

Ecological Assessment Report

**Free State Strategic Solar Project
Development, Bethulie, Free State
Province**

March 2020

Compiled for:



Compiled by:

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Executive Summary

The project applicant, Korean Solar Power Consortium South Africa Ltd proposes to develop a new 600 MW photovoltaic solar power generation facility outside the town of Bethulie, Free State Province. The proposed project will be split into two separate development phases of 300 MW each.

An office building, mini-substations and associated transmission line will also be constructed. The transmission line will tie into an existing Eskom substation situated approximately 1.5 km to the north of the assessment area.

Green Box Consulting was appointed by the applicant as the independent Environmental Practitioner (EAP) to conduct the Environmental Impact Assessment (EIA) process.

Due to the nature of the potential impacts of the proposed development on the local ecology, an Ecological study is required. This is required in order to determine the potential presence of ecologically significant species, habitats or wetland areas within the proposed development footprint which may be affected by the proposed development. Proposed mitigation and management measures in accordance with the NEMA (Act 107 of 1998) mitigation hierarchy must also be recommended in order to attempt to reduce/alleviate the identified potential impacts.

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist to conduct the required Ecological study for the proposed development. This report constitutes the Ecological Assessment. A site assessment for the proposed development footprint area was conducted on 25 & 26 February 2020. These dates form part of the growing season and most plant species present could therefore be successfully identified.

Methodology

The proposed development area was assessed on foot and visual observations/identifications were made of habitat conditions, ecologically sensitive areas and relevant species present. Species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014 and the Provincially Protected species of the Free State's Nature Conservation Ordinance (No 8 of 1969). Georeferenced photographs were taken of ecologically sensitive areas as well as of relevant nationally or

provincially protected species if encountered in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

Potential impacts of the proposed development on the surrounding natural environment were identified, evaluated and rated. The Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of the proposed project area were also assessed and rated.

Assessment Area

The assessment area for the proposed 600 MW photovoltaic solar power generation facility, office building and mini-substations is approximately 2064 ha in size and is situated directly adjacent west and south of the town of Bethulie. The town forms part of the Kopanong Local Municipality which in turn, forms part of the Xhariep District Municipality, Free State Province.

The majority of the assessment area is situated on the Remaining Extent of the Farm Bethulie no 303 (SG 21 Digit Code: F00200000000030300000) while only the most southerly portion is situated on Portion 15 of the Farm Bethulie no 303 (SG 21 Digit Code: F00200000000030300015).

The associated transmission which will tie into an existing Eskom substation situated approximately 1.5 km to the north of the assessment area, will transverse the Remaining Extent of the Farm Krugerskop no 524 (SG 21 Digit Code: F00200000000052400000).

According to SANBI (2006-2019), the overwhelming majority of the assessment area falls within the Xhariep Karroid Grassland vegetation type (Gh 3) which is characterised by extensive even or slightly undulating bottomland flats forming a matrix of large landscape patches, which are interrupted by high dolerite sills, koppies and conspicuous ring dykes. The areas support low- to medium height open grassland intertwined with smaller patches of dwarf karroid shrubs. The grass element usually becomes more visible in the summer months, especially when such areas have received good rainfall. This vegetation type is classified as least concerned (SANBI, 2006-2019).

A significantly sized hill complex traverses the northern portion of the assessment area which falls within the Besemkaree Koppies Shrubland vegetation type (Gh 4) (SANBI, 2006-2019). This vegetation type is characterised by slopes of koppies, butts and tafelbergs covered by two-layered karroid shrubland. The lower layer is dominated by dwarf small-leaved shrubs while the upper layer

is dominated by taller shrubs. This vegetation type is classified as least concerned (SANBI, 2006-2019).

The majority of the assessment area falls within an Ecological Support Area one (ESA 1) in accordance with the Free State Provincial Spatial Biodiversity Plan 2017, which sets out biodiversity priority areas in the province. The most easterly portion falls within an Ecological Support Area two (ESA 2). ESA's are areas that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a Critical Biodiversity Area (CBA) or protected area or that play an important role in delivering ecosystem services (Collins, 2017).

The entire southern and south-eastern portions of the assessment area however fall within the boundary of the Gariep Nature Reserve, which is a formally declared protected area in accordance with the Free State Provincial Spatial Biodiversity Plan 2017 and the Protected Areas Register of the National Department of Environmental Affairs

Results and Conclusion

The proposed solar power development will in all probability completely transform the majority of the existing natural surface vegetation on the portion of the assessment area used for the development.

Grassland

The majority of the assessment area constitutes slightly sloping homogenous terrestrial grassland associated with the Xhariep Karroid Grassland vegetation type (Gh 3). The southern and south-eastern portions of the assessment area surrounding the Gariep Dam however constitute a transitional zone from the terrestrial grassland to a more aquatic grassland habitat.

The entire central and western portions of the terrestrial grassland are in a natural condition and mainly constitute medium height dense grassland with small open dwarf karroid shrub patches being sparsely scattered throughout. These areas scored a relatively high PES value. Due to the natural state of the terrestrial grassland, the area is utilised by a wide variety of common and specialised bird species, small antelope as well as burrowing and predatory mammals for breeding, foraging and persistence purposes.

The entire southern and south-eastern portions of the assessment area which are associated with the terrestrial grassland and specifically the transitional zone towards the aquatic grassland habitat surrounding the Gariep Dam, are in a slight to moderately degraded state. This is mainly due to continued overgrazing by livestock from the surrounding local communities taking place. The grass layer is significantly sparser in these areas relative to the more natural central and western portions of the assessment area. The presence and size of open dwarf karroid shrub patches and subsequent dominance of dwarf karroid shrub species are also significantly increased as a result of the impacts of continued overgrazing. These areas scored a moderate PES value.

Hill Complex

A significantly sized hill complex associated with the Besemkaree Koppies Shrubland vegetation type (Gh 4), traverses the northern portion of the assessment area while another small solitary hill is also present on the western boundary of the assessment area. The proposed transmission line will traverse the significantly sized hill complex and will tie into the existing Eskom substation situated approximately 1.5 km to the north of the assessment area.

The significantly sized hill complex is in a pristine natural state. The small solitary hill is also in a natural state although farm tracks for vehicles are evident on and around the hill. The hill complex scored a high PES value and the small solitary hill scored a relatively high PES value.

This hill complex and small solitary hill possess locally unique and distinct habitat attributes within the broader grassland landscape and it is reasonably expected that these areas are utilised by a wide variety of common and specialised bird species, small antelope, reptile species (snakes and lizards) as well as burrowing and predatory mammals as refuge and for breeding, foraging and persistence purposes.

The hill complex and small solitary hill scored a relatively high EIS value and are therefore viewed as being of moderate conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type as well as the locally unique and distinct important breeding, foraging and persistence habitat for various faunal and avifaunal species.

It is therefore recommended that the hill complex and the small solitary hill should be adequately buffered out of the proposed development footprint area. A minimum approximately 200 m buffer

must be placed around the hill complex and the small solitary hill and no development is allowed to take place within the buffered zones. This must be done in order to ensure the continued ecological functionality and -integrity of the hill complex and the small solitary hill.

It is further recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. This is required in order to ensure continued ecological connectivity between the different ecological components within the assessment area and broader surrounding landscape and subsequently allow for continued movement of faunal and floral species. The western portion of the assessment area starting from the second significant water drainage line, should be buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.

Water drainage lines

The majority of the assessment area forms part of the broad surface water catchment- and drainage area towards the Gariep Dam to the south while only the small portion of the assessment area located north of the hill complex, slopes towards the Bethulie Dam to the east.

Six significant first order water drainage lines/areas as well as two smaller water drainage lines traverse the majority portion of the assessment area while three significant water drainage lines also traverse the small portion of the assessment area located north of the hill complex. The majority of these drainage lines/areas have their points of origin within the localised catchments of the hill complex and are all therefore ephemeral in nature.

The four most westerly located significant water drainage lines commence separately from the hill complex as deep erosion gullies with distinct woody riparian components and then eventually combine within the grassland area and flow towards the Gariep Dam.

The other two significant water drainage areas located in the south-eastern portion of the assessment area as well as the three significant drainage lines within the small portion located north of the hill complex, possess no distinct riparian components.

All of these significant drainage lines/areas flow through the grassland areas and channel and eventually discharge significant volumes of surface water runoff into the two dams. They are

therefore viewed as playing an important role in the local and regional water catchment and drainage.

These significant water drainage lines/areas are therefore viewed as being of moderate conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type as well as the local and regional water catchment and drainage.

It is therefore recommended that all of these drainage lines/areas should be adequately buffered out of the proposed development footprint area. A minimum approximately 40 m buffer must be placed around all of these drainage lines/areas and no development is allowed to take place within the buffered zones. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the drainage lines/areas.

The two smaller water drainage lines possess no distinct riparian component and they both eventually dissipate into the surrounding grassland within the assessment area. They are therefore not necessarily viewed as playing an important role in the local and regional water catchment.

Ecological Support Area and Formally Protected Area

The majority of the assessment area falls within an Ecological Support Area one (ESA 1) in accordance with the Free State Provincial Spatial Biodiversity Plan 2017, which sets out biodiversity priority areas in the province. The most easterly portion falls within an Ecological Support Area two (ESA 2).

The entire southern and south-eastern portions of the assessment area fall within the boundary of the Gariep Nature Reserve, which is a formally declared protected area in accordance with the Free State Provincial Spatial Biodiversity Plan 2017 and the Protected Areas Register of the National Department of Environmental Affairs.

The entire Gariep Dam to the south also falls within an Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>). The Gariep Dam and the associated aquatic grassland surrounding the Dam therefore support an important

aquatic habitat which is likely utilised by a wide variety of specialised waterbirds, amphibian species and aquatic invertebrates for breeding, foraging and persistence purposes.

This transitional zone and aquatic grassland habitat scored a relatively high EIS value and is therefore viewed as being of moderate to high conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, the formally declared protected Gariep Nature Reserve as well as the IBA and subsequent important aquatic habitat.

Development within the nature reserve or IBA is therefore not recommended and it is recommended that the final design layout footprint of the proposed development be placed outside the boundary of the nature reserve and IBA.

Red Data Listed and Protected Species

Clumps/individuals of the provincially protected species *Ammocharis coranica* were found to be present at three separate locations within the terrestrial grassland areas. Merely a single clump of the provincially protected species *Aloe grandidentata* and a single individual of the provincially protected species *Aloe broomii* were found to be present within the terrestrial grassland areas.

If any of these individuals fall within the final design layout footprint of the proposed development (which is highly likely), it is recommended that they be removed and adequately relocated to a suitable and similar area as to where they were removed from. This removal and relocation process must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained from the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTE) prior to the commencement of any such removal and relocation activities.

A single individual of the near threatened Red Data Listed bird species *Sagittarius serpentarius* (Secretary Bird) was also found to be foraging within the open grassland landscape. It is expected that the natural terrestrial grassland will likely be utilised by more individuals of this important bird species for breeding, foraging and persistence purposes.

No other Red Data Listed species or any other species of conservational significance were found to be present within the assessment area.

Conclusion

The following activities were identified and addressed as significant potential long term ecological impacts of the proposed development, which could cumulatively add to existing negative impacts caused by residential developments and agricultural management activities within the broader regional landscape:

- Transformation of the relevant Xhariep Karroid Grassland vegetation type (Gh 3)
- Transformation of the Ecological Support Area (ESA)
- Transformation of the Gariep Nature Reserve associated with the southern and south-eastern portions of the assessment area
- Impeding and contamination of the flow regimes of the water drainage lines/areas and the associated broad surface water catchment- and drainage area towards the Gariep and Bethulie Dams
- Impeding of the ecological connectivity between the broader terrestrial and aquatic ecosystems

It is however the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that all of these potential ecological impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels by implementation of the recommended mitigation measures. It is however recommended that only the identified potentially suitable development areas be considered for the proposed development.

The project should therefore be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigations measures as per this ecological report must however be adequately implemented and managed for the construction- and subsequent operational phase. All necessary authorisations, permits and licenses must also be obtained prior to the commencement of any construction.

It must however be kept in mind that this ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

The recommended avifaunal specialist must also advise on potential bird friendly transmission line and -tower design options as well as on required specifications for bird diverters and distance spacing between diverters along the entire length of the proposed transmission line in order to prevent significant bird collisions.

Depending on the nature and magnitude of impacts identified during the Avifaunal Assessment, the avifaunal specialist must also advise on the potential necessity for the investigation and implementation of a suitable Biodiversity Offset as part of the NEMA Mitigation Hierarchy. If recommended by the Avifaunal Assessment Report, a comprehensive Biodiversity Offset Feasibility Assessment and Report would need to be conducted and compiled in order to identify and inform on potential areas of suitable size and similar ecological value, which could meaningfully contribute to the provincial and national biodiversity targets and conservation strategies. The proposed Biodiversity Offset Feasibility Assessment and Report will have to be evaluated by the relevant competent authorities in order to inform on their approval/rejection process.

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Abbreviations

BA	Basic Assessment
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
DAFF	Department of Agriculture Forestry and Fisheries
DESTEA	Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
MAP	Mean Annual Precipitation
NCPSBP	Northern Cape Provincial Spatial Biodiversity Plan 2016
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMA	National Environmental Management Act (Act 107 of 1998)
NFA	National Forests Act (Act 84 of 1998)
NWA	National Water Act (Act 36 of 1998)
ONA	Other Natural Area
PES	Present Ecological State
WULA	Water Use License Application

Declaration of Independence

I, Adriaan Johannes Hendrikus Lamprecht, ID 870727 5043 083, declare that I:

- am the Director and Ecological Specialist of EcoFocus Consulting (Pty) Ltd
- act as an independent specialist consultant in the field of botany and ecology
- am assigned as the Ecological Specialist consultant by the Environmental Assessment Practitioner (EAP), Green Box Consulting, for the proposed development
- do not have or will not have any financial interest in the undertaking of the proposed development activity other than remuneration for work as stipulated in the Purchase Order terms of reference
- confirm that remuneration for my services relating to the proposed development is not linked to approval or rejection of the development by the competent authority
- have no interest in secondary or subsequent developments as a result of the authorisation of the proposed development
- have no and will not engage in any conflicting interests in the undertaking of the activity
- undertake to disclose to the applicant and the competent authority any information that has or may have the potential to influence the decision of the competent authority
- will provide the applicant and competent authority with access to all relevant project information in my possession whether favourable or not

AJH Lamprecht



Signature

1. Introduction

The project applicant, Korean Solar Power Consortium South Africa Ltd proposes to develop a new 600 MW photovoltaic solar power generation facility outside the town of Bethulie, Free State Province. The proposed project will be split into two separate development phases of 300 MW each.

An office building, mini-substations and associated transmission line will also be constructed. The transmission line will tie into an existing Eskom substation situated approximately 1.5 km to the north of the assessment area.

Green Box Consulting was appointed by the applicant as the independent Environmental Practitioner (EAP) to conduct the Environmental Impact Assessment (EIA) process.

Due to the nature of the potential impacts of the proposed development on the local ecology, an Ecological study is required. This is required in order to determine the potential presence of ecologically significant species, habitats or wetland areas within the proposed development footprint which may be affected by the proposed development. Proposed mitigation and management measures in accordance with the NEMA (Act 107 of 1998) mitigation hierarchy must also be recommended in order to attempt to reduce/alleviate the identified potential impacts.

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist to conduct the required Ecological study for the proposed development. This report constitutes the Ecological Assessment.

Preliminary preparations conducted prior to the ecological site assessment where as follows:

- Georeferenced spatial information was obtained of the proposed development area in order to determine the direct impact footprint area.
- A desktop study was conducted of the information available on the relevant vegetation types and national/provincial conservation significance status associated with the proposed footprint area.

2. Date and Season of Ecological Site Assessment

A site assessment for the proposed development footprint area was conducted on 25 & 26 February 2020. These dates form part of the growing season and most plant species present could therefore be successfully identified.

3. Assessment Rational

South Africa is a country rich in natural resources and splendour and is rated as having some of the highest biodiversity in the world. Other than the pure aesthetic value which our biodiversity and natural resources provides, it also plays a significant positive role in our national economy. While continuous economic development and progress is a key national focus area, which forms a cornerstone in the socio-economic improvement of society and the livelihoods of communities and individuals, the preservation and management of the integrity and sustainability of our natural resources is also essential in achieving this objective.

Socio-economic development and progress can therefore not be completely inhibited for the sake of ensuring environmental conservation, therefore solutions and compromises rather need to be explored in order to achieve the need for socio-economic development without unreasonably jeopardising the needs of environmental conservation. A sustainable and responsible balance needs to be maintained in order to accommodate the requirements of both.

Adequate, sustainable and responsible utilisation and management of our natural resources is crucial. Finding the required balance between socio-economic development and environmental conservation, should therefore always be a priority focus point during any proposed development process.

Various environmental legislation in South Africa makes provision for the protection of our natural resources and the functionality of ecological systems in order to ensure sustainability. Such acts include the National Environmental Management: Biodiversity Act (Act 10 of 2004), National Forests Act (Act 84 of 1998), Conservation of Agricultural Resources Act (Act 43 of 1983), National Water Act (Act 36 of 1998) and framework legislation such as the National Environmental Management Act (Act 10 of 2004).

An Ecological Assessment of the proposed development area was therefore conducted in order to determine and quantify the impacts of the development on the natural environment in the area.

4. Objectives of the Assessment

Ecological and habitat survey:

- Describe the vegetation on the assessment area and identify and list conservationally significant faunal and floral species encountered within the assessment area.
 - List any nationally and/or provincially protected and/or Red Data Listed species.
- Determine and discuss the Present Ecological State (PES) and extent of degradation and/or transformation of the vegetation on the assessment area and surrounding areas. Also indicate the Ecological Importance and Sensitivity (EIS) of the assessment area in order to provide an indication of the conservational significance of the assessment area.
- Identify and delineate all watercourses/wetland areas potentially present within the assessment area.
- Identify, evaluate and rate the potential ecological impacts of the proposed development on the natural environment.
- Provide recommendations on mitigation and management measures in order to attempt to reduce/alleviate these identified potential ecological impacts.
- Provide recommendations on the suitability of the proposed development area.
- A digital report (this document) as well as the digital KML files of any identified ecologically sensitive/conservationally significant areas will be provided to the applicant.

5. Methodology

- The proposed development area was assessed on foot and visual observations/identifications were made of habitat conditions, ecologically sensitive areas and relevant species present.
- Species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014 and the Provincially Protected species of the Free State's Nature Conservation Ordinance (No 8 of 1969).
- Georeferenced photographs were taken of ecologically sensitive areas as well as of relevant nationally or provincially protected species if encountered in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

The **Present Ecological State (PES)** of the proposed development area was assessed and rated as per the table below.

- The Present Ecological State (PES) refers to the current state or condition of an area in terms of all its characteristics and reflects the change to the area from its reference condition. The value gives an indication of the alterations that have occurred in the ecosystem.

Table 1: Criteria for PES calculations

Ecological Category	Score	Description
A	> 90-100%	Unmodified , natural and pristine.
B	> 80-90%	Largely natural . A small change in natural habitats and biota may have taken place but the ecosystem functionality has remained essentially unchanged.
C	> 60-80%	Moderately modified . Moderate loss and transformation of natural habitat and biota have occurred, but the basic ecosystem functionality has still remained predominantly unchanged.
D	> 40-60%	Largely modified . A significant loss of natural habitat, biota and subsequent basic ecosystem functionality has occurred.
E	> 20-40%	Seriously modified . The loss of natural habitat, biota and basic ecosystem functionality is extensive.
F	0-20%	Critically/Extremely modified . Transformation has reached a critical level and the ecosystem has been modified completely with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is irreversible.

The **Ecological Importance and Sensitivity (EIS)** of the proposed development area was assessed and rated as per the table below.

- The Ecological Importance and Sensitivity (EIS) of an area is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales, and both abiotic and biotic components of the system are taken into consideration. Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred.

Table 2: Criteria for EIS calculations

EIS Categories	Score	Description
Low/Marginal	D	Not ecologically important and/or sensitive on any scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.
Moderate	C	Ecologically important and sensitive on local or possibly provincial scale. Biodiversity is still relatively ubiquitous and not usually sensitive to habitat modifications.
High	B	Ecologically important and sensitive on provincial or possibly national scale. Biodiversity is relatively unique and may be sensitive to habitat modifications.
Very High	A	Ecologically important and sensitive on national and possibly international scale. Biodiversity is very unique and sensitive to habitat modifications.

Potential impacts of the proposed development on the surrounding natural environment were identified, evaluated and rated as per the methodology described below. The tables below indicate and explain the methodology and criteria used for the evaluation of the Environmental Risk Ratings as well as the calculation of the final Environmental Significance Ratings of the identified potential ecological impacts. Each potential environmental impact is scored for each of the Evaluation Components as per the table below.

Table 3: Scale utilised for the evaluation of the Environmental Risk Ratings

Evaluation Component	Rating Scale and Description/Criteria
Magnitude of Negative or Positive Impact	<p>10 - Very high: Bio-physical features and/or ecological functionality/processes may be severely impacted upon.</p> <p>8 - High: Bio-physical features and/or ecological functionality/processes may be significantly impacted upon.</p> <p>6 - Medium: Bio-physical features and/or ecological functionality/processes may be moderately impacted upon.</p> <p>4 - Low: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon.</p> <p>2 - Very Low: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon.</p> <p>0 - Zero: Bio-physical features and/or ecological functionality/processes will not be impacted upon.</p>
Duration of Negative or Positive Impact	<p>5 – Permanent: Impact will continue on a permanent basis.</p> <p>4 - Long term: Impact should cease a period (> 40 years) after the operational phase/project life of the activity.</p> <p>3 - Medium term: Impact may occur for the period of the operational phase/project life of the activity.</p> <p>2 - Short term: Impact may only occur during the construction phase of the activity after which it will cease.</p> <p>1 - Immediate: Impact may only occur as a once off during the construction phase of the activity.</p>

Extent of Positive or Negative Impact	<p>5 - International: Impact will extend beyond National boundaries.</p> <p>4 - National: Impact will extend beyond Provincial boundaries but remain within National boundaries.</p> <p>3 - Regional: Impact will extend beyond 5 km of the development footprint but remain within Provincial boundaries.</p> <p>2 - Local: Impact will not extend beyond 5 km of the development footprint.</p> <p>1 - Site-specific: Impact will only occur on or within 200 m of the development footprint.</p> <p>0 – No impact.</p>
Irreplaceability of Natural Resources being impacted upon	<p>5 – Definite loss of irreplaceable natural resources.</p> <p>4 – High potential for loss of irreplaceable natural resources.</p> <p>3 – Moderate potential for loss of irreplaceable natural resources.</p> <p>2 – Low potential for loss of irreplaceable natural resources.</p> <p>1 – Very low potential for loss of irreplaceable natural resources.</p> <p>0 – No impact.</p>
Reversibility of Impact	<p>5 – Impact cannot be reversed.</p> <p>4 – Low potential that impact may be reversed.</p> <p>3 – Moderate potential that impact may be reversed.</p> <p>2 – High potential that impact may be reversed.</p> <p>1 – Impact will be reversible.</p> <p>0 – No impact.</p>
Probability of Impact Occurrence	<p>5 - Definite: Probability of impact occurring is > 95 %.</p> <p>4 - High: Probability of impact occurring is > 75 %.</p> <p>3 - Medium: Probability of impact occurring is between 25 % - 75 %.</p> <p>2 - Low: Probability of impact occurring is between 5 % - 25 %.</p> <p>1 - Improbable: Probability of impact occurring is < 5 %.</p>
Cumulative Impact	<p>High: Numerous similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts.</p> <p>Medium: Few similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts.</p> <p>Low: Virtually no similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts. The development is anticipated to be an isolated occurrence and should therefore have a negligible cumulative impact.</p> <p>None: No cumulative impact.</p>

Once the Environmental Risk Ratings have been evaluated for each potential ecological impact, the Significance Score of each potential ecological impact is calculated by using the following formula:

- **SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.**

The maximum Significance Score value is 150.

The Significance Score is then used to rate the Environmental Significance of each potential ecological impact as per Table 4 below. The Environmental Significance rating process is completed for all identified potential ecological impacts both before and after implementation of the recommended mitigation measures.

Table 4: Scale used for the evaluation of the Environmental Significance Ratings

Environmental Significance Score	Environmental Significance Rating	Description/Criteria
125 – 150	Very high	An impact of very high significance after mitigation will mean that the development may not take place. The impact cannot be suitably reduced and mitigated to within acceptable levels.
100 – 124	High	An impact of high significance after mitigation should influence a decision about whether or not to proceed with the development. Additional, impact-specific mitigation measures must be implemented if the continuation of the development is to be considered.
75 – 99	Medium-high	Additional, impact-specific mitigation measures must be implemented for an impact of medium-high significance if the continuation of the development is to be considered.
50 – 74	Medium	An impact of medium significance after mitigation must be adequately managed in accordance with the mitigation measures provided by the specialist.
< 50	Low	If any mitigation measures are provided by the specialist for an impact of low significance after mitigation, the impact must be adequately managed in accordance with these measures.
+	Positive impact	A positive impact is likely to result in a beneficial consequence/effect and should therefore be viewed as a motivation for the development to proceed.

Wetlands/watercourses were identified and delineated on the proposed development area as per the methodology described below:

For the purposes of this investigation a wetland was defined according to the definition in the National Water Act (Act 36 of 1998) as: “land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.”

In 2005 DWAF published a wetland delineation procedure in a guideline document titled “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas”. Guidelines for the undertaking of biodiversity assessments exist. These guidelines contain a number of stipulations relating to the protection of wetlands and the undertaking of wetland assessments.

The wetland delineation procedure identifies the outer edge of the temporary zone of the wetland, which marks the boundary between the wetland and adjacent terrestrial areas. This constitutes the part of the wetland that might remain flooded or saturated close to the soil surface for only a few weeks in the year, but long enough to develop anaerobic conditions and determine the nature of the plants growing in the soil.

The guidelines also state that the locating of the outer edge of the temporary zone must make use of four specific indicators namely:

- terrain unit indicator,
- soil form indicator,
- soil wetness indicator and
- vegetation indicator.

In addition, the wetland/watercourse and a protective buffer zone beginning from the outer edge of the wetland temporary zone, was designated as sensitive in a sensitivity map. The guidelines stipulate buffers to be delineated around the boundary of a wetland. An adequate protective buffer zone, beginning from the outer edge of the wetland temporary zone, was implemented and designated as sensitive within which no development must be allowed to occur.

6. Assessment Area

The assessment area for the proposed 600 MW photovoltaic solar power generation facility, office building and mini-substations is approximately 2064 ha in size and is situated directly adjacent west and south of the town of Bethulie. The town forms part of the Kopanong Local Municipality which in turn, forms part of the Xhariep District Municipality, Free State Province.

The majority of the assessment area is situated on the Remaining Extent of the Farm Bethulie no 303 (SG 21 Digit Code: F00200000000030300000) while only the most southerly portion is situated on Portion 15 of the Farm Bethulie no 303 (SG 21 Digit Code: F00200000000030300015).

The associated transmission which will tie into an existing Eskom substation situated approximately 1.5 km to the north of the assessment area, will transverse the Remaining Extent of the Farm Krugerskop no 524 (SG 21 Digit Code: F00200000000052400000).

See locality map below.

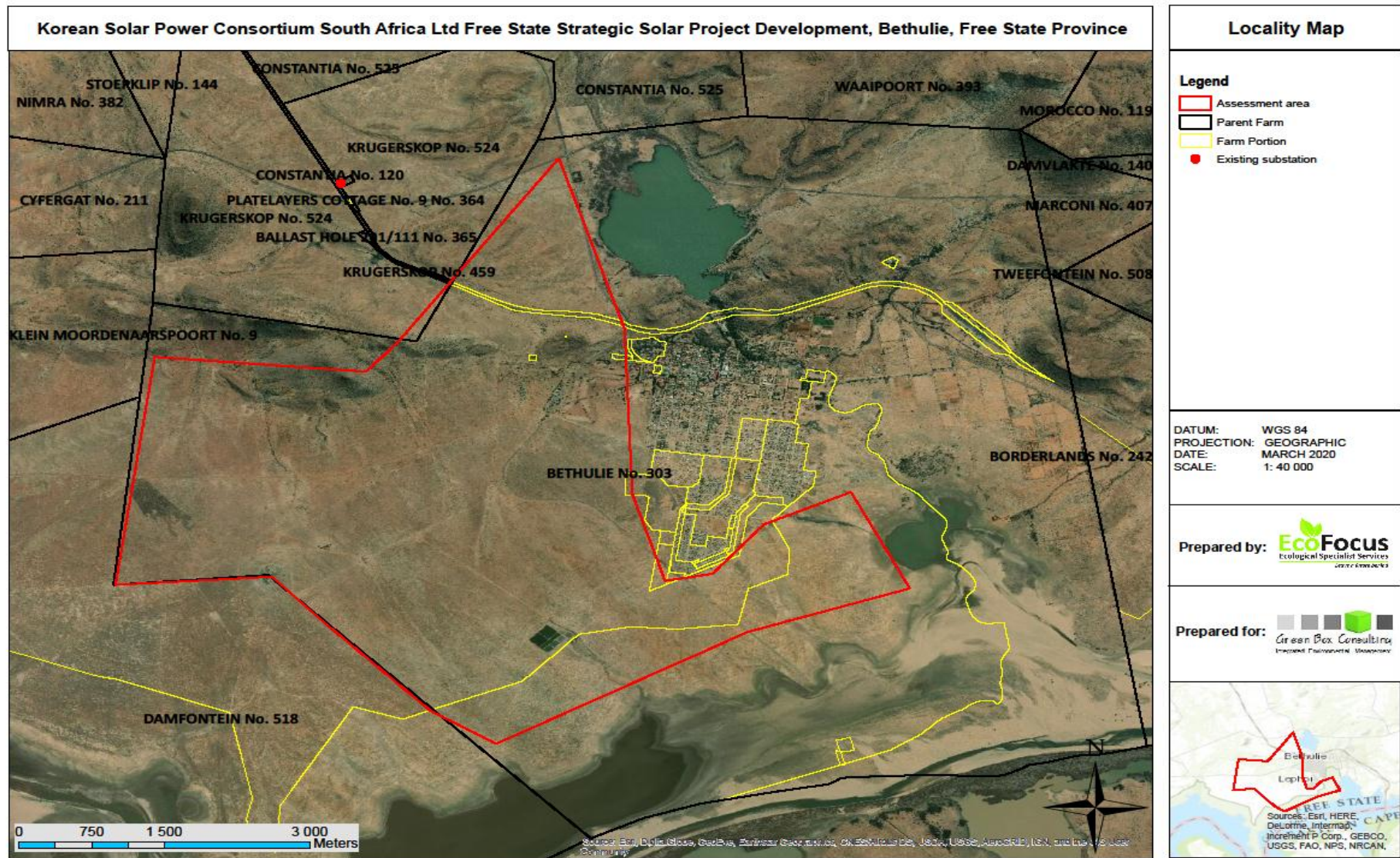


Figure 1: Locality map illustrating the assessment area (see A3 sized map in the Appendices)

6.1. Climate

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 481 mm (www.climate-data.org). The maximum average monthly temperature is approximately 22.7°C in the summer months while the minimum average monthly temperature is approximately 8.3°C during the winter. Maximum daily temperatures can reach up to 31°C in the summer months and dip to as low as -0.1°C during the winter.

6.2. Geology and Soils

According to Mucina & Rutherford (2006) the geology of the landscape and associated vegetation type can be described as the following:

Alternating layers of mudstone and sandstone mostly of the Permian Adelaide Subgroup (Beaufort Group). In certain areas, specifically towards the more arid west, patches of calcrete are present on the soil surface. Soil forms such as Kimberley and Plooyburg are dominant in these areas. The entire area is classified as Da or Db land types.

6.3. Vegetation and Conservation Status

According to SANBI (2006-2019), the overwhelming majority of the assessment area falls within the Xhariep Karroid Grassland vegetation type (Gh 3) which is characterised by extensive even or slightly undulating bottomland flats forming a matrix of large landscape patches, which are interrupted by high dolerite sills, koppies and conspicuous ring dykes. The areas support low- to medium height open grassland intertwined with smaller patches of dwarf karroid shrubs. The grass element usually becomes more visible in the summer months, especially when such areas have received good rainfall. This vegetation type is classified as least concerned (SANBI, 2006-2019).

A significantly sized hill complex traverses the northern portion of the assessment area which falls within the Besemkaree Koppies Shrubland vegetation type (Gh 4) (SANBI, 2006-2019). This vegetation type is characterised by slopes of koppies, butts and tafelbergs covered by two-layered karroid shrubland. The lower layer is dominated by dwarf small-leaved shrubs while the upper layer is dominated by taller shrubs. This vegetation type is classified as least concerned (SANBI, 2006-2019).

The majority of the assessment area falls within an Ecological Support Area one (ESA 1) in accordance with the Free State Provincial Spatial Biodiversity Plan 2017, which sets out biodiversity priority areas in the province. The most easterly portion falls within an Ecological Support Area two (ESA 2). ESA's are areas that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a Critical Biodiversity Area (CBA) or protected area or that play an important role in delivering ecosystem services (Collins, 2017).

The entire southern and south-eastern portions of the assessment area however fall within the boundary of the Gariep Nature Reserve, which is a formally declared protected area in accordance with the Free State Provincial Spatial Biodiversity Plan 2017 and the Protected Areas Register of the National Department of Environmental Affairs.

The proposed solar power development will in all probability completely transform the majority of the existing natural surface vegetation on the portion of the assessment area used for the development.

See vegetation and conservation status maps below.

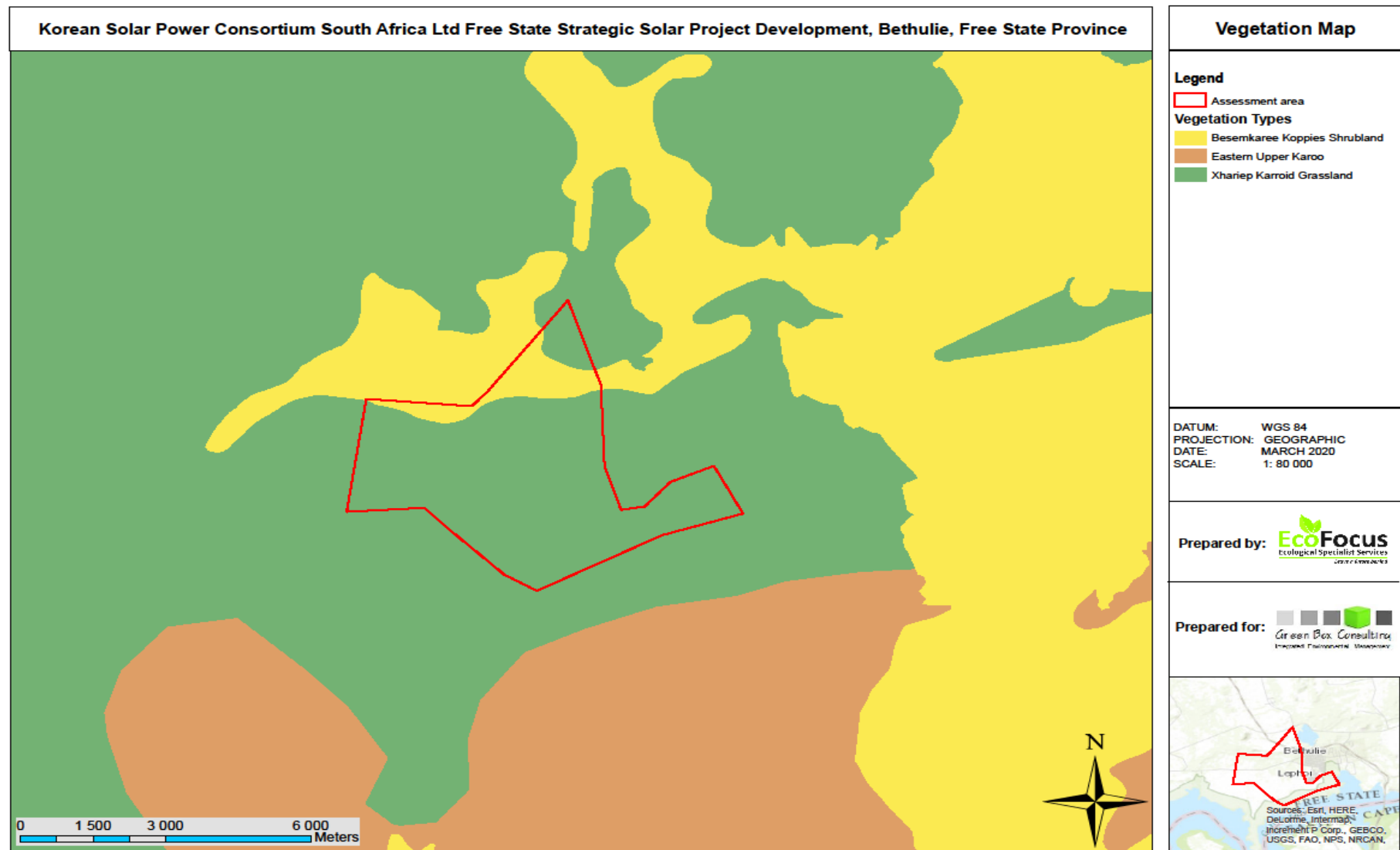


Figure 2: Vegetation map illustrating the vegetation types associated with the assessment area (see A3 sized map in the Appendices)

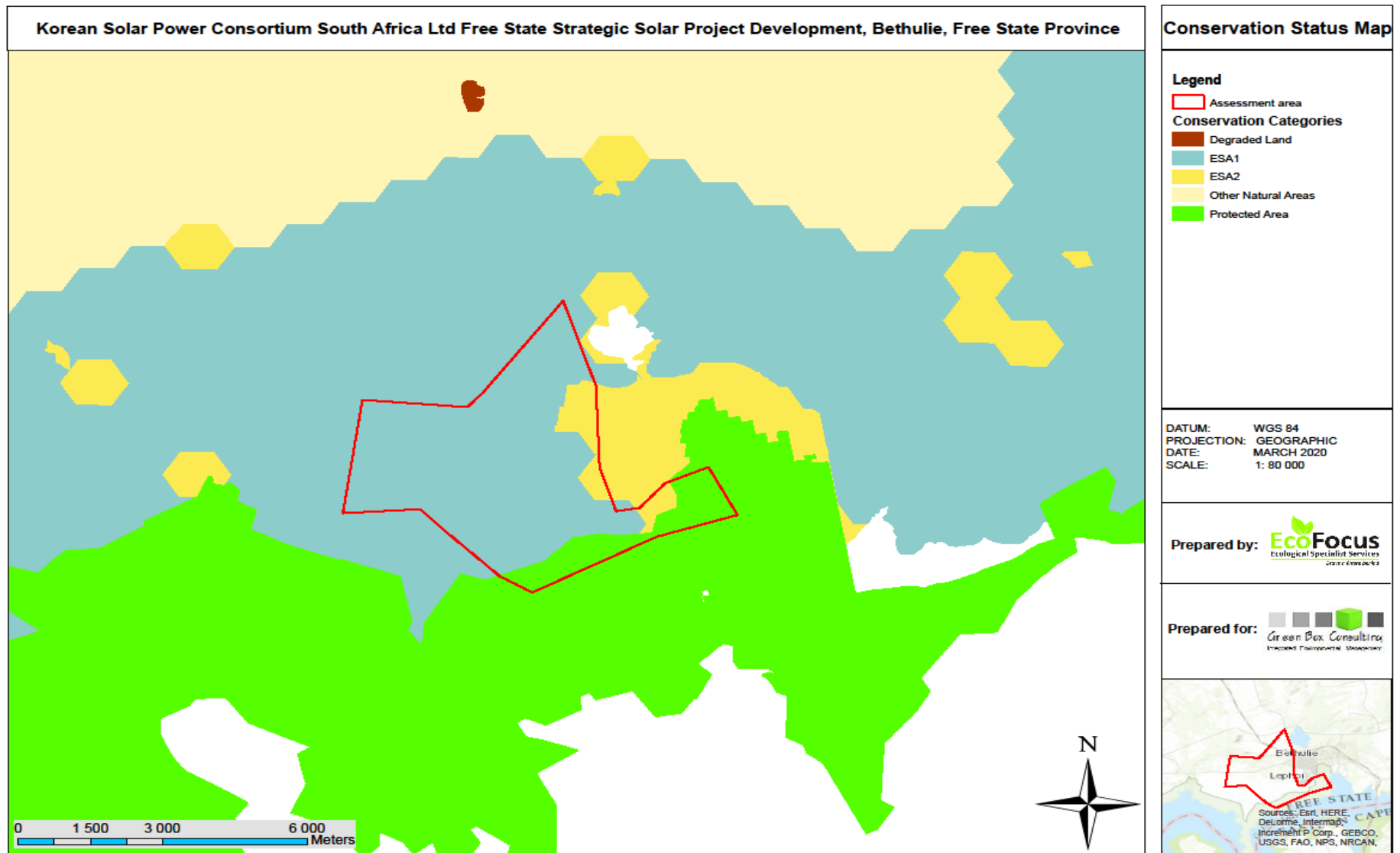


Figure 3: Conservation status map illustrating the conservation statuses associated with the assessment area (see A3 sized map in the Appendices)

7. Assumptions, Uncertainties and Gaps in Knowledge

Various assumptions need to be made during the assessment process at the hand of the relevant specialist. It is therefore assumed that:

- all relevant project information provided by the applicant to the ecological specialist was correct and valid at the time that it was provided.
- the proposed development area as provided by the applicant, is correct and will not be significantly deviated from as this was the only area assessed.
- strategic level investigations undertaken by the applicant prior to the commencement of the Environmental Impact Assessment process, determined that the proposed development footprint represents potentially suitable and technically acceptable locations.
- the public, local communities, relevant organs of state and landowners will receive a sufficient reoccurring opportunity to participate and comment on the proposed development during the Environmental Impact Assessment process, through the provision of adequately facilitated public participation interventions and timeframes as stipulated in the NEMA: EIA Regulations, 2014.
- the need and desirability of the proposed development is based on strategic national, provincial and local plans and policies which reflect the interests of both statutory and public viewpoints.
- the EIA process is a project-level framework and the specialists are limited to assessing the anticipated environmental impacts associated with the construction and operational phases of the proposed development.
- it is assumed that strategic level decision making by the relevant authorities will be conducted through cooperative governance principles, with the consideration of environmentally sustainable and responsible development principles underpinning all decision making.

Given that an EIA involves prediction, the uncertainty factor forms part of the assessment process. Two types of uncertainty are associated with the EIA process, namely process-related and prediction-related.

- Uncertainty of prediction is critical at the data collection phase as observations and conclusions are made, only based on professional specialist opinion. Final certainty will only be obtained upon actual implementation of the proposed development. Adequate research, specialist experience and expertise should however minimise this uncertainty.
- Uncertainty of relevant decision making relates to the interpretation of provided information by relevant authorities during the EIA process. Continual two way communication and

coordination between EAP's and relevant authorities should however decrease the uncertainty of subjective interpretation. The importance of widespread/comprehensive consultation towards minimising the risk/possibility of omitting significant information and impacts is further stressed. The use of quantitative impact significance rating formulas (as utilised in this document) can further standardise the objective interpretation of results and limit the occurrence and scale of uncertainty and subjectivity.

- The principle of human nature provides for uncertainties and unpredictability with regards to the socio-economic impacts of the proposed development and the subsequent public reaction/opinion which will be received during the Public Participation Process (PPP).

Gaps in knowledge can be attributed to:

- The ecological study process was undertaken prior to the availing of certain information which would only be derived from the final development design and layout. The design layouts for the separate two phases of 300 MW each, had not been finalised yet at the time of the ecological study.
- The proposed transmission line route had not been finalised yet at the time of the ecological study.
- The potential of future similar developments in the same geographical area, which could lead to cumulative impacts cannot be meaningfully anticipated. It is however not expected that any other large solar power generation facilities will be developed within the broader area.
- This ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it was recommended prior to the commencement of the ecological assessment, that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

EcoFocus Consulting is an independent ecological specialist company. All information and recommendations as per this report are therefore provided in a fair and unbiased/objective manner based on professional specialist opinion.

8. Results and Discussion

The proposed solar power development will in all probability completely transform the majority of the existing natural surface vegetation on the portion of the assessment area used for the development.

The majority of the assessment area constitutes slightly sloping homogenous terrestrial grassland associated with the Xhariep Karroid Grassland vegetation type (Gh 3). The inflow of the Orange River into the Gariep Dam is located approximately 300 m south of the assessment area and the majority of the assessment area therefore slopes in a southerly direction and forms part of the broad surface water catchment- and drainage area towards the Dam. A number of water drainage lines/areas subsequently traverse the grassland.

The southern and south-eastern portions of the assessment area surrounding the Dam therefore constitute the lowest topographic parts of the assessment area and subsequently constitute a transitional zone from the terrestrial grassland to a more aquatic grassland habitat.

A significantly sized hill complex associated with the Besemkaree Koppies Shrubland vegetation type (Gh 4), traverses the northern portion of the assessment area while another small solitary hill is also present on the western boundary of the assessment area.

The small portion of the assessment area located north of the hill complex also constitutes slightly sloping terrestrial grassland associated with the Xhariep Karroid Grassland vegetation type (Gh 3). This area slopes in an easterly direction towards the Bethulie Dam which is located approximately 90 m to the east of the assessment area.

A small portion along the eastern boundary of the assessment area constitutes existing urban development while a number of small adjacent portions have also been historically excavated. These portions are viewed as completely transformed and have therefore been excluded from this ecological assessment.

These different ecological components will be discussed separately under headings 8.1., 8.2, 8.3 & 8.4. It must however be kept in mind that although the assessment area is being artificially separated into different ecological components for practical reporting purposes, the components do not function independently and should not be viewed as separate, isolated units. They rather form part of a larger interrelated ecological network associated with the entire assessment area and broader surrounding ecosystem.

8.1. Terrestrial grassland associated with the Xhariep Karroid Grassland vegetation type (Gh 3)

8.1.1. Current Existing Vegetation and Site Description

The majority of the assessment area constitutes slightly sloping homogenous terrestrial grassland associated with the relevant vegetation type. The entire central and western portions of the terrestrial grassland are in a natural condition and mainly constitute medium height dense grassland with small open dwarf karroid shrub patches being sparsely scattered throughout.

These natural areas possess good grass species diversity and is mainly dominated by the species *Themeda triandra*. Grass species also found to be present and well represented include *Eragrostis chloromelas*, *E lehmanniana*, *Sporobolus africanus*, *Aristida spp.*, *Setaria spp.*, *Cynodon incompletes* & *Digitaria spp.* Other grass species also found to be present but less well represented include *Eragrostis curvula*, *E obtusa*, *Cyperus spp.*, *Panicum coloratum*, *Cymbopogon pospischilii*, *Aristida adscensionis*, *Heteropogon contortus*, *Fingerhuthia africana*, *Trachus berteronianus* & *Chloris virgata*. The latter two species are however mainly associated with the sparsely present open dwarf karroid shrub patches.

The forb layer of the natural terrestrial grassland areas also houses a high species diversity and species found to be present include *Chlorophytum fasciculatum*, *Salvia runcinata*, *Eriospermum cooperi*, *Dimorphotheca caulescens*, *Iris sp.*, *Jamesbrittenia aurantiaca*, *Gisekia pharnaceoides*, *Stachys rugosa*, *Aptosimum procumbens*, *Commelina africana*, *Blepharis mitrata*, *Oxalis obliquifolia*, *Geigeria ornativa*, *Ruschia hamata*, *Tribulus terrestris*, *Berkheya radula*, *Hibiscus trionum*, *H marlothianus*, *Bulbine abyssinica*, *B narcissifolia*, *Ledebouria luteola* & *Hermannia depressa*.

Clumps/individuals of the provincially protected species *Ammocharis coranica* were found to be present at three separate locations within the terrestrial grassland areas. Merely a single clump of the provincially protected species *Aloe grandidentata* and a single individual of the provincially protected species *Aloe broomii* were found to be present within the terrestrial grassland areas.

If any of these individuals fall within the final design layout footprint of the proposed development (which is highly likely), it is recommended that they be removed and adequately relocated to a suitable and similar area as to where they were removed from. This removal and relocation process must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained from the Free State Department of Economic,

Small Business Development, Tourism and Environmental Affairs (DESTE) prior to the commencement of any such removal and relocation activities.

Karroid shrub species found to be present throughout the terrestrial grassland and specifically within the open dwarf karroid shrub patches include *Felicia filifolia*, *Felicia sp.*, *Pentzia spp.*, *Asparagus spp.*, *Salsola spp.*, *Phaeoptilum spinosum*, *Lycium cinereum*, *Eriocephalus spinescens*, *E. ericoides*, *Selago geniculata*, *S. saxatilis*, *Roepera incrustata*, *Euryops sp.*, & *Osteospermum leptolobum*.

The natural terrestrial grassland areas do not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>).

A single individual of the near threatened Red Data Listed bird species *Sagittarius serpentarius* (Secretary Bird) was however found to be foraging within the open grassland landscape. It is expected that the natural terrestrial grassland will likely be utilised by more individuals of this important bird species for breeding, foraging and persistence purposes.

No other Red Data Listed species or any other species of conservational significance were found to be present within the natural terrestrial grassland areas. However, due to the natural state of the terrestrial grassland, the area is utilised by a wide variety of common and specialised bird species, small antelope as well as burrowing and predatory mammals for breeding, foraging and persistence purposes.

See photographs below.



Figure 4: Three images illustrating examples of the natural homogenous terrestrial grassland within the entire central and western portions of the assessment area associated with the relevant Xhariep Karroid Grassland vegetation type (Gh 3)

8.1.2. Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The Present Ecological State (PES) of the natural terrestrial grassland area is classified as Class B as it is largely natural. A small change in natural habitats and biota may have taken place due to continued farm management practices, but the ecosystem functionality has remained essentially unchanged.

The Ecological Importance and Sensitivity (EIS) of the natural terrestrial grassland area is classified as Class C (moderate) as it is viewed as being ecologically important and sensitive on local scale mainly due to it forming part of an Ecological Support Area (ESA), the utilisation of the open grassland landscape by individuals of the near threatened Red Data Listed bird species *Sagittarius serpentarius* (Secretary Bird) as well as by a wide variety of common and specialised bird species, small antelope as well as burrowing and predatory mammals for breeding, foraging and persistence purposes.

The natural terrestrial grassland area is therefore viewed as being of moderate conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA as well as important breeding, foraging and persistence habitat for various faunal and avifaunal species.

It is therefore recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. This is required in order to ensure continued ecological connectivity between the different ecological components within the assessment area and broader surrounding landscape and subsequently allow for continued movement of faunal and floral species. The western portion of the assessment area starting from the second significant water drainage line, should be buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.

8.2. Transitional zone from the terrestrial grassland towards the aquatic grassland habitat surrounding the Gariep Dam

8.2.1. Current Existing Vegetation and Site Description

The entire southern and south-eastern portions of the assessment area which are associated with the terrestrial grassland and specifically the transitional zone towards the aquatic grassland habitat surrounding the Gariep Dam, are in a slight to moderately degraded state. This is mainly due to continued overgrazing by livestock from the surrounding local communities taking place.

The grass layer is significantly sparser in these areas relative to the more natural central and western portions of the assessment area. The presence and size of open dwarf karroid shrub patches and subsequent dominance of dwarf karroid shrub species are also significantly increased as a result of the impacts of continued overgrazing. This sparse karroid grassland possesses a significantly lower species diversity relative to the natural areas and is mainly dominated by the grass species *Aristida* spp. & *Eragrostis chloromelas* while the karroid shrub species *Roepera incrustata* & *Osteospermum leptolobum* are also mostly dominant. Individuals of the legally declared invasive species *Cirsium vulgare*, *Argemone mexicana* and *Datura stramonium* (all Category 1b) are also sparsely present, which reiterates the degraded and overgrazed state of the areas. The aquatic species *Phyla nodiflora* is prominent within the more aquatic grassland habitat surrounding the Gariep Dam.

No Red Data Listed species or any other species of conservational significance were found to be present within the transitional zone or the aquatic grassland habitat surrounding the Gariep Dam. The entire southern and south-eastern portions of the assessment area however fall within the boundary of the Gariep Nature Reserve, which is a formally declared protected area in accordance with the Free State Provincial Spatial Biodiversity Plan 2017 and the Protected Areas Register of the National Department of Environmental Affairs.

The entire Gariep Dam to the south also falls within an Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>). The Gariep Dam and the associated aquatic grassland surrounding the Dam therefore support an important aquatic habitat which is likely utilised by a wide variety of specialised waterbirds, amphibian species and aquatic invertebrates for breeding, foraging and persistence purposes.

Development within the nature reserve or IBA is therefore not recommended and it is recommended that the final design layout footprint of the proposed development be placed outside the boundary of the nature reserve and IBA.

Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is further recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

See photographs below.



Figure 5: Two images illustrating examples of the slight to moderately degraded state of the entire southern and south-eastern portions of the assessment area associated with the transitional zone from the terrestrial grassland towards the aquatic grassland habitat surrounding the Gariep Dam



Figure 6: Two images illustrating examples of the moderately degraded state of the more aquatic grassland habitat surrounding the Gariep dam

8.2.2. Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The Present Ecological State (PES) of the transitional zone and aquatic grassland habitat is classified as Class C as it is moderately modified. Moderate loss and transformation of natural habitat and biota have occurred due to continued overgrazing by livestock from the surrounding local communities taking place, but the basic ecosystem functionality has still remained predominantly unchanged.

The Ecological Importance and Sensitivity (EIS) of the transitional zone and aquatic grassland habitat is classified as Class B (high) as it is viewed as being ecologically important and sensitive on provincial scale mainly due to the entire southern and south-eastern portions of the assessment area falling within the boundary of the formally declared protected Gariep Nature Reserve. The entire Gariep Dam to the south also falls within an Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>). The Gariep Dam and the associated aquatic grassland surrounding the Dam therefore support an important aquatic habitat which is likely utilised by a wide variety of specialised waterbirds, amphibian species and aquatic invertebrates for breeding, foraging and persistence purposes.

The transitional zone and aquatic grassland habitat is therefore viewed as being of moderate to high conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, the formally declared protected Gariep Nature Reserve as well as the IBA and subsequent important aquatic habitat.

Development within the nature reserve or IBA is therefore not recommended and it is recommended that the final design layout footprint of the proposed development be placed outside the boundary of the nature reserve and IBA.

Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is further recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

8.3. Significant hill complex associated with the Besemkaree Koppies Shrubland vegetation type (Gh 4)

8.3.1. Current Existing Vegetation and Site Description

The significantly sized hill complex associated with the relevant vegetation type, which traverses the northern portion of the assessment area is in a pristine natural state. The small solitary hill which is present on the western boundary of the assessment area is also in a natural state although farm tracks for vehicles are evident on and around the hill.

This hill complex and small solitary hill possess locally unique and distinct habitat attributes within the broader grassland landscape and it is reasonably expected that these areas are utilised by a wide variety of common and specialised bird species, small antelope, reptile species (snakes and lizards) as well as burrowing and predatory mammals as refuge and for breeding, foraging and persistence purposes. It is therefore recommended that the hill complex and the small solitary hill should be adequately buffered out of the proposed development footprint area. A minimum approximately 200 m buffer must be placed around the hill complex and the small solitary hill and no development is allowed to take place within the buffered zones. This must be done in order to ensure the continued ecological functionality and -integrity of the hill complex and the small solitary hill.

It is further recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. This is required in order to ensure continued ecological connectivity between the different ecological components within the assessment area and broader surrounding landscape and subsequently allow for continued movement of faunal and floral species. The western portion of the assessment area starting from the second significant water drainage line, should be buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.

See photographs below.



Figure 7: Two images illustrating examples of the significantly sized hill complex which traverses the northern portion of the assessment area associated with the Besemkaree Koppies Shrubland vegetation type (Gh 4)



Figure 8: Image illustrating the small solitary hill which is present on the western boundary of the assessment area

The proposed transmission line will traverse the significantly sized hill complex and will tie into the existing Eskom substation situated approximately 1.5 km to the north of the assessment area.

As discussed earlier under this heading, this hill complex possesses locally unique and distinct habitat attributes within the broader grassland landscape and it is reasonably expected that these areas are utilised by a wide variety of common and specialised bird species, small antelope, reptile species (snakes and lizards) as well as burrowing and predatory mammals as refuge and for breeding, foraging and persistence purposes.

It is therefore imperative that the linear footprint of the proposed transmission line be kept as small and narrow as practicably possible and that the construction phase be completed as swiftly as practicably possible. The construction footprint over the hill complex must also be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be developed for this by a suitably qualified and experienced ecologist. This must all be done in order to minimise the impacts on the habitat and ecology and subsequently ensure the continued ecological functionality and -integrity of the hill complex.

Adequate measures must also be implemented to prevent significant bird collisions with the established transmission line during the operational phase. It is therefore recommended that a bird friendly transmission line and -tower design be opted for and that suitable bird diverters be installed along the entire length of the proposed transmission line in order to deter birds away from the transmission line.

The recommended avifaunal specialist must advise on potential bird friendly transmission line and -tower design options as well as on required specifications for bird diverters and distance spacing between diverters in the Avifaunal Assessment Report. Once the bird diverters have been installed, their integrity and functionality must be inspected and adequately maintained on a minimum annual basis.

8.3.2. Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The Present Ecological State (PES) of the significantly sized hill complex is classified as Class A as it is unmodified, natural and pristine.

The Present Ecological State (PES) of the small solitary hill is classified as Class B as it is largely natural. A small change in natural habitats and biota may have taken place due to the presence of farm tracks for vehicles on and around the hill, but the ecosystem functionality has remained essentially unchanged.

The Ecological Importance and Sensitivity (EIS) of the significantly sized hill complex and small solitary hill is classified as Class C (moderate) as they are viewed as being ecologically important and sensitive on local or possibly provincial scale mainly due to them forming part of an Ecological Support Area (ESA), as well as possessing locally unique and distinct habitat attributes within the broader grassland landscape which are likely utilised by a wide variety of common and specialised bird species, small antelope, reptile species (snakes and lizards) as well as burrowing and predatory mammals as refuge and for breeding, foraging and persistence purposes.

The significantly sized hill complex and small solitary hill are therefore viewed as being of moderate conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA as well as the locally unique and distinct important breeding, foraging and persistence habitat for various faunal and avifaunal species.

It is therefore recommended that the hill complex and the small solitary hill should be adequately buffered out of the proposed development footprint area. A minimum approximately 200 m buffer must be placed around the hill complex and the small solitary hill and no development is allowed to take place within the buffered zones. This must be done in order to ensure the continued ecological functionality and -integrity of the hill complex and the small solitary hill.

It is further recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. This is required in order to ensure continued ecological connectivity between the different ecological components within the assessment area and broader surrounding landscape and subsequently allow for continued movement of faunal and floral species. The western portion of the assessment area starting from the second significant water drainage line, should be buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.

8.4. Water drainage lines which traverse the assessment area

8.4.1. Current Existing Vegetation and Site Description

The majority of the assessment area forms part of the broad surface water catchment- and drainage area towards the Gariep Dam to the south while only the small portion of the assessment area located north of the hill complex, slopes towards the Bethulie Dam to the east.

Six significant first order water drainage lines/areas as well as two smaller water drainage lines traverse the majority portion of the assessment area while three significant water drainage lines also traverse the small portion of the assessment area located north of the hill complex. The majority of these drainage lines/areas have their points of origin within the localised catchments of the hill complex and are all therefore ephemeral in nature.

The four most westerly located significant water drainage lines commence separately from the hill complex as deep erosion gullies with distinct woody riparian components and then eventually combine within the grassland area and flow towards the Gariep Dam. The woody riparian components are mainly dominated by shrubs and small tree individuals of the species *Searsia burchellii*, *S. ciliata*, *Osyris lanceolata*, *Diospyros lycioides*, *Melanthus comosus* & *Vachellia karroo*.

The other two significant water drainage areas located in the south-eastern portion of the assessment area as well as the three significant drainage lines within the small portion located north of the hill complex, possess no distinct riparian components.

All of these significant drainage lines/areas flow through the grassland areas and channel and eventually discharge significant volumes of surface water runoff into the two dams. They are therefore viewed as playing an important role in the local and regional water catchment and drainage. It is therefore recommended that all of these drainage lines/areas should be adequately buffered out of the proposed development footprint area. A minimum approximately 40 m buffer must be placed around all of these drainage lines/areas and no development is allowed to take place within the buffered zones. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the drainage lines/areas.

The two smaller water drainage lines also possess no distinct riparian component and they both eventually dissipate into the surrounding grassland within the assessment area. They are therefore not necessarily viewed as playing an important role in the local and regional water catchment.

See photographs below.



Figure 9: Three images illustrating examples of the four most westerly located significant ephemeral water drainage lines which traverse the assessment area, along with their associated distinct woody riparian components



Figure 10: Image illustrating an example of the other five significant water drainage lines/areas which traverse the assessment area but possess no distinct riparian components



Figure 11: Image illustrating an example of the two smaller ephemeral water drainage lines which traverse the assessment area but possess no distinct riparian components and eventually dissipate into the surrounding grassland

8.4.2. Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The Present Ecological State (PES) of the majority of the significant water drainage lines which traverse the assessment area is classified as Class B as they are largely natural. A small change in natural habitats and biota may have taken place due to continued farm management practices, but the ecosystem functionality has remained essentially unchanged.

The Present Ecological State (PES) of the two significant water drainage areas located within the south-eastern portion of the assessment area is classified as Class C as they are moderately modified. Moderate loss and transformation of natural habitat and biota have occurred due to continued overgrazing by livestock from the surrounding local communities taking place, but the basic ecosystem functionality has still remained predominantly unchanged.

The Ecological Importance and Sensitivity (EIS) of all the significant water drainage lines/areas is classified as Class C (moderate) as they are viewed as being ecologically important and sensitive on local or possibly provincial scale mainly due to them channelling and eventually discharging significant volumes of surface water runoff into the Gariep and Bethulie Dams. They are therefore viewed as playing an important role in the local and regional water catchment and drainage.

The significant water drainage lines/areas are therefore viewed as being of moderate conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type as well as the local and regional water catchment and drainage.

It is therefore recommended that all of these significant drainage lines/areas should be adequately buffered out of the proposed development footprint area. A minimum approximately 40 m buffer must be placed around all of these drainage lines/areas and no development is allowed to take place within the buffered zones. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the drainage lines/areas.

It is further recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. This is required in order to ensure continued ecological connectivity between the different ecological components within the assessment area and broader surrounding landscape and subsequently allow for continued movement of faunal and floral species. The western portion of the assessment area starting from the second significant water drainage line, should be buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.

8.5. Ecological Site Sensitivity Map

The first site sensitivity map below illustrates the recommended hill complex buffers, the slight to moderately overgrazed area, the boundary of the Gariep Nature Reserve, the locations of the various water drainage lines/areas and provincially protected species individuals.

The second site sensitivity map below illustrates the potentially suitable development areas.

It must however be kept in mind that this ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

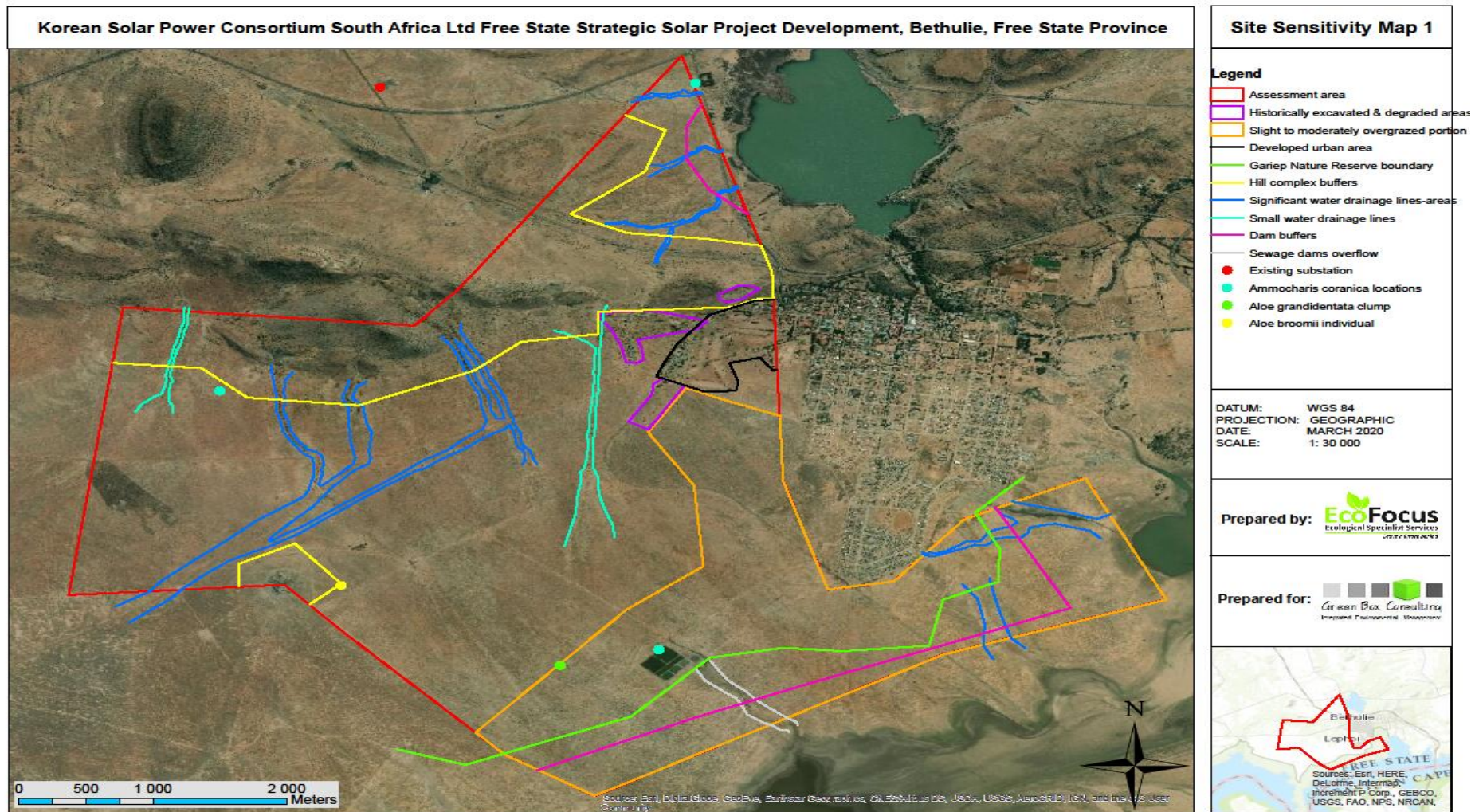


Figure 12: Site sensitivity map illustrating the recommended hill complex buffers, the slight to moderately overgrazed area, the boundary of the Gariep Nature Reserve, the locations of the various water drainage lines/areas and provincially protected species individuals (see A3 sized map in the Appendices)

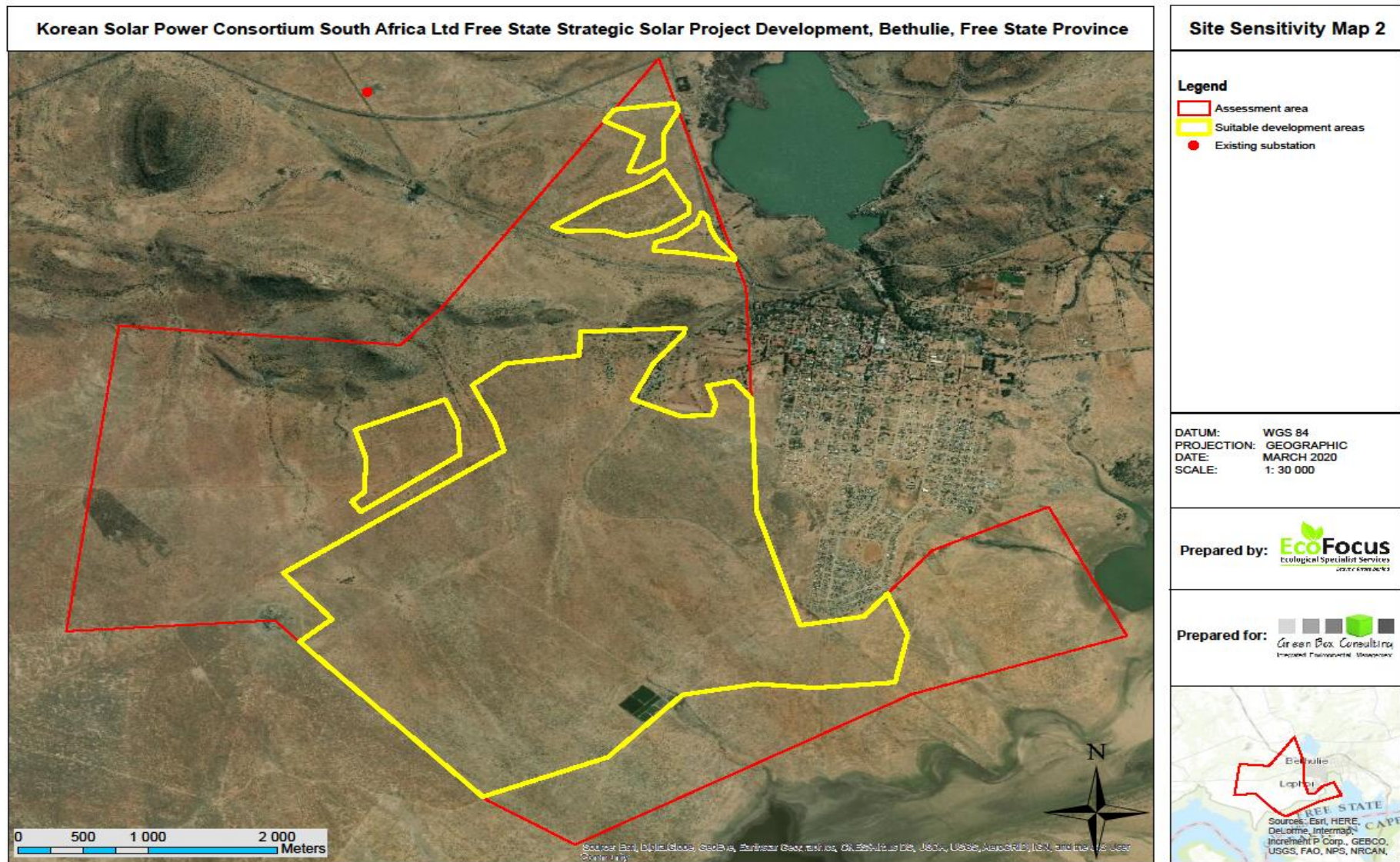


Figure 13: Site sensitivity map illustrating the potentially suitable development areas (see A3 sized map in the Appendices)

8.6. Species List for the Assessment Area

Table 5: Species list for the assessment area (Provincially protected species highlighted in yellow; Legally declared invasive species highlighted in pink)

Graminoids	Forbs	Shrubs & trees
<i>Aristida adscensionis</i>	<i>Aloe broomii</i>	<i>Asparagus spp.</i>
<i>Aristida spp.</i>	<i>Aloe grandidentata</i>	<i>Diospyros lycioides</i>
<i>Chloris virgata</i>	<i>Ammocharis coranica</i>	<i>Eriocephalus ericoides</i>
<i>Cymbopogon pospischilii</i>	<i>Aptosimum procumbens</i>	<i>Eriocephalus spinescens</i>
<i>Cynodon incompletes</i>	<i>Argemone mexicana</i>	<i>Euryops sp.</i>
<i>Cyperus spp.</i>	<i>Berkheya radula</i>	<i>Felicia filifolia</i>
<i>Digitaria spp.</i>	<i>Blepharis mitrata</i>	<i>Felicia sp.</i>
<i>Eragrostis chloromelas</i>	<i>Bulbine abyssinica</i>	<i>Lycium cinereum</i>
<i>Eragrostis curvula</i>	<i>Bulbine narcissifolia</i>	<i>Melianthus comosus</i>
<i>Eragrostis lehmanniana</i>	<i>Chlorophytum fasciculatum</i>	<i>Osteospermum leptolobum</i>
<i>Eragrostis obtusa</i>	<i>Cirsium vulgare</i>	<i>Osyris lanceolata</i>
<i>Fingerhuthia africana</i>	<i>Commelina africana</i>	<i>Pentzia spp.</i>
<i>Heteropogon contortus</i>	<i>Datura stramonium</i>	<i>Phaeoptilum spinosum</i>
<i>Panicum coloratum</i>	<i>Dimorphotheca caulescens</i>	<i>Roepera incrustata</i>
<i>Setaria spp.</i>	<i>Eriospermum cooperi</i>	<i>Salsola spp.</i>
<i>Sporobolus africanus</i>	<i>Geigeria ornativa</i>	<i>Searsia burchellii</i>
<i>Themeda triandra</i>	<i>Gisekia pharnaceoides</i>	<i>Searsia ciliata</i>
<i>Trachus berteronianus</i>	<i>Hermannia depressa</i>	<i>Selago geniculata</i>
-	<i>Hibiscus marlothianus</i>	<i>Selago saxatilis</i>
-	<i>Hibiscus trionum</i>	<i>Vachellia karroo</i>
-	<i>Iris sp.</i>	-
-	<i>Jamesbrittenia aurantiaca</i>	-
-	<i>Ledebouria luteola</i>	-
-	<i>Oxalis obliquifolia</i>	-
-	<i>Phyla nodiflora</i>	-
-	<i>Ruschia hamata</i>	-
-	<i>Salvia runcinata</i>	-
-	<i>Stachys rugosa</i>	-
-	<i>Tribulus terrestris</i>	-

9. Ecological Impact Assessment

The following section identifies the potential ecological impacts (both positive and negative) which the proposed development will have on the surrounding environment.

Once the potential ecological impacts are identified, they are assessed by rating their Environmental Risk after which the final Environmental Significance is calculated and rated for each identified ecological impact.

The same Environmental Risk rating process is then followed for each ecological impact to determine the Environmental Significance if the recommended mitigation measures were to be implemented.

The objective of this section is therefore firstly to identify all the potential ecological impacts of the proposed development and secondly to determine the significance of the impacts and how effective the recommended mitigation measures will be able to reduce their significance. The potential ecological impacts which are still rated as highly significant, even after implementation of mitigations, can then be identified in order to specifically focus on implement of effective management strategies for them.

9.1. Construction Phase

Transformation of vegetation on the assessment area associated with the Xhariep Karroid Grassland vegetation type (Gh 3)

The relevant vegetation type is classified as least concerned (SANBI, 2006-2019). The majority of the assessment area constitutes slightly sloping homogenous terrestrial grassland associated with the relevant vegetation type. The southern and south-eastern portions of the assessment area surrounding the Gariep Dam however constitute a transitional zone from the terrestrial grassland to a more aquatic grassland habitat.

The entire central and western portions of the terrestrial grassland are in a natural condition and mainly constitute medium height dense grassland with small open dwarf karroid shrub patches being sparsely scattered throughout. These areas scored a relatively high PES value.

The entire southern and south-eastern portions of the assessment area which are associated with the terrestrial grassland and specifically the transitional zone towards the aquatic grassland habitat surrounding the Gariep Dam, are in a slight to moderately degraded state. This is mainly due to

continued overgrazing by livestock from the surrounding local communities taking place. These areas scored a moderate PES value.

The proposed solar power development will in all probability completely transform the majority of the existing natural surface vegetation on the portion of the assessment area used for the development.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Transformation of vegetation on the assessment area associated with the Besemkaree Koppies Shrubland vegetation type (Gh 4)

The relevant vegetation type is classified as least concerned (SANBI, 2006-2019). A significantly sized hill complex associated with the relevant vegetation type, traverses the northern portion of the assessment area while another small solitary hill is also present on the western boundary of the assessment area.

The significantly sized hill complex is in a pristine natural state. The small solitary hill is also in a natural state although farm tracks for vehicles are evident on and around the hill. The hill complex scored a high PES value and the small solitary hill scored a relatively high PES value.

This hill complex and small solitary hill possess locally unique and distinct habitat attributes within the broader grassland landscape and it is reasonably expected that these areas are utilised by a wide variety of common and specialised bird species, small antelope, reptile species (snakes and lizards) as well as burrowing and predatory mammals as refuge and for breeding, foraging and persistence purposes.

The proposed solar power development will in all probability completely transform the majority of the existing natural surface vegetation on the portion of the assessment area used for the development.

The proposed transmission line will traverse the significantly sized hill complex and will tie into the existing Eskom substation situated approximately 1.5 km to the north of the assessment area.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Transformation of an Ecological Support Area (ESA) associated with the assessment area

The majority of the assessment area falls within an Ecological Support Area one (ESA 1) in accordance with the Free State Provincial Spatial Biodiversity Plan 2017, which sets out biodiversity priority areas in the province. The most easterly portion falls within an Ecological Support Area two (ESA 2).

The different portions of the assessment area all scored moderate to high EIS values and are therefore viewed as being of moderate to high conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA, IBA and subsequent important aquatic habitat, the local and regional water catchment and drainage as well as important breeding, foraging and persistence habitat for various faunal and avifaunal species.

The proposed solar power development will in all probability completely transform the majority of the existing natural surface vegetation on the portion of the assessment area used for the development.

The proposed transmission line will traverse the significantly sized hill complex and will tie into the existing Eskom substation situated approximately 1.5 km to the north of the assessment area.

The significance of this potential impact will be medium-high.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Transformation of the Gariep Nature Reserve associated with the southern and south-eastern portions of the assessment area

The entire southern and south-eastern portions of the assessment area which are associated with the terrestrial grassland and specifically the transitional zone towards the aquatic grassland habitat surrounding the Gariep Dam, are in a slight to moderately degraded state. This is mainly due to continued overgrazing by livestock from the surrounding local communities taking place. These areas scored a moderate PES value.

The entire southern and south-eastern portions of the assessment area fall within the boundary of the Gariep Nature Reserve, which is a formally declared protected area in accordance with the Free

State Provincial Spatial Biodiversity Plan 2017 and the Protected Areas Register of the National Department of Environmental Affairs.

The entire Gariep Dam to the south also falls within an Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>). The Gariep Dam and the associated aquatic grassland surrounding the Dam therefore support an important aquatic habitat which is likely utilised by a wide variety of specialised waterbirds, amphibian species and aquatic invertebrates for breeding, foraging and persistence purposes.

This area scored a relatively high EIS value and is therefore viewed as being of moderate to high conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, the formally declared protected Gariep Nature Reserve as well as the IBA and subsequent important aquatic habitat.

The proposed solar power development will in all probability completely transform the majority of the existing natural surface vegetation on the portion of the assessment area used for the development.

The significance of this potential impact will be medium-high.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment area

Clumps/individuals of the provincially protected species *Ammocharis coranica* were found to be present at three separate locations within the terrestrial grassland areas. Merely a single clump of the provincially protected species *Aloe grandidentata* and a single individual of the provincially protected species *Aloe broomii* were found to be present within the terrestrial grassland areas.

A single individual of the near threatened Red Data Listed bird species *Sagittarius serpentarius* (Secretary Bird) was however found to be foraging within the open grassland landscape. It is expected that the natural terrestrial grassland will likely be utilised by more individuals of this important bird species for breeding, foraging and persistence purposes.

No other Red Data Listed species or any other species of conservational significance were found to be present within the assessment area. However, due to the natural state of the terrestrial grassland and hill complex, the area is utilised by a wide variety of common and specialised bird species, small antelope, reptile species (snakes and lizards) as well as burrowing and predatory mammals for breeding, foraging and persistence purposes.

The entire Gariep Dam to the south also falls within an Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>). The Gariep Dam and the associated aquatic grassland surrounding the Dam therefore support an important aquatic habitat which is likely utilised by a wide variety of specialised waterbirds, amphibian species and aquatic invertebrates for breeding, foraging and persistence purposes.

The proposed solar power development will in all probability completely transform the majority of the existing natural surface vegetation on the portion of the assessment area used for the development.

The proposed transmission line will traverse the significantly sized hill complex and will tie into the existing Eskom substation situated approximately 1.5 km to the north of the assessment area.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Terrestrial and aquatic alien invasive species establishment

No significant establishments of any alien invasive species were found to be present within the assessment area. Individuals of the legally declared invasive species *Cirsium vulgare*, *Argemone mexicana* and *Datura stramonium* (all Category 1b) were merely found to be sparsely present within the transitional zone and aquatic grassland habitat, which reiterates the degraded and overgrazed state of the areas.

The assessment area and surrounding areas could however potentially be prone to significant alien invasive species establishment due to surface disturbances caused by construction activities. The presence of the numerous water drainage lines/areas, the Gariep Dam to the south and the Bethulie

Dam to the east could further also potentially act as significant transport/distribution vectors for numerous terrestrial and aquatic invasive species into the broader region.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Surface material erosion

The majority of the assessment area constitutes slightly sloping terrestrial grassland. The inflow of the Orange River into the Gariep Dam is located approximately 300 m south of the assessment area and the majority of the assessment area therefore slopes in a southerly direction and forms part of the broad surface water catchment- and drainage area towards the Dam.

The small portion of the assessment area located north of the hill complex also constitutes slightly sloping terrestrial grassland. This area slopes in an easterly direction towards the Bethulie Dam which is located approximately 90 m to the east of the assessment area.

Due to the large size and sloping topography of the assessment area, the area could potentially be prone to significant soil erosion due to the loosening of surface materials and vegetation clearance caused by construction activities.

The significance of this potential impact will be low.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Dust generation and emissions

The initial soil preparation associated with the construction phase of the proposed development could potentially result in significant fugitive dust emissions due to vegetation clearance and movement of machinery and equipment. Generated dust could spread into- and contaminate the surrounding natural areas, the inflow of the Orange River into the Gariep Dam which is located approximately 300 m south of the assessment area as well as the Bethulie Dam which is located approximately 90 m to the east of the assessment area.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Impeding and contamination of the flow regimes of the water drainage lines/areas and the associated broad surface water catchment- and drainage area towards the Gariep and Bethulie Dams

The majority of the assessment area forms part of the broad surface water catchment- and drainage area towards the Gariep Dam to the south while only the small portion of the assessment area located north of the hill complex, slopes towards the Bethulie Dam to the east.

All of the significant water drainage lines/areas flow through the grassland areas and channel and eventually discharge significant volumes of surface water runoff into the two dams. They are therefore viewed as playing an important role in the local and regional water catchment and drainage.

The two smaller water drainage lines both eventually dissipate into the surrounding grassland within the assessment area. They are therefore not necessarily viewed as playing an important role in the local and regional water catchment.

The activities associated with the construction phase could potentially result in contamination and impeding of natural surface water flow towards the two dams due to artificial obstruction of flow during rainfall events and hydrocarbon or other chemical spills by construction machinery and equipment.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Over-utilisation of potable water during construction

The construction phase of the proposed development will require significant volumes of potable water to complete the process. In accordance with the information received from the EAP, the Kopanong Local Municipality has provided a letter of confirmation that they possess adequate capacity to provide the required volumes of water for both the construction and operational phases.

The significance of this potential impact will be zero.

Mitigation measures to reduce impacts are recommended under heading 9.4.

9.2. Operational Phase

Once the construction phase has been completed, the subsequent operational phase of the proposed development could also result in significant additional potential ecological impacts. A number of identified potential ecological impacts could also change in nature and increase in significance from the construction phase into the operational phase and will continue throughout the entire lifespan and operational phase of the proposed project. The following continued and additional potential ecological impacts could take place during the operational phase:

Continued terrestrial and aquatic alien invasive species establishment

The assessment area and surrounding areas could potentially be prone to continued significant alien invasive species establishment due to activities associated with the operational phase of the proposed development. The presence of the numerous water drainage lines/areas, the Gariep Dam to the south and the Bethulie Dam to the east could further also potentially continue to act as significant transport/distribution vectors for numerous terrestrial and aquatic invasive species into the broader region.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Continued surface material erosion

Due to the large size and sloping topography of the assessment area, the area could potentially be prone to continued significant soil erosion due to activities associated with the operational phase of the proposed development.

The significance of this potential impact will be low.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Continued dust generation and emissions

The assessment area could potentially be prone to continued significant fugitive dust emissions due to activities associated with the operational phase of the proposed development. Generated dust could continue to spread into- and contaminate the surrounding natural areas, the inflow of the Orange River into the Gariep Dam which is located approximately 300 m south of the assessment

area as well as the Bethulie Dam which is located approximately 90 m to the east of the assessment area.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4

Continued impeding of the flow regimes of the water drainage lines/areas and the associated broad surface water catchment- and drainage area towards the Gariep and Bethulie Dams

The established solar power generation facility could potentially continuously impede on the natural flow of the water drainage lines/areas and the associated broad surface water catchment- and drainage area towards the Gariep and Bethulie Dams, due to continued artificial obstruction of natural surface water flow during rainfall events.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Continued contamination of the water drainage lines/areas and the associated broad surface water catchment- and drainage area towards the Gariep and Bethulie Dams

Operations of the established solar power generation facility requires for the solar panels to be washed and cleaned on a regular basis. Various chemical products are used during the washing process. Washing of the panels could therefore potentially result in significant contamination of the natural flow of the water drainage lines/areas and the associated broad surface water catchment- and drainage area towards the Gariep and Bethulie Dams, due to the large volumes of chemical products being utilised.

The activities associated with the operational phase could also potentially result in contamination of natural surface water flow towards the two dams due to hydrocarbon or other chemical spills by operational machinery and equipment.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Over-utilisation of potable water during operations

The operational phase of the proposed development will require significant volumes of potable water to maintain the processes. In accordance with the information received from the EAP, the Kopanong Local Municipality has provided a letter of confirmation that they possess adequate capacity to provide the required volumes of water for both the construction and operational phases.

The significance of this potential impact will be zero.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Impeding of the ecological connectivity between the broader terrestrial and aquatic ecosystems

Operations of the established solar power generation facility could impede and fragment the ecological connectivity and functionality between the broader terrestrial and aquatic ecosystems. The recommended broad ecological corridor to be left undeveloped within the western portion of the assessment area, which will stretch from the hill complex, through the grassland towards the Gariep Dam, should however ensure continued ecological connectivity between the different ecological components within the assessment area and broader surrounding landscape and subsequently allow for continued movement of faunal and floral species.

The significance of this impact will be medium-high.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Impact of the established solar power generation facility and associated transmission line on Avifauna

It must be kept in mind that this ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

9.3. Cumulative Impacts

The proposed solar power development will in all probability completely transform the majority of the existing natural surface vegetation on the portion of the assessment area used for the development.

Transformation of the relevant Xhariep Karroid Grassland vegetation type (Gh 3), the Ecological Support Area (ESA), the Gariep Nature Reserve associated with the southern and south-eastern portions of the assessment area, impeding and contamination of the flow regimes of the water drainage lines/areas and the associated broad surface water catchment- and drainage area towards the Gariep and Bethulie Dams as well as the impeding of the ecological connectivity between the broader terrestrial and aquatic ecosystems, were identified and addressed as significant potential long term ecological impacts of the proposed development, which could cumulatively add to existing negative impacts caused by residential developments and agricultural management activities within the broader regional landscape.

It is however the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that all of these potential cumulative ecological impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels by implementation of the recommended mitigation measures.

It is therefore not anticipated that the proposed development will necessarily add any significant residual cumulative ecological impacts to the surrounding environment if all recommended mitigations measures as per this ecological report are adequately implemented and managed for both the construction and operational phases of the proposed development. All necessary authorisations, permits and licenses must also be obtained prior to any commencement.

It must however be kept in mind that this ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

Depending on the nature and magnitude of impacts identified during the Avifaunal Assessment, the avifaunal specialist must also advise on the potential necessity for the investigation and implementation of a suitable Biodiversity Offset as part of the NEMA Mitigation Hierarchy. If recommended by the Avifaunal Assessment Report, a comprehensive Biodiversity Offset Feasibility Assessment and Report would need to be conducted and compiled in order to identify and inform on potential areas of suitable size and similar ecological value, which could meaningfully contribute to the provincial and national biodiversity targets and conservation strategies. The proposed Biodiversity Offset Feasibility Assessment and Report will have to be evaluated by the relevant competent authorities in order to inform on their approval/rejection process.

9.4. Risk Ratings of Potential Impacts

The following section provides the Environmental Risk as well as the Environmental Significance Ratings for the potential ecological impacts for the proposed development both before and after implementation of the recommended mitigation measures.

9.4.1. Construction Phase

Table 6: Environmental Risk and Significance Ratings

	Assessment area	No go alternative
Identified Environmental Impact	Transformation of vegetation on the assessment area associated with the Xhariep Karroid Grassland vegetation type (Gh 3)	
Magnitude of Negative or Positive Impact	Medium (6)	-
Duration of Negative or Positive Impact	Long term (4)	-
Extent of Positive or Negative Impact	Local (2)	-
Irreplaceability of Natural Resources being impacted upon	Low (2)	-
Reversibility of Impact	Low (4)	-
Probability of Impact Occurrence	High (4)	-
Cumulative Impact Rating prior to mitigation	Medium	-
Environmental Significance Score and Rating prior to mitigation	Medium (72)	-

<p>Mitigation Measures to be implemented</p>	<p>The development construction footprint must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.</p> <p>No site construction basecamps may be established within the surrounding undeveloped areas outside the proposed development footprint.</p> <p>Adequately cordon off the proposed development construction footprint area and ensure that no construction activities, -machinery or -equipment operate or impact within the surrounding undeveloped areas outside the cordoned off area.</p> <p>Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern movement of machinery only within the proposed development construction footprint area and to ensure environmentally responsible construction practices and activities.</p> <p>Existing roads and farm tracks in close proximity to the proposed development construction footprint area must be used during the construction phase. No new temporary roads or tracks may be constructed or implemented within the surrounding undeveloped areas outside the proposed development footprint area.</p> <p>It is recommended that all of the significant drainage lines/areas should be adequately buffered out of the proposed development footprint area. A minimum approximately 40 m buffer must be placed around all of these drainage lines/areas and no development is allowed to take place within the buffered zones.</p>
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It is further recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. The western portion of the assessment area starting from the second significant water drainage line, should be buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.

Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction.

It must be kept in mind that this ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

Depending on the nature and magnitude of impacts identified during the Avifaunal Assessment, the avifaunal specialist must also advise on the potential necessity for the investigation and implementation of a suitable Biodiversity Offset as part of the NEMA Mitigation Hierarchy. If recommended by the Avifaunal Assessment Report, a comprehensive Biodiversity Offset Feasibility Assessment and Report would need to be conducted and compiled in order to identify and inform on potential areas of suitable size and similar ecological value, which could meaningfully contribute to the provincial and national biodiversity targets and conservation strategies. The proposed Biodiversity Offset Feasibility Assessment and Report will have to be evaluated by the relevant competent authorities in order to inform on their approval/rejection process.

	It is recommended that only the identified potentially suitable development areas be considered for the proposed development.	
Cumulative Impact Rating after mitigation implementation	Medium	-
Environmental Significance Score and Rating after mitigation implementation	Medium (60)	-
	Assessment area	No go alternative
Identified Environmental Impact	Transformation of vegetation on the assessment area associated with the Besemkaree Koppies Shrubland vegetation type (Gh 4)	
Magnitude of Negative or Positive Impact	Low (4)	-
Duration of Negative or Positive Impact	Long term (4)	-
Extent of Positive or Negative Impact	Local (2)	-
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	-
Reversibility of Impact	Low (4)	-

Probability of Impact Occurrence	Medium (3)	-
Cumulative Impact Rating prior to mitigation	Medium	-
Environmental Significance Score and Rating prior to mitigation	Medium (51)	-
Mitigation Measures to be implemented	<p>It is recommended that the hill complex and the small solitary hill should be adequately buffered out of the proposed development footprint area. A minimum approximately 200 m buffer must be placed around the hill complex and the small solitary hill and no development is allowed to take place within the buffered zones.</p> <p>It is further recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. The western portion of the assessment area starting from the second significant water drainage line, should be buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.</p> <p>It is imperative that the linear footprint of the proposed transmission line be kept as small and narrow as practicably possible and that the construction phase be completed as swiftly as practicably possible.</p> <p>The construction footprint over the hill complex must also be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be developed for this by a suitably qualified and experienced ecologist.</p>	

It must be kept in mind that this ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

Adequate measures must also be implemented to prevent significant bird collisions with the established transmission line during the operational phase. It is therefore recommended that a bird friendly transmission line and -tower design be opted for and that suitable bird diverters be installed along the entire length of the proposed transmission line in order to deter birds away from the transmission line.

The recommended avifaunal specialist must advise on potential bird friendly transmission line and -tower design options as well as on required specifications for bird diverters and distance spacing between diverters in the Avifaunal Assessment Report. Once the bird diverters have been installed, their integrity and functionality must be inspected and adequately maintained on a minimum annual basis.

Depending on the nature and magnitude of impacts identified during the Avifaunal Assessment, the avifaunal specialist must also advise on the potential necessity for the investigation and implementation of a suitable Biodiversity Offset as part of the NEMA Mitigation Hierarchy. If recommended by the Avifaunal Assessment Report, a comprehensive Biodiversity Offset Feasibility Assessment and Report would need to be conducted and compiled in order to identify and inform on potential areas of suitable size and similar ecological value, which could meaningfully contribute to the provincial and national biodiversity targets and conservation strategies. The proposed Biodiversity Offset Feasibility Assessment and Report will have to be evaluated by the relevant competent authorities in order to inform on their approval/rejection process.

	It is recommended that only the identified potentially suitable development areas be considered for the proposed development.	
Cumulative Impact Rating after mitigation implementation	Low	-
Environmental Significance Score and Rating after mitigation implementation	Low (28)	-
	Assessment area	No go alternative
Identified Environmental Impact	Transformation of an Ecological Support Area (ESA) associated with the assessment area	
Magnitude of Negative or Positive Impact	Medium (6)	-
Duration of Negative or Positive Impact	Long term (4)	-
Extent of Positive or Negative Impact	Regional (3)	-
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	-

Reversibility of Impact	Low (4)	-
Probability of Impact Occurrence	High (4)	-
Cumulative Impact Rating prior to mitigation	Medium-High	-
Environmental Significance Score and Rating prior to mitigation	Medium-High (80)	-
Mitigation Measures to be implemented	<p>The development construction footprint must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.</p> <p>No site construction basecamps may be established within the surrounding undeveloped areas outside the proposed development footprint.</p> <p>Adequately cordon off the proposed development construction footprint area and ensure that no construction activities, -machinery or -equipment operate or impact within the surrounding undeveloped areas outside the cordoned off area.</p> <p>Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern movement of machinery only within the proposed development construction footprint area and to ensure environmentally responsible construction practices and activities.</p> <p>Existing roads and farm tracks in close proximity to the proposed development construction footprint area must</p>	

be used during the construction phase. No new temporary roads or tracks may be constructed or implemented within the surrounding undeveloped areas outside the proposed development footprint area.

Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction.

It is recommended that all of the significant drainage lines/areas should be adequately buffered out of the proposed development footprint area. A minimum approximately 40 m buffer must be placed around all of these drainage lines/areas and no development is allowed to take place within the buffered zones.

It is recommended that the hill complex and the small solitary hill should be adequately buffered out of the proposed development footprint area. A minimum approximately 200 m buffer must be placed around the hill complex and the small solitary hill and no development is allowed to take place within the buffered zones.

It is further recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. The western portion of the assessment area starting from the second significant water drainage line, should be buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.

It is imperative that the linear footprint of the proposed transmission line be kept as small and narrow as practicably possible and that the construction phase be completed as swiftly as practicably possible.

The construction footprint over the hill complex must also be adequately rehabilitated as soon as practicably

possible after construction. A Rehabilitation Management Plan must be developed for this by a suitably qualified and experienced ecologist.

It must be kept in mind that this ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

Adequate measures must also be implemented to prevent significant bird collisions with the established transmission line during the operational phase. It is therefore recommended that a bird friendly transmission line and -tower design be opted for and that suitable bird diverters be installed along the entire length of the proposed transmission line in order to deter birds away from the transmission line.

The recommended avifaunal specialist must advise on potential bird friendly transmission line and -tower design options as well as on required specifications for bird diverters and distance spacing between diverters in the Avifaunal Assessment Report. Once the bird diverters have been installed, their integrity and functionality must be inspected and adequately maintained on a minimum annual basis.

Depending on the nature and magnitude of impacts identified during the Avifaunal Assessment, the avifaunal specialist must also advise on the potential necessity for the investigation and implementation of a suitable Biodiversity Offset as part of the NEMA Mitigation Hierarchy. If recommended by the Avifaunal Assessment Report, a comprehensive Biodiversity Offset Feasibility Assessment and Report would need to be conducted and compiled in order to identify and inform on potential areas of suitable size and similar ecological value, which could meaningfully contribute to the provincial and national biodiversity targets and conservation strategies. The proposed Biodiversity Offset Feasibility Assessment and Report will have to be evaluated by the relevant

	<p>competent authorities in order to inform on their approval/rejection process.</p> <p>It is recommended that only the identified potentially suitable development areas be considered for the proposed development.</p>	
Cumulative Impact Rating after mitigation implementation	Medium	-
Environmental Significance Score and Rating after mitigation implementation	Medium (51)	-
	Assessment area	No go alternative
Identified Environmental Impact	Transformation of the Gariep Nature Reserve associated with the southern and south-eastern portions of the assessment area	
Magnitude of Negative or Positive Impact	High (8)	-
Duration of Negative or Positive Impact	Long term (4)	-
Extent of Positive or Negative Impact	Regional (3)	-
Irreplaceability of Natural	High (4)	-

Resources being impacted upon		
Reversibility of Impact	Low (4)	-
Probability of Impact Occurrence	High (4)	-
Cumulative Impact Rating prior to mitigation	Medium-High	-
Environmental Significance Score and Rating prior to mitigation	Medium-High (92)	-
Mitigation Measures to be implemented	<p>Development within the nature reserve or IBA is not recommended and it is recommended that the final design layout footprint of the proposed development be placed outside the boundary of the nature reserve and IBA.</p> <p>It is recommended that all of the significant drainage lines/areas should be adequately buffered out of the proposed development footprint area. A minimum approximately 40 m buffer must be placed around all of these drainage lines/areas and no development is allowed to take place within the buffered zones.</p> <p>It is further recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. The western portion of the assessment area starting from the second significant water drainage line, should be buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.</p> <p>It must be kept in mind that this ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is</p>	

	<p>recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.</p> <p>It is recommended that only the identified potentially suitable development areas be considered for the proposed development.</p>	
Cumulative Impact Rating after mitigation implementation	Low	-
Environmental Significance Score and Rating after mitigation implementation	Low (36)	-
	Assessment area	No go alternative
Identified Environmental Impact	Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment area	
Magnitude of Negative or Positive Impact	Low (4)	-
Duration of Negative or Positive Impact	Long term (4)	-

Extent of Positive or Negative Impact	Local (2)	-
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	-
Reversibility of Impact	Low (4)	-
Probability of Impact Occurrence	Medium (3)	-
Cumulative Impact Rating prior to mitigation	Medium	-
Environmental Significance Score and Rating prior to mitigation	Medium (51)	-
Mitigation Measures to be implemented	<p>If any individuals of the identified provincially protected species <i>Ammocharis coranica</i>, <i>Aloe grandidentata</i> & <i>Aloe broomii</i> fall within the final design layout footprint of the proposed development (which is highly likely), it is recommended that they be removed and adequately relocated to a suitable and similar area as to where they were removed from. This removal and relocation process must be completed prior to the commencement of any vegetation clearance- or construction activities.</p> <p>A Provincial Flora Permit has to be obtained from the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTE) prior to the commencement of any such removal and relocation activities.</p> <p>The development construction footprint must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding</p>	

	<p>areas may take place.</p> <p>No site construction basecamps may be established within the surrounding undeveloped areas outside the proposed development footprint.</p> <p>Adequately cordon off the proposed development construction footprint area and ensure that no construction activities, -machinery or -equipment operate or impact within the surrounding undeveloped areas outside the cordoned off area.</p> <p>Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern movement of machinery only within the proposed development construction footprint area and to ensure environmentally responsible construction practices and activities.</p> <p>Existing roads and farm tracks in close proximity to the proposed development construction footprint area must be used during the construction phase. No new temporary roads or tracks may be constructed or implemented within the surrounding undeveloped areas outside the proposed development footprint area.</p> <p>It is recommended that the hill complex and the small solitary hill should be adequately buffered out of the proposed development footprint area. A minimum approximately 200 m buffer must be placed around the hill complex and the small solitary hill and no development is allowed to take place within the buffered zones.</p> <p>It is further recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. The western portion of the assessment area starting from the second significant water drainage line, should be</p>
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buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.

It is imperative that the linear footprint of the proposed transmission line be kept as small and narrow as practicably possible and that the construction phase be completed as swiftly as practicably possible.

The construction footprint over the hill complex must also be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be developed for this by a suitably qualified and experienced ecologist.

It must be kept in mind that this ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

Adequate measures must also be implemented to prevent significant bird collisions with the established transmission line during the operational phase. It is therefore recommended that a bird friendly transmission line and -tower design be opted for and that suitable bird diverters be installed along the entire length of the proposed transmission line in order to deter birds away from the transmission line.

The recommended avifaunal specialist must advise on potential bird friendly transmission line and -tower design options as well as on required specifications for bird diverters and distance spacing between diverters in the Avifaunal Assessment Report. Once the bird diverters have been installed, their integrity and functionality must

	<p>be inspected and adequately maintained on a minimum annual basis.</p> <p>Depending on the nature and magnitude of impacts identified during the Avifaunal Assessment, the avifaunal specialist must also advise on the potential necessity for the investigation and implementation of a suitable Biodiversity Offset as part of the NEMA Mitigation Hierarchy. If recommended by the Avifaunal Assessment Report, a comprehensive Biodiversity Offset Feasibility Assessment and Report would need to be conducted and compiled in order to identify and inform on potential areas of suitable size and similar ecological value, which could meaningfully contribute to the provincial and national biodiversity targets and conservation strategies. The proposed Biodiversity Offset Feasibility Assessment and Report will have to be evaluated by the relevant competent authorities in order to inform on their approval/rejection process.</p> <p>It is recommended that only the identified potentially suitable development areas be considered for the proposed development.</p>	
Cumulative Impact Rating after mitigation implementation	Low	-
Environmental Significance Score and Rating after mitigation implementation	Low (32)	-

	Assessment area	No go alternative
Identified Environmental Impact	Terrestrial and aquatic alien invasive species establishment	
Magnitude of Negative or Positive Impact	Low (4)	-
Duration of Negative or Positive Impact	Short term (2)	-
Extent of Positive or Negative Impact	Regional (3)	-
Irreplaceability of Natural Resources being impacted upon	Low (2)	-
Reversibility of Impact	High (2)	-
Probability of Impact Occurrence	High (4)	-
Cumulative Impact Rating prior to mitigation	Medium	-
Environmental Significance Score and Rating prior to mitigation	Medium (52)	-
Mitigation Measures to be implemented	All the identified alien invasive species individuals must be actively eradicated from the assessment area and adequately disposed of in accordance with the National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014.	

	<p>Implement an adequate Alien Invasive Species Establishment Management and Prevention Plan during the construction and operational phases. Such a management plan must be compiled by a suitably qualified and experienced ecologist.</p> <p>Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction in order to prevent significant alien invasive species establishment.</p>	
Cumulative Impact Rating after mitigation implementation	Low	-
Environmental Significance Score and Rating after mitigation implementation	Low (18)	-
	Assessment area	No go alternative
Identified Environmental Impact	Surface material erosion	
Magnitude of Negative or Positive Impact	Low (4)	-
Duration of Negative or Positive Impact	Short term (2)	-

Extent of Positive or Negative Impact	Local (2)	-
Irreplaceability of Natural Resources being impacted upon	Low (2)	-
Reversibility of Impact	High (2)	-
Probability of Impact Occurrence	Medium (3)	-
Cumulative Impact Rating prior to mitigation	Low	-
Environmental Significance Score and Rating prior to mitigation	Low (36)	-
Mitigation Measures to be implemented	<p>Implement an adequate Erosion and Stormwater Management Plan during the construction and operational phases in order to prevent any significant soil erosion in and around the assessment area.</p> <p>Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction in order to prevent significant erosion from occurring.</p> <p>It is recommended that all of the significant drainage lines/areas should be adequately buffered out of the proposed development footprint area. A minimum approximately 40 m buffer must be placed around all of these drainage lines/areas and no development is allowed to take place within the buffered zones.</p>	

Cumulative Impact Rating after mitigation implementation	Low	-
Environmental Significance Score and Rating after mitigation implementation	Low (18)	-
	Assessment area	No go alternative
Identified Environmental Impact	Dust generation and emissions	
Magnitude of Negative or Positive Impact	Low (4)	-
Duration of Negative or Positive Impact	Short term (2)	-
Extent of Positive or Negative Impact	Local (2)	-
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	-
Reversibility of Impact	High (2)	-
Probability of Impact Occurrence	High (4)	-

Cumulative Impact Rating prior to mitigation	Medium	-
Environmental Significance Score and Rating prior to mitigation	Medium (52)	-
Mitigation Measures to be implemented	<p>Implement suitable dust management and prevention measures during the construction and operational phases of the proposed development.</p> <p>Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction in order to prevent significant dust emissions.</p>	
Cumulative Impact Rating after mitigation implementation	Low	-
Environmental Significance Score and Rating after mitigation implementation	Low (20)	-
	Assessment area	No go alternative
Identified Environmental Impact	Impeding and contamination of the flow regimes of the water drainage lines/areas and the associated broad surface water catchment- and drainage area towards the Gariep and Bethulie Dams	
Magnitude of Negative or Positive Impact	Medium (6)	-

Duration of Negative or Positive Impact	Short term (2)	-
Extent of Positive or Negative Impact	Regional (3)	-
Irreplaceability of Natural Resources being impacted upon	High (4)	-
Reversibility of Impact	High (2)	-
Probability of Impact Occurrence	High (4)	-
Cumulative Impact Rating prior to mitigation	Medium	-
Environmental Significance Score and Rating prior to mitigation	Medium (68)	-
Mitigation Measures to be implemented	<p>Implement an adequate Erosion and Stormwater Management Plan during the construction and operational phases. This must be done to ensure and sufficiently manage storm water runoff as well as clean/dirty water separation towards the significant drainage lines/areas and two dams in order to ensure their continued flow and subsequent ecological functionality and –integrity.</p> <p>It is recommended that all of the significant drainage lines/areas should be adequately buffered out of the proposed development footprint area. A minimum approximately 40 m buffer must be placed around all of these drainage lines/areas and no development is allowed to take place within the buffered zones.</p>	

	<p>It is further recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. The western portion of the assessment area starting from the second significant water drainage line, should be buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.</p> <p>Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction.</p> <p>If hydrocarbons or other chemicals are to be stored on site during the construction phase, the storage areas must be situated as far away as practicably possible from the drainage lines/areas and the two dams.</p> <p>Hydrocarbon and other chemical storage areas must be adequately banded in order to be able to contain a minimum of 150 % of the capacity of storage tanks/units.</p> <p>Adequate hydrocarbon and other chemical storage, handling, usage and emergency spill procedures must be developed and all relevant construction personnel must be sufficient trained on- and apply these procedures during the entire construction phase.</p> <p>A Water Use License Application (WULA) must be submitted to the Department of Water and Sanitation in accordance with the National Water Act (Act 36 of 1998).</p> <p>A comprehensive South African Scoring System 5 (SASS 5) aquatic bio-monitoring assessment must be conducted of the inflow of the Orange River into the Gariep Dam as well as the Bethulie Dam directly downstream of the proposed development area prior to commencement of the construction phase. This information will serve as baseline watercourse health data to be used for subsequent monitoring assessments to be conducted. Such an</p>
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	<p>assessment must be conducted by a suitably qualified and experienced ecologist.</p> <p>Water samples of the inflow of the Orange River into the Gariep Dam as well as the Bethulie Dam must be collected directly downstream of the proposed development area prior to commencement of the construction phase. The quality of these samples must be chemically and biologically analysed by an accredited laboratory in order to serve as baseline water quality data to be used for subsequent monitoring assessments to be conducted.</p> <p>It is recommended that only the identified potentially suitable development areas be considered for the proposed development.</p>	
Cumulative Impact Rating after mitigation implementation	Low	-
Environmental Significance Score and Rating after mitigation implementation	Low (28)	-
	Assessment area	No go alternative
Identified Environmental Impact	Over-utilisation of potable water during construction	
Mitigation Measures to be implemented	Water saving initiatives must be implemented for the construction and operational phases of the proposed development.	

	<p>Environmentally responsible water use practices and activities must be adopted for the construction and operational phases of the proposed development.</p> <p>A Water Use License Application (WULA) must be submitted to the Department of Water and Sanitation in accordance with the National Water Act (Act 36 of 1998).</p> <p>Only the allotted water quantities as per the approved Water Use License are to be extracted.</p> <p>A flow meter is to be installed in order to enable monitoring and management water consumption.</p> <p>Water consumption figures must be submitted to the Department of Water and Sanitation (DWS) on a regular basis in order to ensure compliance with the allotted water quantities as per the approved Water Use License.</p>
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9.4.2. Operational Phase

Table 7: Environmental Risk and Significance Ratings

	Assessment area	No go alternative
Identified Environmental Impact	Continued terrestrial and aquatic alien invasive species establishment	
Magnitude of Negative or Positive Impact	Low (4)	-
Duration of Negative or Positive Impact	Medium term (3)	-
Extent of Positive or Negative Impact	Regional (3)	-
Irreplaceability of Natural Resources being impacted upon	Low (2)	-
Reversibility of Impact	High (2)	-
Probability of Impact Occurrence	High (4)	-
Cumulative Impact Rating prior to mitigation	Medium	-
Environmental Significance Score and Rating prior to mitigation	Medium (56)	-

Mitigation Measures to be implemented	<p>Implement an adequate Alien Invasive Species Establishment Management and Prevention Plan during the construction and operational phases. Such a management plan must be compiled by a suitably qualified and experienced ecologist.</p> <p>If all the recommended mitigations measures for the construction phase are adequately implemented and managed, it should prove sufficient in preventing any continued significant alien invasive species establishment in and around the assessment area.</p>	
Cumulative Impact Rating after mitigation implementation	Low	-
Environmental Significance Score and Rating after mitigation implementation	Low (20)	-
	Assessment area	No go alternative
Identified Environmental Impact	Continued surface material erosion	
Magnitude of Negative or Positive Impact	Low (4)	-
Duration of Negative or Positive Impact	Medium term (3)	-
Extent of Positive or Negative Impact	Local (2)	-

Irreplaceability of Natural Resources being impacted upon	Low (2)	-
Reversibility of Impact	High (2)	-
Probability of Impact Occurrence	Medium (3)	-
Cumulative Impact Rating prior to mitigation	Low	-
Environmental Significance Score and Rating prior to mitigation	Low (39)	-
Mitigation Measures to be implemented	<p>Implement an adequate Erosion and Stormwater Management Plan during the construction and operational phases in order to prevent any significant soil erosion in and around the assessment area.</p> <p>The proposed buffer zones around the significant drainage lines/areas and the entire western portion of the assessment area must be adequately maintained and no future development is allowed to take place within the buffered zones.</p> <p>If all the recommended mitigations measures for the construction phase are adequately implemented and managed, it should prove sufficient in preventing any continued significant soil erosion in and around the assessment area.</p>	
Cumulative Impact Rating after mitigation implementation	Low	-

Environmental Significance Score and Rating after mitigation implementation	Low (20)	-
	Assessment area	No go alternative
Identified Environmental Impact	Continued dust generation and emissions	
Magnitude of Negative or Positive Impact	Low (4)	-
Duration of Negative or Positive Impact	Medium term (3)	-
Extent of Positive or Negative Impact	Local (2)	-
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	-
Reversibility of Impact	High (2)	-
Probability of Impact Occurrence	High (4)	-
Cumulative Impact Rating prior to mitigation	Medium	-

Environmental Significance Score and Rating prior to mitigation	Medium (56)	-
Mitigation Measures to be implemented	<p>Implement suitable dust management and prevention measures during the construction and operational phases of the proposed development.</p> <p>If all the recommended mitigations measures for the construction phase are adequately implemented and managed, it should prove sufficient in preventing any continued significant fugitive dust generation and emissions into the surrounding natural areas.</p>	
Cumulative Impact Rating after mitigation implementation	Low	-
Environmental Significance Score and Rating after mitigation implementation	Low (22)	-
	Assessment area	No go alternative
Identified Environmental Impact	Continued impeding of the flow regimes of the water drainage lines/areas and the associated broad surface water catchment- and drainage area towards the Gariep and Bethulie Dams	
Magnitude of Negative or Positive Impact	Medium (6)	-
Duration of Negative or Positive Impact	Medium term (3)	-

Extent of Positive or Negative Impact	Regional (3)	-
Irreplaceability of Natural Resources being impacted upon	High (4)	-
Reversibility of Impact	High (2)	-
Probability of Impact Occurrence	High (4)	-
Cumulative Impact Rating prior to mitigation	Medium	-
Environmental Significance Score and Rating prior to mitigation	Medium (72)	-
Mitigation Measures to be implemented	<p>The proposed buffer zones around the significant drainage lines/areas and the entire western portion of the assessment area must be adequately maintained and no future development is allowed to take place within the buffered zones.</p> <p>If all the recommended mitigations measures for the construction phase are adequately implemented and managed, it should prove sufficient in preventing any continued impeding of- or significant impact on the water drainage lines/areas and the associated broad surface water catchment- and drainage area.</p>	
Cumulative Impact Rating after mitigation implementation	Low	-

Environmental Significance Score and Rating after mitigation implementation	Low (30)	-
	Assessment area	No go alternative
Identified Environmental Impact	Continued contamination of the water drainage lines/areas and the associated broad surface water catchment- and drainage area towards the Gariep and Bethulie Dams	
Magnitude of Negative or Positive Impact	Medium (6)	-
Duration of Negative or Positive Impact	Medium term (3)	-
Extent of Positive or Negative Impact	Regional (3)	-
Irreplaceability of Natural Resources being impacted upon	High (4)	-
Reversibility of Impact	High (2)	-
Probability of Impact Occurrence	High (4)	-
Cumulative Impact Rating prior to mitigation	Medium	-

Environmental Significance Score and Rating prior to mitigation	Medium (72)	-
Mitigation Measures to be implemented	<p>The proposed buffer zones around the significant drainage lines/areas and the entire western portion of the assessment area must be adequately maintained and no future development is allowed to take place within the buffered zones.</p> <p>Eco-friendly biodegradable chemical cleaning products should be opted for, for all cleaning processes during the operational phase.</p> <p>Implement an adequate Erosion and Stormwater Management Plan during the construction and operational phases. This must be done to ensure and sufficiently manage storm water runoff as well as clean/dirty water separation towards the significant drainage lines/areas and two dams in order to ensure their continued flow and subsequent ecological functionality and –integrity.</p> <p>Water saving initiatives must be implemented for the construction and operational phases of the proposed development.</p> <p>Environmentally responsible water use practices and activities must be adopted for the construction and operational phases of the proposed development.</p> <p>Only the allotted water quantities as per the approved Water Use License are to be extracted.</p>	

	<p>A flow meter is to be installed in order to enable monitoring and management water consumption.</p> <p>Water consumption figures must be submitted to the Department of Water and Sanitation (DWS) on a regular basis in order to ensure compliance with the allotted water quantities as per the approved Water Use License.</p> <p>If hydrocarbons or other chemicals are to be stored on site during the operational phase, the storage areas must be situated as far away as practicably possible from the drainage lines/areas and the two dams.</p> <p>Hydrocarbon and other chemical storage areas must be adequately bunded in order to be able to contain a minimum of 150 % of the capacity of storage tanks/units.</p> <p>Adequate hydrocarbon and other chemical storage, handling, usage and emergency spill procedures must be developed and all relevant operational personnel must be sufficient trained on- and apply these procedures during the entire operational phase.</p> <p>A comprehensive South African Scoring System 5 (SASS 5) aquatic bio-monitoring assessment must be conducted of the inflow of the Orange River into the Gariep Dam as well as the Bethulie Dam directly downstream of the proposed development area on a minimum annual basis in order to ensure that the ecological functionality and integrity of the dams are maintained. This information must then be compared to the baseline data collected during the initial assessment prior to the commencement of the construction phase. Such an assessment must be conducted by a suitably qualified and experienced ecologist.</p> <p>Water samples of the inflow of the Orange River into the Gariep Dam as well as the Bethulie Dam must be collected directly downstream of the proposed development area on a minimum annual basis. The quality of</p>
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	<p>these samples must be chemically and biologically analysed by an accredited laboratory and compared to the baseline data collected during the initial assessment prior to the commencement of the construction phase.</p> <p>If any reduction in SASS 5 scores (watercourse health) or chemical and biological water quality is determined due to the development, the competent authority must immediately be notified and the necessary steps must be followed by the applicant to locate and remediate the source of contamination/health reduction as soon as practicably possible.</p>	
Cumulative Impact Rating after mitigation implementation	Low	-
Environmental Significance Score and Rating after mitigation implementation	Low (30)	-
	Assessment area	No go alternative
Identified Environmental Impact	Over-utilisation of potable water during operations	
Mitigation Measures to be implemented	<p>Water saving initiatives must be implemented for the construction and operational phases of the proposed development.</p> <p>Environmentally responsible water use practices and activities must be adopted for the construction and operational phases of the proposed development.</p>	

	Only the allotted water quantities as per the approved Water Use License are to be extracted.	
	A flow meter is to be installed in order to enable monitoring and management water consumption.	
	Water consumption figures must be submitted to the Department of Water and Sanitation (DWS) on a regular basis in order to ensure compliance with the allotted water quantities as per the approved Water Use License.	
	Assessment area	No go alternative
Identified Environmental Impact	Impeding of the ecological connectivity between the broader terrestrial and aquatic ecosystems	
Magnitude of Negative or Positive Impact	Medium (6)	-
Duration of Negative or Positive Impact	Medium term (3)	-
Extent of Positive or Negative Impact	Regional (3)	-
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	-
Reversibility of Impact	Low (4)	-

Probability of Impact Occurrence	High (4)	-
Cumulative Impact Rating prior to mitigation	Medium-High	-
Environmental Significance Score and Rating prior to mitigation	Medium-High (76)	-
Mitigation Measures to be implemented	<p>The proposed buffer zones around the significant drainage lines/areas and the entire western portion of the assessment area must be adequately maintained and no future development is allowed to take place within the buffered zones.</p> <p>The proposed buffer zones around the hill complex and the small solitary hill must be adequately maintained and no future development is allowed to take place within the buffered zones.</p> <p>Development within the nature reserve or IBA is not recommended and it is recommended that the final design layout footprint of the proposed development be placed outside the boundary of the nature reserve and IBA.</p> <p>If all the recommended mitigations measures for the construction phase are adequately implemented and managed, it should prove sufficient in preventing any continued significant soil erosion in and around the assessment area.</p>	
Cumulative Impact Rating after mitigation implementation	Low	-

Environmental Significance Score and Rating after mitigation implementation	Low (32)	-
	Assessment area	No go alternative
Identified Environmental Impact	Impact of the established solar power generation facility and associated transmission line on Avifauna	
Mitigation Measures to be implemented	<p>It must be kept in mind that this ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.</p> <p>Adequate measures must also be implemented to prevent significant bird collisions with the established transmission line during the operational phase. It is therefore recommended that a bird friendly transmission line and -tower design be opted for and that suitable bird diverters be installed along the entire length of the proposed transmission line in order to deter birds away from the transmission line.</p> <p>The recommended avifaunal specialist must advise on potential bird friendly transmission line and -tower design options as well as on required specifications for bird diverters and distance spacing between diverters in the Avifaunal Assessment Report. Once the bird diverters have been installed, their integrity and functionality must be inspected and adequately maintained on a minimum annual basis.</p>	

	<p>Depending on the nature and magnitude of impacts identified during the Avifaunal Assessment, the avifaunal specialist must also advise on the potential necessity for the investigation and implementation of a suitable Biodiversity Offset as part of the NEMA Mitigation Hierarchy. If recommended by the Avifaunal Assessment Report, a comprehensive Biodiversity Offset Feasibility Assessment and Report would need to be conducted and compiled in order to identify and inform on potential areas of suitable size and similar ecological value, which could meaningfully contribute to the provincial and national biodiversity targets and conservation strategies. The proposed Biodiversity Offset Feasibility Assessment and Report will have to be evaluated by the relevant competent authorities in order to inform on their approval/rejection process.</p>
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10. Summary and Conclusion

The proposed solar power development will in all probability completely transform the majority of the existing natural surface vegetation on the portion of the assessment area used for the development.

Grassland

The majority of the assessment area constitutes slightly sloping homogenous terrestrial grassland associated with the Xhariep Karroid Grassland vegetation type (Gh 3). The southern and south-eastern portions of the assessment area surrounding the Gariep Dam however constitute a transitional zone from the terrestrial grassland to a more aquatic grassland habitat.

The entire central and western portions of the terrestrial grassland are in a natural condition and mainly constitute medium height dense grassland with small open dwarf karroid shrub patches being sparsely scattered throughout. These areas scored a relatively high PES value. Due to the natural state of the terrestrial grassland, the area is utilised by a wide variety of common and specialised bird species, small antelope as well as burrowing and predatory mammals for breeding, foraging and persistence purposes.

The entire southern and south-eastern portions of the assessment area which are associated with the terrestrial grassland and specifically the transitional zone towards the aquatic grassland habitat surrounding the Gariep Dam, are in a slight to moderately degraded state. This is mainly due to continued overgrazing by livestock from the surrounding local communities taking place. The grass layer is significantly sparser in these areas relative to the more natural central and western portions of the assessment area. The presence and size of open dwarf karroid shrub patches and subsequent dominance of dwarf karroid shrub species are also significantly increased as a result of the impacts of continued overgrazing. These areas scored a moderate PES value.

Hill Complex

A significantly sized hill complex associated with the Besemkaree Koppies Shrubland vegetation type (Gh 4), traverses the northern portion of the assessment area while another small solitary hill is also present on the western boundary of the assessment area. The proposed transmission line will traverse the significantly sized hill complex and will tie into the existing Eskom substation situated approximately 1.5 km to the north of the assessment area.

The significantly sized hill complex is in a pristine natural state. The small solitary hill is also in a natural state although farm tracks for vehicles are evident on and around the hill. The hill complex scored a high PES value and the small solitary hill scored a relatively high PES value.

This hill complex and small solitary hill possess locally unique and distinct habitat attributes within the broader grassland landscape and it is reasonably expected that these areas are utilised by a wide variety of common and specialised bird species, small antelope, reptile species (snakes and lizards) as well as burrowing and predatory mammals as refuge and for breeding, foraging and persistence purposes.

The hill complex and small solitary hill scored a relatively high EIS value and are therefore viewed as being of moderate conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type as well as the locally unique and distinct important breeding, foraging and persistence habitat for various faunal and avifaunal species.

It is therefore recommended that the hill complex and the small solitary hill should be adequately buffered out of the proposed development footprint area. A minimum approximately 200 m buffer must be placed around the hill complex and the small solitary hill and no development is allowed to take place within the buffered zones. This must be done in order to ensure the continued ecological functionality and -integrity of the hill complex and the small solitary hill.

It is further recommended that a broad ecological corridor be left undeveloped within the western portion of the assessment area which must stretch from the hill complex, through the grassland towards the Gariep Dam. This is required in order to ensure continued ecological connectivity between the different ecological components within the assessment area and broader surrounding landscape and subsequently allow for continued movement of faunal and floral species. The western portion of the assessment area starting from the second significant water drainage line, should be buffered out of the proposed development footprint and no development is allowed to take place within the buffered zone.

Water drainage lines

The majority of the assessment area forms part of the broad surface water catchment- and drainage area towards the Gariep Dam to the south while only the small portion of the assessment area located north of the hill complex, slopes towards the Bethulie Dam to the east.

Six significant first order water drainage lines/areas as well as two smaller water drainage lines traverse the majority portion of the assessment area while three significant water drainage lines also traverse the small portion of the assessment area located north of the hill complex. The majority of these drainage lines/areas have their points of origin within the localised catchments of the hill complex and are all therefore ephemeral in nature.

The four most westerly located significant water drainage lines commence separately from the hill complex as deep erosion gullies with district woody riparian components and then eventually combine within the grassland area and flow towards the Gariep Dam.

The other two significant water drainage areas located in the south-eastern portion of the assessment area as well as the three significant drainage lines within the small portion located north of the hill complex, possess no distinct riparian components.

All of these significant drainage lines/areas flow through the grassland areas and channel and eventually discharge significant volumes of surface water runoff into the two dams. They are therefore viewed as playing an important role in the local and regional water catchment and drainage.

These significant water drainage lines/areas are therefore viewed as being of moderate conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type as well as the local and regional water catchment and drainage.

It is therefore recommended that all of these drainage lines/areas should be adequately buffered out of the proposed development footprint area. A minimum approximately 40 m buffer must be placed around all of these drainage lines/areas and no development is allowed to take place within the buffered zones. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the drainage lines/areas.

The two smaller water drainage lines possess no distinct riparian component and they both eventually dissipate into the surrounding grassland within the assessment area. They are therefore not necessarily viewed as playing an important role in the local and regional water catchment.

Ecological Support Area and Formally Protected Area

The majority of the assessment area falls within an Ecological Support Area one (ESA 1) in accordance with the Free State Provincial Spatial Biodiversity Plan 2017, which sets out biodiversity priority areas in the province. The most easterly portion falls within an Ecological Support Area two (ESA 2).

The entire southern and south-eastern portions of the assessment area fall within the boundary of the Gariep Nature Reserve, which is a formally declared protected area in accordance with the Free State Provincial Spatial Biodiversity Plan 2017 and the Protected Areas Register of the National Department of Environmental Affairs.

The entire Gariep Dam to the south also falls within an Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>). The Gariep Dam and the associated aquatic grassland surrounding the Dam therefore support an important aquatic habitat which is likely utilised by a wide variety of specialised waterbirds, amphibian species and aquatic invertebrates for breeding, foraging and persistence purposes.

This transitional zone and aquatic grassland habitat scored a relatively high EIS value and is therefore viewed as being of moderate to high conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, the formally declared protected Gariep Nature Reserve as well as the IBA and subsequent important aquatic habitat.

Development within the nature reserve or IBA is therefore not recommended and it is recommended that the final design layout footprint of the proposed development be placed outside the boundary of the nature reserve and IBA.

Red Data Listed and Protected Species

Clumps/individuals of the provincially protected species *Ammocharis coranica* were found to be present at three separate locations within the terrestrial grassland areas. Merely a single clump of the provincially protected species *Aloe grandidentata* and a single individual of the provincially protected species *Aloe broomii* were found to be present within the terrestrial grassland areas.

If any of these individuals fall within the final design layout footprint of the proposed development (which is highly likely), it is recommended that they be removed and adequately relocated to a suitable and similar area as to where they were removed from. This removal and relocation process must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained from the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTE) prior to the commencement of any such removal and relocation activities.

A single individual of the near threatened Red Data Listed bird species *Sagittarius serpentarius* (Secretary Bird) was also found to be foraging within the open grassland landscape. It is expected that the natural terrestrial grassland will likely be utilised by more individuals of this important bird species for breeding, foraging and persistence purposes.

No other Red Data Listed species or any other species of conservational significance were found to be present within the assessment area.

Conclusion

The following activities were identified and addressed as significant potential long term ecological impacts of the proposed development, which could cumulatively add to existing negative impacts caused by residential developments and agricultural management activities within the broader regional landscape:

- Transformation of the relevant Xhariep Karroid Grassland vegetation type (Gh 3)
- Transformation of the Ecological Support Area (ESA)
- Transformation of the Gariep Nature Reserve associated with the southern and south-eastern portions of the assessment area
- Impeding and contamination of the flow regimes of the water drainage lines/areas and the associated broad surface water catchment- and drainage area towards the Gariep and Bethulie Dams

- Impeding of the ecological connectivity between the broader terrestrial and aquatic ecosystems

It is however the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that all of these potential ecological impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels by implementation of the recommended mitigation measures. It is however recommended that only the identified potentially suitable development areas be considered for the proposed development.

The project should therefore be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigations measures as per this ecological report must however be adequately implemented and managed for the construction- and subsequent operational phase. All necessary authorisations, permits and licenses must also be obtained prior to the commencement of any construction.

It must however be kept in mind that this ecological assessment does not include an avifaunal assessment. Due to the nature and magnitude of the potential impacts of the proposed solar power development on avifauna, it is recommended that an avifaunal specialist must be appointed to conduct a separate Avifaunal Assessment. This assessment must specifically determine the potential impacts of the proposed development on avifauna in the area and provide recommendations regarding the suitability of the proposed development area and adequate buffers to be placed around the IBA.

The recommended avifaunal specialist must also advise on potential bird friendly transmission line and -tower design options as well as on required specifications for bird diverters and distance spacing between diverters along the entire length of the proposed transmission line in order to prevent significant bird collisions.

Depending on the nature and magnitude of impacts identified during the Avifaunal Assessment, the avifaunal specialist must also advise on the potential necessity for the investigation and implementation of a suitable Biodiversity Offset as part of the NEMA Mitigation Hierarchy. If recommended by the Avifaunal Assessment Report, a comprehensive Biodiversity Offset Feasibility Assessment and Report would need to be conducted and compiled in order to identify and inform on potential areas of suitable size and similar ecological value, which could

meaningfully contribute to the provincial and national biodiversity targets and conservation strategies. The proposed Biodiversity Offset Feasibility Assessment and Report will have to be evaluated by the relevant competent authorities in order to inform on their approval/rejection process.

11. References

Collins, N.B. 2017. Free State Province Biodiversity Plan: CBA map. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs. Internal Report.

Collins, N.B. 2017. Free State Province Biodiversity Plan: Technical Report v1.0. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs. Internal Report.

Conservation of Agricultural Resources Act (Act 43 of 1983)

Free State Nature Conservation Ordinance (No 8 of 1969)

Mucina, L. & Rutherford, M.C. (eds.) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

National Environmental Management Act (Act 107 of 1998)

National Environmental Management: Biodiversity Act (Act 10 of 2004)

National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014

National Environmental Management: Biodiversity Act (Act 10 of 2004); National list of ecosystems that are threatened and in need of protection, Government Gazette No 34809, 9 December 2011

National Forests Act (Act 84 of 1998)

National Water Act (Act 36 of 1998)

South African National Biodiversity Institute (2006-2019). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors)

www.climate-data.org

12. Details of the Specialist

Adriaan Johannes Hendrikus Lamprecht (Pr.Sci.Nat)

M.Env.Sci. Ecological remediation and sustainable utilisation (NWU: Potchefstroom)

South African Council for Natural Scientific Professions (SACNASP): Professional Ecological Scientist
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Abbreviated Curriculum Vitae

Qualifications

- M.Env.Sci Ecological Remediation and Sustainable Utilisation/Vegetation Ecology
 - 2010 - North West University Potchefstroom
- B.Sc Botany and Zoology (Cum Laude)
 - 2008 - North West University Potchefstroom

Accredited courses completed

- Implementing Environmental Management Systems ISO 14001
 - 2011 - North West University Potchefstroom
- Environmental Law for Environmental Managers
 - 2011 - North West University Potchefstroom
- SASS 5 Aquatic Biomonitoring Training Course
 - 2017 – GroundTruth Consulting

Professional registrations

- South African Council for Natural Scientific Professions (**SACNASP**)
 - Professional Ecological Scientist Registration number 115601

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- International Association for Impact Assessment (**IAIA**)
 - Registration number 5232
- South African Green Industries Council (**SAGIC**) Invasive Species training
 - Registration number 2405/2459

Employment and Experience Background

Upon completion of his studies, Rikus started his career in 2011 as an **Environmental Professional in Training (PIT) at Anglo American Thermal Coal: Environmental Services**. He received environmental training and practical implementation experience in all environmental facets of the mining industry with the focus on: Environmental rehabilitation, land management (biodiversity and invasive species eradication), waste & water-, air quality-, game reserve-, environmental management and legislation, as well as corporate reporting. He was also appointed as the Biodiversity management custodian at Anglo American Thermal Coal collieries.

He was subsequently employed by **Fraser Alexander Tailings from October 2011 to the end of November 2015 as an Environmental Contracts Manager**, where he was responsible for the technical and operational management of all Fraser Alexander Tailings' mining environmental rehabilitation work. He was responsible for all facets of project management, as well as implementation of rehabilitation and environmental strategies, by planning activities, organising physical, financial and human resources, delegating task responsibilities, leading people, controlling risks and providing technical support.

He conducted a significant amount of quantitative and qualitative ecological vegetation monitoring during his employment period with the company. Such monitoring mainly included environmentally rehabilitated mining areas in the open-cast coal-, gold-, platinum- and chrome mining industries situated in the Free State, Gauteng, Mpumalanga, North-West and Limpopo Provinces. He was involved with analysis, processing and interpretation of environmental monitoring data and compilation of high quality technical/scientific environmental monitoring reports for clients. He was subsequently further involved with providing adequate ecological management and maintenance recommendations for rehabilitated areas. He also provided technical/scientific environmental rehabilitation support to mining clients, with regards to sufficient soil preparation and amelioration, grassing processes, as well as grass species mixtures and ratios.

He was then employed by **Enviroworks Consulting from January 2016 to the end of May 2017 as a Senior Ecological Specialist** where he was responsible for virtually all Ecological, Aquatic and Wetland specialist assessments and reporting related to Environmental Impact Assessment (EIA) and Basic Assessment (BA) projects. He also completed numerous EIA and BA projects as the main project Environmental Assessment Practitioner (EAP).

Rikus then subsequently established the company EcoFocus Consulting (Pty) Ltd, which provides high quality professional environmental and ecological specialist services and solutions to the industrial development-, construction-, mining-, agricultural and other sectors, at the end of May 2017.

He possesses significant qualifications, vast knowledge, skills and practical experience in the specialist field of ecological and environmental management. This, coupled with his disciplined, determined and goal-driven mind-set, as well as his high level of personal standards, ensure high quality, timely and outcomes based outputs and service delivery relating to any project.

Ecological & Wetland Specialist Assessment & Report Completion for the last two years

2020

- Proposed 120 ha Northern Cape Department Agriculture Hopetown Agricultural Development outside Hopetown, Northern Cape Province.
- Proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Protected Species Relocation Management Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Stormwater Management Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- GIS Master Layout Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.

- Preliminary Ecological Specialist Findings and Opinion Letter for the proposed 294 ha Northern Cape Department Agriculture Bucklands Agricultural Development, Douglas Northern Cape Province.
- Proposed 1.58 km Dihlabeng Local Municipality Sewer Bridge and Pipeline Development, Paul Roux, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 1.58 km Dihlabeng Local Municipality Sewer Bridge and Pipeline Development, Paul Roux, Free State Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 1.58 km Dihlabeng Local Municipality Sewer Bridge and Pipeline Development, Paul Roux, Free State Province.

2019

- Water Use License Application (WULA) Risk Assessment for a proposed Kopanong Local Municipality Bridge Upgrading development project in Philippolis, Free State Province.
- Proposed 4.9 ha Royal Vision Developments Gravel Quarry development project outside Kroonstad, Free State Province.
- Proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Proposed 53 ha Arborlane Estates (Pty) Ltd agricultural development project outside Augrabies, Northern Cape Province.
- Proposed 42.7 ha Arborlane Estates (Pty) Ltd NEMA Section 24G agricultural development project outside Augrabies, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 53 ha Arborlane Estates (Pty) Ltd agricultural development project outside Augrabies, Northern Cape Province.
- Proposed 20.2 km Water Pipeline Development from Lindley to Arlington, Free State Province.
- Watercourse delineation and report for a proposed 5.36 ha Filling Station and Shopping Centre Development project in Thaba Nchu, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 20.2 km Water Pipeline Development from Lindley to Arlington, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Driefontein no 274, outside Ficksburg, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.

- Rehabilitation and Alien Invasive Species Management Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Protected Species Relocation Management Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- GIS Master Layout Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Proposed 535 ha Farms Bultfontein & Folmink agricultural development project outside Prieska, Northern Cape Province.
- Proposed 6.42 ha Phokwane Local Municipality Residential development project in Jan Kempdorp, Northern Cape Province.
- Stormwater Management Plan for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- GIS Master Layout Plan for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Proposed 13.8 ha Phokwane Local Municipality Cemetery expansion project in Jan Kempdorp, Northern Cape Province.
- Proposed 19.9 ha Vergenoeg NEMA Section 24G residential development project in Wesselsbron, Free State Province.
- Proposed 20.5 ha Khalinkomo NEMA Section 24G residential development project in Wesselsbron, Free State Province.
- Erosion and Rehabilitation Monitoring Report for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Zaaihoek no 1251, outside Vrede, Free State Province.
- Grazing and Invasive Species Management Plan for Plot 19 of the Farm Ballyduff no 1594, in Bethlehem, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Mooiuitzicht no 205, outside Bethlehem, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Rietfontein no 1457, outside Bethlehem, Free State Province.
- Proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.

- Rehabilitation and Alien Invasive Species Management Plan for a proposed Kopanong Local Municipality Bridge Upgrading development project in Philippolis, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.
- Protected Species Relocation Management Plan for a proposed Gamagara Local Municipality Water Reticulation Development project in Olifantshoek, Northern Cape Province.
- Grazing and Invasive Species Management Plan for the Farm Erfenis no 1014, outside Bethlehem, Free State Province.
- Proposed 35 ha Gladium Boerdery Familietrust NEMA Section 24G agricultural development project outside Niekerkshoop, Northern Cape Province.
- Grazing and Invasive Species Management Plan for the Farms Liebenbergsvlei no 148 & Aasvogelkrans no 96, outside Bethlehem, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Dwarsberg no 350, outside Paul Roux, Free State Province.
- Proposed 50 ha Siyathemba Local Municipality residential development project in Prieska, Northern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 35 ha Gladium Boerdery Familietrust NEMA Section 24G agricultural development project outside Niekerkshoop, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 35 ha Gladium Boerdery Familietrust NEMA Section 24G agricultural development project outside Niekerkshoop, Northern Cape Province.
- Stormwater Management Plan for a proposed 35 ha Gladium Boerdery Familietrust NEMA Section 24G agricultural development project outside Niekerkshoop, Northern Cape Province.
- Grazing and Invasive Species Management Plan for the Farm Waterval West no 653, outside Steynsrus, Free State Province.
- Proposed 7.6 ha Annie van den Hever NEMA Section 24G agricultural development project outside Hanover, Northern Cape Province.
- Revision of a proposed 535 ha Farms Bultfontein & Folmink agricultural development project outside Prieska, Northern Cape Province.

2018

- Proposed 30 ha Portion 30 of the Farm Lilyvale no 2313 Residential development project in Bloemfontein, Free State Province.
- Proposed 20 ha Luckhoff Waste Facility development project in Luckhoff, Free State Province.
- Proposed 19 ha agricultural development project outside Griekwastad, Northern Cape Province.
- Proposed 135 ha agricultural development project outside Griekwastad, Northern Cape Province.
- Five proposed Dawid Kruiper Local Municipality Residential Developments around Upington, Northern Cape Province.
- Grazing and Erosion Management Plan for the Farm Retiefs Nek no 123, outside Bethlehem, Free State Province.
- Grazing and Erosion Management Plan for the Farm Dekselfontein no 317, outside Bethlehem, Free State Province.
- Proposed 12 ha agricultural development project in Petrusville, Northern Cape Province.
- Proposed 270 ha industrial park development project in Secunda, Mpumalanga Province.
- Proposed 233 ha industrial park development project in Sabie, Mpumalanga Province.
- Proposed Dawid Kruiper Local Municipality Residential Development around Upington, Northern Cape Province.
- Two proposed 15 ha agricultural development projects outside Hopetown, Northern Cape Province.
- Two Alien Invasive Species Management Plans for two proposed 15 ha agricultural development projects outside Hopetown, Northern Cape Province.
- Protected Species Relocation Management Plan for a proposed 15 ha agricultural development project outside Hopetown, Northern Cape Province.
- Proposed 169 ha industrial park development project in Sabie, Mpumalanga Province.
- Grazing and Erosion Management Plan for the Farm Barnea no 231, outside Bethlehem, Free State Province.
- GIS locality, vegetation and sensitivity map for the proposed 7.13 ha Karoo Hoogland Local Municipality Residential Development project in Sutherland, Northern Cape Province.
- Erosion and Rehabilitation Monitoring Report for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Drafting of an official Environmental Policy for Teambo Facilitators (Pty) Ltd in Bloemfontein, Free State Province.

- Proposed 11.6 ha COGHSTA NEMA Section 24G residential development project in Douglas, Northern Cape Province.
- Proposed 3.26 ha COGHSTA NEMA Section 24G residential development project in Strydenburg, Northern Cape Province.
- Proposed 25.6 ha COGHSTA NEMA Section 24G residential development project in Loxton, Northern Cape Province.
- Biodiversity offset feasibility assessment and report for a proposed 805 ha agricultural development project outside Douglas, Northern Cape Province.
- Proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Ecological exemption letter for the proposed Vanderkloof Tegnologie Chicken Abattoir development project in Petrusville, Northern Cape Province.
- Protected Species Relocation Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Stormwater and Erosion Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Revision of a proposed 17.7 ha Luckhoff Waste Facility development project in Luckhoff, Free State Province.
- Proposed 113.3 ha Dawn Valley Estate development project in Bloemfontein, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Klipfontein no 71, outside Lindley, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Meyerskop no 1801, outside Bethlehem, Free State Province.
- Proposed 2.24 ha Mullerstuine Cemetery development project in Vanderbijlpark, Gauteng Province.
- Species of Special Concern & Alien Invasive Species assessment and report for all the Transnet Engineering Group 5 Free State Province Sites.
- Species of Special Concern & Alien Invasive Species assessment and report for all the Transnet Engineering Group 6 Northern Cape Province Sites.

- Proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Proposed 545 ha residential development project in Leandra, Mpumalanga Province.
- Proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Protected Species Relocation Management Plan for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Grazing Management Plan for the Farm Fairdale no 1048, outside Vrede, Free State Province.
- Proposed 14.4 ha Frankfort Landfill Site expansion project in Frankfort, Free State Province.