	Scrub hare	LC
Sylvicapra grimmia	Common Duiker	LC
**Canis mesomelas*	Black-backed Jackal	LC
Tragelaphus strepsiceros	Kudu	LC
Orycteropus afer	Antbear	P
Phacochoerus africanus	Warthog	LC
Raphicerus campestris	Steenbok	LC
**Galerella sanguinea*	Slender Mongoose	LC
Civettictis civetta	African Civet	LC
Hystrix africaeaustralis	Cape Porcupine	LC
Genetta genetta	Small-spotted Genet	LC

*Species observed on site, LC = Least Concern, P = Protected (TOPS, 2007).

Table C2: Avifaunal species recorded (*) or expected to occur on site.

Scientific name	Common Name	Threat Status
Passer melanurus	Cape Sparrow	LC
Streptopelia capicola	Cape Turtle Dove	LC
Motacilla capensis	Cape Wagtail	LC
Lanius collaris	Common Fiscal	LC
Pycnonotus tricolor	Dark-capped Bulbul	LC
Bostrychia hagedash	Hadeda Ibis	LC
Numida meleagris	Helmeted Guineafowl	LC
Passer domesticus	House Sparrow	LC
Streptopelia senegalensis	Laughing Dove	LC
Chrysococcyx caprius	Diederik Cuckoo	LC
Anthus cinnamomeus	African Pipit	LC
Saxicola torquatus	African Stonechat	LC
Myrmecocichla formicivora	Ant-eating Chat	LC
Ardea melanocephala	Black-headed Heron	LC
Macronyx capensis	Cape Longclaw	LC
Moticilla capensis	Cape Wagtail	LC
Cisticola textrix	Cloud Cisticola	LC
Estrilda astrild	Common Waxbill	LC
Vanellus coronatus	Crowned Lapwing	LC
Mirafra fasciolata	Eastern Clapper Lark	LC
Cercomela familiaris	Familiar Chat	LC
Passer domesticus	House Sparrow	LC
Euplectes progne	Long-tailed Widowbird	LC
Pternistis natalensis	Natal Spurfowl	LC
Hirunda dimidiata	Pearl-breasted Swallow	LC
Fulica cristata	Red-knobbed Coot	LC
Euoplectes orix	Southern Red Bishop	LC

Scientific name	Common Name	Threat Status
Plectropterus gambensis	Spur-winged Goose	LC
Prinia subflava	Tawny-flanked Prinia	LC
Ploceus cucullatus	Village Weaver	LC
Cisticola ayresii	Wing-snapping Cisticola	LC
Euplectes capensis	Yellow Bishop	LC
Cristicola juncidis	Zitting Cisticola	LC

LC = Least Concern

Table C3: Amphibian species previously recorded by SAFAP for the QDS (2627DC).

Scientific name	Common Name	Threat Status
Kassina senegalensis	Bubbling Kassina	LC
**Pyxicephalus adspersus*	Bull Frog	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC
Cacosternum boettgeri	Common Caco	LC
Phrynobatrachus natalensis	Snoring Puddle Toad	LC
Schismaderma carens	Red Toad	LC
Sclerophrys garmani	Olive Toad	LC
Sclerophrys gutturalis	Guttural Toad	LC
Amietophrynus rangeri	Raucous Toad	LC
Amietia angolensis	Angolan River Frog	LC
Semnodactylus wealii	Waele's Running Frog	LC

LC = Least Concern, * Observed on site.

Table C4: Reptile species recorded (*) or expected to occur on site.

Scientific name	Common Name	Threat Status
Trachylepis varia	Variable Skink	NYBA
Trachylepis margaritifer	Rainbow Skink	LC
Pachydactylus panctatus	Speckled Gecko	NYBA
* *Pelomedusa subrufa*	Marsh Terrapin	LC

*Species observed on site, LC = Least Concern

Table C5: Insect species recorded (*) or expected to occur on site.

Scientific Name	Common Name	Threat Status
Graphipterus trilineatus	Three-lined Velvet Ground Beetle	NYBA
Dischista rufa	Savannah Fruit Chafer	NYBA
Trinervitermes sp.	Snouted harvester termites	NYBA
Diaphone eumela	Cherry Spot Moth	NYBA
Conocephalus caudatis	Meadow Katydid	NYBA
Platycorynus dejeani	Milkweed Leaf Beetle	NYBA
Conchyloctenia hybrida	Tortoise Beetle	NYBA
Lema bilineata	Tabacco Slug Beetle	NYBA
**Musca domestica*	House Fly	NYBA
Spialia sp.	Sandman	NYBA

Scientific Name	Common Name	Threat Status
Creoleon sp.	Large Grassland Antlion	NA
Conchyloctenia hybrida	Tortoise Beetle	NYBA
Lycus sp.	Net-winged Beetle	NA
Garreta sp	Dung Beetle	NYBA
Danaus chrysippus	African Monarch	LC
Sonchia sternalis	Four-spot Leaf Beetle	NYBA
Leucocelis amethustina	Amethyst Fruit Chafer	NYBA
Eupezus natalensis	Tree Darkling Beetle	NYBA
Gymnopleurus humanus	Small Green Dung Beetle	NYBA
Alcimus sp.	Robber Fly	NA
Kheper nigroaeneus	Large Copper Dung Beetle	NYBA
Protostrophus sp	Bearded Weevils	NYBA
Pachylomerus femoralis	Flattened Giant Dung Beetle	NYBA
Thermophilum homoplatum	Two-spotted Ground Beetle	NYBA
Anoplolepis custodiens	Pugnacious Ant	NYBA

*Species observed on site, LC = Least Concern, NYBA = Not Yet Been Assessed

Table C6: Arachnid species expected to occur on site.

Scientific Name	Common Name	Threat Status
Thomisus sp	NA	NYBA
Agelena sp.	NA	NYBA
Miturgidae	NA	NYBA
Euryopis sp.	NA	NYBA
Lycosidae	NA	NYBA
Uroplectes sp.	Thick-tailed Scorpion	NA

NYBA = Not Yet Been Assessed, NA = Not applicable