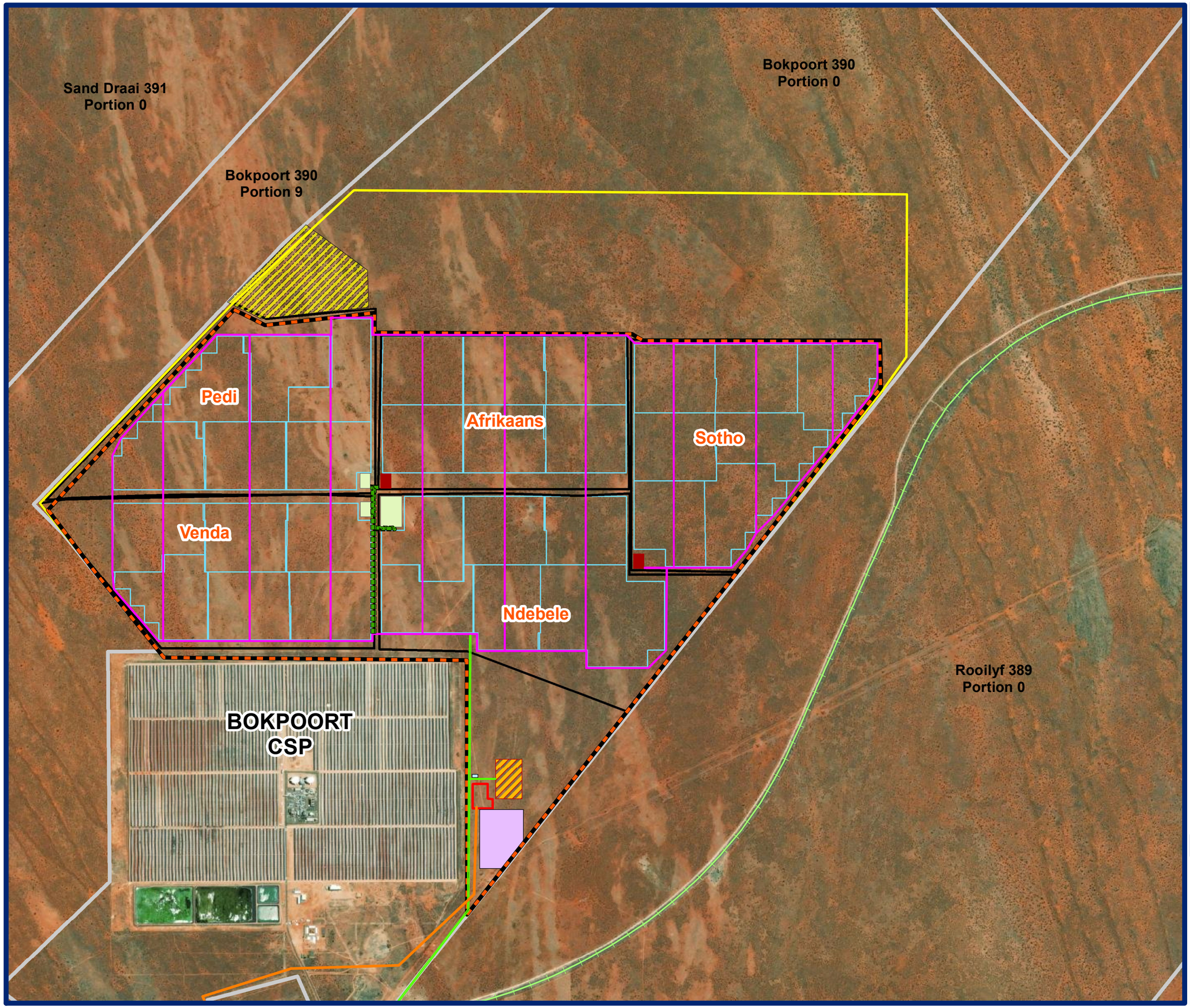
Appendix A:
Maps & Layouts

Development of two 9.9MW Internal Combustion Engines at the farm Bokpoort 390, Groblershoop

Locality Map



Legend

- Internal Roads
- Underground Cables
- 132 kV Transmission Line
- Access Road
- Fence
- Sishen-Saldhana Iron Ore Railway
- Additional ICE
- Authorised ICE
- Accommodation Rooms and Site Office (Temp Facilities)
- Administrative Buildings
- Project Boundary
- Shared infrastructure (Previously Approved)
- BESS Plant
- IPP Step-Up Station 2
- PV Plant Subsite
- PV Trackers
- Cadastral

0 0,275 0,55 1,1 Kms

N

Source:
ESRI
CSG:DALRRD

Scale 1:20000

Royal HaskoningDHV
Enhancing Society Together

Development of two 9.9MW Internal Combustion Engines at the farm Bokpoort 390, Groblershoop

Sensitivity Map

Sand Draai 391
Portion 0

Bokpoort 390
Portion 9

Bokpoort 390
Portion 0

Rooilyf 389
Portion 0

Pedi

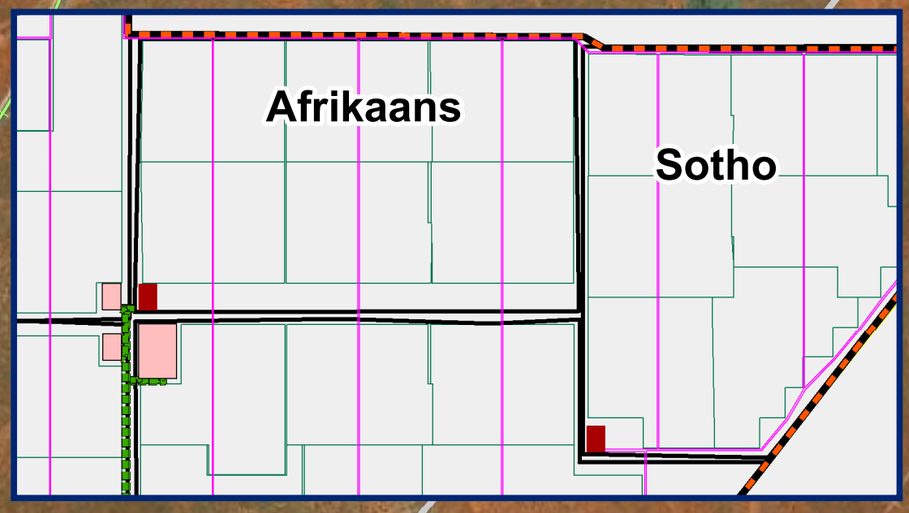
Afrikaans

Sotho

Venda

Ndebele

BOKPOORT
CSP



Legend

- Internal Roads
- Underground Cables
- 132 kV Transmission Line
- Access Road
- Fence
- Sishen-Saldhana Iron Ore Railway
- Accommodation Rooms and Site Office (Temp Facilities)
- Additional ICE
- Authorised ICE
- Project Boundary
- Administrative Buildings
- Shared infrastructure (Previously Approved)
- BESS Plant
- IPP Step-Up Station 2
- PV Plant Subsite
- PV Trackers
- Cadastral

Development Sensitivity Zoning

- Acceptable
- Not Preferred
- Preferred Area

0 0,35 0,7 1,4 Kms

N

Scale 1:26444

Source:
ESRI
CSG:DALRRD

Royal HaskoningDHV
Enhancing Society Together

Development of two 9.9MW Internal Combustion Engines at the farm Bokpoort 390, Groblershoop

Renewable Energy Development Zone Map

Bokpoort 390
Portion 9

Bokpoort 390
Portion 0

Afrikaans

Pedi

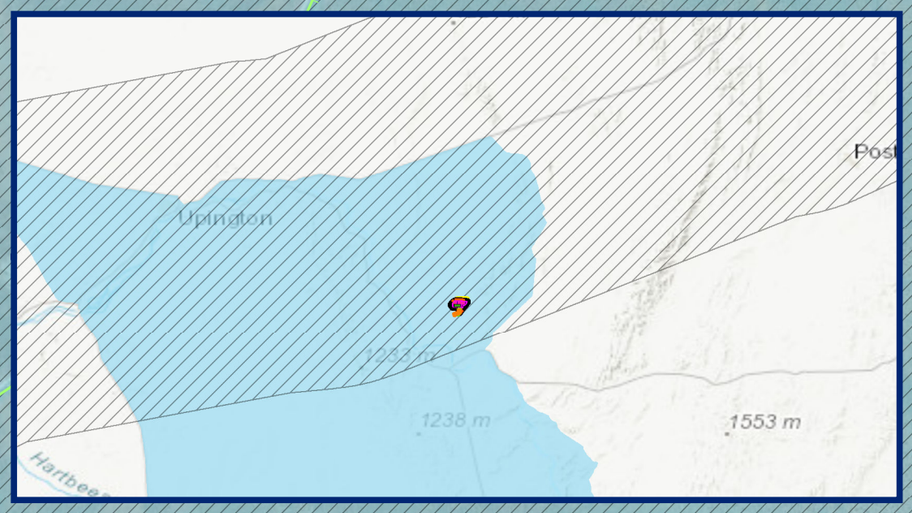
Sotho

Ndebele

Venda

Rooilyf 389
Portion 0

BOKPOORT
CSP



Legend

- Internal Roads
- Underground Cables
- 132 kV Transmission Line
- Access Road
- Fence
- Sishen-Saldhana Iron Ore Railway
- Additional ICE
- Authorised ICE
- Accommodation Rooms and Site Office (Temp Facilities)
- Project Boundary
- Administrative Buildings
- Shared infrastructure (Previously Approved)
- BESS Plant
- IPP Step-Up Station 2
- PV Plant Subsite
- PV Trackers
- Cadastral

Power Corridor

- Northern corridor

Renewable Energy Development Zone

- Upington - REDZ7

0 0,25 0,5 1 Kms

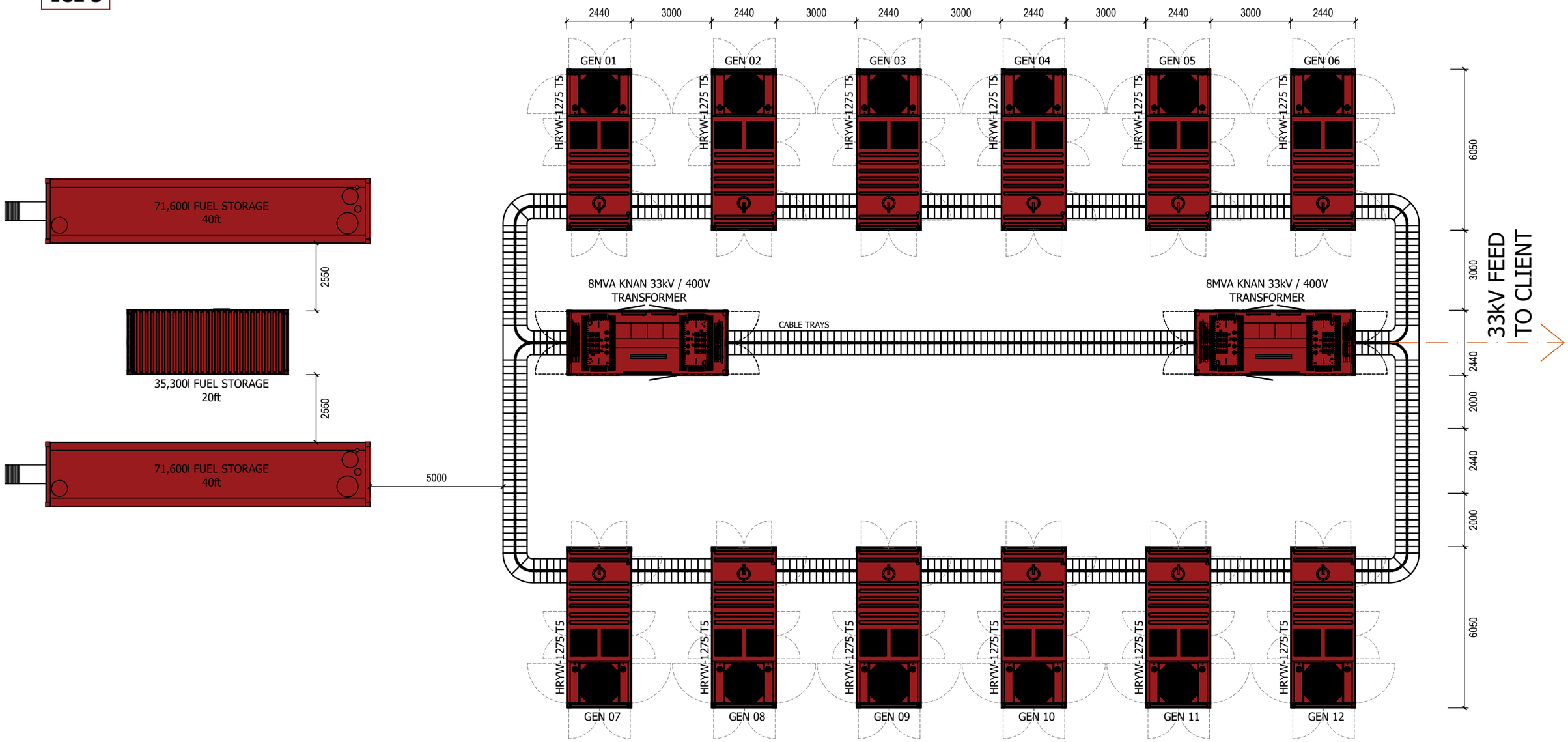
N

Scale 1:18500

Source:
ESRI
CSG:DALRRD

Royal HaskoningDHV
Enhancing Society Together

ICE 5



SCALE BAR

1m 10m

1/002 ACWA - Site Layout: ICE 5 33kV Diesel Plant

scale 1: 150 at A3

HIMOINSA

REVISIONS

no.	date	details
-	19.10.21	First Issue
01	27.01.22	Scale Bar added, 2 x fuel tanks removed
02	20.04.22	General Amendments

Client Name	ACWA
Project Name	ICE 5 33kV COP Diesel Power Plant
Drawing Title	Site Layout

Proposal	Himoinsa South Africa
Date	19.10.2021
Drawn	PJS
Scale	Shown at A3
Drawing No	**0199 - 002**
Revision	**02**

Appendix B:
DFFE Consultation and Approval of PP Plan

From: [redacted]
To:
Cc:

Subject:
Date:

Dear Malcolm

Please note it is not compulsory in terms of EIA regulations that a pre-application meeting must be undertaken before an application is lodged with the Department. It is the choice of the applicant or EAP to request a pre-application meeting or not to request it.

Kind regards
Thando Booi

From: Malcolm Roods [mailto:Malcolm.Roods@rhdhv.com]
Sent: Friday, 22 October 2021 14:03
To: Thando Booi <TBooi@environment.gov.za>
Cc: Lusani Jacqueeline Madali <LRathanya@acwapower.com>; Thuledu Ntshingila <TNtshingila@acwapower.com>; Prashika Reddy <prashika.reddy@rhdhv.com>; Seshni Govender <seshni.govender@rhdhv.com>; Mahlatse Shubane <MShubane@environment.gov.za>; Makhosi Yeni <MYeni@environment.gov.za>; Olivia Letlalo <OLetlalo@environment.gov.za>; Thembisile Hlatshwayo <THlatshwayo@environment.gov.za>
Subject: RE: 2021-10-0023

Hi Thando

Thank you very much for the feedback

Can you confirm that no pre-application is then required

Kind regards

[redacted]

Subject: 2021-10-0023

Dear Malcolm

See my response in red.

Kind regards
Thando

[redacted]

[redacted]

Subject: RE: 2021-10-0023

Hi Thando

Our discussion yesterday refers

Due to some unforeseen circumstances on my side, you indicated that its fine if I send you an e-mail instead of the meeting next week

In this regard, please find attached the presentation which we intended giving to yourself / DFFE

In essence, we wanted to introduce the project, get clearance on the process and give a motivation why this is required noting that ACWA lapsed their other four ICE EAs

In light of the above, can you please confirm the following:

a) That a new Basic Assessment process would be required for the two (2) additional ICE. Kindly note that if the proposed development will trigger LN1 and LN3 activities, the Basic Assessment process would be required. In addition, if the proposed development triggers LN2 activities a full scoping EIA process would be required. However, it remains the task of applicants and their environmental assessment practitioners ("EAPs") to ascertain which listed activities are triggered in terms of LN1, LN2 and LN3.
b) Whether the attached PP Plan is approved. The plan will be reviewed and considered by the Department for approval.

Should you need any further clarification, please contact me at any time

Kind regards

[redacted]

Subject: 2021-10-0023

Dear Malcolm

The 27 October 2021 is convenient for this meeting. Please send an invite to this meeting to be held via MS teams.

Kind regards
Thando Booi

[redacted]

[redacted]

Subject: 2021-10-0023

Dear Thando.

Please note that you have been allocated an application:

Type of Application: Pre-Application Meeting Request;
Reference Number: 2021-10-0023;
Date Received: 20/10/2021;
Action Required: Decide on meeting request.

Kindly let Ephron know which date the meeting is to be held, if it will be set.

*EAP/Applicant: please use this reference number when submitting the application for EA/amendment application (page 1 of the application form), as well as attach the approved PP Plan if the application requires a PP process.

EIA Applications
Integrated Environmental Authorisations
Department of Forestry, Fisheries and the Environment

Please note that this email is for the receipt and processing of online applications only, and is not monitored for responses. All queries must be directed to EIAadmin@environment.gov.za.

You are advised that this mailbox has a 48 hour response time.

Please note that this mailbox has a 5mb mail limit. No zip files are to be attached in any email.

[redacted]

Subject: RE: Request for pre-application meeting for the development of 2 additional 9.9MW ICE at the farm Bokpoort, Northern Cape

Dear Madam / Sir

Please find attached correct form as requested

Kind regards

F [redacted]

Sent: Wednesday, October 20, 2021 11:43 AM

[redacted]

Subject: RE: Request for pre-application meeting for the development of 2 additional 9.9MW ICE at the farm Bokpoort, Northern Cape

Dear Malcolm.

Please note that we cannot process your application for Pre-Application Meeting as you have used the incorrect form. The form used is dated June 2020. Please use the correct form (attached) and we will gladly process your request and allocate your application.

Regards

EIA Applications
Integrated Environmental Authorisations
Department of Forestry, Fisheries and the Environment

Please note that this email is for the receipt and processing of online applications only, and is not monitored for responses. All queries must be directed to EIAadmin@environment.gov.za.

You are advised that this mailbox has a 48 hour response time.

Please note that this mailbox has a 5mb mail limit. No zip files are to be attached in any email.

[redacted]

Subject: Request for pre-application meeting for the development of 2 additional 9.9MW ICE at the farm Bokpoort, Northern Cape

Dear Madam / Sir

Please find attached request

Kind regards

Malcolm Roods
Environmental Consultant

[redacted]

This email and any attachments are intended solely for the use of the addressee(s); disclosure or copying by others than the intended person(s) is strictly prohibited. If you have received this email in error, please treat this email as confidential, notify the sender and delete all copies of the email immediately

Disclaimer

This message and any attachments transmitted with it are intended solely for the addressee(s) and may be legally
privileged and/or confidential. If you have received this message in error please destroy it and notify the sender. Any
unauthorized usage, disclosure, alteration or dissemination is prohibited. The Department of Forestry, Fisheries and the Environment
no responsibility for any loss whether it be direct, indirect or consequential, arising from information made available and
actions resulting there from. The views and opinions expressed in this e-mail message may not necessarily be those of
Management.The processing of personal information by the Department of Forestry, Fisheries and the Environment is done
lawfully and not excessive to the purpose of processing in compliance with the POPI Act, any codes of conduct issued by the
Information Regulator in terms of the POPI Act and / or relevant legislation providing appropriate security safeguards for the
processing of personal information of others.

From: [redacted]
To:
Cc:

Subject: Approval of PP plan
Date: 04 November 2021 11:13:24
Attachments: MD4195-RHD-ZZ-XX-CO-Z-0001-PP Plan_Two 9.9MW ICE BA_f01.docx

Dear Mr Roods

Public Participation Plan for Project DAO – Two (2) 9.9MW Internal Combustion Engine (ICE) Basic Assessment received by this Department on 22 October 2021, refers.

Based on the information provided this Department decided to approve the PP Plan for the proposed project. You may proceed with the PP process in accordance with tasks contemplated in the PP plan. Should you wish to deviate from the submitted PP Plan, an amended PP Plan must be submitted to the Department for approval prior commencement.

A copy of the PP Plan and this approval must be submitted as part of the application form when the application is lodged.

Also note that submission of a PP Plan and approval thereof do not negate your responsibility to comply with the requirements for public participation in terms of Regulations 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended.

Kind regards

[redacted]

Appendix C:
Specialist Studies

Appendix C1:
Soils and Agricultural Potential

SPECIALIST DECLARATION

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Basic Assessment for the Proposed Development of Internal Combustion Engines (ICE) on the Remaining Extent of Farm Bokpoort 390, Groblershoop, Northern Cape.

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1 SPECIALIST INFORMATION

Specialist Company Name: B-BBEE	[redacted]
Specialist name:	
Specialist Qualifications:	
Professional affiliation/registration:	
Physical address:	
Postal address:	
Postal code:	
Telephone:	
E-mail:	

2. DECLARATION BY THE SPECIALIST

I, **Johann Lanz**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section [redacted]

[redacted]

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, **Johann Lanz**, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

[redacted]

Date

SUID-AFRIKAANSE POLISIEDIENS
STATION COMMANDER
WYNBERG KP
22 -11- 2021
STATION COMMANDER
WYNBERG CP
SOUTH AFRICAN POLICE SERVICE

SPECIALIST OPINION
FIVE INTERNAL COMBUSTION ENGINES – NOVEMBER 2021

Johann Lanz
Soil Scientist (Pri.Sci.Nat)
[redacted]

Environmental Authorisation Amendment for 7 x PV solar power facilities on the farm Bokpoort near Groblershoop, Northern Cape Province

The specialist assessment, *Agricultural and soils impact assessment for proposed Bokpoort 10 x PV solar power facilities on the farm Bokpoort near Groblershoop, Northern Cape Province*, dated January 2020 by Johann Lanz refers.

The applicant wishes to amend the project so that it has a total of five (5) Internal Combustion Engines (ICE) and associated infrastructure on the PV facilities instead of the seven (7) ICE that were granted Environmental Authorisation (EA) in an earlier amendment. The locations of these are shown in the map below.

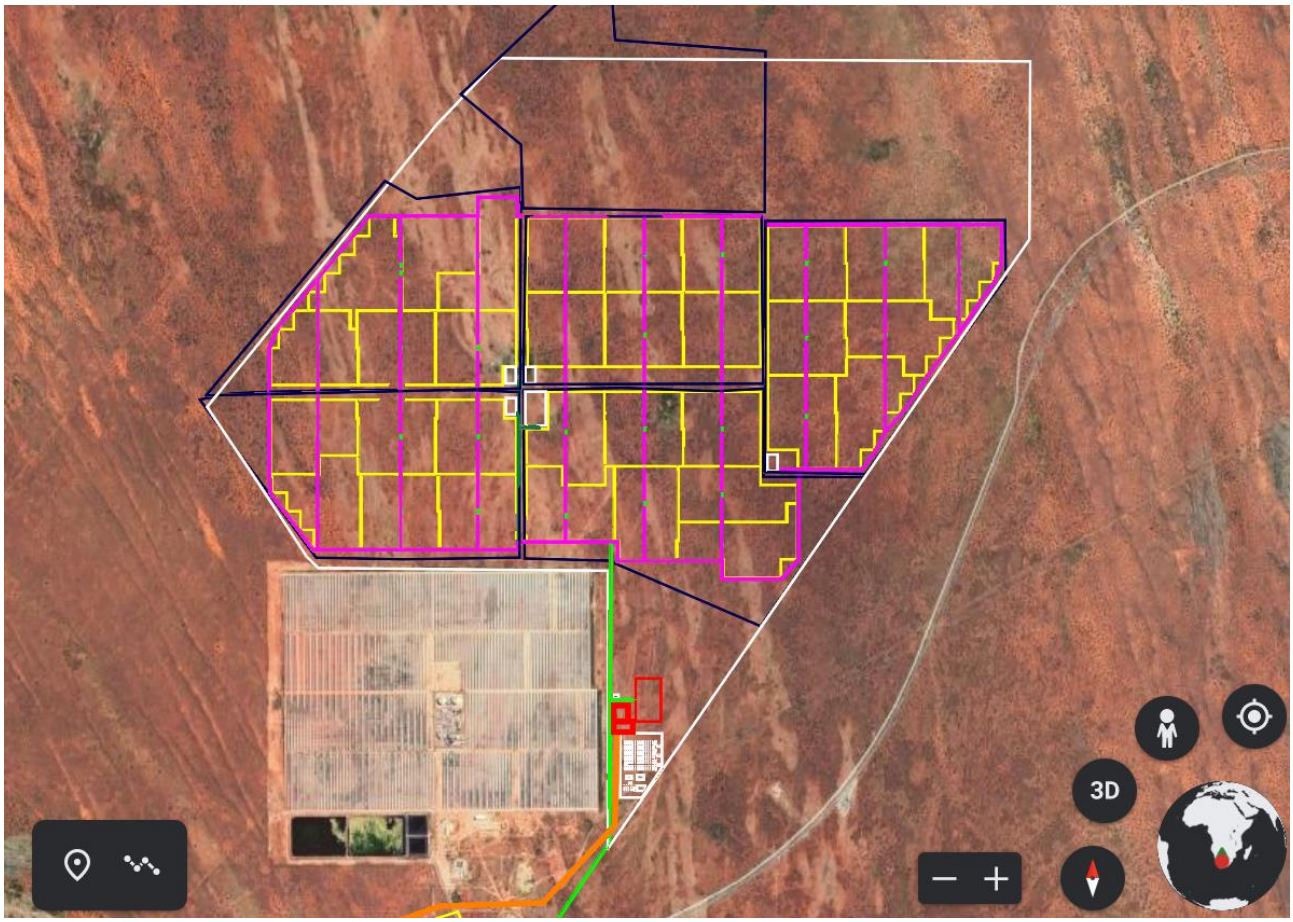


Figure 1. The layout of the facilities including the 5 ICE's, shown as white outlines within the PV facility areas.

The significance of all agricultural impacts on this site is low because of the very low agricultural potential of the site. So, there are no additional agricultural impacts related to this proposed amendment. This includes a consideration of the cumulative impact of all five (5) sites. It will not change the nature or significance of any of the impacts assessed in the original study. Therefore, there are no agricultural advantages or disadvantages related to it. The amendment does not require any changes or additions to the mitigation measures for agricultural impacts that were recommended in the original assessment. Thus, there are no required changes to the EMPr. The agricultural impact of the amended project will therefore be identical to the impact assessed in the original specialist assessment report.

Therefore, from an agricultural impact point of view, the amendment should be authorised.

Johann Lanz (Pr. Sci. Nat.)
22 November 2021

SPECIALIST OPINION
SEVEN INTERNAL COMBUSTION ENGINES – NOVEMBER 2020

Johann Lanz

Soil Scientist (Pri.Sci.Nat)

[redacted]

Environmental Authorisation Amendment for 7 x ICE on solar power facilities on the farm Bokpoort near Groblershoop, Northern Cape Province

The specialist assessment, *Agricultural and soils impact assessment for proposed Bokpoort 10 x PV solar power facilities on the farm Bokpoort near Groblershoop, Northern Cape Province*, dated January 2020 by Johann Lanz refers.

The applicant wishes to amend the project to include an internal combustion engine (ICE) and associated infrastructure on 7 of the PV facilities. All of these will be located within the already assessed development area. The locations of these are shown in the map below.

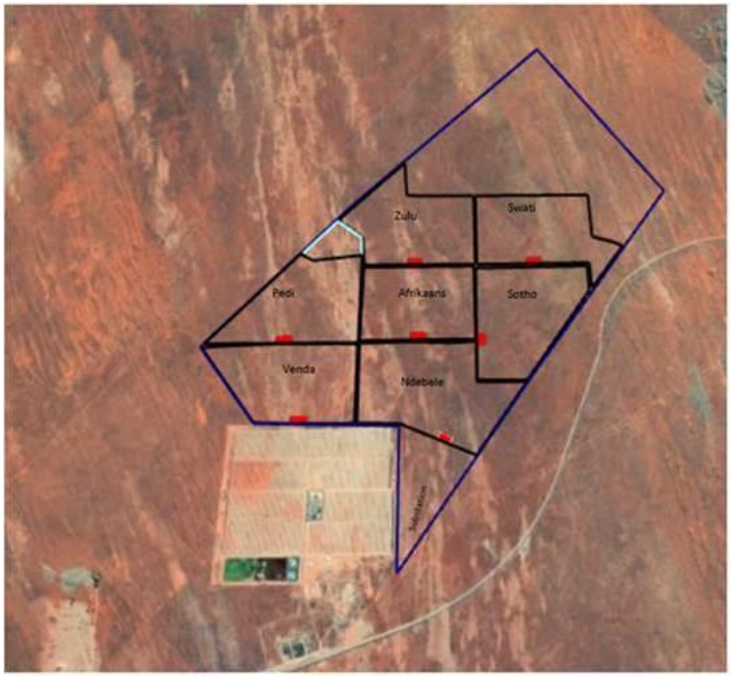


Figure 1. Locations of the 7 ICE's (red areas) on the development site.

Each of the ICE's will have the following specifications:

Generating capacity: 9.9 MW
Fuel Type: LPG/LNG or diesel
Stack height: 50-70m
Number of engines: 1 for each plot (it is subject to the engine size, various load size available in the market)
Fuel storage tanks: 5 for each plot
Fuel volume: 500 m^3 for each plot
Water requirements: limited water for cooling
Area size: 1.5 ha

The significance of all agricultural impacts on this site is low because of the very low agricultural potential of the site. There are no additional agricultural impacts related to this proposed amendment. This includes a consideration of the cumulative impact of all 7 sites. It will not change the nature or significance of any of the impacts assessed in the original study. There are no agricultural advantages or disadvantages related to it. The amendment does not require any changes or additions to the mitigation measures for agricultural impacts that were recommended in the original assessment, and there are therefore no required changes to the EMPr. The agricultural impact of the amended project will therefore be identical to the impact that was assessed in the original specialist assessment report.

Therefore, from an agricultural impact point of view, the amendment should be authorised.

Johann Lanz (Pri. Sci. Nat.)
27 November 2020

AGRICULTURAL AND SOILS IMPACT ASSESSMENT FOR PROPOSED BOKPOORT 10 X PV SOLAR POWER FACILITIES ON THE FARM BOKPOORT NEAR GROBLERSHOOP NORTHERN CAPE PROVINCE – DECEMBER 2019

Johann Lanz
Soil Scientist (Pri.Sci.Nat.)
[redacted]

AGRICULTURAL AND SOILS IMPACT ASSESSMENT FOR PROPOSED BOKPOORT 10 X PV SOLAR POWER FACILITIES ON THE FARM BOKPOORT NEAR GROBLERSHOOP NORTHERN CAPE PROVINCE

BA PHASE REPORT

Report by
Johann Lanz

December 2019

Johann Lanz
Professional profile

Education

• M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - June 1997
• B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
• BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
• Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I am registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science, registration number 400268/12, and am a member of the Soil Science Society of South Africa.

- **Soil Science Consultant Self employed 2002 - present**
  I run a soil science consulting business, servicing clients in both the environmental and agricultural industries. Typical consulting projects involve:

1. Soil specialist study inputs to EIA's, SEA's and EMPR's. These have focused on impact assessments and rehabilitation on agricultural land, rehabilitation and re-vegetation of mining and industrially disturbed and contaminated soils, as well as more general aspects of soil resource management. Recent clients include: CSIR; SRK Consulting; Aurecon; Mainstream Renewable Power; SiVEST; Savannah Environmental; Subsolar; Red Cap Investments; MBB Consulting Engineers; Enviroworks; Sharples Environmental Services; Haw & Inglis; BioTherm Energy; Tiptrans.
2. Soil resource evaluations and mapping for agricultural land use planning and management. Recent clients include: Cederberg Wines; Unit for Technical Assistance - Western Cape Department of Agriculture; Wedderwill Estate; Goedgedacht Olives; Zewenwacht Wine Estate, Lourensford Fruit Company; Kaarsten Boerdery; Thelema Mountain Vineyards; Rudera Wines; Flagstone Wines; Solms Delta Wines; Dornier Wines.

3. **Soil Science Consultant Agricultural Consultors International (Tinie du Preez) 1998 - end 2001**
   Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

1. **Contracting Soil Scientist De Beers Namaqualand Mines July 1997 - Jan 1998**
   Completed a contract to make recommendations on soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*

I am a reviewing scientist for the *South African Journal of Plant and Soil*.

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

PROPOSED DEVELOPMENT OF BOKPOORT 10 X 200 MW PV SOLAR POWER FACILITIES, NORTHERN CAPE PROVINCE

Kindly note the following:

- This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
- This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
- A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
- All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
- All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:
B-BBEE

Specialist name:
Specialist Qualifications:
Professional affiliation/registration:
Physical address:
Postal address:
Postal code:
Telephone:
E-mail:

2. DECLARATION BY THE SPECIALIST

I, **Johann Lanz**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Si

Jo

Na

Da

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, **Johann Lanz**, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

SUID-AFRIKAANSE POLISIEDIENS
STATION COMMANDER
WYNBERG KP
30 OCT 2019
STATION COMMANDER
WYNBERG CP
SOUTH AFRICAN POLICE SERVICE

Table of Contents

Executive Summary

The proposed development is on land zoned as 'Special'. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable for cultivation. This assessment has found that the proposed site is on land which is unsuitable for cultivation due to both climate and soil limitations.

The key findings of this study are:

- Soils on the site are shallow to moderately deep, red, sandy soils overlying hard pan carbonate and sometimes rock (Coega and Plooysburg soil forms).
- The major limitation to agriculture is the limited climatic moisture availability. The low water holding capacity of the soils is a further limitation.
- As a result, the site is unsuitable for cultivation and agricultural land use is limited to grazing.
- The project site is classified with a predominant land capability evaluation value of 5 (low). The site has a grazing capacity of 22 hectares per large stock unit.
- No agriculturally sensitive areas occur within the proposed site and no part of it is therefore required to be set aside from the development.
- The low agricultural potential of the site limits the significance of all on-site agricultural impacts.
- Two potential negative impacts of the development on agricultural resources and productivity were identified as:
    - Loss of agricultural land use caused by direct occupation of land by the energy facility footprint.
    - Soil degradation resulting from erosion, topsoil loss and contamination.
- All impacts were assessed as having low significance.
- Recommended mitigation measures include implementation of an effective system of storm water run-off control to mitigate erosion; and topsoil stripping and re-spreading to mitigate loss of topsoil.
- Because of the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which would preclude authorisation of the proposed development. From an agricultural impact point of view, the development can be authorised.
- Despite any cumulative regional impact that may occur, it is preferable, in terms of the national mandate to conserve land for agricultural production, to incur a loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development elsewhere in the country.

2 INTRODUCTION

This report is an update of an agricultural impact assessment that was completed in 2016.

ACWA Power obtained 3 Environmental Authorisations in 2016 for 2 x 75MW PV facilities as well as a 150MW CSP facility. However, ACWA Power now proposes to, instead of the 150MW CSP facility, construct (8), 200 MW PV plants in its place on the same footprint, which was assessed in 2016. The location is shown in Figure 1. Previously, approval for 2 PV facilities was obtained, PV 1 (Ndebele) and PV 2 (Xhosa), however the proposal for these two sites did not include the battery storage energy system for either of the sites as well as the capacity increase from 75 to 200MW.

Each of the PV plants has the following components: PV panels, battery storage site of 16 ha, access routes (the access roads will be in between the PV panels), substation, water pipeline connection to the main water pipeline (note: main water pipeline already authorised) and 132kV overhead line (31m servitude) and shared infrastructure consisting of buildings, including a workshop area for maintenance, storage (i.e. fuel tanks, etc.), laydown area, parking, warehouse, and offices (previously approved). Each of the 10 PV plants will cover an area of 150 hectares. There is also a 132kv overhead line connection to the Garona substation.

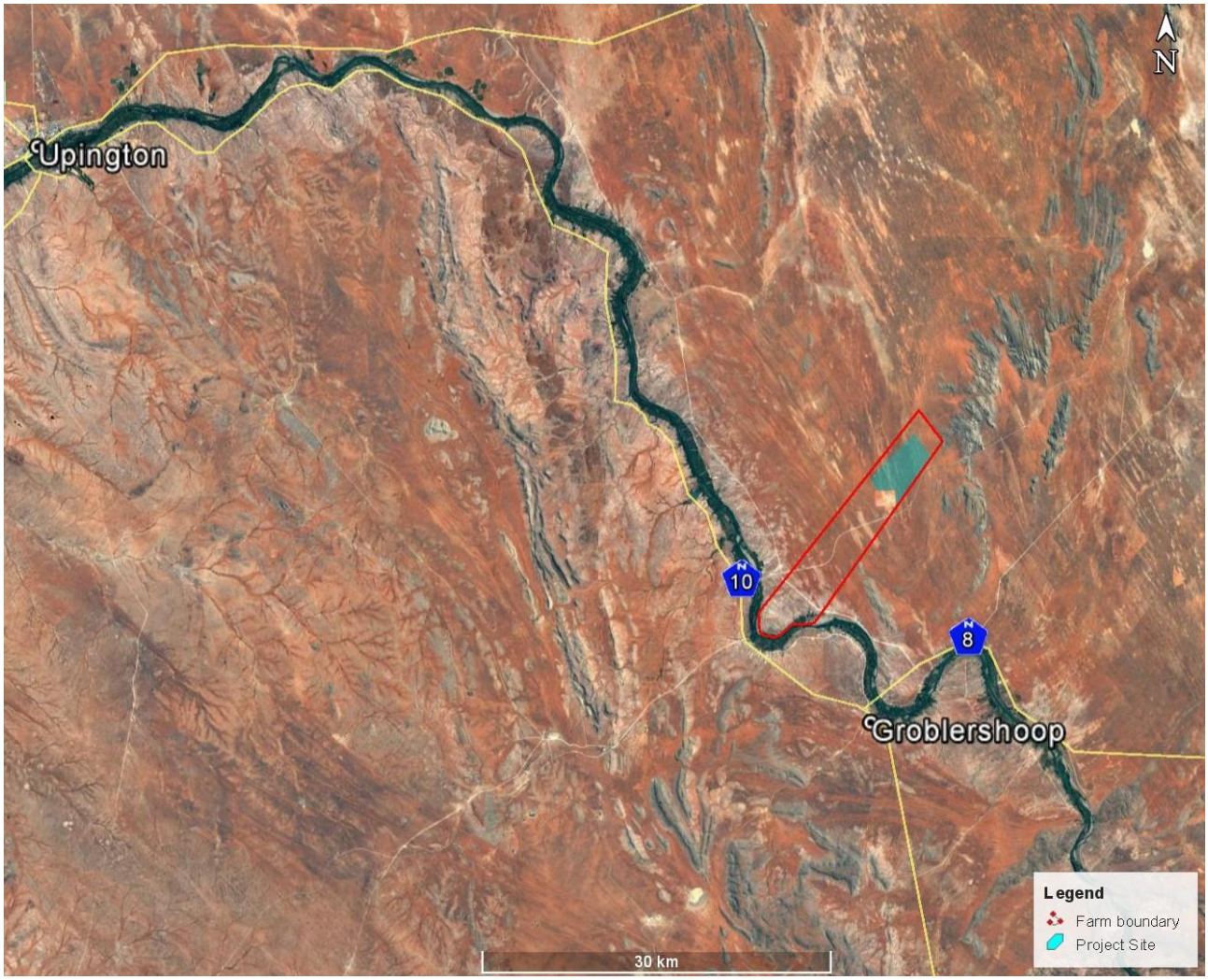


Figure 1. *Location map of the proposed site, north of the town of Groblershoop. The same site was assessed for the environmental authorisations obtained in 2016.*

The site is within one of South Africa's eight renewable energy development zones, and has therefore been identified as one of the most suitable areas in the country for renewable energy development, in terms of a number of environmental impact, economic and infrastructural factors.

3 TERMS OF REFERENCE

The scope of work for this updated report is to update the existing specialist study which was undertaken in support of the 150MW CSP Environmental Impact Assessment in 2016.

1. to reflect the project changes which are:10 new PV developments on the already assessed CSP site
2. Possible realignments of shared infrastructure (i.e. water pipeline, powerline, access road) on the same farm
2. to comply with the latest requirements for specialist reports according to the NEMA regulations
3. to comply with the latest Department of Agriculture protocol for agricultural assessments
4. to include updated baseline data on land capability

The terms of reference for the 2016 report were:

- Identify and assess all potential impacts (direct, indirect and cumulative) of the proposed development on soils and agricultural potential.
- Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers).
- Describe the topography of the site.
- Describe the climate in terms of agricultural suitability.
- Summarise available water sources for agriculture.
- Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options.
- Describe the erosion, vegetation and degradation status of the land.
- Determine the agricultural potential across the site.
- Determine the agricultural sensitivity to development across the site.
- Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

Table 1. Compliance with the Appendix 6 of the 2014 EIA Regulations

Requirements of Appendix 6 – GN R326 EIA Regulations 7 April 2017	**Addressed in the Specialist Report**
(1) A specialist report prepared in terms of these Regulations must contain-	
• details of-	
i. the specialist who prepared the report; and	Following title page
ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Following title page
• a declaration that the specialist is independent in a form as may be specified by the competent authority;	Following CV
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Sections 1 & 3
(cA)an indication of the quality and age of base data used for the specialist report;	Section 3
(cB)a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Sections 6.6 & 7.4
(d) the date, duration and season of the site investigation and the relevance of the season to the outcome of the assessment;	Not applicable
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 6.8 & 7 & Figure 3
(g) an identification of any areas to be avoided, including buffers;	Section 6.8
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 3
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 7
(k) any mitigation measures for inclusion in the EMPr;	Section 7
(l) any conditions for inclusion in the environmental authorisation;	Section 8
(m)any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 7
(n) a reasoned opinion-	
(i) whether the proposed activity, activities or portions thereof should be authorised;	Section 8
(iA) regarding the acceptability of the proposed activity or activities and	Section 8
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 7
(o) a description of any consultation process that was undertaken	Not applicable

during the course of preparing the specialist report;	
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable
(q) any other information requested by the competent authority.	Not applicable
(2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Not applicable

4 METHODOLOGY OF STUDY

The approach for this study was informed by the new protocol for the assessment and reporting of environmental impacts on agricultural resources which is linked to the national web-based environmental screening tool. The protocols have not been gazetted yet, but it is considered best practise to follow the assessment protocol because it represents the most recent thinking in this regard.

The tool identifies the entire project site as low agricultural sensitivity. The protocol therefore requires an Agricultural Compliance Statement and a field assessment is not required.

An Agricultural Compliance Statement must verify that:

1. The site is of "medium" or "low" sensitivity for agricultural resources; and
2. Whether or not the proposed development will have an unacceptable negative impact on the agricultural production capability of the site.

It must contain:

1. Details and relevant expertise as well as the SACNASP registration number of the soil scientist/agricultural specialist preparing the statement including a curriculum vita;
2. A signed statement of independence by the specialist;
3. A map showing the proposed development footprint (including supporting infrastructure) with a 50 m buffered development envelope, overlaid on the agricultural sensitivity map generated by the national environmental screening tool;
4. Calculations of the total development footprint area for each land parcel as well as the total footprint area of the development (including supporting infrastructure);
5. Confirmation as to whether the development footprint is in line with the development limits set in the assessment protocol
6. Confirmation as to whether the sensitivity of the agricultural resource coincides with that indicated on the web-based screening tool;
7. Confirmation from the specialist that all reasonable measures have been taken through micro-siting to minimize fragmentation and disturbance of agricultural activities;
8. A substantiated statement from the agricultural specialist on the acceptability of the

development and a recommendation on the approval or not of the development;

9. Any conditions to which the statement is subjected;
10. Where required, proposed impact management outcomes or any monitoring requirements for inclusion in the Environmental Management Programme (EMPr); and
11. A description of the assumptions made and any uncertainties or gaps in knowledge.

Because of the low agricultural sensitivity of the site, the assessment was a desktop analysis of existing soil and agricultural potential data for the site. This is considered entirely adequate for a thorough assessment of all the agricultural impacts of the proposed development.

The following sources of information were used:

- Soil data was sourced from the land type data set, of the Department of Agriculture, Forestry and Fisheries. This data set originates from the land type survey that was conducted from the 1970's until 2002. It is the most reliable and comprehensive national database of soil information in South Africa and although the data was collected some time ago, it is still entirely relevant as the soil characteristics included in the land type data do not change within time scales of hundreds of years.
- Land capability data was sourced from the 2017 National land capability evaluation raster data layer produced by the Department of Agriculture, Forestry and Fisheries, Pretoria.
- Field crop boundaries were sourced from the national web-based environmental screening tool.
- Rainfall and temperature data was sourced from The World Bank Climate Change Knowledge Portal.
- Grazing capacity data was sourced from the 2018 Department of Agriculture, Forestry and Fisheries long-term grazing capacity map for South Africa, available on Cape Farm Mapper.
- Satellite imagery of the site and surrounds was sourced from Google Earth.

Although a site visit is not required for low and medium agricultural sensitivity sites, this author has visited the site in 2015 for previous studies.

The potential impacts identified in this specialist study were assessed based on the criteria and methodology common to the whole impact assessment. The ratings of impacts were based on the specialist's knowledge and experience of the field conditions of the environment in which the proposed development is located, and of the impact of disturbances on that agricultural environment.

5 CONSTRAINTS AND LIMITATIONS OF STUDY

The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist but is done with due regard and as accurately as possible within these constraints.

The study makes the assumption that water for irrigation is not available across the site. This is based on the assumption that a long history of farming experience in an area will result in the exploitation of viable water sources if they exist, and none have been exploited in this area.

There are no other specific constraints, uncertainties and gaps in knowledge for this study.

6 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

The Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA), requires that an application for a renewable energy facility on agriculturally zoned land be approved by the Department of Agriculture, Forestry and Fisheries (DAFF) – now Department of Agriculture, Land Reform and Rural Development (DALR&RD). Despite the name of the Act, it does not apply only to subdivision, and its purpose is to ensure productive use of agriculturally zoned land. Therefore, even if land is not being subdivided or leased, SALA approval is required to develop agriculturally zoned land for non-agricultural purposes.

Power lines require the registration of a servitude for each farm portion crossed. In terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA), the registration of a power line servitude requires written consent of the Minister if the following two conditions apply:

1. if the servitude width exceeds 15 metres; and
2. if Eskom is not the applicant for the servitude.

If one or both of these conditions do not apply, then no agricultural consent is required. Eskom is currently exempt from agricultural consent for power line servitudes.

The Act 70 of 1970 consent is separate from the EIA and needs to be applied for and obtained after the EIA.

Rehabilitation after disturbance to agricultural land is managed by the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA). No application is required in terms of CARA. The EIA process covers the required aspects of this.

7 DESCRIPTION OF THE SOILS AND AGRICULTURAL CAPABILITY OF THE AFFECTED ENVIRONMENT

7.1 Climate and water availability

Rainfall for the site is given as 265 mm per annum (The World Bank Climate Change Knowledge Portal, undated). The average monthly distribution of rainfall is shown in Figure 2. One of the most important climate parameters for agriculture in a South African context is moisture availability, which is the ratio of rainfall to evapotranspiration. Moisture availability is classified into 6 categories across the country (see Table 2). The site falls into the driest of

these six categories, which is labelled as a very severe limitation to agriculture.

Theoretically there is the possibility of water from the Orange River for the site, but the distance (13km) and the height of the site above the river (over 100 metres) makes irrigation from the river completely non-viable. Water for stock on the site is supplied from wind pumps.

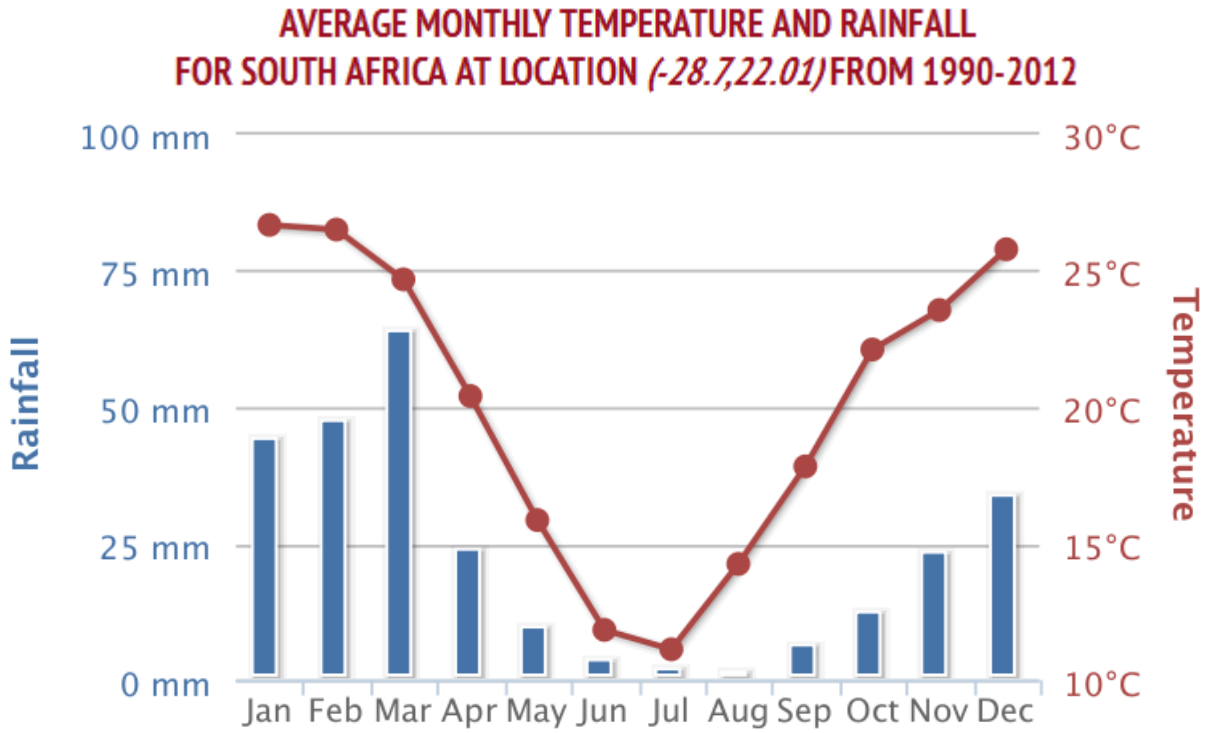


Figure 2. *Average monthly temperature and rainfall for the site (The World Bank Climate Change Knowledge Portal, undated).*

Table 2. The classification of moisture availability climate classes for summer rainfall areas across South Africa (Agricultural Research Council, Undated)

Climate class	Moisture availability (Rainfall/0.25 PET)	Description of agricultural limitation
C1	>34	None to slight
C2	27-34	Slight
C3	19-26	Moderate
C4	12-18	Moderate to severe
C5	6-12	Severe
C6	<6	Very severe

7.2 Terrain, topography and drainage

The proposed development is located on a terrain unit of plains with open low hills or ridges,

changing to rolling or irregular plains with low hills or ridges in the extreme north of the site. It is at an altitude of around 1,000 meters. Slope is less than 2% across the site. A satellite image map of the site is shown in Figure 3.

The geology is red to flesh-coloured wind-blown sand and surface limestone of Tertiary to Recent age. Occasional outcrops of quartz- sericite schist and quartzite of the Groblershoop Formation occur.

There are no water courses on or near the site.

7.3 Soils

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climate conditions into different land types. There is predominantly one land type across most of the site, namely Ae4. A small part of the site in the extreme north east is on land type Af7. The soils of Ae4 are shallow to moderately deep, red, sandy soils overlying hard pan carbonate and sometimes rock. These soils fall into the Calcic and Lithic soil groups according to the classification of Fey (2010). Land type Af7 comprises deeper red sands and includes dunes. A summary detailing soil data for the land type is provided in Appendix 1. Soils are predominantly of the Coega soil form, with lesser coverage of shallow Plooysburg form. It should be noted that the land type classification presented in Appendix 1 made use of the older South African soil classification system, which did not include the Coega and Plooysburg forms. These forms would have been classified, according to the older system, as Mispah and Hutton respectively.

The soils are classified as having low to moderate susceptibility to water erosion (class 5), and as highly susceptible to wind erosion (Ae4 = class 1b; Af7 = class 1a).

7.4 Agricultural capability

Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rainfed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability classes are suitable as arable land for the production of cultivated crops, while the lower suitability classes are only suitable as non-arable grazing land, or at the lowest extreme, not even suitable for grazing. In 2017, DAFF released updated and refined land capability mapping across the whole of South Africa. This has greatly improved the accuracy of the land capability rating for any particular piece of land anywhere in the country. The new land capability mapping divides land capability into 15 different categories with 1 being the lowest and 15 being the highest. Values below 8 are generally not suitable for production of any cultivated crop. Detail of this land capability scale is shown in Table 3.

The project area is classified with a predominant land capability evaluation value of 5, although it varies from 3 to 5 across the site. Agricultural limitations that result in the low land

capability classification are predominantly due to the very limited climatic moisture availability. The very sandy soils, with very limited water holding capacity are a further limitation. These factors render the site unsuitable for any kind of mainstream cultivation without irrigation, and limit it to low density grazing only.

The long-term grazing capacity of the site is fairly low at 22 hectares per large stock unit.

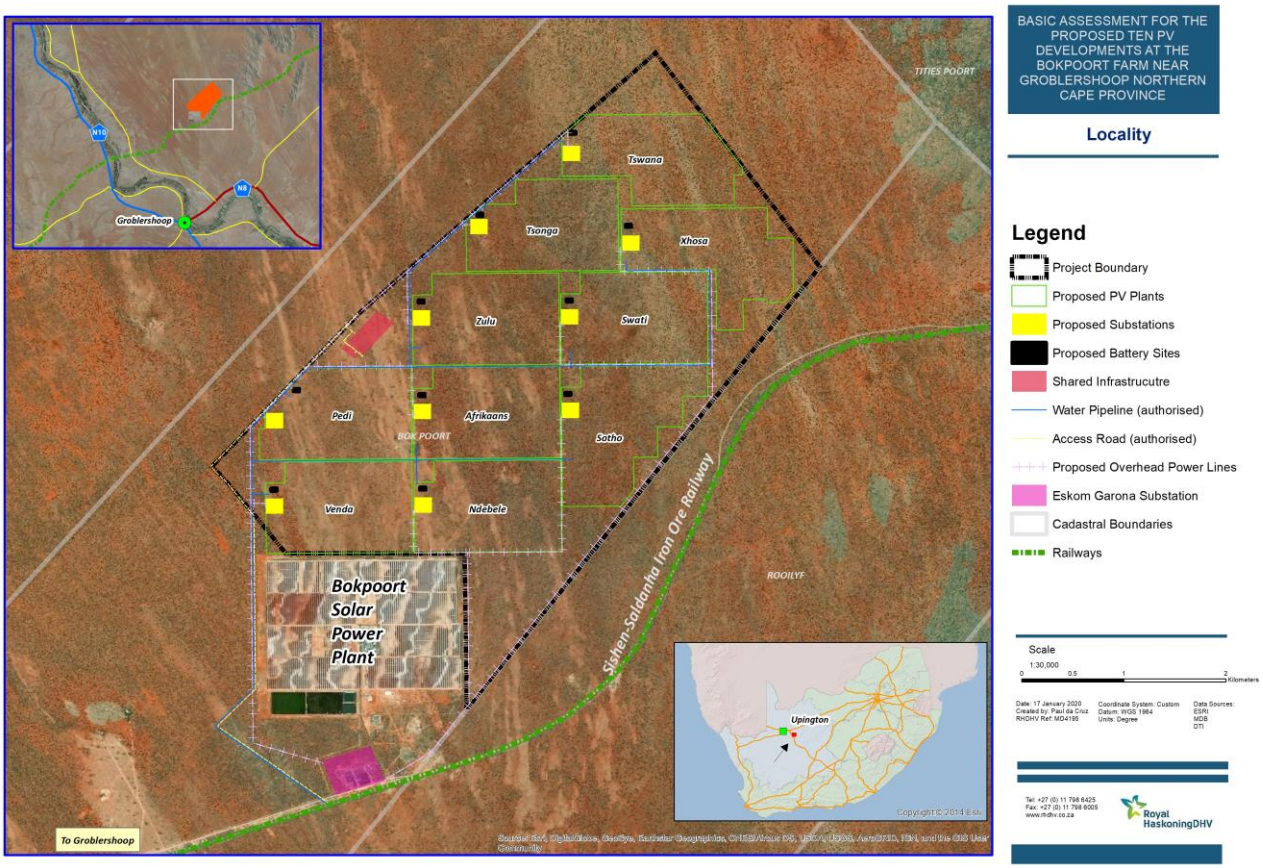


Figure 3. *Satellite image map of the proposed layout. The entire project site has low agricultural sensitivity.*

Table 3. Details of the 2017 Land Capability classification for South Africa.

Land capability evaluation value	Description
1	Very Low
2	
3	Very Low to Low
4	
5	Low
6	Low to Moderate
7	
8	Moderate
9	Moderate to High

10	
11	High
12	High to Very High
13	
14	Very High
15	

7.5 Land use and development on and surrounding the site

The site is located within a sheep farming agricultural region and currently used only for grazing. There has never been any cultivation on the site.

There are no buildings on the site. The only agricultural infrastructure on the site is fencing into grazing camps, wind pumps and stock watering points. There is an existing solar development on the farm adjacent to the proposed site, to its south.

Road access to the site is from the existing road access to the adjacent solar development.

7.6 Status of the land

The biome classification for the site is Kalahari Karroid Shrubland, with a small section of Gordonia Duneveld on land type Af7. The vegetation is grazed and sparse due to low rainfall, but there is no evidence of significant erosion or other land degradation on the site.

7.7 Possible land use options for the site

Because of predominantly the climate limitations, the site is totally unsuitable for cultivated crops, and viable agricultural land use is limited to grazing only.

The site is within one of South Africa's eight renewable energy development zones, and has therefore been identified as one of the most suitable areas in the country for renewable energy development, in terms of a number of environmental impact, economic and infrastructural factors. These factors include an assessment of the significance of the loss of agricultural land. Renewable energy development is therefore a very suitable land use option for the site.

7.8 Agricultural sensitivity

Agricultural sensitivity is a direct function of the capability of the land for agricultural production. This is because a negative impact on land of higher agricultural capability is more detrimental to agriculture than the same impact on land of low agricultural capability. A general assessment of agricultural sensitivity, in terms of loss of agricultural land in South Africa, considers arable land that can support viable production of cultivated crops, to have high sensitivity. This is because there is a scarcity of such land in South Africa, in terms of how much is required for food security. However, there is not a scarcity in the country of land that is only suitable as grazing land and such land is therefore not considered to have high agricultural sensitivity.

The national web-based environmental screening tool identifies the entire site as low agricultural sensitivity. This is confirmed by this assessment. Because no agricultural high sensitivity areas occur within the site, no parts of it need to be avoided by the development. There are no required buffers.

8 IDENTIFICATION AND ASSESSMENT OF IMPACTS ON AGRICULTURE

The change from the CSP, which had environmental authorisation, to the proposed 10 x PV facilities has no bearing on the significance of agricultural impacts, and there is therefore no change to the impact significance which received environmental authorisation.

This assessment has taken the previous EIA reports and their recommendations into account. The previous reports were done by the same specialist as this current report,

The impact assessment is also identical for all 10 PV facilities.

The focus and defining question of an agricultural impact assessment is to determine to what extent a proposed development will compromise (negative impacts) or enhance (positive impacts) current and/or future agricultural production. The significance of an impact is therefore a direct function of the degree to which that impact will affect current or future agricultural production. If there will be no impact on production, then there is no agricultural impact. Impacts that degrade the agricultural resource base pose a threat to production and therefore are within the scope of an agricultural impact assessment. Lifestyle impacts on the resident farming community, for example visual impacts, do not necessarily impact agricultural production and, if they do not, are not relevant to and within the scope of an agricultural impact assessment.

The components of the project that can impact on soils, agricultural resources and productivity are:

- Occupation of the land by the total, direct, physical footprint of the proposed project including all roads.
- Construction (and decommissioning) activities that may disturb the soil profile and vegetation, for example for levelling, excavations, etc.

The significance of all potential agricultural impacts is kept low by the fact that the proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing. The rating of an impact is based on the extent to which that impact can potentially affect agricultural production, in line with the discussion in paragraph 1 of this section.

The following two potential impacts of the developments on agricultural resources and productivity are identified and assessed in the table formats below.

Mitigation and monitoring recommendations are included in the table for each impact.

8.1 Impacts associated with the construction phase

8.1.1 Loss of agricultural land use

Agricultural grazing land directly occupied by the development infrastructure, which includes all associated infrastructure, will become unavailable for agricultural use.		
Status	Negative	
	Without mitigation	**With mitigation**
Probability	Definite (5)	Definite (5)
Duration	Long term (4)	Long term (4)
Scale / extent	Site only (1)	Site only (1)
Magnitude / severity	Minor (2)	Minor (2)
Significance	Moderate (35)	Moderate (35)
Comment on significance: The significance rating only comes out moderate because of the way the definite probability and the long - term duration influence the calculation. In my opinion the actual significance of this impact is low, and it has little real effect and does not need to have an influence on or require modification of the project design.		
Mitigation: None possible.		
Reversibility	The impact is reversible after the life of the project, with effective topsoiling of the land during rehabilitation, where necessary.	
Irreplaceable loss of resources?	Minor because of the low value of the agricultural resource, which is not scarce	
Confidence level of assessment	Medium - determination is based on common sense and general knowledge	

8.1.2 Soil degradation

Soil degradation can result from erosion, topsoil loss and contamination. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related excavations. Hydrocarbon spillages from construction activities can contaminate soil. Soil degradation will reduce the ability of the soil to support vegetation growth.	
Comments: The water erosion risk is low due to the low slope gradients and low to moderate erodibility of the soils, but wind erosion risk is high.	
Status	Negative

	Without mitigation	With mitigation
Probability	Medium (3)	Low (2)
Duration	Medium term (3)	Medium term (3)
Scale / extent	Site only (1)	Site only (1)
Magnitude / severity	Minor (2)	Minor (2)
Significance	Low (18)	Low (12)

Mitigation:

Implement an effective system of storm water run-off control, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion. Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there.

If an activity will mechanically disturb the soil profile below surface, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation, which may be after construction or only at decommissioning. The depth of topsoil stripping is dependent on the specific field conditions. The maximum depth should be 30cm. If additional unconsolidated material exists below 30cm and needs to be removed for construction purposes, it must be stripped and stockpiled separately from the upper 30cm topsoil. Such material should only be used for fill below a topsoil layer, and not used for spreading on the surface. If there is less than 30cm of unconsolidated soil material above a limiting layer of rock or hardpan, then the entire depth must be stripped and stockpiled as topsoil, even if it contains a high proportion of course fragments.

Topsoil should be retained in the area below the panels (or mirrors). It is not desirable to strip and stockpile this topsoil for the whole of the operational phase. It will be much more effective for rehabilitation, to retain the topsoil in place. If levelling requires significant cutting, topsoil should be temporarily stockpiled and then re-spread after cutting, so that there is a covering of topsoil over the entire surface before the panels are mounted. It will be advantageous to have topsoil and vegetation cover below the panels during the operational phase for the following reasons: conservation of topsoil, dust suppression and erosion control.

It is only in areas where topsoil cannot be retained on the surface during the operational phase, and where the area will be rehabilitated back to veld after decommissioning, that it should be stripped and stockpiled for the duration of the operational phase for re-spreading during de-commissioning.

Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.

Dispose of all subsurface spoils from excavations where they will not impact on undisturbed land.

During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.
If there is compaction, either in re-spread topsoil or in areas where topsoil was retained during the operational phase, it must be loosened through an appropriate plough action.
If topsoil has been stockpiled for the duration of the operational phase, re-vegetation is likely to require seeding and / or planting.
Erosion must be carefully controlled where necessary on topsoiled areas.

Monitoring:
Establish an effective record keeping system for each area where soil is disturbed for constructional purposes. These records should be included in environmental performance reports, and should include all the records below.
Record the GPS coordinates of each area.
Record the date of topsoil stripping.
Record the GPS coordinates of where the topsoil is stockpiled.
Record the date of cessation of constructional (or operational) activities at the particular site.
Photograph the area on cessation of constructional activities.
Record date and depth of re-spreading of topsoil.
Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.

Include periodical site inspection in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records occurrence or not of any erosion on site or downstream.

Reversibility	The impact is reversible with effective rehabilitation.
Irreplaceable loss of resources?	Minor because of the low value of the agricultural resource, which is not scarce
Confidence level of assessment	Medium - determination is based on common sense and general knowledge

8.2 Impacts associated with the operational phase

Loss of agricultural land use and soil degradation occur at the start of the construction phase and are therefore not listed under operational phase impacts. There is no further loss of land that occurs in subsequent phases.

8.3 Impacts associated with the decommissioning phase

8.3.1 Soil degradation

Soil degradation can result from erosion, topsoil loss and contamination. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by

decommissioning related land surface disturbance. Loss of topsoil can result from poor topsoil management during decommissioning related excavations. Hydrocarbon spillages from decommissioning activities can contaminate soil. Soil degradation will reduce the ability of the soil to support vegetation growth.

Comments: The water erosion risk is low due to the low slope gradients and low to moderate erodibility of the soils, but wind erosion risk is high.

Status	Negative	
	Without mitigation	**With mitigation**
Probability	Medium (3)	Low (2)
Duration	Medium term (3)	Medium term (3)
Scale / extent	Site only (1)	Site only (1)
Magnitude / severity	Minor (2)	Minor (2)
Significance	Low (18)	Low (12)

Mitigation:

If an activity will mechanically disturb the soil profile below surface, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation, which may be after construction or only at decommissioning. The depth of topsoil stripping is dependent on the specific field conditions. The maximum depth should be 30cm. If additional unconsolidated material exists below 30cm and needs to be removed for construction purposes, it must be stripped and stockpiled separately from the upper 30cm topsoil. Such material should only be used for fill below a topsoil layer, and not used for spreading on the surface. If there is less than 30cm of unconsolidated soil material above a limiting layer of rock or hardpan, then the entire depth must be stripped and stockpiled as topsoil, even if it contains a high proportion of course fragments.

Topsoil should be retained in the area below the panels (or mirrors). It is not desirable to strip and stockpile this topsoil for the whole of the operational phase. It will be much more effective for rehabilitation, to retain the topsoil in place. If levelling requires significant cutting, topsoil should be temporarily stockpiled and then re-spread after cutting, so that there is a covering of topsoil over the entire surface before the panels are mounted. It will be advantageous to have topsoil and vegetation cover below the panels during the operational phase for the following reasons: conservation of topsoil, dust suppression and erosion control.

It is only in areas where topsoil cannot be retained on the surface during the operational phase, and where the area will be rehabilitated back to veld after decommissioning, that it should be stripped and stockpiled for the duration of the operational phase for re-spreading during de-commissioning.

Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.

Dispose of all subsurface spoils from excavations where they will not impact on undisturbed land.

During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed

surface.
If there is compaction, either in re-spread topsoil or in areas where topsoil was retained during the operational phase, it must be loosened through an appropriate plough action.
If topsoil has been stockpiled for the duration of the operational phase, re-vegetation is likely to require seeding and / or planting.
Erosion must be carefully controlled where necessary on topsoiled areas.

Monitoring:
Establish an effective record keeping system for each area where soil is disturbed for constructional purposes. These records should be included in environmental performance reports, and should include all the records below.
Record the GPS coordinates of each area.
Record the date of topsoil stripping.
Record the GPS coordinates of where the topsoil is stockpiled.
Record the date of cessation of constructional (or operational) activities at the particular site.
Photograph the area on cessation of constructional activities.
Record date and depth of re-spreading of topsoil.
Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.

Include periodical site inspection in environmental performance reporting that inspects the effectiveness of the run-off control system and specifically records occurrence or not of any erosion on site or downstream.

Reversibility	The impact is reversible with effective rehabilitation.
Irreplaceable loss of resources?	Minor because of the low value of the agricultural resource, which is not scarce
Confidence level of assessment	Medium - determination is based on common sense and general knowledge

8.4 Cumulative impacts

The cumulative impact of a development is the impact that development will have when its impact is added to the incremental impacts of other past, present or reasonably foreseeable future activities that will affect the same environment. The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant.

The potential cumulative agricultural impact of importance is a regional loss or degradation of

agricultural land, with a consequent decrease in agricultural production. The defining question for assessing the cumulative agricultural impact is this:

> What level of loss of agricultural land is acceptable in the area, and will the loss associated with the proposed Bokpoort PV development, cause that level in the area to be exceeded?

The loss of agricultural land in the area is highly likely to be within an acceptable limit in terms of loss of low potential agricultural land, of which there is no scarcity in the country. This is particularly so when considered within the context of the following two points:

- In order for South Africa to achieve its renewable energy generation goals, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a cumulative loss of agricultural land in a region such as the one being assessed, which has no cultivation potential, and low grazing capacity, than to lose agricultural land that has a higher potential, and that is much scarcer, to renewable energy development elsewhere in the country. The limits of acceptable agricultural land loss are therefore far higher in this region than in regions with higher agricultural potential.
- It is also preferable, from an impact point of view as well as from practical considerations, to rather have a concentrated node of renewable energy development within one area, as is the case around this project, than to spread out the same number of developments over a larger area.

Acceptable levels of change in terms of other areas of impact such as visual impact would be exceeded long before agricultural levels of change came anywhere near to being exceeded.

It should also be noted that there are few land uses, other than renewable energy, that are competing for agricultural land use in this area. The cumulative impact from developments, other than renewable energy, is therefore low.

Due to all of the considerations discussed above, the cumulative impact of loss of agricultural land use is assessed as having low significance. In terms of cumulative impact, therefore, the development can be authorised.

8.5 Comparative assessment of alternatives

No proposed technology or grid connection alternatives will have any bearing on agricultural impacts.

The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. The one identified potential such impact is that due to continued low rainfall in the area, in addition to other economic and market pressures on farming, the agricultural enterprises will come under increased pressure in terms of economic

viability, with resultant decrease in productivity.

There is not a big difference in the extent to which the development and the no-go alternative will impact agricultural production, which results in there being, from an agricultural impact perspective, no preferred alternative between the development and the no-go.

9 CONCLUSION AND RECOMMENDATIONS

The proposed development is on land zoned as 'Special'. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable for cultivation. This assessment has found that the investigated site is on land which is of low agricultural potential and is not suitable for cultivation.

It is preferable to incur a loss of agricultural land on such a site, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development elsewhere in the country.

No agriculturally sensitive areas occur within the proposed site and no part of it is therefore required to be set aside from the development.

Because of the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which would preclude authorisation of the proposed development. Therefore, from an agricultural impact point of view, the development should be authorised.

There are no conditions resulting from this assessment that need to be included in the environmental authorisation.

10 REFERENCES

Cape Farm Mapper. Available at: https://gis.elsenburg.com/apps/cfm/

Department of Agriculture, Forestry and Fisheries, 2017. National land capability evaluation raster data layer, 2017. Pretoria.

Department of Agriculture, Forestry and Fisheries, 2002. National land type inventories data set. Pretoria.

DEA, 2015. Strategic Environmental Assessment for wind and solar photovoltaic development in South Africa. CSIR Report Number CSIR: CSIR/CAS/EMS/ER/2015/001/B. Stellenbosch.

Fey, M. 2010. Soils of South Africa. Cambridge University Press, Cape Town.

Soil Classification Working Group. 1991. Soil classification: a taxonomic system for South Africa. Soil and Irrigation Research Institute, Department of Agricultural Development, Pretoria.

The World Bank Climate Change Knowledge Portal available at https://climateknowledgeportal.worldbank.org/country/south-africa/climate-data-historical

APPENDIX 1: SOIL DATA

Table A1. Land type soil data for site.

Land type	Land capability class	Soil series (forms)	Depth (cm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Ae4	7	Hutton	45-100	3-6	6-8	ka	42
		Mispah	10-25	6-10		ka	40
		Hutton	20-60	3-6	6-9	R, ka	10
		Hutton	60-120	2-4	3-6	ka	5
Af7	7	Hutton	60->120	2-4	4-8	ka	58
		Hutton	>120	1-2	2-4		40

Land capability classes: 7 = non-arable, low potential grazing land.

Depth limiting layers: R = hard rock; ka = hardpan carbonate.

Appendix C2:
Ecology

SPECIALIST DECLARATION

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Specialist ecological opinion on the proposed technical amendments of the ICE Developments at the Bokpoort Photovoltaic Project, Northern Cape Province, REF NO: ACW-DAO-2021/19. Version 2021.11.26.02

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE
2021 -12- 03
WIERDABRUG SAPS
SUID-AFRIKAANSE POLISIEDIENS

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:
B-BBEE

Specialist name:
Specialist Qualifications:
Professional affiliation/registration:

Physical address:
Postal address:
Postal code:
Telephone:
E-mail:

2. DECLARATION BY THE SPECIALIST

I, Riaan A. J. Robbeson, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Riaan A. J. Robbeson, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

[redacted]

Signature of the Commissioner of Oaths

2021 12 02

Date

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE
2021 -12- 03
WIERDABRUG SAPS
SUID-AFRIKAANSE POLISIEDIENS

COMPLIANCE WITH GN320 AND GN1150

[redacted]

Riaan A. J. Robbeson (Pr.Sci.Nat.)
[redacted]
Zoological Science (Certi.Nat.Sci.)

15th February 2022
Ref. No: ACW – GNR – 2022/02
Version: 2022.02.15.01

To Whom It May Concern

Response to DFFE requests for alignment of ecological reports to GN320 and GN1150 for the ACWA Bokpoort Photovoltaic Project, Northern Cape Province

1. Background to this Response Letter

1.1 The following report has reference:

⇒ *Bathusi Environmental Consulting cc (2019). Ecological Basic Impact Assessment of the proposed 200 MW Solar Power Development that will be situated on the Remaining Extent of Farm Bokpoort 390 within the !Kheis Local Municipality (ZF Mgcawu District Municipality) of the Northern Cape Province (excluding birds and bats). Reference Number RHD – BPT – 2020/02, Version 2020.02.08.05.*

1.2 This terrestrial biodiversity report was submitted on the 8th February 2020 and the following key aspects that are pertinent to this response letter were highlighted in the report:

⇒ The proposed Bokpoort II development would originally have comprised a combination of Photovoltaic and Concentrated Solar Power Tower technology, including the respective phases Bokpoort II PV1, Bokpoort II PV2 and Bokpoort CSP. However, to allow for technical advancements and considerations, ACWA Power is (*inter alia*) proposing an amendment to the project that will entail the construction of 8 PV plants within the CSP footprint with an output of 200 MW each, instead of the CSP tower.

⇒ Since the inception of the Bokpoort Solar Power Project in 2010, several assessments of the ecological and biodiversity receiving environment have been compiled. BEC, in 2020, has been requested, on behalf of Royal HaskoningDHV, to condense the information from these reports to present a single and comprehensive assessment of the receiving environment.

⇒ Previous reports that are relevant to this particular report and from which information is sourced, include the following documents:

- Final EIA Report: Proposed 150 MW CSP Tower Development on the Remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number: 1400951-301174-15;
- Final EIA Report: Proposed 75 MW Photovoltaic (PV1) Solar Power Development on the Remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number: 1400951-301175-16;

- Final EIA Report: Proposed 75 MW Photovoltaic (PV2) Solar Power Development on the Remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number: 1400951-301175-17;
- Biodiversity (excluding birds and bats) Baseline and Impact Assessment: Proposed 150 MW CSP Tower Development on the remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number: 1400951-300636-14;
- Biodiversity (excluding birds and bats) Baseline and Impact Assessment: Proposed 75 MW Photovoltaic Solar Development (PV1) on the remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number: 1400951-302926-25;
- Biodiversity (excluding birds and bats) Baseline and Impact Assessment: Proposed 75 MW Photovoltaic Solar Development (PV2) on the remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number 1400951-302927-265;
- Biodiversity Impact Assessment for the proposed Concentrated Solar Thermal Power Plant (Siyanda District, Northern Cape Province) on a portion of the Farm Bokpoort 390. 2010. Bathusi Environmental Consulting cc. Project Reference: SSI-CSP-2011/04; and
- Protected Species Survey for the proposed Concentrated Solar Thermal Power Plant on a portion of the Farm Bokpoort 390, Siyanda District, Northern Cape Province. 2010. Bathusi Environmental Consulting cc. Project Reference: SSI-HSP-2012/05 (v. 2011.09.08).

⇒ It should be noted that these reports are based on assessments and surveys of geographical areas that (partially or entirely) include the particular development footprint, and presented professional opinions on anticipated impacts on the receiving environment caused by different processes and activities.

⇒ The principal ecological assessments were conducted in 2010 and were compiled to present the impacts on the floristic and general faunal environment (excluding the avifaunal component) and were based on the conservation status of species at the time of the report and took cognisance of the environmental legislation relevant to biodiversity assessments at the time.

2. Authority Comments and Requests

2.1 Subsequent to a review of the abovementioned terrestrial ecological report, the following comments were submitted by DFFE and has reference to the report:

"Specialist Assessment:

Ensure that specialist studies, where applicable comply with the requirements of GN 320 of 20 March 2020 and GN 1150 of 30 October 2020 unless proof is provided that indicates that the specialist study was commissioned within 50 days after the date of gazetting of the notice i.e. 20 March 2020 and was commissioned prior to 30 October 2020 respectively. Failure to comply with the abovementioned notices presents a risk to this application."

3 GN32 (gazetted 20th March 2020):

3.1 The following aspects from the general notice are pertinent to this letter:

⇒ The GN specifies the protocol for the specialist assessment and minimum report content requirements for environmental impacts on the "Terrestrial Biodiversity Sensitivity Theme", and replaces the requirements of Appendix 6 of the Environmental Impact Assessment Regulations.

⇒ The assessment and minimum reporting requirements of the protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool. The

requirements for terrestrial biodiversity are for landscapes or sites which support various levels of biodiversity.

4 GN1150 (gazetted 30th October 2020)

The following aspects from the general notice are pertinent to this letter:

- ⇒ The GN specifies the procedures for the assessment and minimum criteria for report ion identified environmental themes in terms of Sections 24(5(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation.
- ⇒ The GN specifies protocols in respect of specific environmental themes for the assessment of, as well as the minimum report content requirements on, the environmental impacts for activities requiring environmental authorisation.
- ⇒ The requirements of the protocols will apply from the date of publication, except where the application provides proof to the competent authority (CA) that the specialist assessments affected by these protocols had been commissioned by the date of the publication of these protocols in the Government Gazette, in which case Appendix 6 of the Environmental Impact Assessment Regulations, 2014, as amended, will apply to such applications.
- ⇒ Themes that are relevant to GN1150 include:
  - Terrestrial Animal Species: Protocol of the specialist assessment and minim report content requirements for environmental impacts on terrestrial animal species; and
  - Terrestrial Plant Species: Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial plant species.
- ⇒ The protocol replaces the requirements of Appendix 6 of the Environmental Impact Assessment Regulations.
- ⇒ The assessment and reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool for terrestrial animal and plant species. The relevant terrestrial animal and plant species data in the screening tool has been provided by the South African National Biodiversity Institute (SANBI).

4 Discussion and Comments

- ⇒ Our interpretation of the comments and requirements submitted by the CA (DFFE, par 2.1) requires the amendment of all relevant reports submitted subsequent to the gazetting dates of GN320 and GN1150 (i.e. 20th March 2020 and 30th October 2020, respectively) to align with specified protocol and reporting requirements.
- ⇒ The bulk of the ecological fieldwork for the report was conducted in 2010, which implied some minor changes in the status of regional ecological types and the conservation status of some species, considering the current status.
- ⇒ The use of several new information sources was implemented subsequent to the execution of the principal field investigations, most noticeably the national web based environmental screening tool, which effectively employs a number of GIS information sources to ascribe a level of sensitivity to certain species and regional habitat and ecological types. These sensitivities did not exist at the time of the principal ecological surveys and could therefore not be considered and included/ discussed in the report.

⇒ The prescribed survey protocol from GN320 and GN1150 requires the execution of a detailed level of survey techniques to assess the presence./ abundance and status of certain species, based on their level of conservation importance and (potential) presence on the site, which were not necessarily considered during the principal, and subsequent, surveys as it did not form part of the typical suite of survey protocols and requirements.

⇒ The prescribed minimum reporting requirements from GN320 and GN1150 will require a considerable amendment of the report to present available information to the specified requirements.

5 Conclusions

⇒ To effectively align ecological surveys with GN320 and GN1150 survey protocol, the commissioning of new ecological surveys will be required, also considered retrospectively as much of the original area has already been developed.

⇒ The ecological surveys and data assimilation from the 2010, and subsequent, surveys are considered sufficient to adequately present, illustrate, discuss and portray the status of the receiving environment and species for the purpose of considering the application.

⇒ While the existing report (par 1.1) is not presented to align with minimum reporting requirements, all data, results and discussions presented in the report nonetheless provides effective results for consideration of the application.

⇒ A brief review of the principal results, placed in context with results from the national web based environmental screening report, indicated a high level of correlation, noticeably indicating a higher level of sensitivity than indicted by the national web based environmental screening report.

⇒ Results of the national web based environmental report (refer par 6) indicated no aspect of elevated sensitivity that was not considered during the principal (and subsequent) ecological assessments.

6 National Web Based Environmental Screening Report

6.1 The following aspects of sensitivity were indicated by the national web based environmental screening report (downloaded 2022/02/15) (considering the existing area of development with an approximate 1.0 km buffer):

6.2 Animal Sensitivity Theme:

Low Sensitivity

Medium Sensitivity (Aves – *Neotis ludwigii*)

Medium Sensitivity (Aves – *Saggitarius serpentarius*)

6.3 Plant Sensitivity Theme

Low Sensitivity

6.4 Terrestrial Biodiversity Sensitivity Theme

Low Sensitivity

7 Statement

The relevant report (par 1.1), which was submitted on the 8th February 2020, preceded both the gazetting dates of GN320 and GN1150, and therefore does not require amendment to align with specified protocol and reporting requirements.

It is also concluded that results, sensitivities, impacts and the associated significance, and the resultant mitigation approach, as presented and evaluated in the relevant report (par 1.1), are representative of the terrestrial biodiversity and ecological receiving environment and the realignment of the existing report with GN320 and GN1150 protocol and requirements will not materially affect any results or recommendations.

Should you have any further enquiries or comments, please feel free to contact us immediately.

Kind regards

[redacted]

16th February 2022

SPECIALIST ECOLOGICAL OPINION – ADDITIONAL ICE (NOVEMBER 2021)

[redacted]

26th November 2021
Ref. No: ACW – DAO – 2021/19
Version: 2021.11.26.02

To Whom It May Concern

Specialist ecological opinion on the proposed technical amendments of the ICE Developments at the Bokpoort Photovoltaic Project, Northern Cape Province

The specialist opinion (version 2021.10.26.01) is relevant to this brief opinion letter.

Subsequent to the submission of the previous specialist opinion (refer **Figure 1**), negotiations between the Competent Environmental Authority (CEA) and the Client resulted in technical amendments to the proposed project layout that included the addition of 2 ICE units tot the previous iteration of the project layout. Specifically, the addition of the Sotho and Afrikaans units are required to ensure operation stability for the units (refer **Figure 2**).

A brief review of the anticipated impacts and effects of the additional ICE units on the receiving environment, indicated that these anticipated impacts will not result in elevated significance or additional impacts that were not foreseen and evaluated during the previous opinion.

It is therefore concluded impacts and the associated significance, as presented and evaluated in the previous version of the review, are representative of the amended layout, as presented in **Figure 2** below.

Should you have any further enquiries, please feel free to contact us immediately.

Kind regards

[redacted]

26th November 2021

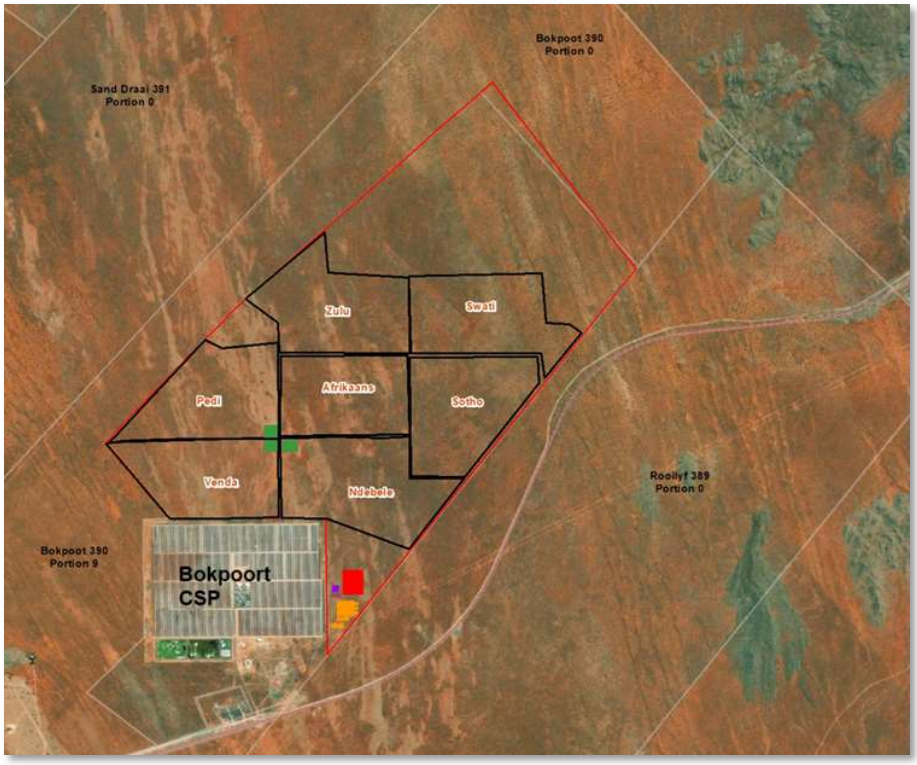


Figure 1: Spatial arrangement of the planned 3 x ICE units within the existing footprint of previously assessed areas (refer green squares

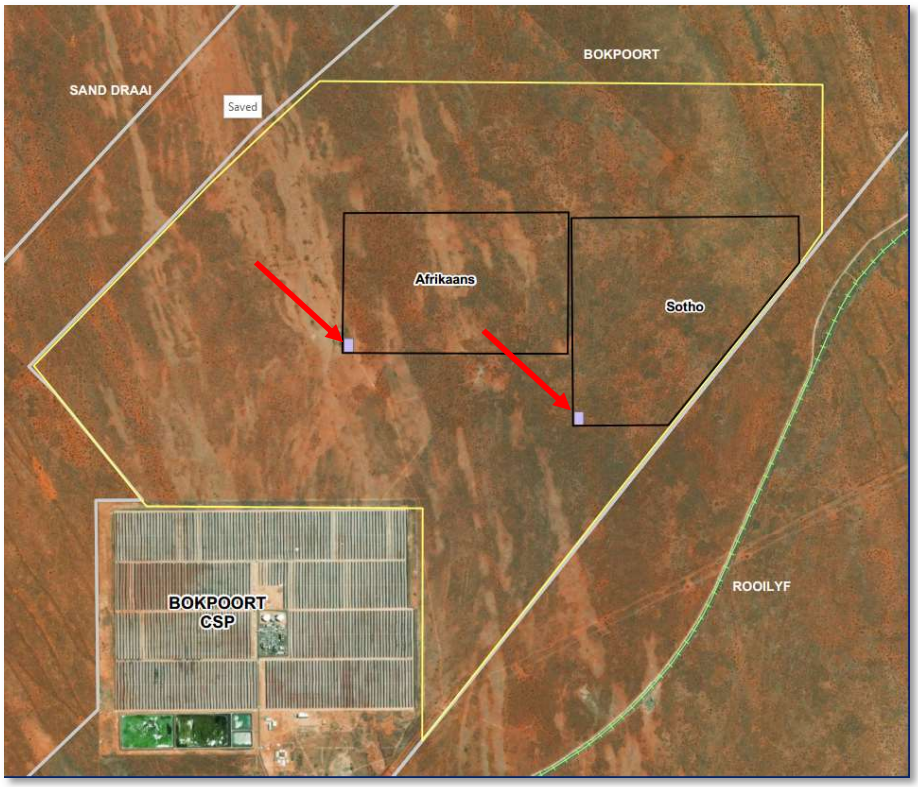


Figure 2: Spatial arrangement of the planned new 2 x ICE units outside of the previous footprint (notably Sotho and Afrikaans)

SPECIALIST ECOLOGICAL OPINION – SEVEN ICE (MARCH 2021)

[redacted]

10th March 2021
Ref. No: ACW – ICE – 2020/17
Version: 2021.03.10.04

To Whom It May Concern

Specialist opinion on the proposed 7 x (9.9 MW) Internal Combustion Engines as part of the Bokpoort Photovoltaic Project, Northern Cape Province

1 BACKGROUND TO THE PROJECT

Continual and iterative technical considerations and changes to a project requires a constant review by the client to ensure legal and environmental compliance during all stages of the development.

The proposed development of the 7 x 9.9 MW Internal Combustion Engines (ICE), as part of the proposed Bokpoort 200 MW Solar Power Development, which is situated on the Remaining Extent of Farm Bokpoort 390 (within the !Kheis Local Municipality in the Northern Cape Province), will be subjected to a Basic Assessment Process. The Department of Environment, Forestry and Fisheries (DEFF), as the lead authority, requested a reasoned opinion from specialists on whether existing reports and available information provide adequate and detailed information to reach a conclusive decision on the project. Conclusions, recommendations, and opinions that are contained in the report will ultimately be included wholly in the BAR for the proposed ICE development for final consideration by the departments. **Figure 1** illustrates the spatial location of the proposed 7 x 9.9 MW ICE sites in relation to the project boundaries

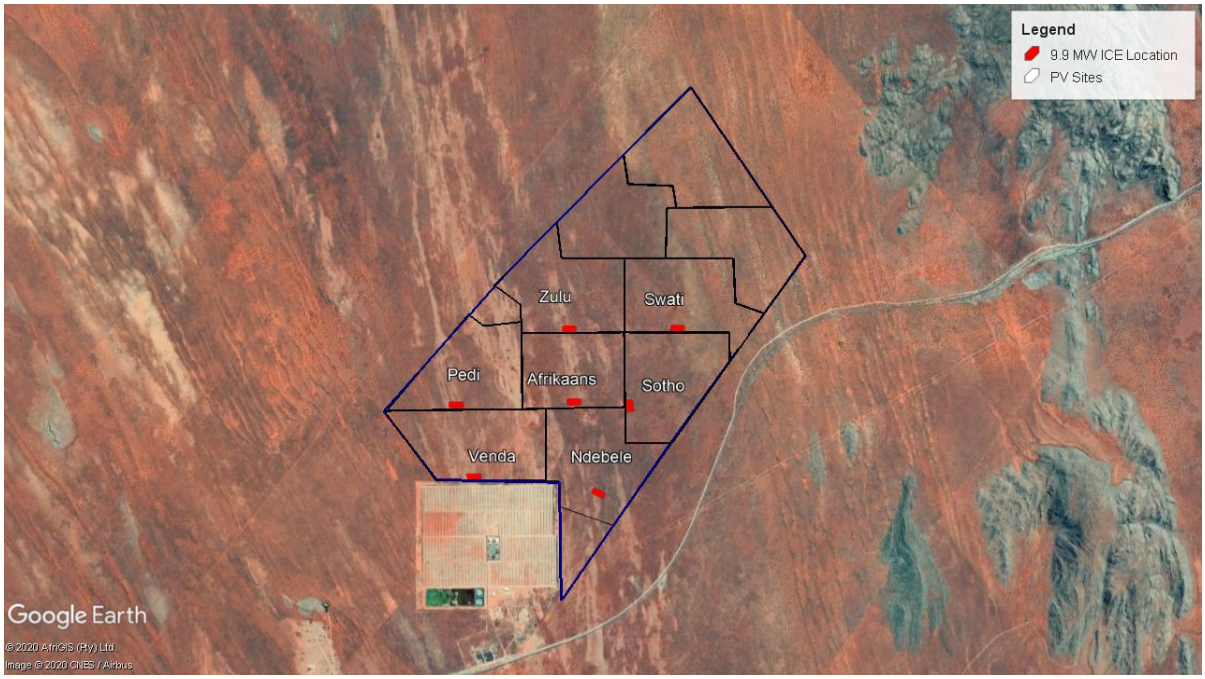


Figure 1: Spatial arrangement of proposed7 x 9.9MWICE sites (note operational Bokpoort I CSP Development)

2 SPECIFICATIONS OF THE DEVELOPMENT

Generating capacity:	9.9 MW
Fuel Type:	LPG/LNG
Stack height:	50-70 m
Number of engines:	1 for each plot (it is subject to the engine size, various load size available in the market)
Fuel storage tanks:	5 for each plot
Fuel volume:	500 m³ for each plot
Water requirements:	limited water for cooling
Area size:	1.5 ha
Design:	Designs varies with engine providers

3 SUPPORTING DOCUMENTATION AND KEY RESULTS

Specifically, the following report has reference to this specialist opinion:

Bathusi Environmental Consulting cc (2019). Ecological Basic Impact Assessment of the proposed 200 MW Solar Power Development that will be situated on the Remaining Extent of Farm Bokpoort 390 within the !Kheis Local Municipality (ZF Mgcawu District Municipality) of the Northern Cape Province (excluding birds and bats). Reference Number RHD – BPT – 2020/02, Version 2020.02.08.05 (The Report).

The following key results were obtained from The Report and are relevant to this specialist opinion:

⇒ The above-mentioned ecological report was compiled from a review of several previous ecological assessments that were done on the study area, which represents a geographic area that spatially includes these particular sites, namely:

- BEC conducted the principal sampling of the ecological environment, providing species inventories, habitat delineations and descriptions (2010). These surveys also included an evaluation of the likelihood of presence of flora and fauna species of conservation concern within the Study Area that were preliminarily identified as potentially occurring, through habitat suitability assessment;
- Golder Associates conducted limited ground-truthing surveys between 21/09/2015 and 23/09/2015 to ascertain the accuracy of vegetation communities identified in 2010 and 2014, and assess the current extent of use of the study area by fauna; and
- RHDHV conducted detailed field surveys within the study area on several occasions (RHDV, 2014a; RHDV, 2014b).

⇒ No threatened ecological type is represented in the study area or occur within the immediate region.

⇒ Three (3) plant species of conservation consideration (protected trees) have been recorded within the site; these trees occur at moderate densities and their removal is subject to permit authorisation (DEFF).

⇒ Several other plant taxa of local importance are known to occur in the immediate area, their location and removal from the site is subject to permit authorisation (NCDENC).

⇒ A review of the IFC criteria for natural and modified habitat indicated that only the Rocky outcrops and foothills of the Koranna Mountains that are situated to the north of the proposed site, is categorised as natural habitat. Because of persistent and intensive grazing and deterioration, the actual footprint of the development site comprises largely modified habitat.

⇒ Based on results of the various ecological investigations, it is the considered opinion of the specialist that no specific objection is raised to the proposed PV solar facilities development. Although the proposed activity will result in unavoidable impacts on a local scale, these losses are within an acceptable range and significance level, notably with the application of a comprehensive mitigation approach.

4 PREDICTED IMPACTS AND QUANTIFICATION OF IMPACTS

Potential impacts of the Project on biodiversity were identified in the principal report, also taking note of those that were outlined in the previous Scoping Report (Golder Associates, 2016) and the original terrestrial biodiversity impact assessments for the proposed Project footprint (RHDV, 2014b; BEC, 2010).

The predicted impacts on biodiversity for the construction, operational and closure phases of this Project are outlined in the following sections.

4.1 Identified Impacts for the Construction Phase

The main impacts on biodiversity during the construction phase will arise from changes in land cover due to the proposed construction of the Project and all associated infrastructure, resulting in direct impacts on the extent and composition of vegetation communities and associated faunal groups. Specific project impacts that could occur include:

⇒ Reduction in extent of habitats within the Project footprint;
⇒ Introduction and exacerbation of declared and invasive plant species;
⇒ Loss/disturbance of flora and fauna species of conservation concern;
⇒ Loss/disturbance of other fauna species;
⇒ Reduction in extent of Natural Habitat; and
⇒ Reduction in extent of Critical Habitat; and
⇒ Soil erosion and sediment loading of surface water runoff.

4.2 Identified Impacts for the Operational Phase

Predicted impacts on biodiversity during the operational phase of the Project relate to disturbance to resident fauna species as a result of the presence of the photovoltaic facility, and contamination risks for the Orange River. The specific operational impacts that are anticipated include:

⇒ Spread of invasive species; and
⇒ Disturbance of resident faunal species caused by ongoing operation and maintenance activities at the facility (e.g. security lighting at night, security patrols of the boundary throughout the day) (human-animal conflict situations;

4.3 Identified Impacts for the Decommissioning/Closure Phase

Predicted impacts on biodiversity and ecosystem services during the decommissioning and closure phase of the Project include the following:

⇒ Spread of invasive species;
⇒ Soil erosion and loss/disturbance of ecosystems of conservation concern.

4.4 Quantification of Impacts

The appraisal of identified impacts (pre- and post mitigation) on the terrestrial biodiversity environment during the various stages of the development yielded the following results:

Summary table for the impact significance on the ecological receiving environment (before and after mitigation)*		
Nature	*Before Mitigation*	*After Mitigation*
Construction Phase - Loss of extent of modified habitats within the Project footprint (direct impacts on natural vegetation)	50	35
Construction Phase - Introduction/spread of exotic invasive species	52	15
Construction Phase - Loss/disturbance of flora and fauna species of conservation concern	56	36
Construction Phase - Loss/disturbance of other fauna species	55	27
Construction Phase - Reduction in extent of natural habitats, systems of conservation concern	42	18
Construction Phase - Soil erosion and sediment loading of surface water runoff	40	12
Operational Phase - Spread of invasive plant species	52	15
Operational Phase - Direct loss (injury/mortality) of fauna species via roadkill	70	40
Operational Phase - Disturbance of faunal species of conservation concern – site lighting	60	20
Operational Phase - Disturbance of faunal species of conservation concern – barrier to movement	48	36
Decommissioning Phase - Spread of invasive plant species	65	21
Decommissioning Phase - Soil erosion and sediment loading of surface water runoff	39	14

* *taken from the principal report*

4.5 Cumulative Impacts

Cumulative impacts represent the totality of impacts in a given area resulting from this activity and related (similar projects or activities that could conceivably be regarded as 'spin-offs' from this project), and how these activities impact upon the ecology of a region. The exact nature, duration, significance, and scale of cumulative impacts are difficult to quantify and also extremely problematic to mitigate against. However, cumulative impacts are significant and require consideration during this process of mitigating impacts and managing the natural ecological environment of the region.

The Project is spatially situated immediately east of the existing Bokpoort I development. In addition, the proposed SolAfrica Sanddraai 75 MW PV Project in !Kheis LM is situated on the farm directly adjacent to the Project, and the proposed Kheis Solar Park 1 PV project is located in similar habitat approximately 20 km north of the Project (refer **Figure 2**).

Potential residual (post-mitigation) impacts of the Bokpoort II PV Project that may contribute to the cumulative effects of other proposed and permitted solar developments in the region relate to exacerbated direct and indirect impacts on fauna, such as increased incidences of road kill as a result of the increase in traffic on a regional scale and the continued loss of remaining natural habitat and changes to the landscape that affect migration patterns. From a floristic perspective, the continued and incremental loss of natural habitat is an important consideration. Additionally, the exponential increase in population often result in exacerbation of harvesting and utilisation pattens.

Because of the comparatively small size of the proposed development, the significance of anticipated cumulative impacts are expected to be of a low significance. Similarly, since the proposed development represents an extension of

the existing development, the cumulative exacerbation of identified impacts on a regional scale is anticipated to be minimal.

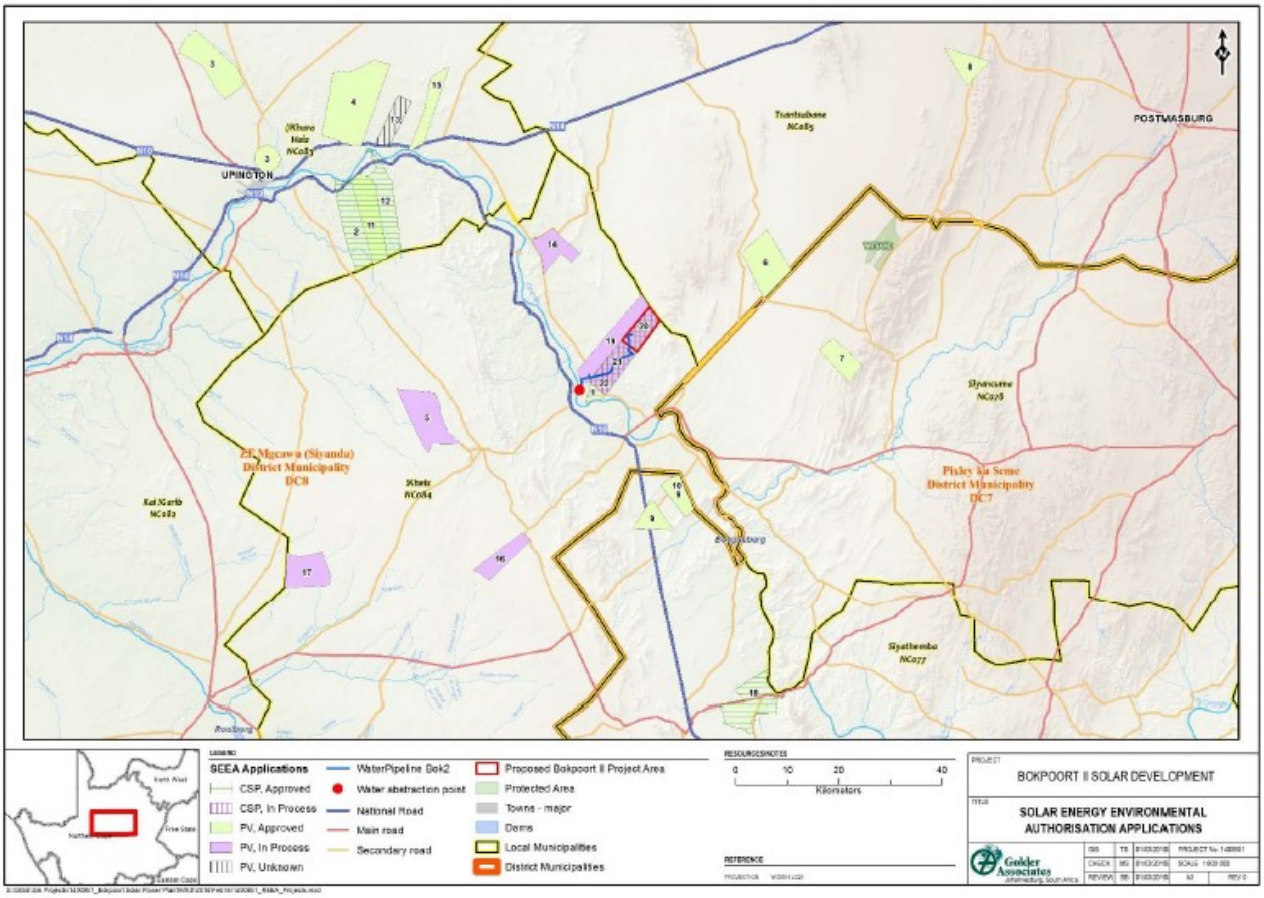


Figure 2: Proposed and authorised solar developments in the larger region that may contribute to cumulative impacts

Summary table for the cumulative exacerbation of impacts from the proposed activity relating to similar and induced activities on a regional scale	
Nature	*Cumulative Impact Significance*
Cumulative losses of modified habitats (direct impacts on remaining natural vegetation)	9
Cumulative exacerbation of the effects of exotic invasive species	18
Cumulative effects of continued and exacerbated loss and disturbance of flora and fauna species of conservation concern	18
Cumulative impacts on natural faunal movement and migration patterns and effects on locally indigenous fauna species, inclusive of direct impacts such as road kills, induced mortality, harvesting patterns, general disturbance effects, etc.	16
Cumulative losses of remaining natural habitats, systems of conservation concern	8
Cumulative exacerbation of soil erosion and sediment loading of surface water runoff	7

5 REASONED SPECIALIST OPINION

It is a regulatory requirement that the specialist provides a professional opinion with regards to the proposed development.

Based on a review of The Report (BEC, 2020), it is our reasoned opinion that:

⇒ Information, data, results, and recommendations contained in The Report provide a fair and comprehensive interpretation of the current ecological status and ecological importance/ sensitivity on a local and regional scale.

⇒ The Report provides a fair evaluation of the significance and importance of anticipated and likely impacts on the biological receiving environment. As these features will be included within the development footprints of the photovoltaic developments, the anticipated level of impacts is not anticipated to be exacerbated.

⇒ The appraisal of anticipated and likely impacts on the terrestrial biodiversity environment indicated impacts of a moderate nature. With the timeous and comprehensive application of a mitigation approach, the significance of the anticipated impacts will be ameliorated to an acceptable significance level.

⇒ Since the proposed ICE technical features represent an addition to the planned industrial development, the level and detail of mitigation recommendations that are provided in The Report is considered adequate and sufficient to mitigate against any impacts that could reasonably be expected to result from the addition of the ICE components to the development footprint (refer Section 19.3 of the report). No additional mitigation measures are recommended at this stage, but normal monitoring protocol should be followed during all stages of the development to identify and address any concerns that could not have been anticipated and to inform the active mitigation approach and project management.

⇒ Because of the comparatively small size of the proposed development, the significance of anticipated cumulative impacts are expected to be of a low significance. Similarly, since the proposed development represents an extension of the existing development, the cumulative exacerbation of identified impacts on a regional scale is anticipated to be minimal.

6 CONCLUSIONS

In conclusion:

⇒ No specific objection is raised to the proposed development and, although the proposed activity will result in unavoidable impacts on a local scale, these losses are within an acceptable range and significance and will not result in exacerbation of anticipated impacts or irreversible impacts on sensitive biological receptors.

⇒ I support the inclusion of The Report as part of the Basic Assessment Process for the 7 x 9.9 MW ICE components of the Bokpoort PV Development.

7 SPECIALIST INVESTIGATOR

The Natural Scientific Professions Act (South Africa, No. 27 of 2003) aims to 'provide for the establishment of the South African Council of Natural Scientific Professions (SACNASP), and for the registration of professional, candidate and certified natural scientists; and to provide for matters connected therewith'. Quoting the South African Council for Natural Scientific Professions Act revised 2019), specialists must:

"5 Only undertake natural scientific work which their education, experience or background have rendered them competent to perform; and

8 Not knowingly misrepresent or permit misrepresentation of their own or their associates' academic or professional qualifications, neither exaggerate their own degree of responsibility for any work of a natural scientific nature."

Biodiversity specialist for this project	
Botanical Specialist:	Riaan Robbeson (Pr.Sci.Nat.)[1]
Qualification:	[redacted]
Affiliation:	
Fields of Expertise:	
Registration Number:	

Riaan obtained his B.Sc. degree, with zoology and botany as major subjects in 1990. He committed to post-graduate studies in 1991; ultimately obtaining his M.Sc. degree in Plant Ecology at the University of Pretoria in 1998, while working as a research assistant and team member of the National Grassland Biome Project between 1994 and 1998. In 1999 Riaan established Bathusi Environmental Consulting cc with the objective of conducting ecological studies with a holistic approach and a strong emphasis of the inclusion of faunal disciplines. Towards this objective, the development of working relations with numerous other specialists was, and still remains, a major priority. Inter-disciplinary collaboration on numerous projects enabled Riaan to acquire a working knowledge of these disciplines, including invertebrates, mammals, herpetofauna and birds.

During his career that spans more than 20 years, Riaan has acquired extensive experience in the evaluation of the status and reaction of the natural environment to development, across the ecological spectrum of plants, animals and biophysical attributes of the receiving environment. He has compiled in excess of 400 biodiversity related reports since the start of his career. In addition to pure scientific investigations and ecological investigations (EIA related studies), he has also successfully developed and implemented several biodiversity monitoring programmes on mining areas. In addition to a comprehensive knowledge of the Grassland and Savanna Biomes, Riaan has also successfully contributed to several projects in the Succulent and Nama Karoo biomes.

[1] *A detailed CV can be presented on request*

8 DECLARATION OF INDEPENDENCE

I, the undersigned, acting in a capacity as a specialist biodiversity consultant, and the legal representative of Bathusi Environmental Consulting, declare that:

- ⇒ While I am committed to the conservation of biodiversity, I also concomitantly acknowledge and recognize the need for economic development and the sustainable utilisation of natural resources;
- ⇒ I execute my duties as independent specialist consultant conducting the biodiversity impact assessments and preparing the products;
- ⇒ I shall perform all activities associated with the project in line with relevant legislation and comply with ethical requirements related to our profession;
- ⇒ At the time of presenting this proposal, I did not have any interest, hidden or otherwise, in the proposed development or activity, as outlined in this document, other than expecting fair financial compensation for work performed in a professional capacity, as specified by the National Environmental Management Act (No 107 of 1998) (2014) Regulations GNR 983 and GNR 986, as amended in 2017;
- ⇒ As an affiliated member, I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);
- ⇒ BEC is not a legal of financial subsidiary of the Client;
- ⇒ I shall not be affected in any manner by the outcome of the environmental process of which the reports and biodiversity assessments form part of, other than being part of the general public;
- ⇒ I do not necessarily object to or endorse the proposed development from a personal perspective, but aim to present facts and recommendations based on scientific data and relevant professional experience;
- ⇒ I do not have any influence over decisions made by the governing authorities; and
- ⇒ I undertake to disclose to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2005.

Should I consider myself in conflict with any of the above declarations, I shall formally submit a Notice of Withdrawal to all relevant parties and register as an Interested and Affected Party.

Rigan A. J. Robbeson (Pr.Sci.Nat.), on behalf of:

[redacted]

10th March 2021

[redacted]

ECOLOGICAL BASIC IMPACT ASSESSMENT OF THE TEN PROPOSED 200 MW SOLAR POWER DEVELOPMENT – FEBRUARY 2020

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Ecological Basic Impact Assessment of the proposed 200 MW Solar Power Development that will be situated on the Remaining Extent of Farm Bokpoort 390 within the !Kheis Local Municipality (ZF Mgcawu District Municipality) of the Northern Cape Province (excluding birds and bats). Reference Number RHD – BPT – 2020/02

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE
2020 -02- 19
WIERDABRUG SAPS
SUID-AFRIKAANSE POLISIE

1. SPECIALIST INFORMATION

Specialist Company Name:	[redacted]
B-BBEE	
Specialist name:	
Specialist Qualifications:	
Professional affiliation/registration:	
Physical address:	
Postal address:	
Postal code:	
Telephone:	
E-mail:	

2. DECLARATION BY THE SPECIALIST

I, Riaan A. J. Robbeson, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act

[redacted]

Bathusi Environmental Consulting cc

Name of Company:

2020 / 02 / 18

Date

SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE
2020 -02- 19
WIERDABRUG SAPS
SUID-AFRIKAANSE POLISIEDIENS

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Riaan A. J. Robbeson, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

[redacted]

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SOUTH AFRICAN POLICE SERVICE
COMMUNITY SERVICE CENTRE
2020 -02- 19
WIERDABRUG SAPS
SUID-AFRIKAANSE POLISIEDIENS

Reference:	RHD - BPT – 2020/02
Version:	2020.02.08.05
Date:	8th February 2020

ECOLOGICAL BASIC IMPACT ASSESSMENT OF THE PROPOSED 200 MW SOLAR POWER DEVELOPMENT

THAT WILL BE SITUATED ON:

THE REMAINING EXTENT OF FARM BOKPOORT 390,

WITHIN THE !KHEIS LOCAL MUNICIPALITY (ZF MGCAWU DISTRICT MUNICIPALITY)

OF THE NORTHERN CAPE PROVINCE

{excluding avifauna and bats}

drafted by

B E C

Bathusi Environmental Consulting

this report was this report was prepared for:

Royal HaskoningDHV

Enhancing Society Together

DOCUMENT NAVIGATION

LIST OF TABLES

LIST OF FIGURES

1 PROJECT DETAILS

Table 1: Project details	
Client	Royal HaskoningDHV, on behalf of ACWA Power Energy Africa (Pty) Ltd
Report name	Ecological Basic Impact Assessment of the proposed 200 MW Solar Power Development that will be situated on the Remaining Extent of Farm Bokpoort 390 within the !Kheis Local Municipality (ZF Mgcawu District Municipality) of the Northern Cape Province
BEC Reference Number	RHD – BPT – 2020/02
Report Version	2020.02.08.05
Compiled by	Riaan A. J. Robbeson (Pr.Sci.Nat.), Bathusi Environmental Consulting cc

2 REPORT REFERENCE & CITATION

When used as a reference, or included as an addendum, this report should be cited as:

Bathusi Environmental Consulting cc (2019). Ecological Basic Impact Assessment of the proposed 200 MW Solar Power Development that will be situated on the Remaining Extent of Farm Bokpoort 390 within the !Kheis Local Municipality (ZF Mgcawu District Municipality) of the Northern Cape Province (excluding birds and bats). Reference Number RHD – BPT – 2020/02, Version 2020.02.08.05.

3 SPECIALIST INVESTIGATOR[1]

The Natural Scientific Professions Act of 2003 aims to '*provide for the establishment of the South African Council of Natural Scientific Professions (SACNASP), and for the registration of professional, candidate and certified natural scientists; and to provide for matters connected therewith'*. Quoting the Natural Scientific Professions Act of 2003: '*Only a registered person may practice in a consulting capacity*' (20(1) – pg 14).

Table 2: Biodiversity specialists for this project	
Botanical Specialist:	Riaan Robbeson (Pr.Sci.Nat.)
Qualification:	M.Sc. (Botany), UP
Affiliation:	South African Council for Natural Scientific Professions
Fields of Expertise:	Botanical Scientist & Ecological Scientist
Registration Number:	[redacted]

Riaan obtained his B.Sc. degree, with zoology and botany as major subjects in 1990. He committed to post-graduate studies in 1991; ultimately obtaining his M.Sc. degree in Plant Ecology at the University of Pretoria in 1998, while working as a research assistant and team member of the National Grassland Biome Project between 1994 and 1998. In 1999 Riaan established Bathusi Environmental Consulting cc with the objective of conducting ecological studies with a holistic approach and a strong emphasis of the inclusion of faunal disciplines. Towards this objective, the development of working relations with numerous other specialists was, and still remains, a major priority. Inter-disciplinary collaboration on numerous projects enabled Riaan to acquire a working knowledge of these disciplines, including invertebrates, mammals, herpetofauna and birds.

During his career that spans more than 20 years, Riaan has acquired extensive experience in the evaluation of the status and reaction of the natural environment to development, across the ecological spectrum of plants, animals and biophysical attributes of the receiving environment. He has compiled in excess of 400 biodiversity related reports since the start of his career. In addition to pure scientific investigations and ecological investigations (EIA related studies), he has also successfully developed and implemented several biodiversity monitoring programmes on mining areas. In addition to a comprehensive knowledge of the Grassland and Savanna Biomes, Riaan has also successfully contributed to several projects in the Succulent and Nama Karoo biomes.

[1] A CV for the specialist is presented in Section 26

4 PROJECT SYNOPSIS AND BACKGROUND INFORMATION

4.1 BACKGROUND

ACWA Power Energy Africa (Pty) Ltd (hereafter referred to as ACWA Power) applied for several Environmental Authorisations (EA) for the respective phases of the project in 2016. Subsequent to the completion of the CSP development (refer **Figure 1**), ACWA Power is applying to replace a previously authorised (separate) CSP (refer **Figure 2**) with 10 Photo Voltaic plants. Authorisation for 2 PV plants have already been obtained as part of a previous application process, but is subject to slight amendments. The development area is situated on the remaining extent of the Farm Bokpoort 390, which is situated 20 km north-west of the town of Groblershoop within the !Kheis Local Municipality in the ZF Mgcawu District Municipality, Northern Cape Province.

The proposed site is situated within one of South Africa's eight renewable energy development zones, and has therefore been identified as one of the most suitable areas in the country for renewable energy development, in terms of a number of environmental impact, economic and infrastructural factors.

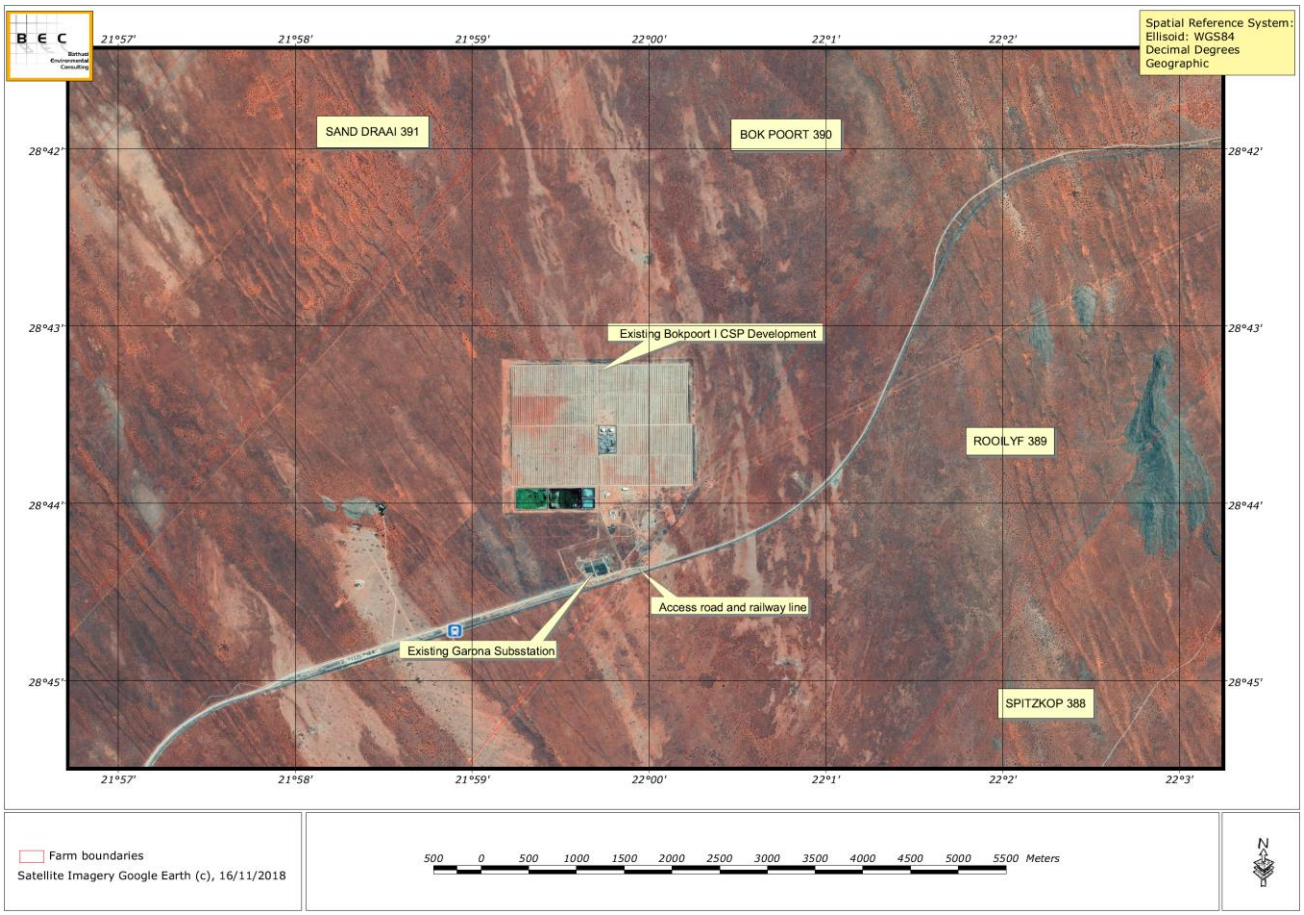


Figure 1: Satellite imagery that reflects the existing status of the site and immediate surrounds, indicating the operational Bokpoort I CSP Development

4.2 AMENDMENTS TO THE DEVELOPMENT

The proposed Bokpoort II development would originally have comprised a combination of Photovoltaic and Concentrated Solar Power Tower technology, including the respective phases Bokpoort II PV1, Bokpoort II PV2 and Bokpoort CSP (refer **Figure 2**). However, to allow for technical advancements and considerations, ACWA Power is now proposing an amendment to the project that will entail the construction of 8 PV plants within the CSP footprint with an output of 200 MW each, instead of the CSP tower. It should be noted that two of the proposed PV Plants (i.e. Ndebele and Xhosa, refer **Figure 3**) have already been authorised; however the authorisation for these two sites did not include the battery

energy storage systems for either of the sites as well as the capacity increase from 75 to 200 MW and will be undergoing a separate BA study (refer **Figure 3**). The total area that will be required for the development will be 1,500 ha.

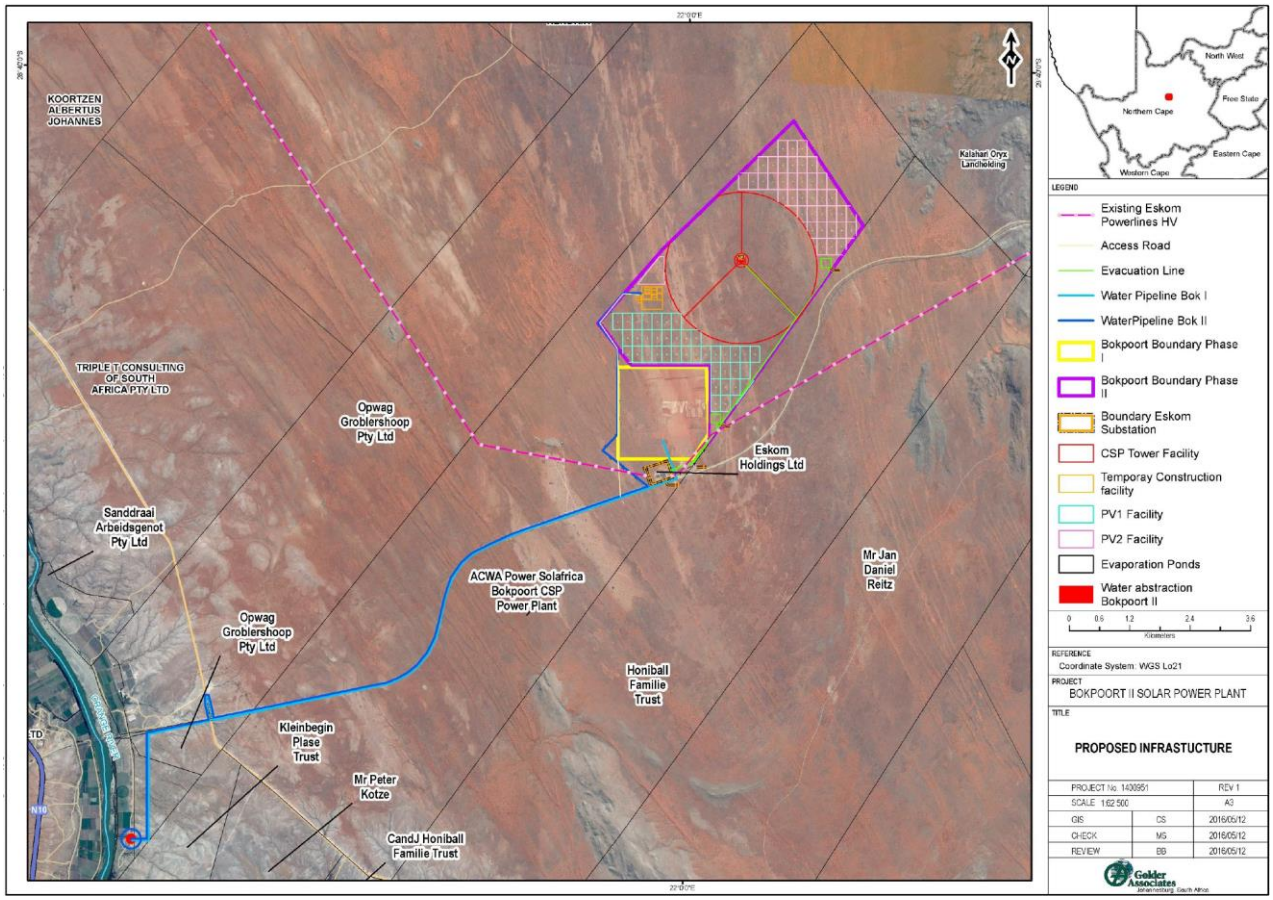


Figure 2: Initial layout of the Bokpoort II PV1, PV2 and CSP development footprint prior to amendment of the application
Image courtesy of Golder Associates

4.3 THE 200 MW PV SOLAR POWER PLANT DESIGN SPECIFICATIONS

The proposed individual 200 MW PV Solar Development will comprise of the following appurtenant infrastructure:

⇒ Solar PV modules that will comprise of monocrystalline PV modules that will be able to deliver up to 200 MW to the Eskom National Grid;

⇒ Inverters that convert direct current (DC) generated by the PV modules into alternating current (AC) to be exported to the electrical grid;

⇒ A transformer that raises the system AC low voltage (LV) to medium voltage (MV). The transformer converts the voltage of the electricity generated by the PV panels to the correct voltage for delivery to Eskom;

⇒ Transformer substation;

⇒ Inclusion of a Battery Energy Storage System (BESS) on all 10 PV sites, with an anticipated storage capacity of 150 MW and a footprint of 16 ha on each of the 10 sites; and

⇒ Instrumentation and control consisting of hardware and software for remote plant monitoring and operation of the facility.

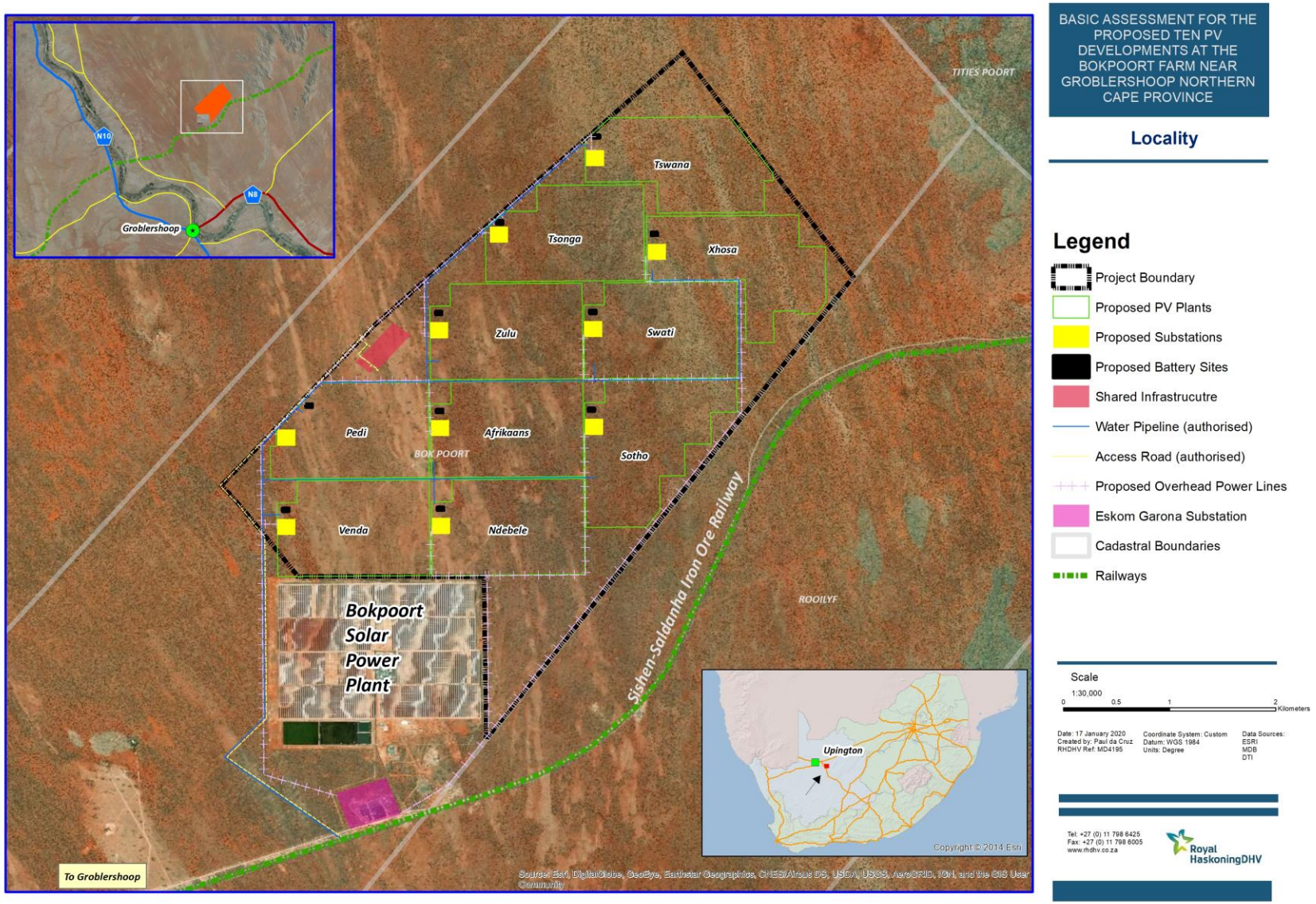


Figure 3: Proposed layout of the 200 MW PV Power Development, indicating the 10 PV footprints and appurtenant infrastructure

Appurtenant infrastructure:

⇒ Mounting structures for the solar panels;
⇒ Cabling between the structures, to be lain underground where practical;
⇒ A new 132 kV overhead power line which will connect the facility to the national grid via Eskom's existing Garona Substation;
⇒ The powerline will be approximately 5 km in length and will be located within a servitude spanning 15.5 meters on both sides. The powerline towers will be 35 meters high; and
⇒ Internal access roads (4 – 6 m wide) will be constructed where necessary, but existing roads will be used as far as possible, with appropriate fencing (approximately 3 m in height).
⇒ Shared infrastructure consisting of buildings, including a workshop area for maintenance, storage (i.e. fuel tanks, etc.), laydown area, parking, warehouse, and offices (previously approved).

Some physical dimensions:

⇒ The proposed total photovoltaic development will cover 1,500 ha in totality (development footprint);
⇒ The proposed solar facility will have the following infrastructure that are important in terms of height:
  - The PV panels disposition over support structures will be maximum 4.5 meters high; and
  - The substation will be 10 meters high;
⇒ The construction laydown area will be 5 ha; and
⇒ The proposed individual solar facility will generate 200 MW.

Battery Energy Storage System:

⇒ Battery power at the point of connection is 150 MW;
⇒ Footprint of each BESS site will be approximately 16 ha, i.e. 400 m x 400 m
⇒ The BESS will store approximately 4,500 m³ of hazardous substance; and
⇒ Water volumes during construction and operational phase will be approximately 22,000 m³.

4.4 THIS ASSESSMENT

Since the inception of the Bokpoort Solar Power Project, several assessments of the ecological and biodiversity receiving environment have been compiled. BEC has been appointed, on behalf of Royal HaskoningDHV, to condense the information from these reports to:

1 present an overview of the ecological receiving environment that will be affected by the proposed PV development, also with reference to recent changes in available information sources; and
2 establish the impact on the biodiversity and ecological receiving environment that are relevant to the amended project.

It should be noted that this report will address aspects of botany and fauna, which include mammals, invertebrates and herpetofauna, but specifically excludes bats (Chiroptera) and avian aspects; these disciplines will be addressed as 'stand-alone' reports by relevant specialists.

Previous reports that are relevant to this particular report and from which information is sourced, include the following documents:

1. Final EIA Report: Proposed 150 MW CSP Tower Development on the Remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number: 1400951-301174-15;
2. Final EIA Report: Proposed 75 MW Photovoltaic (PV1) Solar Power Development on the Remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number: 1400951-301175-16;

3. Final EIA Report: Proposed 75 MW Photovoltaic (PV2) Solar Power Development on the Remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number: 1400951-301175-17;
4. Biodiversity (excluding birds and bats) Baseline and Impact Assessment: Proposed 150 MW CSP Tower Development on the remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number: 1400951-300636-14;
5. Biodiversity (excluding birds and bats) Baseline and Impact Assessment: Proposed 75 MW Photovoltaic Solar Development (PV1) on the remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number: 1400951-302926-25;
6. Biodiversity (excluding birds and bats) Baseline and Impact Assessment: Proposed 75 MW Photovoltaic Solar Development (PV2) on the remaining Extent of Farm Bokpoort 390, Northern Cape. Golder Associates. 2016. Report Number 1400951-302927-265;
7. Biodiversity Impact Assessment for the proposed Concentrated Solar Thermal Power Plant (Siyanda District, Northern Cape Province) on a portion of the Farm Bokpoort 390. 2010. Bathusi Environmental Consulting cc. Project Reference: SSI-CSP-2011/04; and
8. Protected Species Survey for the proposed Concentrated Solar Thermal Power Plant on a portion of the Farm Bokpoort 390, Siyanda District, Northern Cape Province. 2010. Bathusi Environmental Consulting cc. Project Reference: SSI-HSP-2012/05 (v. 2011.09.08).

It should also be noted that these reports assessed geographical areas that (partially or entirely) include this particular development footprint, and presented professional opinions on anticipated impacts on the receiving environment caused by different processes and activities. While this particular report will extract relevant observations and opinions from these reports, the principal objective is to amend the impact statement to reflect the proposed changes to the nature of the project.

5 EXECUTIVE SUMMARY

5.1 BIOPHYSICAL ENVIRONMENT

The following biophysical attributes of the region are relevant to the biodiversity traits that is exhibited by the site and immediate surrounds:

⇒ The project site is located within a decidedly rural region; livestock agricultural practices, notably sheep farming, constitute the major land use of the region (Lanz, 2016).

⇒ Due to the climatic limitations of the area, the site is totally unsuitable for cultivated crops and the viable agricultural land use is limited to grazing only.

⇒ The geology of the area is generally characterised by metamorphosed sediments and volcanics intruded by granites; it is known as the Namaqualand Metamorphic Province with a aeolian surface which is characteristic of the group (the Gordonia Formation) (Council for Geoscience , 2016).

⇒ The proposed site is situated on red-brown windblown sands of the Gordonia Formation, Kalahari Group.

⇒ Dune ridges occur in the northern portions of the site and are characterised by NNW-SSE orientation.

⇒ Rainfall in the project area is low and generally occurs in late summer and early autumn between January and April with an average between 170 and 240 mm per annum.

⇒ Daily average summer temperatures range between 23°C and 37°C, and winter temperatures ranging between 4°C and 20°C.

⇒ Areas of conservation importance include the Witsand Nature Reserve, which is situated approximately 42 km to the east-northeast of the proposed site (unlikely be affected) and the Lower Gariep Alluvial Vegetation type, comprising the Gariep River, which is considered an Endangered ecosystem, largely due to transformation. While the proposed activity is likely to have a minor influence on this system, any irremediable losses that exacerbate existing impacts are regarded unacceptable.

5.2 KEY RESULTS OF THE ECOLOGICAL ASSESSMENT

The following key results were obtained from the ecological assessments:

⇒ The Study Area is located in a transitional area that includes elements of both the Savanna Biome and the Nama Karoo Biome, more specifically comprising the Kalahari Karroid Shrubland and Gordonia Duneveld ecological types.

⇒ No threatened ecological type is represented in the study area, or occur within the immediate region.

⇒ The SANBI database indicates the presence of only 91 species within the ¼ degree grids in which the study site is located, reflecting a paucity of comprehensive and accurate floristic knowledge of the region.

⇒ The species list that was compiled during the site investigation (BEC, 2010) is considered moderately comprehensive; a total of 112 plant species were identified during the site investigations.

⇒ In spite of a relative homogenous appearance and correlation to the regional types, with the exception of extensive mountain ranges to the north, a relative obvious physiognomic variability is noted in the study area with grassy and calcareous plains alternating with parallel dunes in the northern parts.

⇒ Results of a photo analysis and site investigations revealed the presence of three broad-scale habitat types within the development footprint, namely:

- Calcareous Low Shrub Plains;
- Open Shrub Duneveld; and
- Open Shrub Plains.

⇒ A total of 12 butterfly species were previously recorded in the study area; all species are common and ubiquitous species of the region. Nevertheless, the butterfly species richness is likely a factor of the largely untransformed and non-fragmented nature of the Study Area.

⇒ No amphibian species have been recorded within the study area. Taking cognisance of the absence of surface water within the proposed development footprint, it is regarded unlikely that any amphibian species will occur on site.

⇒ Eight reptile species were observed during the previous baseline studies (BEC, 2010).

⇒ A total of fifty-one (51) mammal species are considered potentially occupants of the study area. Fourteen (14) of these have been confirmed during field studies (RHV, 2014; BEC, 2010).

A review of the local and regional context of the Biodiversity Value that the site exhibit, indicated the following:

⇒ 3 plant species of conservation consideration (protected trees) have been recorded within the site; these trees occur at moderate densities and their removal is subject to permit authorisation (DEFF).

⇒ Several other plant taxa of local importance is known to occur in the site, their removal is subject to a detailed assessment and permit authorisation (NCDENC).

⇒ Several fauna species (excluding birds and bats) are regarded likely to persist within the site, or are known from surrounding localities. Anticipated impacts on these animals have been demonstrated as moderate and the mitigation approach should be dedicated to avoiding direct impacts on these animals.

⇒ Ecosystems of priority conservation concern that are relevant to this study, include the following:

- The rocky outcrop to the north of the study area associated with the Koranna-Langeberg Mountain Bushveld Vegetation type. Apart from exhibiting intact ecological integrity in terms of vegetation community composition, it is an important area in terms of its support of roosting bat species, and is classified as Natural Habitat by IFC; and
- The riparian habitat associated with the Orange River – this area supports the endangered vegetation type Lower Gariep Alluvial Vegetation, and has importance as an ecological corridor through the landscape. In addition, it is an important support area for foraging faunal species, including bats.

⇒ A review of the IFC criteria for natural and modified habitat indicated that only the Rocky outcrops and foothills of the Koranna Mountains to the north of the proposed site is categorised as natural habitat. As a result of persistent and intensive grazing and deterioration, the actual footprint of the development comprises largely modified habitat.

⇒ A review of IFC criteria for Critical Habitat indicated that only the Lower Gariep Alluvial Vegetation unit qualifies as Critical Habitat within the study area, under Criterion 4, and although it is not likely to be directly affected by this project, it is being considered in terms of Cumulative Impacts from the remainder of the project. No area within the development footprint is regarded Critical Habitat.

5.3 Impact Assessment and Significance

The proposed project is likely to result in significant, albeit localised impacts on the ecological receiving environment. Specific project impacts that could occur include:

⇒ Reduction in extent of habitats within the Project footprint;

⇒ Introduction and exacerbation of declared and invasive plant species;

⇒ Loss/disturbance of flora and fauna species of conservation concern;

⇒ Loss/disturbance of other fauna species;

⇒ Reduction in extent of Natural Habitat; and

⇒ Reduction in extent of Critical Habitat; and

⇒ Soil erosion and sediment loading of surface water runoff.

Summary table for the impact significance on the ecological receiving environment (before and after mitigation)		
Nature	*Before Mitigation*	*After Mitigation*
Construction Phase - Loss of extent of modified habitats within the Project footprint (direct impacts on natural vegetation)	50	35
Construction Phase - Introduction/spread of exotic invasive species	52	15
Construction Phase - Loss/disturbance of flora and fauna species of conservation concern	56	36
Construction Phase - Loss/disturbance of other fauna species	55	27
Construction Phase - Reduction in extent of natural habitats, systems of conservation concern	42	18
Construction Phase - Soil erosion and sediment loading of surface water runoff	40	12
Operational Phase - Spread of invasive plant species	52	15
Operational Phase - Direct loss (injury/mortality) of fauna species via roadkill	70	40
Operational Phase - Disturbance of faunal species of conservation concern – site lighting	60	20
Operational Phase - Disturbance of faunal species of conservation concern – barrier to movement	48	36
Decommissioning Phase - Spread of invasive plant species	65	21
Decommissioning Phase - Soil erosion and sediment loading of surface water runoff	39	14

Appurtenant infrastructure that is situated outside the indicated footprint include access roads, the water pipeline and the power line. Natural habitat that will be affected by the required linear infrastructure exhibit similar characteristics to habitat contained within the development footprint. Taking cognisance of the nature of impacts associated with construction and operation of linear infrastructure, the nature and extent of impacts associated with these infrastructures are similar in significance than the principal development footprint, albeit with limited physical extent. As the linear infrastructure is indelibly linked to the PV development, a similar impact significance is therefore estimated, and a similar mitigation approach is recommended.

5.4 CONCLUDING REMARKS

Based on results of the various ecological investigations, it is the considered opinion of the specialist that no specific objection is raised to the proposed PV solar facilities development. Although the proposed activity will result in unavoidable impacts on a local scale, these losses are within an acceptable range and significance level, notably with the application of a comprehensive mitigation approach.

This concluding statement is based on the following key considerations:

⇒ It is recognised that the proposed site is situated within one of South Africa's eight renewable energy development zones, and has therefore been identified as one of the most suitable areas in the country for renewable energy development, in terms of a number of environmental impacts, economic and infrastructural factors;

⇒ Biological and biophysical attributes that characterises the study site are regarded common and are abundantly represented in the wider region;

⇒ A number of protected tree species were recorded on the site and requires legislative authorisation prior to removal;

⇒ No threatened plant or animal species were recorded on the site during the site investigations;

⇒ It is regarded unlikely that any plant or animal species of a threatened status will persist on the site, other than possibly migratory or opportunistic purposes;

- ⇒ No habitat type that were recorded within the site are regarded restricted on a local or wider scale. The site also does not exhibit any significant biophysical feature of rarity or ecological importance;
- ⇒ The loss of natural habitat within the site is not expected to result in significant, or unacceptable, effects of provincial biodiversity conservation patterns or obligations. Similarly, the inclusion of this portion of remaining natural habitat as part of a conservation stewardship will not result in significant gains of conservation efforts on a local or regional scale. Particular reference is made to existing and planned developments in the immediate surrounds (cumulative impacts);
- ⇒ The loss of this portion of natural habitat is also not anticipated to cause severe or unacceptable changes to or disruptions of ecological processes or animal migratory patterns on a local or regional scale;
- ⇒ No impact was identified that would result in significant or unacceptable impacts on the ecological receiving environment;
- ⇒ The application of the recommended mitigation approach is expected to ameliorate anticipated impacts to an acceptable low level.

6 TERMS OF REFERENCE FOR THIS STUDY

The Terms of Reference for this study is perceived as follows:

⇒ Collate and appraise all relevant reports, studies, applications and EMPr documents pertaining to the project;
⇒ Provide a brief overview of the (regional and local scale) biophysical characteristics of the receiving environment;
⇒ Review the regional and local botanical and faunal diversity by means of a desk-top assessment of available historic reports;
⇒ Reflect on the potential presence of conservation important plant and animal species (excluding bats and birds) on the site (DAFF, IUCN, SANBI);
⇒ Establish sensitive biodiversity/ ecological receptors on the site that might be adversely affected by the proposed development;
⇒ Verify/ amend the Impact Statement presented as part of the principal ecological reports that is relevant to the project development footprint and the nature of the proposed development activity;
⇒ Provide a comprehensive mitigation approach and EMPr contributions that will ameliorate anticipated impacts on the ecological environment;
⇒ Provide monitoring recommendations that should be executed as part of the proposed project as part of the construction and operational phases;
⇒ Compile suitable maps, illustrating pertinent aspects; and
⇒ Present all results in a suitable report.

7 APPROACH AND METHODS STATEMENT

This section presents the methods used in this study report to identify any important biodiversity within the Study Area.

The study comprises a desktop appraisal of existing information that included previous baseline reports for the Study Area (DHV 2014a; DHV 2014b; BEC, 2010; Golder, 2016). A review of national and international law, policies, agreements and standards pertaining to biodiversity in South Africa and the Northern Cape Province formed part of the previous assessments, notably the Golder report. These included South African national law and policies, international conventions and treaties. The review of relevant legal documentation (refer Section 21) highlights relevant legislative and policy requirements that must be met in order to fulfil biodiversity protection objectives, and achieve the desired biodiversity outcomes.

7.1 STUDY AREA

The primary effect on biodiversity arising from the Project will be loss of habitat, implying a loss in extent of ecosystems due to site clearance and groundworks. These works are unlikely to be limited to the exact footprint of the CSP tower in isolation, therefore impacts are considered as occurring within the extent of the PV solar facilities boundary.

Previous baseline reports were compiled through a rigorous assessment of a geographical area that include this particular development footprint. Results, discussions and narrative illustrations are used to embellish the account of anticipated impacts on the ecological receiving environment, although some aspects that are not relevant to this development footprint was subsequently omitted.

7.2 DESKTOP REVIEW AND GAP ANALYSIS

A comprehensive review of available information on biodiversity features within the study area was conducted as part of the previous reports and relevant extractions thereof is presented in this report as it relates to changes in the development footprint and activities. The following tasks were undertaken:

⇒ Review of available literature and GIS information on baseline biodiversity conditions within the Study Area, and ecosystem services supplied. Reviewed data included biodiversity baseline data gathered within the Study Area for aspects of the Bokpoort I development (RHDV, 2014a; RHDV, 2014b; BEC, 2010) as well as the reports generated by Golder (2016). Other information that was reviewed included IUCN Red Data lists for the Northern Cape, South Africa and any available information on nearby protected areas; and

⇒ An assessment of available baseline data and information and in order to identify data gaps was conducted, highlighting the additional data required to be gathered as part of the baseline phase, in addition to those already identified in the previous studies.

Sensitive species and habitats and existing threats in the context of the biodiversity within the Study Area were identified through review of background biodiversity and environmental reports relating to the site, available published biodiversity literature, consideration of South Africa's national and Northern Cape's provincial biodiversity legislation and policies, Non-Governmental Organisation (NGO) opinion and guidance documentation, and through application of the expertise of the biodiversity impact assessment team.

7.3 BASELINE DATA GATHERING

No site visit was conducted for this particular report. However, field and site investigations were conducted for historic reports, which is regarded suitable to reflect ecological and biodiversity attributes of the receiving environment. These include:

⇒ Golder Associates conducted limited ground-truthing surveys between 21/09/2015 and 23/09/2015 to ascertain the accuracy of vegetation communities identified in 2010 and 2014, and assess the current extent of use of the Study Area by fauna;

⇒ RHDHV conducted detailed field surveys have been within the Study Area on several occasions (RHDV, 2014a; RHDV, 2014b);

⇒ BEC conducted the principal sampling of the ecological environment, providing species inventories, habitat delineations and descriptions (2010). These surveys also included an evaluation of the likelihood of presence of flora and fauna species of conservation concern within the Study Area that were preliminarily identified as potentially occurring, through habitat suitability assessment; and

7.4 ASSESSMENT OF BIODIVERSITY VALUE

7.4.1 ECOSYSTEMS OF CONSERVATION CONCERN

Habitats were preliminarily defined as being either natural or modified, based on the International Finance Corporation (IFC) approach to assigning value to biodiversity (IFC PS6, 2012). For this impact assessment, natural habitats were defined as those habitats where the key processes, composition, and structure were largely intact, and modified habitats were defined as areas that have been altered by human activity and may contain large portions of non-native plants and animals (e.g. agricultural landscapes).

The ecological integrity of ecosystems and habitats was estimated (based on criteria including species diversity, habitat heterogeneity, presence of habitat linkages, representativeness and resilience) and assigned a subjective class: pristine, near-pristine, slightly-degraded, moderately-degraded, and heavily-degraded.

7.4.2 SPECIES OF CONSERVATION CONCERN

Although all species occurring within an area of interest form a component of the overall biodiversity and ecological value, it is neither practicable, nor necessary, to assess potential effects of a project on every species that might be affected. Therefore, species of concern are defined as plant or animal species that require special conservation consideration based on certain characteristics, or one which may be particularly sensitive to project effects.

The following selection criteria were used to identify terrestrial species of concern for the assessment:

a) Threatened and restricted-range/endemic species;
b) Statutory species (protected by national/international legislation, agreements, conventions);
c) 'Specially protected' and 'Protected' species listed on Schedules I and II of the Northern Cape Nature Conservation Act 2009;
d) Species of economic and/or cultural importance;
e) Convention on the International Trade in Endangered Species (CITES)-listed species;
f) Evolutionarily distinct species;
g) Species that play a critical ecological role, represent guilds of species, or capture effects to other species with similar habitat requirements and sensitivities;
h) Vulnerable (VU) species where there is uncertainty regarding the IUCN listing, and the actual status of the species may be critically endangered (CR) or endangered (EN); and
i) Species new or little-known to science.

Predicted effects of the Project on species of conservation concern that were confirmed to be present and/or whose likelihood of presence is 'probable' (or higher) are specifically addressed in the impact assessment.

7.4.3 NATURAL, MODIFIED AND CRITICAL HABITAT

Natural and modified habitats were mapped using the results of the previous vegetation assessments conducted for the Bokpoort development (BEC, 2010 & RDHV, 2014) to identify existing pressures on habitats within the study area, and assign natural and modified statuses. The determination of natural vs modified status is made based on the level of human-induced disturbance (e.g., presence of invasive species, level of pollution, extent of habitat fragmentation, viability of existing naturally-occurring species assemblages, resemblance of existing ecosystem functionality and structure to historical conditions, degree of other types of habitat degradation, etc.) and the biodiversity values of the site (e.g., threatened species and ecosystems, culturally important biodiversity features, ecological processes necessary for maintaining nearby critical habitats) (IFC 2012).

The potential presence of critical habitat as defined by IFC PS6 was screened through a comparison of the quantitative and qualitative IFC critical habitat determination criteria against the identified biodiversity values supported within the Study Area. This approach provides a high level determination of whether critical habitat exists, and if so, whether it could be impacted by the Project and its area of influence.

7.5 IMPACT ASSESSMENT

The significance of the identified impacts will be determined using the approach outlined below (terminology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998). This approach incorporates two aspects for assessing the potential significance of impacts, namely probability of occurrence and severity, which are further sub-divided as follows:

Occurrence		Severity	
Probability of occurrence	Duration of occurrence	Scale/ extent of impact	Magnitude (severity) of impact

To assess each of these factors for each impact, the following four ranking scales are used:

Probability	Duration
5 - Definite/ Don't know	5 - Permanent
4 - Highly probable	4 - Long-term
3 - Medium probability	3 - Medium term (8-15 years)
2 - Low probability	2 - Short term (0-7 years)
1 - Improbable	1 - Immediate
0 - None	
Scale	**Magnitude**
5 - International	10 - Very high/ Don't know
4 - National	8 - High
3 - Regional	6 - Moderate
2 - Local	4 - Low
1 - Site only	2 - Minor
0 - None	

Once these factors are ranked for each impact, the significance of the two aspects, occurrence and severity, is assessed using the following formula:

SP (significance points) = (magnitude + duration + scale) x probability

The maximum value is 100 significance points (SP). The impact significance will then be rated as follows:

SP	Significance	Description
SP >75	Indicates high environmental significance	An impact which could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.
SP 30 – 75	Indicates moderate environmental significance	An impact or benefit which is sufficiently important to require management and which could have an influence on the decision unless it is mitigated.
SP <30	Indicates low environmental significance	Impacts with little real effect and which should not have an influence on or require modification of the project design.
+	Positive impact	An impact that constitutes an improvement over pre-project conditions.

8 LIMITATIONS AND ASSUMPTIONS

It is assumed that:

⇒ all observations, identifications, calculations and opinions, as presented in the principal ecological reports (refer Section 4.4) are accurate and correct.

⇒ all drawings, illustrations and documentation presented to the specialist are correct and accurate.

⇒ all information that were sourced for this project are accurate and comprehensive at the time of extraction.

⇒ no field surveys were conducted for this particular report and it comprises a desktop evaluation of existing information that included previous baseline reports for the larger study area. (DHV, 2014a; DHV, 2014b; BEC, 2010) and supplementary studies that were conducted to address identified gaps in the baseline dataset for the project.

9 SITE LOCATION

The project area is located on the north eastern portion of the Remaining Extent of the Farm Bokpoort 390, which is 20 km north-west of the town of Groblershoop within Ward 3 of the !Kheis Local Municipality in the ZF Mgcawu District Municipality, Northern Cape Province. The geographic location of the site is illustrated in **Figure 4**. The proposed PV solar facilities development footprint will comprise of approximately 1 500 ha. The project site is situated approximately 77 km south-east of Upington and the Orange River is located approximately 12 km south-west of the site. A general GPS locality for the middle of the site is S28.7095° and E22.0076°.

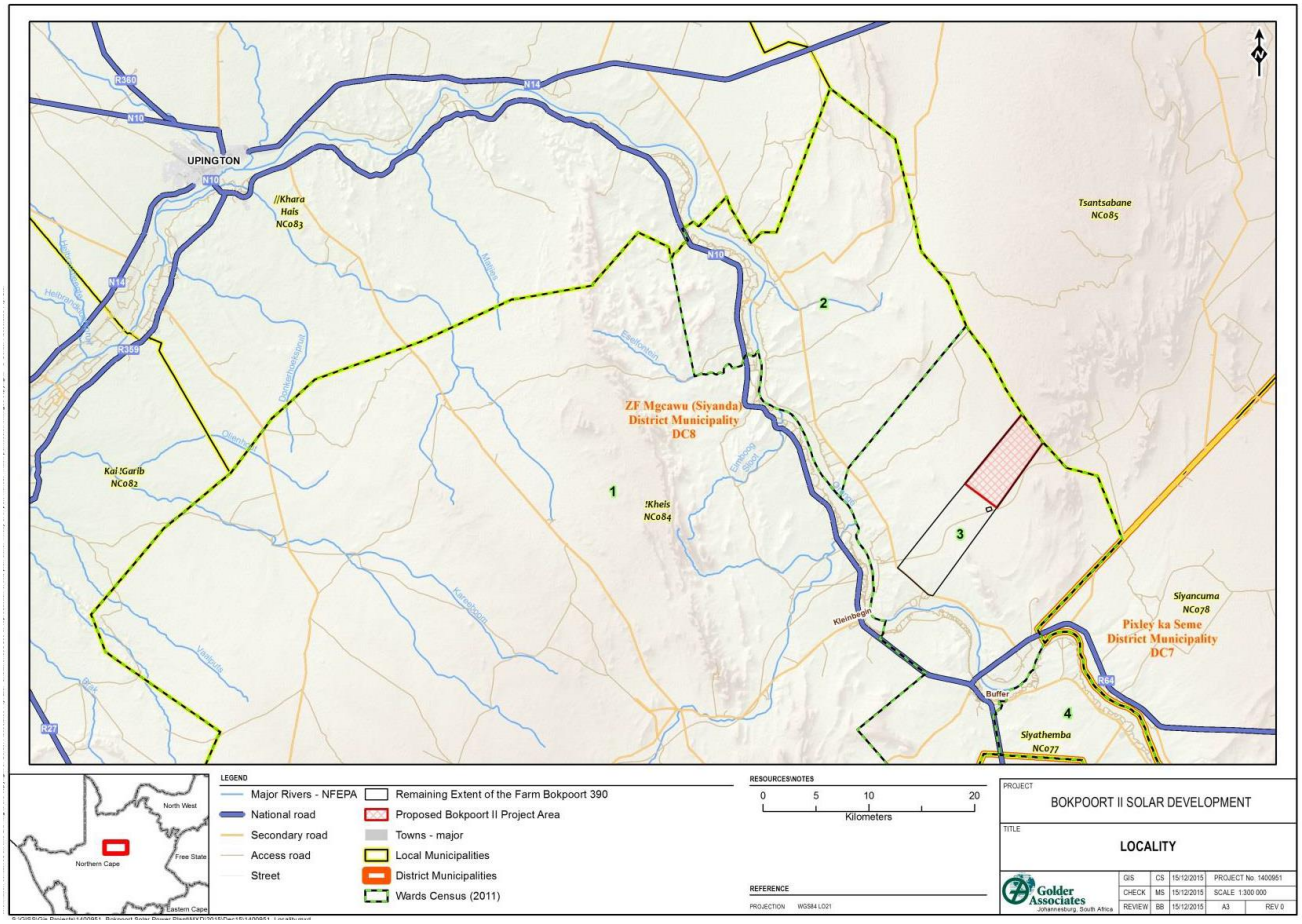


Figure 4: Geographic location of the proposed Bokpoort II: 200 MW PV Power Development

10 LAND COVER & LAND USE OF THE REGION

A brief appraisal of satellite imagery and available information sources indicated that the project site is located within a decidedly rural region. Livestock agricultural practices, notably sheep farming, constitute the most significant land use of the region (Lanz, 2016). The infrastructure on the site is limited to wind pumps, stock watering points and the fencing around the grazing camps. The neighbouring property to the south of the project site has also been developed for solar power generation (industrial) purposes (refer **Section 18.3**). A private game reserve is located to the north of the site. The land use assessment conducted by Lanz (2016) concluded that, due to the climatic limitations of the area, the site is totally unsuitable for cultivated crops and viable agricultural land use is limited to grazing only.

The BGIS information source indicates that the !Kheis Municipality comprises approximately 643 580 ha, of which 10 987 ha has been irreversibly transformed (c. 1.7 %), and 98.3 % remains untransformed. A brief review of available satellite imagery indicated that the immediate region, apart from the existing solar developments, is characterised by a largely untransformed landscape with minor fragmentation from roads and railway lines (refer **Figures 2 and 3**).

11 SOILS & GEOLOGY

The geology of the area is generally characterised by metamorphosed sediments and volcanics intruded by granites; it is known as the Namaqualand Metamorphic Province. The Groblershoop area is spatially situated on the Kalahari Group, which is divided into four formations:

1. At the base is a soft, clay gravel of fluvial origin (the Wessels Formation);
2. Upon this follows calcareous claystone with interlayered gravel (the Budin Formation);
3. This is in turn overlain by clay-containing, calcareous sandstone (the Eden Formation); and
4. Upon the Eden Formation follows the aeolian surface which is characteristic of the group (the Gordonia Formation) (Council for Geoscience , 2016).

The proposed site is situated on red-brown windblown sands of the Gordonia Formation, Kalahari Group. GCS (Pty) Ltd (2010) describes the general geology of the site as comprising mainly red-brown, coarse grained granite gneiss and quartz-muscovite schist, quartzite, quartz-amphibole schist and greenstone of the Groblershoop formation, Brulpan group. Calcrete is also present, especially in the south-eastern part of the area.

Dune ridges occur in the northern portions of the site and are characterised by NNW-SSE orientation. Calcrete outcrops occur approximately 2 km west and southwest from the Garona Substation. An anticlinal structure (upward pointing fold) causes the Groblersdal formation to be elevated in the area to the east of the site where it forms a range of hills known as the Skurweberge (Benedek, F; Roods, M;, February 2011).

12 CLIMATE

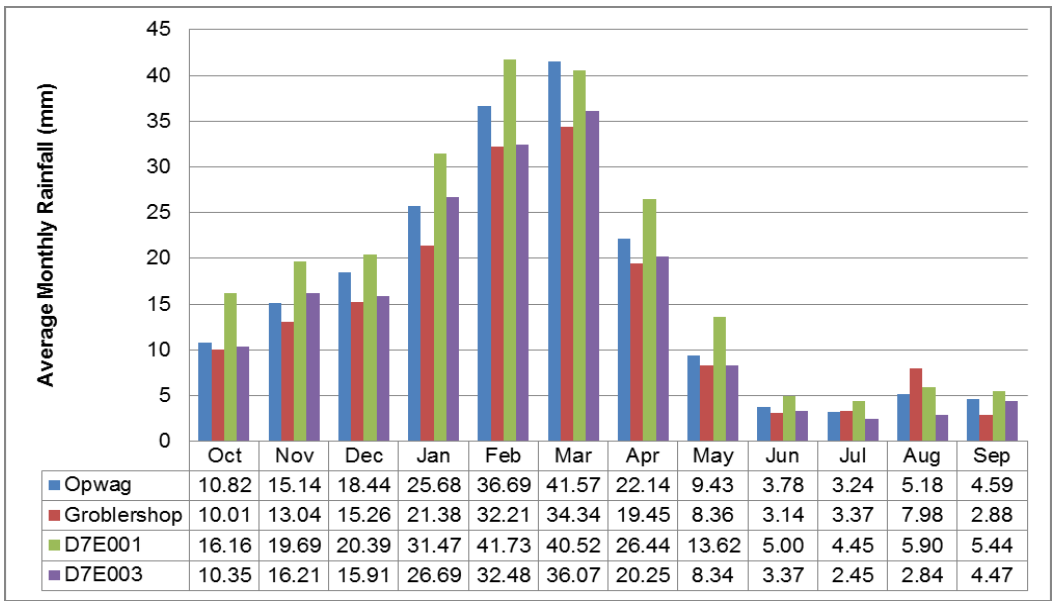
Climate data in the area around the project site was sourced from the Daily Rainfall Extraction Utility (Kunz, 2004) and the Department of Water and Sanitation's website (Department of Water Affairs, 2008).

Rainfall in the project area is scarce and generally occurs in late summer and early autumn between January and April (refer **Figure 5**[2]). Average rainfall in the area varies between 170 and 240 mm per annum (refer **Figure 6**), while evaporation is extremely high, due to the high temperatures, which can reach 35° to 40°C in summer.

Daily average summer temperatures range between 23°C and 37°C with winter temperatures ranging between 4°C and 20°C (refer **Figure 7**).

Based on the evaluation of the meteorological data, done by (Walton & Thompson, November 2010) for the Bokpoort I EIA, winds originate predominantly from the north-north-east (10 % of the time) and north (9 % of the time). Monitoring data recorded from January 2005 to December 2009 indicated that moderate to fast winds was generally recorded over the monitoring period. Calm winds, which are classified as wind speeds less than 0.5 $m.s^{-1}$ occur infrequently (4 % of the time). Moderate to fast winds originate predominantly from the westerly and northerly sectors during the day-time (06:00 – 18:00). During the night-time, winds originate from all sectors with a shift observed to the north-north-east and north-east between 00:00 – 06:00. Winds originate predominantly from the west during the summer months (December, January and February). During autumn (March, April and May), a shift is observed with winds originating predominantly from the north-north-east and north-east. A similar pattern is observed during the winter months (June, July and August). During spring (September, October and November), winds originate from all sectors, with the highest frequency recorded form the westerly sector (Walton & Thompson, November 2010).

[2] Graphs and figures courtesy of Golder Associates



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Opwag	10.82	15.14	18.44	25.68	36.69	41.57	22.14	9.43	3.78	3.24	5.18	4.59
Groblershop	10.01	13.04	15.26	21.38	32.21	34.34	19.45	8.36	3.14	3.37	7.98	2.88
D7E001	16.16	19.69	20.39	31.47	41.73	40.52	26.44	13.62	5.00	4.45	5.90	5.44
D7E003	10.35	16.21	15.91	26.69	32.48	36.07	20.25	8.34	3.37	2.45	2.84	4.47

Figure 5: Monthly rainfall distribution for rainfall stations in the surrounding areas

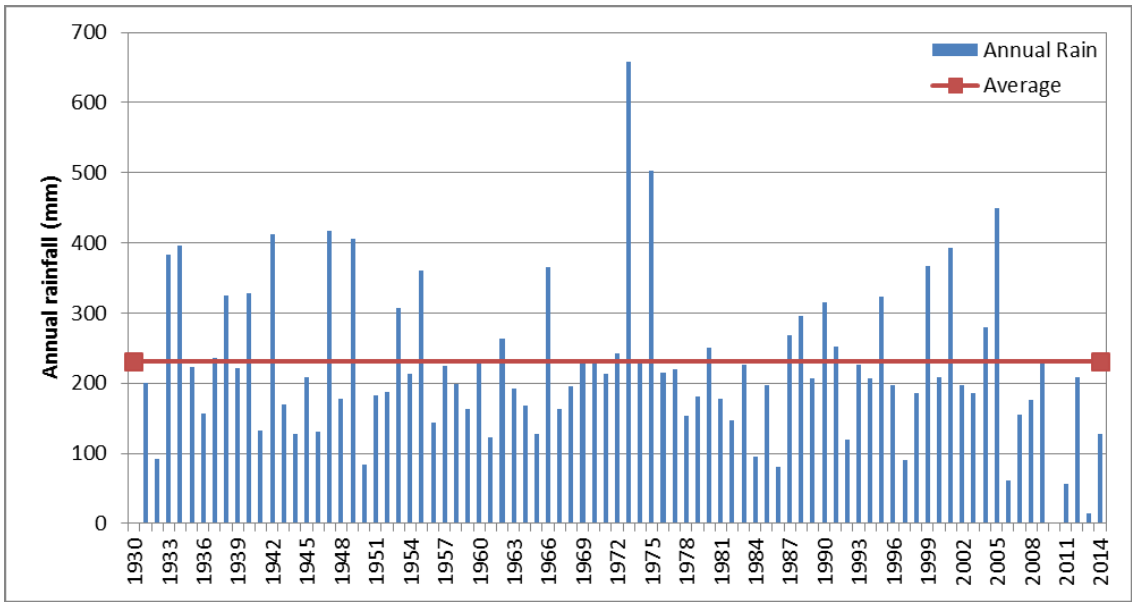


Figure 6: Annual rainfall recorded at the D7E001 (Boegoeberg Dam) station

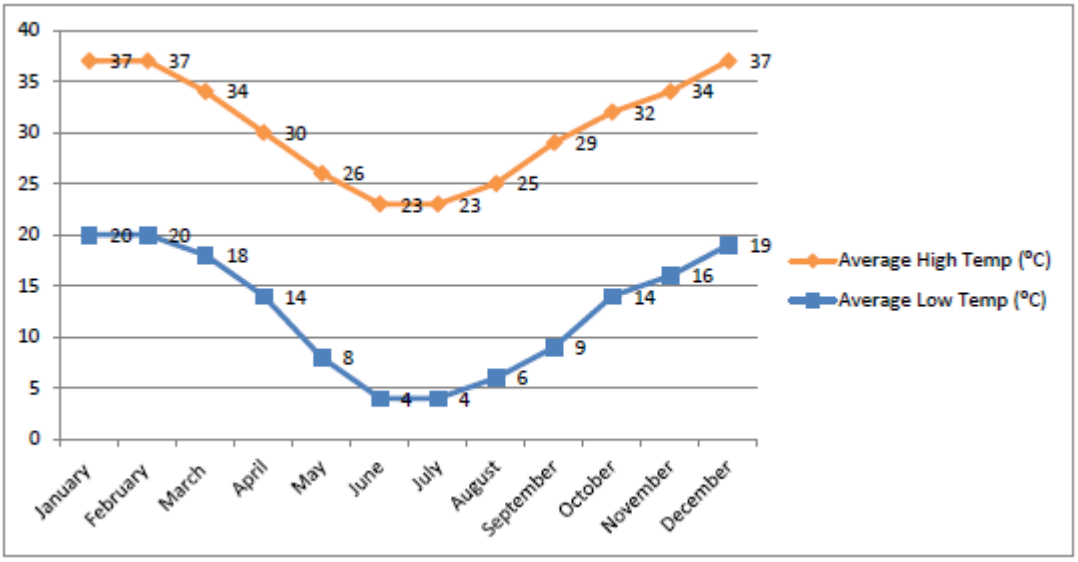


Figure 7: Average temperature (°C) graph for Groblershoop

13 TOPOGRAPHY, RELIEF AND SLOPES

The terrain on the Remaining Extent of the Farm Bokpoort 390 is relatively flat, sloping from 1,110 mamsl in the south-eastern corner to 950 mamsl in the south-western corner over a distance of 5,466 m and from 1,030 mamsl in the northern corner to 955 mamsl in the southern corner over a distance of 6,522 m. The larger surrounding area is characterised by elevated areas, ranging between 1,140 and 1,080 mamsl to the north of the site due to the Korannaberg foothills being located in the extreme northern section of the area. The land slopes gently from the study area towards the Orange River (elevation 860 mamsl) to the south-west over a distance of 12,522 m.

14 PROTECTED AREAS & THREATENED ECOSYSTEMS

The Witsand Nature Reserve is situated approximately 42 km to the east-northeast of the proposed site, but will unlikely be affected as it is adequately buffered by extensive regions of natural habitat as well as the isolated nature of the proposed development (refer **Figure 8**).

The Lower Gariep Alluvial Vegetation type, comprising the Gariep River, is considered an Endangered ecosystem, due to largely due to transformation. Approximately 50 % of the extent of this unit has been used for agricultural cultivation and alluvial diamond mining (Mucina & Rutherford, 2006). Only 6 % is statutorily conserved inside National Parks, and an additional 25 % is targeted for conservation. It is likely that transformation is ongoing in this vegetation unit, although the rate of decline is not known. It is classified as being of High Conservation Value (IFC PS6 GN35). While the proposed activity is likely to have a minor influence on this system, any irremediable losses that exacerbate existing impacts are regarded unacceptable.

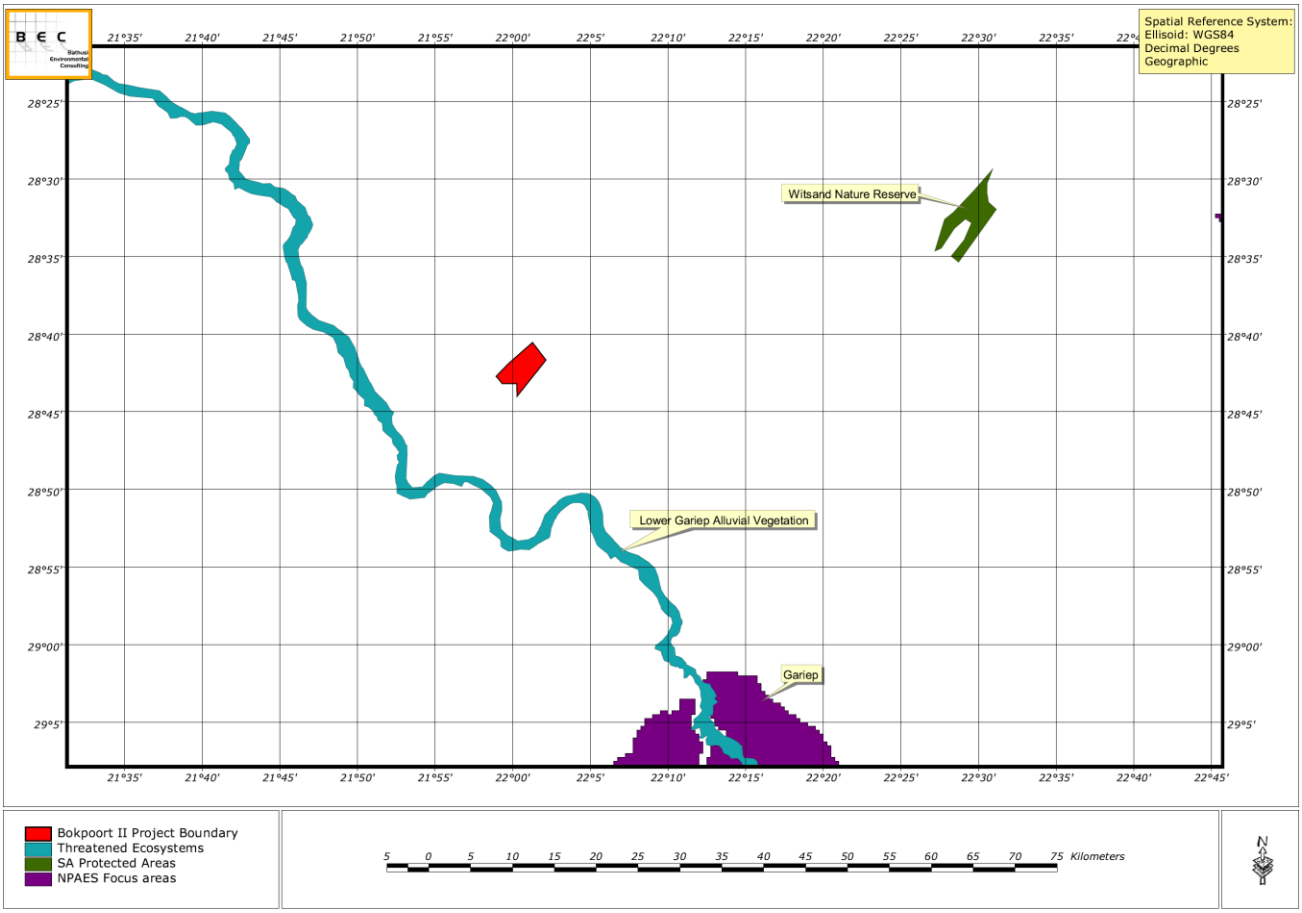


Figure 8: Protected and conservation important areas in relation to the study area

15 BASELINE BIODIVERSITY CHARACTERISATION

15.1 REGIONAL VEGETATION TYPES

The study area is located in a transitional area that includes elements of both the Savanna Biome and the Nama Karoo Biome. The Savanna Biome is defined by the co-dominance of grasses and trees (Sankaran et al. 2005), and is the largest biome in South Africa, covering approximately 35% of the country's land surface (Scholes & Walker 1993). Savannas are described as patch-mosaic landscapes, comprising patches of grassland, scattered trees or closed woodlands, the relative proportions of which vary both spatially and temporally (Bond, 2008). Primary determinants of Savanna composition, structure and functioning include fire, a distinct seasonal climate, substrate type (soils), as well as browsing and grazing by large herbivores (Scholes & Walker 1993; Bond 2008). The Nama Karoo Biome, the second largest biome in Southern Africa, is characterised by plains of dwarf shrubs and grasses, dotted with characteristic 'koppies' (rocky outcrops). It is essentially a grassy, dwarf shrubland; the ratio of grasses to shrubs increases progressively until the Nama Karoo merges with the Savanna Biome (Mucina & Rutherford, 2006).

Two principal natural vegetation types are predicted for the study area (Mucina & Rutherford 2018), namely Kalahari Karroid Shrubland comprising the largest extent of the site and Gordonia Duneveld that is situated in the northern part of the site (refer **Figure 9**).

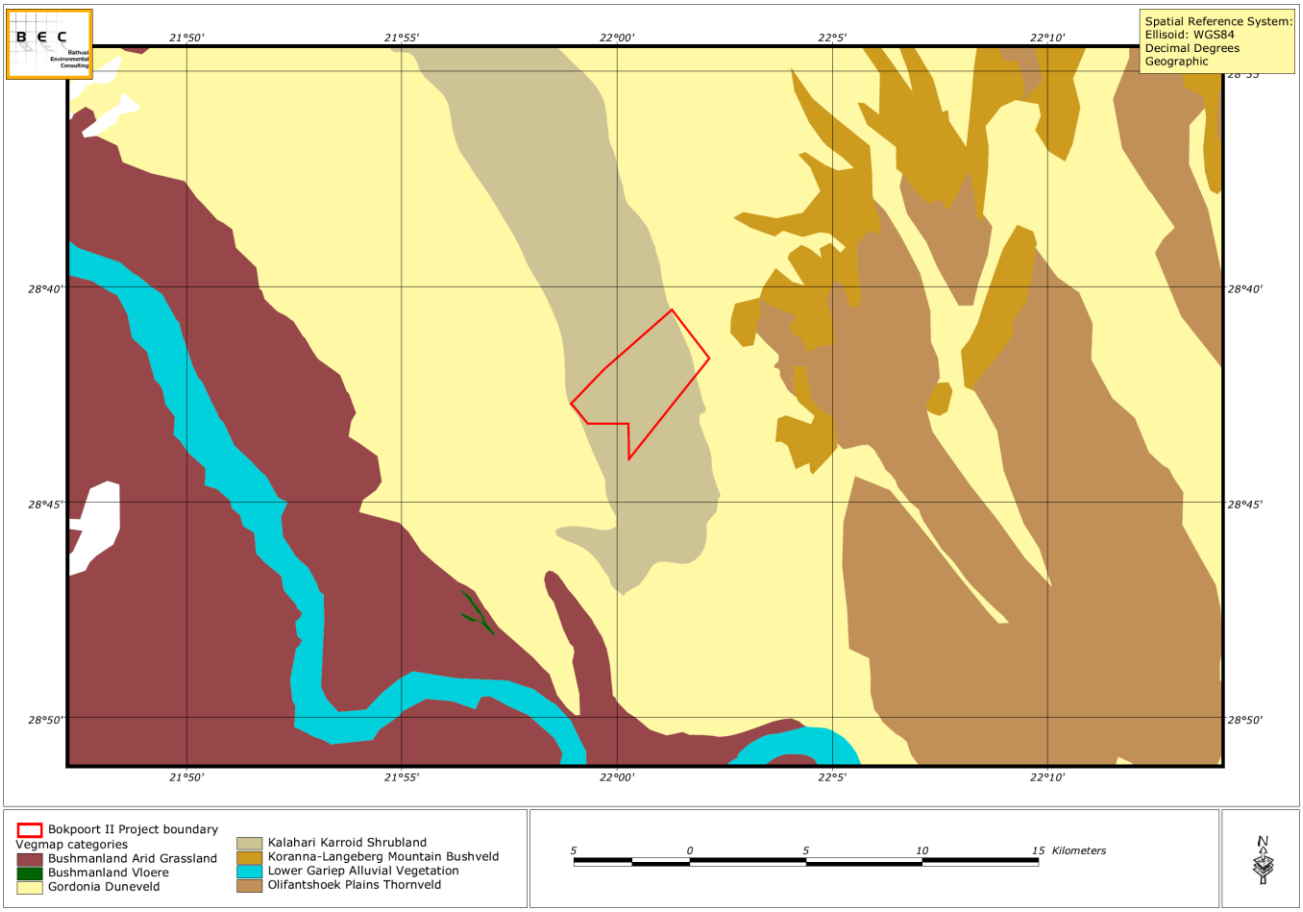


Figure 9: Regional ecological types in spatial relation to the study area

15.1.2 KALAHARI KARROID SHRUBLAND (NKB5)

This vegetation type occurs in the Northern Cape Province, forming part of the Nama Karoo Biome (Bushmanland Bioregion), typically forming belts alternating with belts of Gordonia Duneveld on plains northwest of Upington through Lutzputs and Noenieput to the Rietfontein/ Mier area in the north. Other patches occur around Kakamas and north of Groblershoop. The unit is also found in the neighbouring Namibia. The vegetation and landscape features are typically low karroid shrubland on flat, gravel plains. Karoo-related elements (shrubs) meet here with northern floristic elements, indicating a transition to the Kalahari region and sandy soils. The geographically important taxon (South-western distribution limit) graminoid *Dinebra retroflexa* is present in this unit.

The conservation status is Least Threatened. Very little of this unit is statutorily conserved in Augrabies Falls National Park. Although only a small area has been transformed many of the belts of this types were preferred routes for early roads, thus promoting the introduction of alien plants (about a quarter of the unit has scattered *Prosopis* species). Vegetation of this mapping unit shows transitional features between the Kalahari proper (Savanna Biome) and the northern Nama-Karoo.

Important taxa that characterise this unit include the following:

Small Trees *Acacia*[3] *mellifera* subsp*. detinens, Parkinsonia africana* and *Boscia foetida* subsp*. foetida.*

Tall shrub *Rhigozum trichotomum*

Epiphytic Semiparasitic shrub - *Tapinanthus oleifolius*

Low Shrubs *Hermannia spinosa, Limeum aethiopicum, Phaeoptilum spinosum, Aizoon schellenbergii, Aptosimum albomarginatum, A. lineare, A. marlothii, A. spinescens, Barleria rigida, Hermannia modesta, Indigofera heterotricha, Leucosphaera bainesii, Monechma genistifolium* subsp*. genistifolium, Phyllanthus maderaspatensis, Polygala seminuda, Ptycholobium biflorum* subsp*. biflorum, Sericocoma avolans, Solanum capense* and *Tephrosia dregeana.*

Herbs *Dicoma capensis, Chamaesyce inaequilatera, Amaranthus praetermissus, Barleria lichtensteiniana, Chamaesyce glanduligera, Chascanum garipense, Cleome angustifolia* subsp*. diandra, Cucumis africanus, Geigeria ornativa, Hermannia abrotanoides, Indigastrum argyraeum, Indigofera alternans, I. auricoma, Kohautia cynanchica, Limeum argutecarinatum, Mollugo cerviana, Monsonia umbellata, Sesamum capense, Tribulus cristatus, T. pterophorus* and *T. terrestris.*

Succulent Herbs *Gisekia africana, G. pharnacioides* and *Trianthema parvifolia.*

Graminoids *Aristida adscensionis, Enneapogon desvauxii, E. scaber, Stipagrostis obtusa, Aristida congesta, Enneapogon cenchroides, Eragrostis annulata, E. homomalla, E. porosa, Schmidtia kalahariensis, Stipagrostis anomala, S. ciliata, S. hochstetteriana, S. uniplumis, Tragus berteronianus* and *T. racemosus.*

It is estimated that the proposed development footprint will comprises approximately 1,601 ha of this ecological type.

15.1.3 GORDONIA DUNEVELD N(SVKD1)

This unit is part of the Savanna Biome (Kalahari Duneveld Bioregion), with vegetation and landscape features comprising characteristically parallel dunes about 3-8 m above the plains. This unit also occurs as a number of loose dune cordons south of the Orange River near Keimoes and between Upington and Putsonderwater. It is typically an open shrubland with ridges of grassland dominated by *Stipagrostis amabilis* on the dune crests and *Acacia haematoxylon* on the dune slopes, also with *A. mellifera* on lower slopes and *Rhigozum trichotomum* in the interdune streets are typical of this unit.

[3] [3] Note: Recently this genus has controversially been split into several genera, with Africa's indigenous *Acacia* now being either *Senegalia* or *Vachellia*. The author, however, do not accept the validity of the new nomenclature and therefore maintains the name *Acacia* in its broad sense.

The conservation status of this unit is regarded Least Threatened with only 14 % statutorily conserved in the Kgalagadi Transfrontier Park. Very little of the area is transformed and erosion is very low.

Biogeographically Important Taxa (Kalahari Endemics) include the tall shrub *Acacia haematoxylon*, the graminoids *Stipagrostis amabilis, Anthephora argentea, Megaloprotrachne albescens* and the herbs *Helichrysum arenicola, Kohautia ramosissima* and *Neuradopsis austro-africana*.

Important taxa include the following:

Small Tree *Acacia mellifera* subsp. *detinens*

Tall Shrubs *Grewia flava* and *Rhigozum trichotomum.*

Low Shrubs *Aptosimum albomarginatum, Monechma incanum* and *Requienia sphaerosperma.*

Succulent Shrubs *Lycium bosciifolium, L. pumilum* and *Talinum caffrum.*

Graminoids *Schmidtia kalahariensis, Brachiaria glomerata, Bulbostylis hispidula, Centropodia glauca, Eragrostis lehmanniana, Stipagrostis ciliata, S. obtusa* and *S. uniplumis.*

Herbs *Hermbstaedtia fleckii, Acanthosicyos naudinianus, Hermannia tomentosa, Limeum arenicolum, L. argute-carinatum, Oxygonum dregeanum* subsp. *canescens* var. *canescens, Sericorema remotiflora, Sesamum triphyllum* and *Tribulus zeyheri.*

It is estimated that the proposed development footprint will comprises approximately 91 ha of this ecological type.

15.2 REGIONAL FLORISTIC DIVERSITY (SANBI, 2010)

The Northern Cape Province is characterised by five biomes. **Table 3** presents the area coverage and proportion of each biome within the Northern Cape Province.

Table 3: Extent of biomes within the Northern Cape Province

Biome	*Area*	*Percentage*
Fynbos	663,527 ha	1.83 %
Grassland	123,837 ha	0.34 %
Nama Karoo	19,593,363 ha	54.05 %
Savanna	10,686,003 ha	29.48 %
Succulent Karoo	5,182,370 ha	14.30 %

The proposed site is mainly located within the Nama Karoo Biome, the second largest biome in southern Africa. It is characterised by plains of dwarf shrubs and grasses, dotted with characteristic koppies. It is essentially a grassy, dwarf shrubland; the ration of grasses to shrubs increase progressively, until the Nama Karoo merges with the Grassland Biome. The species richness of this region is not particularly rich; only 2,147 species are known within this unit. An estimated 386 (18 %) species are endemic and 67 are threatened.

The Savanna Biome, represented in a small north-eastern portion of the site, is known to support more than 5,700 plant species, exceed only by the Fynbos Ecoregion in species richness. The study site is located within the Kalahari variation of the Savanna Biome, which although referred to as a desert, is not a true desert as it does not approximate the extreme aridity of a true desert. This area is densely covered by grasses, shrubs and trees.

The SANBI database indicates the known presence of approximately 5,315 plant species within Northern Cape Province, with only 91 species within the ¼ degree grids in which the study site is located (2821DB, DD, 2822CA). This low diversity reflects a paucity of floristic knowledge of the region. The species diversity of the immediate region comprises a diversity

of growth forms, and is typically dominated by herbs, dwarf shrubs and grasses. Trees and tall shrubs comprise a relative low part of the total, reflecting on the open savanna/ shrubland physiognomy of the region.

15.3 VEGETATION OF THE STUDY AREA

15.3.1 ALPHA DIVERSITY OF THE STUDY AREA

The species list that was compiled during the site investigation (BEC, 2010) is considered moderately comprehensive. A total of 112 plant species were identified during the site investigations (refer Appendix 1). The regional setting dictates the physiognomic dominance of the herbaceous component (refer Table 4) with 47 forb species (41.9 %) and 24 grass species (21.4 %). Trees and shrubs occur extensively throughout most of the study area (26 species 28.6 %) and apart from *Acacia erioloba* individuals are not particularly physically significant.

Table 4: Growth forms for the study area

Growth Form	*Number*	*Percentage*
Climber	4	3.57%
Forb	47	41.96%
Geophyte	2	1.79%
Grass	24	21.43%
Parasite	1	0.89%
Sedge	1	0.89%
Shrub	20	17.86%
Succulent	7	6.25%
Tree	6	5.36%
Total	**112**	

Taking the setting of the study area into consideration, the species composition of untransformed vegetation types is regarded representative of the regional vegetation. A total of 35 plant families are represented in the study area, dominated by Poaceae (grass family, 24 species, 21.4 %), Fabaceae (16 species, 14.3 %) and Asteraceae (daisy family, 12 species, 10.7 %).

15.3.2 DECLARED INVASIVE SPECIES AND COMMON WEEDS

Table 5 denotes a list of declared alien and invasive species and common weeds that were recorded on the study site during the 2010 site investigation.

Table 5: List of common weeds and declared alien and invasive plant species within the study area

Species Name	Status/ Uses	Common Name
Acacia mellifera	Declared indicator of encroachment, medicinal uses, poison source	Black Thorn (e), Swarthaak (a)
Berkheya species	Weed	--
Flaveria bidentis (L.) Kuntze	Declared Invader - Category 1B (NEM:BA, 2004. AIP, 2016)	Smelter's bush, Smelterbossie (a)
Gomphocarpus fruticosus (L.) Aiton f.	Medicinal uses, common weed	Milkweed (e), Melkbos (a)
Prosopis glandulosa	Declared Invader - Category 1B in EC, FS, NE, WC. Category 3 in NC (NEM:BA, 2004. AIP, 2014)	Honey Mesquite (e), Duitswesdoring (a)
Rhigozum trichotomum	Declared indicator of encroachment	Three Thorn (e), Driedoring (a)

15.3.3 PLANTS WITH TRADITIONAL MEDICINAL USES

Table 6 denotes plant species with traditional medicinal and traditional uses that were recorded within the study site.

Table 6: List of traditional and medicinal uses within the study area

Species Name	*Status/ Uses*	*Common Name*
Acacia erioloba	Declining Status, Protected Tree (National Forest Act, 1998), edible parts, medicinal uses, firewood	Camel Thorn (e), Kameeldoring (a)
Acacia mellifera	Declared indicator of encroachment, medicinal uses, poison source	Black Thorn (e), Swarthaak (a)
Adenium oleifolium	Poisonous parts	Sand Quick (e)
Aptosimum procumbens	Medicinal uses (sheep)	
Boscia albitrunca (Burch.) Gilg & Gilg-Ben.	Protected Tree (National Forest Act, 1998), important fodder, traditional uses, traditional medicinal uses	Sheperd's Tree (e), Witgat (a), Matoppie (a), Mohlopi (ns)
Cadaba aphylla (Thunb.) Wild	Medicinal properties, potentially poisonous	Desert Spray (e), Bobbejaanarm (a)
Ceratotheca triloba (Bernh.) Hook.f.	Medicinal properties	Wild Foxglove (e), Vingerhoedblom (a)
Croton gratissimus	Medicinal uses, larval food for *Charaxes candiope candiope*	Lavender fever-berry (e), Laventelkoorsbessie (a)
Dicoma capensis	Medicinal uses	Koorsbossie (a)
Gomphocarpus fruticosus (L.) Aiton f.	Medicinal uses, common weed	Milkweed (e), Melkbos (a)
Grewia flava DC.	Edible parts, weaving, traditional uses, declared indicator of encroachment	Velvet Raisin (e), Fluweelrosyntjiebos (a)
Kleinia longiflora DC.	Traditional uses	Sjambokbos (a)
Momordica balsamina L.	Edible parts, medicinal uses	Balsam Pear (e), Laloentjie (a), Balsam Peer (a)
Monechma genistifolium subsp. *australe*	Medicinal uses	Medicinal uses, traditional uses
Pergularia daemia	Medicinal uses	Bobbejaankambro (a), Kgaba
Plinthus sericeus	None	--
Senna italica	Medicinal uses	Wild senna (e), Elandsertjie (a)
Solanum supinum Dunal	Medicinal uses	
Tribulus terrestris L.	Medicinal uses	Common Dubbeltjie (e), Gewone Dubbeltjie (a)
Tribulus zeyheri	Medicinal uses, grazed but potentially poisonous	Devil-thorn Weed (e), Dubbeltjiedoring (a)
Ziziphus mucronata Willd. subsp. *mucronata*	Edible parts, traditional medicinal uses, traditional uses	Buffalo-thorn (e), Blinkblaar-wag-'n-bietjie (a)

15.4 BROAD-SCALE HABITAT TYPES

In spite of a relative homogenous appearance and high correlation to the regional types, with the exception of extensive mountain ranges to the north, a relative obvious physiognomic variability is noted in the study area with plains alternating with parallel dunes in the northern parts. It is highly likely that various smaller phytosociological differences are present within each of the identified habitat types, but for the purpose of this assessment, the observed ecological units are considered similar in major phytosociological, physiognomic and biophysical attributes. Many plant species occur across all of the habitat types, but many of the differences between units are ascribed purely on the basis of terrain morphology, soil characteristics or changes in the dominance and structure of the plant species. Surface water and rainfall in this part of the Kalahari is scarce and, together with substrate, is a major driving force of vegetation development. Results of the photo analysis and site investigations (BEC, 2010) revealed the presence of the following habitat types within the development footprint (refer Figure 10):

⇒ Calcareous Low Shrub Plains;

⇒ Open Shrub Duneveld;

⇒ Open Shrub Plains;

The extent and coverage of habitat types within the study area is presented in Table 7.

Table 7: Extent of habitat types within the study area

Habitat Type	*Extent (ha)*	*Percentage*
Calcareous Low Shrub Plains	494.8 ha	34.2 %
Open Shrub Duneveld	288.0 ha	19.9 %
Open Shrub Plains	664.6 ha	45.9 %

15.4.1 CALCAREOUS LOW SHRUB PLAINS

The topography of these areas are characterised by relative flat or slightly undulating plains where the substrate comprises whitish calcareous and compact sandy soils (grey to brown, not red). The vegetation is characterised by low shrubs and grasses; tall shrubs and trees are generally absent from this unit, or occur at extremely low intervals. Prominent species (refer Table 8) include the grasses *Enneapogon desvauxii, Eragrostis obtusa, Eragrostis truncata, Fingerhuthia africana, Stipagrostis ciliata*, the shrub *Salsola etoshensis* and the forbs *Pentzia calcarea, Eriocephalus spinescens, Monechma genistifolium* subsp. *australe, Geigeria* species. The shrubs *Rhigozum trichotomum* and *Lycium horridum* were observed in this unit.

The status of these areas appears to be relative degraded due to grazing pressure from sheep and other livestock; a moderate ecological integrity status is therefore ascribed.

Table 8: Plant taxa recorded within the Calcareous Low Shrub Plains unit

Species Name	*Growth Form*	*Family*
Acacia erioloba	Tree	Fabaceae
Acacia haematoxylon	Tree	Fabaceae
Acacia mellifera	Shrub	Fabaceae
Anthephora pubescens	Grass	Poaceae
Aptosimum procumbens	Forb	Scrophulariaceae
Aristida congesta subsp. *congesta*	Grass	Poaceae
Aristida stipitata	Grass	Poaceae
Asparagus laricinus	Shrub	Liliaceae
Asparagus species	Shrub	Liliaceae
Acacia mellifera	Shrub	Fabaceae
Adenium oleifolium	Succulent	Apocynaceae
Aristida congesta subsp. *congesta*	Grass	Poaceae
Barleria species	Forb	Acanthaceae
Boscia albitrunca	Tree	Capparaceae
Cenchrus ciliaris	Grass	Poaceae
Chrysocoma obtusata	Forb	Asteraceae
Enneapogon desvauxii	Grass	Poaceae
Eragrostis obtusa	Grass	Poaceae
Eragrostis truncata	Grass	Poaceae
Eriocephalus spinescens	Forb	Asteraceae
Fingerhuthia africana	Grass	Poaceae
Geigeria species	Forb	Asteraceae
Lycium bosciifolium	Shrub	Solanaceae
Lycium horridum	Shrub	Solanaceae
Monechma genistifolium subsp. *australe*	Forb	Acanthaceae
Nerine laticoma	Geophyte	Amaryllidaceae
Pentzia calcarea	Forb	Asteraceae
Rhigozum trichotomum	Shrub	Bignoniaceae

Table 8: Plant taxa recorded within the Calcareous Low Shrub Plains unit		
Species Name	*Growth Form*	*Family*
Salsola etoshensis	Shrub	Chenopodiaceae
Salsola tuberculatiformis	Shrub	Chenopodiaceae
Schmidtia kalihariensis	Grass	Poaceae
Setaria verticillata	Grass	Poaceae
Stipagrostis ciliata	Grass	Poaceae
Stipagrostis obtusa	Grass	Poaceae
Tribulus zeyheri	Forb	Zygophyllaceae
Ziziphus mucronata	Tree	Rhamnaceae

15.4.2 Open Shrub Duneveld

The major physiognomic attribute of this unit is the presence of low dunes with characteristic crests, slopes and streets with a floristic composition that largely conforms to an open tree savanna. Each of these units could be described as a variation of this unit on the basis of distinctive habitat attributes and species composition, but for the purpose of this investigation, they are considered holistically as they always occur in association with each other.

The physiognomy conforms to an open tree savanna. Dominant species (refer Table 9) include the tree *Acacia mellifera* and the grass *Schmidtia kalahariensis*. Other prominent woody species are *Acacia haematoxylon, Parkinsonia africana, Rhigozum trichotomum, Boscia albitrunca* and *Acacia erioloba* and occasionally *Lycium bosciifolium*. Besides *Schmidtia kalahariensis,* the grass layer is characterised by *Eragrostis lehmanniana, Centropodia glauca, Stipagrostis amabilis, Brachiaria glomerata Stipagrostis obtusa* and *S. ciliata*. Herbs that are found in this unit include *Hermannia tomentosa, Hermbstaedtia fleckii, Requienia sphaerosperma, Dicoma capensis, Momordica balsamina* and the climber *Pergularia daemia*. The species composition of this unit is indicated in Table 8.

The presence of the grass species *Schmidtia kalihariensis* is generally accepted as an indicator of high utilisation pressure. This habitat type is representative of the Gordonia Duneveld vegetation type (Mucina & Rutherford, 2006) and is in a relative good condition. During subsequent visits, it appeared to be moderately degraded due to livestock grazing pressure. A moderate ecological integrity status and moderate-high sensitivity is therefore ascribed to this unit due to the association with dune habitat.

Table 9: Plant taxa recorded in the Open Shrub Duneveld unit		
Species Name	*Growth Form*	*Family*
Acacia erioloba	Tree	Fabaceae
Acacia haematoxylon	Tree	Fabaceae
Acacia mellifera	Shrub	Fabaceae
Anthephora pubescens	Grass	Poaceae
Aptosimum procumbens	Forb	Scrophulariaceae
Aristida congesta subsp. *congesta*	Grass	Poaceae
Aristida stipitata	Grass	Poaceae
Asparagus laricinus	Shrub	Liliaceae
Asparagus species	Shrub	Liliaceae
Boscia albitrunca	Tree	Capparaceae
Brachiaria glomerata	Grass	Poaceae
Bulbostylis hispidula	Sedge	Cyperaceae
Centropodia glauca	Grass	Poaceae
Chascanum pumilum	Forb	Verbenaceae
Citrullus lanatus	Climber	Cucurbitaceae
Cleome angustifolia	Forb	Capparaceae
Cleome gynandra	Forb	Capparaceae
Commelina species	Forb	Commelinaceae
Crotalaria spartioides	Shrub	Fabaceae
Cucumis africanus	Forb	Cucurbitaceae

Table 9: Plant taxa recorded in the Open Shrub Duneveld unit		
Species Name	*Growth Form*	*Family*
Dicoma capensis	Forb	Asteraceae
Eragrostis lehmanniana	Grass	Poaceae
Eragrostis species	Grass	Poaceae
Eragrostis trichophora	Grass	Poaceae
Heliotropium ciliatum	Forb	Boraginaceae
Hermannia tomentosa	Forb	Sterculiaceae
Hermbstaedtia fleckii	Forb	Amaranthaceae
Hermbstaedtia odorata	Forb	Amaranthaceae
Hirpicium gazanioides	Forb	Asteraceae
Indigofera alternans	Forb	Fabaceae
Indigofera charlieriana var. *charlieriana*	Forb	Fabaceae
Lebeckia linearifolia	Shrub	Fabaceae
Leucas capensis	Forb	Lamiaceae
Limeum fenestratum	Forb	Aizoaceae
Limeum sulcatum	Forb	Aizoaceae
Limeum viscosum	Forb	Aizoaceae
Lycium bosciifolium	Shrub	Solanaceae
Lycium species	Shrub	Solanaceae
Momordica balsamina	Climber	Cucurbitaceae
Monechma incanum	Shrub	Acanthaceae
Nolletia arenosa	Forb	Asteraceae
Oxalis semiloba	Geophyte	Oxalidaceae
Oxygonum dregeanum	Forb	Polygonaceae
Parkinsonia africana	Tree	Fabaceae
Pergularia daemia	Climber	Asclepiadaceae
Plinthus sericeus	Shrub	Aizoaceae
Requienia sphaerosperma	Forb	Fabaceae
Rhigozum trichotomum	Shrub	Bignoniaceae
Rhynchosia species	Forb	Fabaceae
Schmidtia kalihariensis	Grass	Poaceae
Senna italica	Forb	Fabaceae
Stipagrostis amabilis	Grass	Poaceae
Stipagrostis ciliata	Grass	Poaceae
Stipagrostis obtusa	Grass	Poaceae
Tapinanthus oleifolius	Parasite	Loranthaceae
Tribulus terrestris	Forb	Zygophyllaceae
Tribulus zeyheri	Forb	Zygophyllaceae

15.4.3 Open Shrub Plains

This habitat type comprises the largest part of the study area. Biophysical attributes include open plains (flat or slightly undulating) with high shrubs and scattered trees on deep sandy, red soils or gravel plains and a well-developed herbaceous layer.

The species diversity is relative low; only 24 species (refer Table 10) were observed during the survey period. Prominent tall woody species in this undulating landscape are *Acacia erioloba, A. mellifera, Parkinsonia africana, Grewia flava* and *Boscia albitrunca*. Low shrubs include *Lebeckia linearifolia, Lycium bosciifolium, Rhigozum trichotomum* and *Salsola etoshensis.* Conspicuous grass species include *Schmidtia kalahariensis*, *Eragrostis lehmanniana* and *Stipagrostis ciliata*. Prominent forb species include *Monechma genistifolium* subsp. *genistifolium* and *Indigofera* species.

This habitat type is representative of the regional vegetation type Kalahari Karroid Shrubland (Mucina & Rutherford, 2006), which typically forms bands alternating with bands of Gordonia Duneveld. Due to similar grazing pressures in this vegetation community, a moderate floristic status is ascribed to this unit.

Table 10: Plant taxa recorded in the Open Shrub Plains unit		
Species Name	*Growth Form*	*Family*
Acacia erioloba	*Tree*	*Fabaceae*
Acacia mellifera	*Shrub*	*Fabaceae*
Asparagus species	*Shrub*	*Liliaceae*
Blepharis species	Forb	Acanthaceae
Boscia albitrunca	Tree	Capparaceae
Bulbostylis hispidula	Sedge	Cyperaceae
Cenchrus ciliaris	Grass	Poaceae
Eragrostis lehmanniana	Grass	Poaceae
Euphorbia species	Succulent	Euphorbiaceae
Grewia flava	Shrub	Tiliaceae
Indigofera species	Forb	Fabaceae
Lebeckia linearifolia	Shrub	Fabaceae
Limeum viscosum	Forb	Aizoaceae
Lycium bosciifolium	Shrub	Solanaceae
Monechma genistifolium subsp. *australe*	Forb	Acanthaceae
Parkinsonia africana	Tree	Fabaceae
Pergularia daemia	Climber	Asclepiadaceae
Plinthus sericeus	Shrub	Aizoaceae
Rhigozum trichotomum	Shrub	Bignoniaceae
Salsola etoshensis	Shrub	Chenopodiaceae
Schmidtia kalihariensis	Grass	Poaceae
Stipagrostis ciliata	Grass	Poaceae
Stipagrostis obtusa	Grass	Poaceae
Tapinanthus oleifolius	Parasite	Loranthaceae

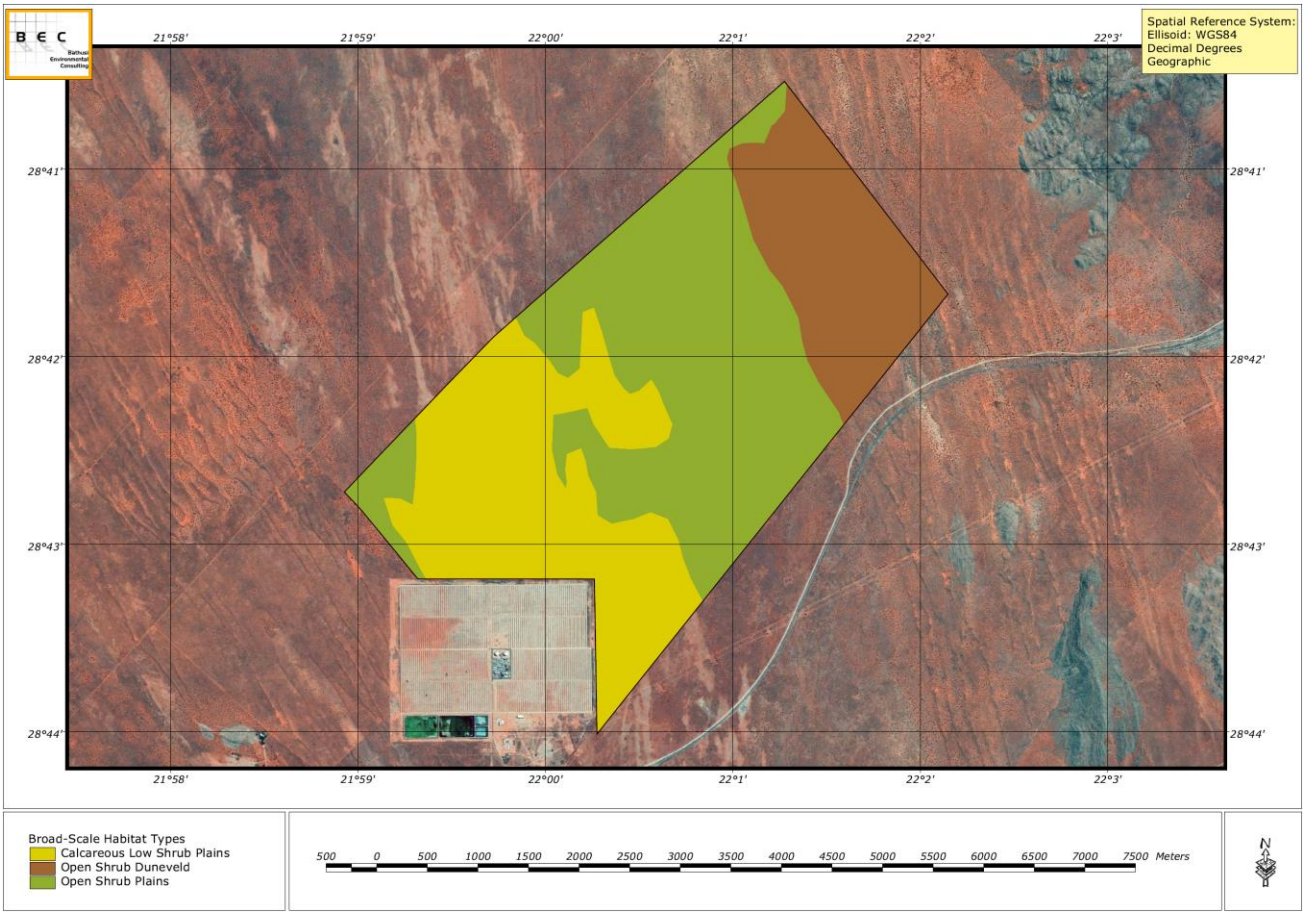


Figure 10: Broad-scale habitat types of the study area

Example of Open shrub duneveld habitat

Example of Open shrub duneveld habitat

Example of Opens shrub plains habitat

Example of Calcareous low shrub plains

Example of rocky habitat terrain (Critical habitat) to the north of the study area

Opens shrub plains habitat

Figure 11: Collage of images depicting habitat conditions of the broad-scale habitat types

16 FAUNAL ATTRIBUTES OT HE STUDY AREA

Please note that aspects pertaining to avifauna and bats are excluded from this assessment as it is presented as 'stand-alone' reports.

16.1 INVERTEBRATES

Invertebrate species previously recorded within the Study Area (BEC, 2010) were restricted to butterflies only (refer Table 11). All species are common and ubiquitous species of the region, nevertheless the butterfly species richness is likely a factor of the largely untransformed and non-fragmented nature of the Study Area.

The invertebrates observed in the study area during the field investigation attested to a healthy, functioning ecosystem on the microhabitat as well as source-sink population dynamics scales. A total of 12 butterflies were observed in the study area; most of these species are common and widespread; if not in Southern Africa then in the drier western regions of the subcontinent. It is highly likely that many other species will complement the observed assemblage of butterflies should the study be repeated in early summer (the only flight time of some Lepidoptera groups, notably Lycaenidae). The drier western regions of South Africa have significantly fewer butterflies than the wetter east; consequently, the number of species observed during the field survey (given timing of the survey as well geographic location of the study area) confirms the untransformed and un-fragmented nature of the study area.

Table 11: Butterfly species recorded in the study area (BEC, 2010)

Biological Name	*English Name*	*Status*
Belenois aurota	Brown-veined White	Least Threatened
Catopsilla florella	African Migrant	Least Threatened
Cigaritis phanes	Silvery Bar	Least Threatened
Colotis eris	Banded Gold Tip	Least Threatened
Colotis lais	Kalahari Orange Tip	Least Threatened
Danaus chryssipus	African Monarch	Least Threatened
Junonia hierta	Yellow Pansy	Least Threatened
Pinacopteryx eriphia	Zebra White	Least Threatened
Spialia diomus	Common Sandman	Least Threatened
Zintha hintza	Hintza Blue	Least Threatened
Zizeeria knysna	Sooty Blue	Least Threatened
Zizula hylax	Gaika Blue	Least Threatened

Two invertebrate species of conservation concern (that have not yet been observed) could potentially occur within the Study Area, these and their likelihood of presence based on habitat suitability are summarised in Table 12.

Table 12: Butterfly species of conservation concern recorded in the region of the study area (BEC, 2010)

Species	*Common name*	*Conservation Status (IUCN)*	*Comment, PoO*
Alfredectes browni	Brown's Shieldback	DD	Possible – This katydid species is understudied, being known only from three specimens, but occurs in a wide range of habitats from grasses along highly disturbed roadsides, to low trees, to high elevation fynbos vegetation so could occur within the Study Area (Bazelet & Naskrecki, 2014).

Table 12: Butterfly species of conservation concern recorded in the region of the study area (BEC, 2010)			
Species	*Common name*	*Conservation Status (IUCN)*	*Comment, PoO*
Lepidochrysops penningtoni	Pennington's Blue	DD	**Unlikely** – Considerable uncertainty exists around this species' taxonomy and distribution and it is likely that the species will fall into the category of Least Concern with further information as it occupies remote habitats and does not face any major threats. Its strongly seasonal appearance has probably led to it being under-recorded (Larsen, 2011). It is thought to be endemic to the Northern Cape; however, it prefers vegetation consisting of Mesembryanthemum species and other low shrubs (succulent Karoo) (Pringle *et al.,* 1994), which has not been recorded within the Study Area.

16.2 HERPETOFAUNA – AMPHIBIANS AND REPTILES

16.2.1 AMPHIBIANS

No amphibian species have been recorded within the study area or in the immediate surrounds of the study site. Taking cognisance of the absence of surface water within the proposed development footprint, it is regarded unlikely that any of these species will occur on site; however, some frog species are expected to occur in the vicinity of the abstraction point in the Orange River (refer **Table 13**).

Table 13: Amphibian species likely to occur in the vicinity of the abstraction point on the Orange River				
Scientific Name	*Common Name*	*Conservation Status*		
		IUCN - Regional Status (2004)	NEMBA TOPS List (2013)	Northern Cape - Protected Species (2009)
Amietophrynus gutturalis	Guttural Toad	-	-	Protected
Amietophrynus rangeri	Raucous Toad	-	-	Protected
Amietophrynus poweri	Western Olive Toad	-	-	Protected
Vandijkophrynus gariepensis	Karoo Toad	-	-	Protected
Xenopus laevis	Common Platanna	-	-	Protected
Amietia angolensis	Common River Frog	-	-	Protected
Cacosternum boettgeri	Common Caco	-	-	Protected
Pyxicephalus adspersus	Giant Bullfrog	Near Threatened	-	Specially Protected
Tomopterna cryptotis	Tremolo Sand Frog	-	-	Protected
Tomopterna tandyi	Tandy's Sand Frog	-	-	Protected
Source: Distributions = du Preez & Carruthers (2009); Conservation Status = Minter et al. (2004), NEMBA ToPS List (2013) & (Northern Cape Nature Conservation Act 2009)				

16.2.2 REPTILES

Eight reptile species were observed during the previous baseline fieldwork (BEC, 2010); confirmed species (shown in **bold**) as well as other species whose distributions overlap with the Study Area and therefore could potentially occur are listed in **Table 14**.

Table 14: Reptile species likely to occur in the vicinity of the study area				
Scientific Name	*Common Name*	*Conservation Status*		
		NEMBA TOPS List (2013)	*Northern Cape - Protected Species (2009)*	*Endemic Status*
Agama aculeata	Western Ground Agama	-	-	-
Agama anchietae	Anchiea's Agama	-	-	-
Agama atra	**Southern Rock Agama**	**-**	**-**	**Near Endemic**
Monopeltis infuscata	Dusky Worm Lizard	-	-	-
Monopeltis mauricei	Mairice's Worm Lizard	-	-	-
Dasypeltis scabra	Rhombic Egg-eater	-	Protected	-

Telescopus beetzii	Beetz's Tiger Snake	-	-	-
Karusasaurus polyzonus	Southern Karusa Lizard	-	Specially Protected	Near Endemic
Aspidelaps lubricus	Coral Shield Cobra	-	-	-
Naja nigricincta woodi	Black Spitting Cobra	-	-	-
Naja nivea	**Cape Cobra**	**-**	**-**	**-**
Chondrodactylus angulifer	Common Giant Gecko	-	-	-
Chondrodactylus bibronii	Bibron's Gecko	-	-	-
Chondrodactylus turneri	Turner's Gecko	-	-	-
Colopus wahlbergii furcifer	Striped Ground Gecko	-	-	-
Lygodactylus bradfieldi	Bradfield's Dwarf Gecko	-	-	-
Pachydactylus capensis	Cape Gecko	Protected	-	-
Pachydactylus latirostris	Quartz Gecko	Protected	-	-
Pachydactylus montanus	Namaqua Mountain Gecko	Protected	-	-
Pachydactylus punctatus	Speckled Gecko	Protected	-	-
Pachydactylus purcelli	Purcell's Gecko	Protected	-	-
Pachydactylus rugosus	Common Rough Gecko	Protected	-	-
Ptenopus garrulus	**Common Barking Gecko**	**-**	**-**	**-**
Ptenopus garrulus maculatus	Spotted Barking Gecko	-	-	-
Cordylosaurus subtessellatus	Dwarf Plated Lizard	-	-	-
Heliobolus lugubris	Bushveld Lizard	-	Protected	-
Meroles suborbitalis	Spotted Desert Lizard	-	Protected	-
Nucras tessellata	Western Sandveld Lizard	-	Protected	-
Pedioplanis inornata	Plain Sand Lizard	-	Protected	-
Pedioplanis laticeps	Karoo Sand Lizard	-	Protected	Endemic
Pedioplanis lineoocellata	**Spotted Sand Lizard**	**-**	**Protected**	**-**
Pedioplanis namaquensis	Namaqua Sand Lizard	-	Protected	-
Boaedon capensis	Common House Snake	-	-	-
Dipsina multimaculata	Dwarf Beaked Snake	-	-	-
Lycophidion capense	Cape Wolf Snake	-	Protected	-
Prosymna bivittata	Two-striped Shovelsnout	-	Protected	-
Prosymna frontalis	Southwestern Shovel-snout	-	Protected	-
Psammophis notostictus	Karoo Sand Snake	-	-	-
Psammophis trinasalis	Four-marked Sand Snake	-	-	-
Pseudaspis cana	Mole Snake	-	Protected	-
Xenocalamus bicolor	Bicoloured Quillsnouted Snake	-	-	-
Acontias kgalagadi	Kgalagadi Legless Skink	-	-	-
Acontias lineatus	Striped Dwarf Legless Skink	-	-	-
Trachylepis sparsa	Karasburg Tree Skink	-	-	-
Trachylepis spilogaster	Kalahari Tree Skink	-	-	-
Trachylepis striata	**Striped Skink**	**-**	**-**	**-**
Trachylepis sulcata	Western Rock Skink	-	-	-
Trachylepis variegata	Variegated Skink	-	-	-
Psammobates oculifer	**Serrated tent Tortoise**	**-**	**Protected**	**-**
Psammobates tentorius	Tent Tortoise	-	Protected	-
Stigmochelys pardalis	Leopard Tortoise	-	Protected	-
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	-	-	-
Rhinotyphlops schinzi	Schinz's Beaked Blind Snake	-	-	-
Varanus albigularis	Rock Monitor	-	Protected	-
Varanus niloticus	Water Monitor	-	-	-
Bitis arietans	**Puff Adder**	**-**	**-**	**-**
Bitis caudalis	Horned Adder	Protected	-	-

16.2.3 MAMMALS (EXCLUDING BIRDS AND BATS)

A total of fifty-one (51) mammal species are considered potentially occupants of the study area. Fourteen (14) of these have been confirmed during field studies (RHV, 2014; BEC, 2010). These and details of their conservation status/level of protection afforded to them are listed on Table 15; species that have been confirmed present during fieldwork are highlighted in **bold** text. The bat and avifaunal baseline descriptions and impact assessments are provided in a separate report.

Table 15: Mammal taxa of the region, with Probability of Occurrence

Scientific Name	*Common Name*	*Conservation Status*			*Probability of Occurrence*
		IUCN - Regional status	NEMBA TOPS List	Northern Cape NCA	
Antidorcas marsupialis	Springbok			Protected	Unlikely – largely restricted to private reserves and protected areas (IUCN SSC Antelope Specialist Group. 2008).
Oreotragus Oreotragus	Klipsringer		Protected	Protected	Unlikely – no suitable rocky/ mountainous terrain is present within the study area.
Raphicerus campestris	Steenbok			Protected	Probable - occur widely in drier savannas, grasslands and scrublands and show a particular preference for heavily grazed areas (IUCN SSC Antelope Specialist Group. 2008b).
Sylvicapra grimmia	Common Duiker			Protected	Probable – widespread and common.
Tragelaphus strepsiceros	Kudu			Protected	Unlikely due to limited scrub/ woodland cover available within the study area.
Canis mesomelas	**Black-backed Jackal**				**Confirmed (BEC, 2010).**
Otocyon megalotis	**Bat-eared Fox**		**Protected**	**Specially Protected**	**Confirmed (BEC, 2010).**
Vulpes chama	Cape Fox		Protected	Specially Protected	Probable - associate with open country, including grassland, grassland with scattered thickets, and lightly wooded areas, particularly in the dry Karoo regions, the Kalahari and the fringes of the Namib Desert (Hoffman, 2014).
Papio ursinus	Chacma Baboon				Possible – although Chacma Baboon are common and widespread, few foraging/ watering opportunities are available within the Study Area.
Cercopithecus pygerythrus	Vervet Monkey				Possible – although Vervet Monkey are common and widespread, few foraging/ watering opportunities are available within the Study Area
Caracal caracal	**Caracal**				**Confirmed (BEC, 2010)**

Table 15: Mammal taxa of the region, with Probability of Occurrence

Scientific Name	*Common Name*	*Conservation Status*			*Probability of Occurrence*
		IUCN - Regional status	NEMBA TOPS List	Northern Cape NCA	
Felis nigripes	Black-footed Cat		Protected	Specially Protected	Possible – it is a specialist of open, short grass areas with an abundance of small rodents and ground-roosting birds. It inhabits dry, open savanna, grasslands and Karoo semi-desert with sparse shrub and tree cover (Sliwa, 2008), which are a feature of the Study Area
Felis sylvestris	African wild cat			Specially Protected	Possible – wide habitat tolerance (Stuart & Stuart, 2007)
Atilax paludinosus	**Water Mongoose**			**Protected**	**Confirmed (DHV, 2014)**
Cynictis penicillata	**Yellow Mongoose**			**Protected**	**Confirmed (BEC, 2010)**
Galerella sanguinea	**Slender Mongoose**			**Protected**	**Confirmed (BEC, 2010)**
Galerella pulverulenta	Small Grey Mongoose			Protected	Probable – very wide habitat tolerance includes open scrub (Stuart & Stuart, 2007)
Suricata suricatta	Suricate			Protected	Probable – its preferred habitat is arid, open country, characterised by short grasses and sparse woody growth, which characterises the Study Area
Parahyaena brunnea	Brown Hyena	Near Threatened	Protected	Specially Protected	Probable – inhabits dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, in semidesert, open scrub and open woodland savanna
Hystrix africaeaustralis	**Porcupine**				**Confirmed (BEC, 2010)**
Lepus capensis	**Cape Hare**			**Protected**	**Confirmed (DHV, 2014)**
Lepus saxatilis	**Scrub Hare**			**Protected**	**Confirmed (BEC, 2010)**
Macroscelides proboscideus	Karoo Round-eared Sengi			Protected	Probable – a habitat specialist, which occupies gravel plains (Rathbun & Smit-Robinson, 2015a) such as those present within the Study Area associated with the Kalahari Karroid Shrubland vegetation type
Elephantulus rupestris	Western Rock Sengi			Protected	Possible – occupies arid habitats including dry savanna and shrubland, and is typically associated with rocky ridges, outcrops or koppies (Rathbun & Smit- Robinson, 2015b)
Elephantulus intufi	Bushveld Sengi	Data Deficient		Protected	Unlikely – prefers very arid terrain and semi-desert (Rathbun, 2015)
Manis temminckii	Ground Pangolin	Vulnerable	Vulnerable	Specially Protected	Unlikely - inhabits mainly savanna woodland in lowlying regions with moderate to dense scrub, and is not present in arid areas or deserts (Pietersen et al., 2014)
Aethomys chrysophilus	Red Rock Rat			Protected	Unlikely – typically a savanna species (Agwanda et al., 2008)
Desmodillus auricularis	Cape Shorttailed Gerbil			Protected	Probable - inhabits arid gravel plains and areas of hardened sand (Coetzee, 2008)

Table 15: Mammal taxa of the region, with Probability of Occurrence

Scientific Name	*Common Name*	*Conservation Status*			*Probability of Occurrence*
		IUCN - Regional status	NEMBA TOPS List	Northern Cape NCA	
Gerbillurus paeba	Hairy-footed Gerbil			Protected	Probable – found in sandy ground or sandy alluvium with a grass, scrub or light woodland cover (Coetzee & Griffin, 2008a)
Malacothrix typica	Large-eared Mouse			Protected	Possible - inhabits a wide range of habitats including dry savanna (Coetzee & Griffin, 2008b))
Myomyscus verreauxii	Verreaux's White-footed Rat			Protected	Unlikely – found in fynbos vegetation (van der Straeten, 2008)
Aethomys namaquensis	Namaqua Rock Rat			Protected	Probable – present in most habitat types Mus musculus House Mouse - - - Unlikely – no inhabited areas within the Study Area
Mus musculus	House Mouse				Unlikely - no inhabited areas within study area
Parotomys brantsii	Brant's Whistling			Protected	Possible – restricted to consolidated sands in semidesert (Coetzee, 2008b)
Parotomys littledalei	Littledale's Whistling Rat	Near Threatened		Protected	Possible – occurs in shrubland (Coetzee & Griffin, 2008c)
Rhabdomys pumilio	Striped Mouse			Protected	Unlikely – prefers agricultural lands and houses (Coetzee & van der Straeten, 2008)
Saccostomus campestris	Pouched Mouse				Unlikely – associated with savanna woodland (Corti et al., 2008)
Tatera brantsii	Highveld Gerbil	Data Deficient		Protected	Probable - associated with open areas, or plains, in subtropical and wooded grasslands on consolidated sands (Griffin & Coetzee, 2008)
Tatera leucogaster	Bushveld Gerbil			Protected	Unlikely – more typically associated with bushland and grasslands (Coetzee, 2008c)
Aonyx capensis	Cape Clawless Otter		Protected	Protected	Confirmed (DHV, 2014)
Ictonyx striatus	**Striped Polecat**	**Data Deficient**		**Specially Protected**	**Confirmed (BEC, 2010)**
Mellivora capensis	**Honey Badger**	**Near Threatened**		**Specially Protected**	**Confirmed (BEC, 2010)**
Graphiurus ocularis	Spectacled Dormouse				Unlikely - associated with the sandstone formations of the Cape (Coetzee et al., 2008)
Orycteropus afer	**Aardvark**		**Protected**		**Confirmed (BEC, 2010)**
Pedetes capensis	**Springhare**				**Confirmed (BEC, 2010)**
Procavia capensis	Rock Hyrax			Protected	Unlikely - typically associated with rocky outcrops, cliffs or boulders which are not a feature of Study Area
Proteles cristatus	Aardwolf			Specially Protected	Probable - prime habitat is open, grassy plains, being entirely absent from forests or pure desert (Green, 2015)
Xerus inauris	Ground Squirrel				Probable – occurs widely throughout arid parts of Southern Africa

Table 15: Mammal taxa of the region, with Probability of Occurrence

Scientific Name	*Common Name*	*Conservation Status*			*Probability of Occurrence*
		IUCN - Regional status	NEMBA TOPS List	Northern Cape NCA	
Crocidura cyanea	Reddish-grey Musk Shrew	Data Deficient		Protected	Unlikely – occurs in montane grasslands and temperatesub-tropical forests (Baxter et al., 2008)
Genetta Small-spotted	Genet				Unlikely – prefers wooded habitat

Source: Distributions = Stuart & Stuart (2007);Conservation Status = Friedmann & Daly (2004), NEMBA ToPS List (2013) & (Northern Cape Nature Conservation Act 2009)

c

Slender mongoose

Rock monitor

Cape fox

Agama species

Figure 12: Collage of images depicting various animals recorded in 2010

17 ASSESSMENT OF BIODIVERSITY VALUE

Species and ecosystems of concern identified as key issues for impact assessment are summarised in the sections that follow.

17.1 SPECIES OF CONSERVATION CONSIDERATION

17.1.1 FLORA

The following plant taxa of conservation consideration were recorded within the site (BEC, 2010), or are considered likely to be present based on habitat association and know regional distribution patterns:

Table 16: Conservation important flora species for the region

Species	*Family*	*Threat status*
Acacia erioloba	Fabaceae	Protected Tree (National Forest Act, 1998)
Acacia haematoxylon	Fabaceae	Protected Tree (National Forest Act, 1998)
Anthephora argentea	Poaceae	Regionally important (Vegmap)
Boscia albitrunca	Capparaceae	Protected Tree (National Forest Act, 1998)
Helichrysum arenicola	Asteraceae	Regionally important (Vegmap)
Megaloprotrachne albescens	Poaceae	Regionally important (Vegmap)
Neuradopsis asutro- africana	Neuradaceae	Regionally important (Vegmap)
Stipagrostis amabilis	Poaceae	Kalahari endemic

17.1.2 FAUNA

Table 17: Fauna species of conservation consideration recorded*/ potentially occurring in the study area

Species Name	*Common Name*	*Conservation Status*	*Habitat Association*
Invertebrates			
Alfredectes browni	Brown's Shieldback	IUCN - Data Deficient	Disturbed roadsides, open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
Herpetofauna			
Pedioplanis lineoocellata	Spotted Sand Lizard	NCNCA 2009 - Protected	Commonly associated with open ground and scattered rock fragments, such as the calcareous low shrub plains in the Study Area (Figure 9)
Psammobates oculifer	Serrated tent Tortoise	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
Varanus albigularis	Rock Monitor	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint; riparian vegetation at water abstraction point
Mammals			
Raphicerus campestris	Steenbok	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains
Sylvicapra grimmia	Common Duiker	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, riparian vegetation
**Otocyon megalotis*	Bat-eared Fox	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
Vulpes chama	Cape Fox	NCNCA 2009 – Specially Protected, NEMBA	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
Felis nigripes	Black-footed Cat	NCNCA 2009 – Specially Protected, NEMBA	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
**Cynictis penicillata*	Yellow Mongoose	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
**Galerella sanguinea*	Slender Mongoose	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint

Galerella pulverulenta	Small Grey Mongoose	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint; riparian vegetation at water abstraction point
Suricata suricatta	Suricate	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
**Lepus capensis*	Cape Hare	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
**Lepus saxatilis*	Scrub Hare	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
Macroscelides proboscideus	Karoo Roundeared Sengi	NCNCA 2009 - Protected	A habitat specialist, which occupies gravel plains such as those present within the Study Area associated with the Kalahari Karroid Shrubland vegetation type; this coincides with the open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
Desmodillus auricularis	Cape Shorttailed Sengi	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
Aethomys namaquensis	Namaqua Rock Rat	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
Tatera brantsii	Highveld Gerbil	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
**Ictonyx striatus*	Striped Polecat	NCNCA 2009 – Specially Protected; Data Deficient	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint; riparian vegetation at water abstraction point
**Mellivora capensis*	Honey Badger	NCNCA 2009 – Specially Protected; Near Threatened	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint; riparian vegetation at water abstraction point
**Orycteropus afer*	Aardvark	NCNCA 2009 – Specially Protected, NEMBA	Open shrub duneveld, open shrub plains, calcareous low shrub plains throughout Bokpoort II footprint
Proteles cristatus	Aardwolf	NCNCA 2009 - Protected	Open shrub duneveld, open shrub plains in northern region of Bokpoort II footprint

17.2 ECOSYSTEMS OF CONSERVATION VALUE

The ecosystems of priority conservation concern include those identified by NEMBA as endangered, those considered to be of pristine ecological integrity, and those considered important for their support of species of conservation concern.

Therefore, the ecosystems of priority conservation concern for impact assessment include the following:

⇒ The rocky outcrop to the north of the study area associated with the Koranna-Langeberg Mountain Bushveld Vegetation type. Apart from exhibiting intact ecological integrity in terms of vegetation community composition, it is an important area in terms of its support of roosting bat species, and is classified as Natural Habitat by IFC; and

⇒ The riparian habitat associated with the Orange River – this area supports the endangered vegetation type Lower Gariep Alluvial Vegetation, and has importance as an ecological corridor through the landscape. In addition, it is an important support area for foraging faunal species, including bats.

17.3 NATURAL AND MODIFIED HABITATS

Natural and modified habitat was mapped using the baseline data provided in the previously conducted vegetation assessments (BEC, 2010; EnviRoss 2014). The vegetation types and associated IFC habitat categories are outlined on Table 18 and illustrated in Figure 13.

Table 18: Natural and modified habitat types (IFC Criteria)

Broad-scale habitat type	*IFC Natural/ Modified*	*Comment*
Calcareous low shrub plains	Modified	Considered relatively degraded due to livestock grazing pressure.
Open shrub plains	Modified	Considered relatively degraded due to livestock grazing pressure.
Open shrub duneveld	Modified	Although previously found to be representative of the Gordonia Duneveld type (BEC, 2010), this unit was found to be degraded due to persistent livestock grazing since then
Rocky outcrop/foothills	Natural	Assessed as being in pristine condition.
Transformed areas	Modified	Areas already transformed through vegetation clearance and construction activity are considered modified.

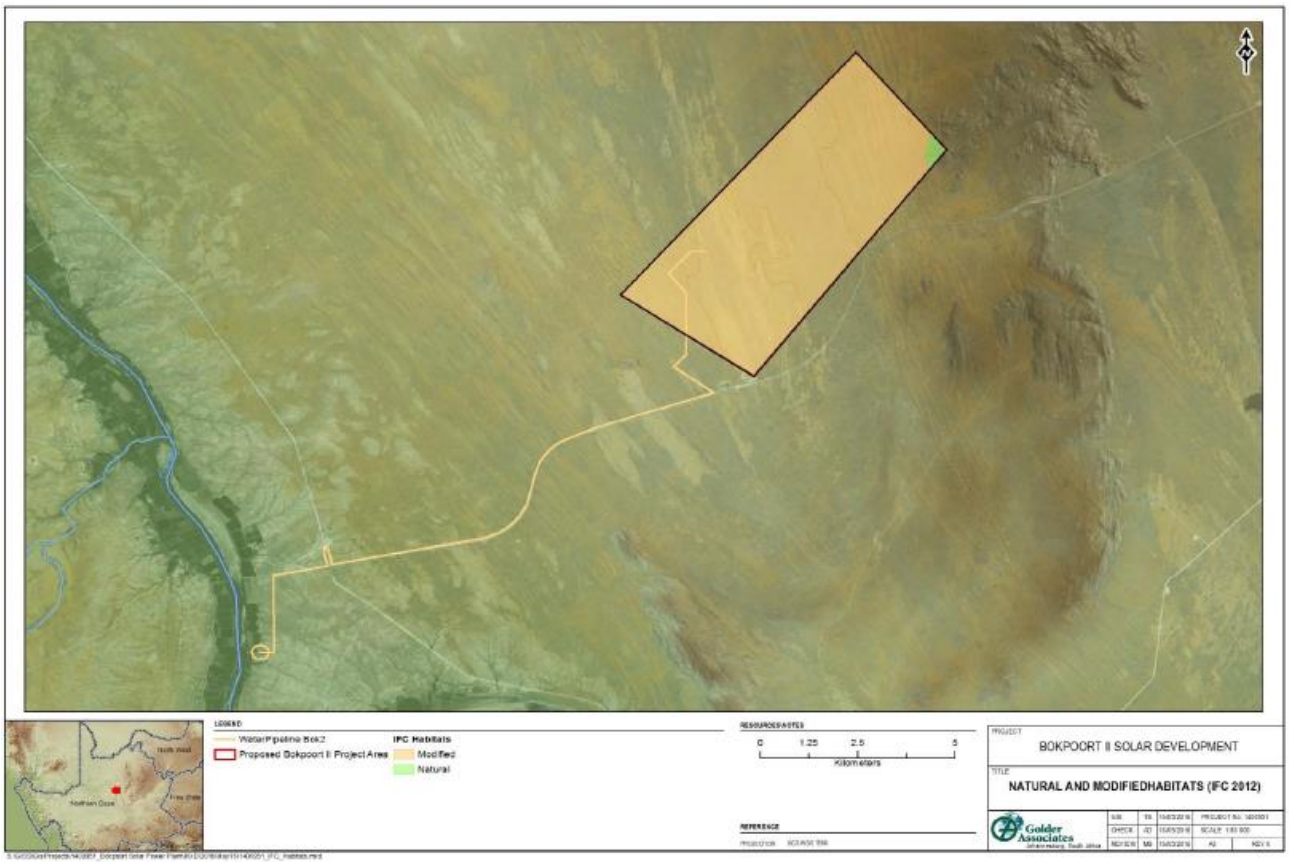


Figure 13: Illustration of modified vs remaining natural habitat according to IFC Criteria

17.4 CRITICAL HABITAT

Critical habitat designation, typically, should be determined on a case-by-case basis according to the concepts of irreplaceability and vulnerability (IFC 2012b). Hence, when applying this guidance, it is often possible to identify critical habitat using the five primary criteria provided by the IFC (2012a), that is:

1) Habitat of significant importance to critically endangered and/or endangered species.
2) Habitat of significant importance to endemic and/or restricted-range species.
3) Habitat supporting globally significant concentrations of migratory species and/or congregatory species.
4) Highly threatened and/or unique ecosystems.
5) Areas associated with key evolutionary processes.

The biodiversity features of the study area are screened against the first three (quantitative) critical habitat determination criteria on Table 19 overleaf.

Criteria 4 and 5, and other qualitative criteria, are addressed on Table 20.

In summary, the Lower Gariep Alluvial Vegetation unit qualifies as Critical Habitat within the Study Area, under Criterion 4; and although it is not likely to be directly affected by this project, it is being considered in terms of Cumulative Impacts from the remainder of the project. Through a process of constant monitoring and dedicated mitigative actions (avoid, minimise, mitigate, offset), the project must ensure that no direct effects on any adjacent areas of Lower Gariep Alluvial Vegetation will occur that is directly associated with the development and associated activities; appropriate steps must be taken to ensure no net loss of this vegetation unit.

Table 19: Screening of quantitative critical habitat criteria against Study Area biodiversity features

Criteria	*Tier 1 Critical Habitat requirement*	*Study area*	*Tier 2 Critical Habitat requirement*	*Study area*
1. Critically Endangered (CR)/Endangered (EN) Species	a) Habitat required to sustain ≥10% of the global population of a CR or EN species/subspecies here there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species. b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management	No CR/EN species confirmed or expected present within the Study Area.	c) Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally-important concentrations of a Red-listed EN species where that habitat could be considered a discrete management unit for that species/ subspecies. d) Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. e) As appropriate, habitat containing nationally/ regionally important concentrations of an EN, CR	No CR/EN species confirmed or expected present within the Study Area.
2. Endemic/ Restricted Range Species	a) Habitat known to sustain ≥95% of the global population of an endemic or restricted-range species, where that habitat could be considered a discrete management unit for that species (e.g., a single-site endemic).	Some flora and fauna species of regional conservation interest occur, however none can be considered restricted range as defined by IFC3, and even if that were the case, no habitat on site supports ≥95% of the global population of any species.	b) Habitat known to sustain ≥1% but <95% of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available	Two Kalahari endemic plant species have been recorded within the Study Area; however it is highly unlikely that these species occur at a scale which would represent ≥1% of the global population of the species, given the size of the extent of occurrence (the Kalahari region) compared to the size of the Study Area.
3. Migratory/ Congregatory Species	a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥95% of the global population of a migratory or congregatory species at any point of the species' lifecycle where that habitat could be considered a discrete management unit for that species.	Migratory/congregatory species confirmed/ considered likely present within the Study Area include the bat species, however these are crevice/bark roosting species which typically congregate in small numbers (<20 and often individually) and therefore do not fit the ≥95% of the global population criteria	b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥1% but <95% of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment. c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. d) For species with large but clumped distributions, a provisional threshold is set at ≥5% of the global population for both terrestrial and marine species. e) Source sites that contribute ≥1% of the global population of recruits.	The expected numbers of populations of any congregatory bat species encountered in the Study Area is not expected to constitute ≥1% of the global population (see Golder Associates Africa, 2016). For birds, see Specialist Ornithology Preconstruction Monitoring report (ARCUS, 2016).

The remaining qualitative critical habitat criteria outlined in PS6 are addressed in the context of the study area in Table 20.

Table 20: Qualitative critical habitat determination criteria in the context of the Study Area

Criteria	*Study area context*
4. Highly threatened or unique ecosystems, i.e. those ecosystems: i. that are at risk of significantly decreasing in area or quality; ii. with a small spatial extent; and/or ii. (iii) containing unique assemblages of species including assemblages or concentrations of biome-restricted species	The Lower Gariep Alluvial Vegetation type is considered Endangered, due to largely due to transformation of approximately 50 % of its extent for agricultural cultivation and via alluvial diamond mining (Mucina & Rutherford, 2006). About 6 % is statutorily conserved inside National Parks, and an additional 25 % is targeted for conservation. It is likely that transformation is ongoing in this vegetation unit, although the rate of decline is not known. It is classified as being of High Conservation Value (IFC PS6 GN35), as it is considered to be an Endangered ecosystem. As an endangered ecosystem that has suffered at least a 50 % loss to transformation, and given that the rate of current loss is unknown, this vegetation unit qualifies as critical habitat under Criterion 4 highly threatened ecosystems, as it is an area of high conservation value that may be at risk of significantly decreasing in area or quality (IFC PS6 GN90). The abstraction point is located within the mapped area of this vegetation unit; however this area is already transformed by agricultural cultivation, and as a result of the construction of the existing abstraction point, and no longer supports natural vegetation; therefore the area where the abstraction pipeline is proposed is classified as modified habitat. Although not likely to be directly affected by the proposed development, it is considered in terms of Cumulative Impacts associated with the rest of the project.
5. Key Evolutionary Processes	Examples of habitat triggering this criterion are peat-forming wetlands which develop over the course of millennia, or islands where new species have developed as a result of isolation. No key evolutionary processes are associated with the Study Area.
6. Areas required for seasonal refugia for critically endangered (CR) and/or endangered (EN) species	No significant numbers of CR or EN species confirmed/expected within the Study Area.
7. Ecosystems of known special significance to critically endangered or endangered species for climate adaptation purposes	No significant numbers of CR or EN species confirmed/expected within the Study Area.
8. Concentrations of vulnerable (VU) species in cases where there is uncertainty regarding the listing, and the actual status of the species may be critically endangered or endangered	No such species confirmed/expected within the Study Area.
9. Areas of primary/old-growth/pristine forests and/or other areas with especially high levels of species diversity	None present within the Study Area.
10. Landscape and ecological processes (for example, water catchments, areas critical to erosion control, disturbance regimes) required for maintaining critical habitat	No such landscapes/ecosystems occur within the Study Area.

Table 20: Qualitative critical habitat determination criteria in the context of the Study Area	
Criteria	*Study area context*
11. Habitat necessary for the survival of keystone species; that is, species that act as ecosystem engineers and drive ecosystem process an functions e.g. elephants in their role as ecosystem engineers	No such species confirmed/expected to occur within the Study Area.
12. Areas of high scientific value, such as those containing concentrations of species new and/or little known to science	None identified within the Study Area.
13. An area of known high concentrations of natural resources exploited by local people	Apart from livestock grazing, no natural resource harvest/use by local people has been observed within the Study Area.
14. Areas that meet the criteria of the IUCN's Protected Area Management Categories Ia, Ib and II, although areas that meet criteria for Management Categories III-VI may also qualify depending on the biodiversity values inherent to those sites	None present within/in close proximity the Study Area.
15. Key Biodiversity Areas (KBAs), which encompass inter alia Ramsar Sites, Important Bird Areas, Important Plant Areas (IPA) and Alliance for Zero Extinction Sites	None present within/in close proximity the Study Area.
16. Areas determined to be irreplaceable or of high priority/significance based on systematic conservation planning techniques carried out at the landscape and/or regional scale by governmental bodies, recognized academic institutions and/or other relevant qualified organizations (including internationally recognized NGOs)	None present within/in close proximity the Study Area.
17. High Conservation Value (HCV) areas	None present within/in close proximity the Study Area.

18 BIODIVERSITY IMPACT ASSESSMENT

18.1 PREDICTED IMPACTS

Potential impacts of the Project on biodiversity were identified, taking cognisance of those already outlined in the Scoping Report (Golder Associates, 2016) and the previous terrestrial biodiversity impact assessments for the proposed Project footprint (RHDV, 2014b; BEC, 2010). The predicted impacts on biodiversity for the construction, operational and closure phases of this Project are outlined in the following sections.

18.1.1 IDENTIFIED IMPACTS FOR THE CONSTRUCTION PHASE

The main impact on biodiversity during the construction phase arises from changes in land cover due to the proposed construction of the Project and all associated infrastructure, resulting in direct impacts on the extent and composition of vegetation communities and associated faunal groups. Specific project impacts that could occur include:

⇒ Reduction in extent of habitats within the Project footprint;
⇒ Introduction and exacerbation of declared and invasive plant species;
⇒ Loss/disturbance of flora and fauna species of conservation concern;
⇒ Loss/disturbance of other fauna species;
⇒ Reduction in extent of Natural Habitat; and
⇒ Reduction in extent of Critical Habitat; and
⇒ Soil erosion and sediment loading of surface water runoff.

18.1.2 IDENTIFIED IMPACTS FOR THE OPERATIONAL PHASE

Predicted impacts on biodiversity during the operational phase of the Project relate to disturbance to resident fauna species as a result of the presence of the photovoltaic facility, and contamination risks for the Orange River. The specific operational impacts that are anticipated include:

⇒ Spread of invasive species; and
⇒ Disturbance of resident faunal species caused by ongoing operation and maintenance activities at the facility (e.g. security lighting at night, security patrols of the boundary throughout the day) (human-animal conflict situations;

18.1.3 IDENTIFIED IMPACTS FOR THE DECOMMISSIONING/CLOSURE PHASE

Predicted impacts on biodiversity and ecosystem services during the decommissioning and closure phase of the Project include the following:

⇒ Spread of invasive species;
⇒ Soil erosion and loss/disturbance of ecosystems of conservation concern.

18.2 IMPACT ASSESSMENT FOR PROJECT PHASES

The Project components and activities potentially affecting biodiversity are broken down by Phase and assessed individually as follows.

18.2.1 CONSTRUCTION PHASE IMPACTS

Predicted impacts on biodiversity during the construction phase of the Project relate to vegetation clearance within the photovoltaic plant development footprint, resulting in direct effects on species and ecosystems of conservation concern, indirect effects on ecosystem integrity due to dust and sediment generation causing contamination of surface water systems. The impact assessment matrix summarises construction-phase related impacts to biodiversity (Table 14); specific impacts are discussed in the paragraphs that follow.

Loss of extent of modified habitats within the Project footprint

Site clearance within the footprint of the photovoltaic plant and associated panels will result in a combined loss of approximately 1 500 ha of existing vegetation within the study area, including calcareous low shrub plains, open shrub plains and open shrub duneveld. These vegetation communities (although largely natural) were considered to be comparatively deteriorated as a result of persistent livestock grazing pressure, and were ascribed a moderate ecological integrity status.

The magnitude of loss of these habitats is considered low in the context of the expansive area covered by the regional Kalahari Karroid shrubland vegetation type which supports similar habitat types and vegetation communities. The loss will be for the duration of the Project until such a time as the photovoltaic plant is decommissioned and the site rehabilitated, so will be long-term in duration. This impact is largely restricted to the development footprint (areas subjected to surface clearance); the overall impact significance is therefore considered moderate, notably as a result of the spatial restriction t moderate ecological sensitivity areas.

The anticipated magnitude of impacts, despite being largely irremediable, could be reduced to minor, and the overall impact significance to low, through the application of the recommended mitigation measures that restrict the exacerbation of this impact to surrounding areas.

Introduction/spread of exotic invasive species

Exotic invasive species have been recorded within the Study Area; vegetation clearance works in advance of construction may create conditions that are favourable for the establishment and spread of these species to neighbouring areas, and even further afield if earth movements take place. The impact magnitude could be high as exotic species are capable of rapidly spreading throughout a locality; and the duration is considered permanent as many exotic species are costly and difficult to eradicate, particularly when these species have become established in an area.

The probability of this occurring is considered medium, given that some (few) declared invasive species have already been recorded within the Study Area. The overall impact significance is considered moderate prior to mitigation. The application of the recommended mitigation measures reduces the potential magnitude and extent of effects, leaving an impact of low significance post- mitigation.

Loss/disturbance of flora and fauna species of conservation concern

Vegetation clearance for construction of the proposed PV solar facilities will result in the loss/disturbance of habitat for species of conservation concern, notably so for flora species, but also for fauna species such as Bat-Eared Fox and Cape Fox, whose prey species inhabit the vegetation within the Study Area for foraging and shelter. Construction activities could cause fatalities to individuals of slow-moving or burrowing species of conservation concern which may not be able to escape oncoming machinery e.g. Suricate, Karoo Round-eared Sengi, Cape Short-tailed Gerbil, and Highveld Gerbil. In addition, indirect effects due to the presence of people and heavy machinery may impact faunal species of conservation concern in the wider landscape. High fatality figures are typical for Bat-eared fox and Cape fox that are particularly susceptible as they are nocturnal species that frequent and utilise roads during the night.

The potential impact of loss/disturbance of species of conservation concern is assessed as high, due to the confirmed presence of several species of conservation concern, and the predicted presence of several others. Anticipated impacts can be reduced to low significance, provided that the recommended mitigation measures are applied; specifically the appointment of an Environmental Control Officer for the duration of construction, and additional targeted surveys in for resting areas/dens of mammal species of conservation concern that are known to be present within the Study Area, such as Honey Badger, Aardvark, Striped Polecat, and Bat-eared Fox, directly in advance of clearance works. Strict control of

vehicle movement, notably during nocturnal periods, in addition to reduced speeds, will assist in limiting accidental fatalities.

Loss/disturbance of other fauna species

Vegetation clearance could result in direct impacts including mortality and injury of other fauna. This is considered to be an impact of moderate significance – although species may not be of specific conservation concern, they contribute to the overall regional biodiversity and ecological integrity of the Study Area.

Provided that the recommended mitigation measures are put in place, the predicted impact can be reduced to one of low significance.

Reduction in extent of natural habitats

Natural habitat within the Study Area consists of the rocky outcrop to the north of the Study Area. The magnitude of predicted effects on this habitat are considered to potentially be of moderate significance, as although only a small area of habitat would be affected in the context of the total area of those habitat types, the good-pristine ecological integrity assigned to these areas and its classification as Natural Habitat (IFC, 2012) increases the biodiversity value of these habitats. The IFC requires no net loss of Natural Habitats, therefore provided that the application of the recommended mitigation measures is adhered to, i.e. avoidance of any construction works or vegetation clearance in this habitat, the predicted effects can be reduced to low significance.

Soil erosion and sediment loading of surface water runoff

Dust is expected to be generated during construction activities and earthworks; dust can suppress photosynthesis and affect the growth rates of some plant species. This can have knock-on effects on the ability of vegetation communities to support wildlife; it can also affect the quality of riparian and wetland habitats through changes in water chemistry. In addition, the clearance of the vegetation on site is expected to create conditions more conducive to soil erosion as a result of wind and storm water runoff, which can also contribute to sedimentation of surface water systems. The impact significance is predicted to be medium prior to mitigation, due to the limited extent and duration of predicted effects which would be greatest during seasonal rains.

With the application of recommended mitigation measures, the duration, extent and probability of impact can all be reduced; reducing the resulting impact to one of low environmental significance post-mitigation.

Nature	Loss of extent of modified habitats within the Project footprint (direct impacts on natural vegetation)	
	Before Mitigation	*After Mitigation*
Probability	5 (Definite)	5 (Definite)
Duration	5 (Permanent)	4 (Long-term)
Scale	1 (Site only)	1 (Site only)
Magnitude	4 (Low)	2 (Minor)
Significance	50 (Moderate)	35 (Moderate)
Nature	Introduction/spread of exotic invasive species	
	Before Mitigation	*After Mitigation*
Probability	4 (Highly probable)	3 (Medium probability)
Duration	5 (Permanent)	2 (Short-term)
Scale	2 (Local)	1 (Site only)
Magnitude	6 (Moderate)	2 (Minor)
Significance	52 (Moderate)	15 (Low)

Nature	Loss/disturbance of flora and fauna species of conservation concern	
	Before Mitigation	*After Mitigation*
Probability	4 (Highly probable)	4 (Highly probable)
Duration	4 (Long-term)	4 (Long-term)
Scale	2 (Local)	1 (Site only)
Magnitude	8 (High)	4 (Low)
Significance	56 (Moderate)	36 (Moderate)
Nature	Loss/disturbance of other fauna species	
	Before Mitigation	*After Mitigation*
Probability	5 (Definite)	3 (Medium probability)
Duration	4 (Long-term)	4 (Long-term)
Scale	1 (Site only)	1 (Site only)
Magnitude	6 (Moderate)	4 (Low)
Significance	55 (Moderate)	27 (Low)
Nature	Reduction in extent of natural habitats, systems of conservation concern	
	Before Mitigation	*After Mitigation*
Probability	3 (Medium probability)	2 Low probability)
Duration	5 (Permanent)	5 (Permanent)
Scale	1 (Site only)	0 (None)
Magnitude	8 (High)	4 (Low)
Significance	42 (Moderate)	18 (Low)
Nature	Soil erosion and sediment loading of surface water runoff	
	Before Mitigation	*After Mitigation*
Probability	4 (Highly probable)	2 Low probability)
Duration	4 (Long-term)	2 (Short-term)
Scale	2 (Local)	2 (Local)
Magnitude	4 (Low)	2 (Minor)
Significance	40 (Moderate)	12 (Low)

18.2.2 Operation Phase Impacts

Predicted operational phase impacts relate to disturbance to resident fauna species as a result of the presence of the photovoltaic plant, and contamination risks for the Orange River. The impact assessment matrix summarises operation phase-related impacts to biodiversity; specific impacts are discussed in the following paragraphs.

Spread of invasive plant species

The spread of invasive species, particularly invasive plant propagules by heavy machinery and earth works could cause an impact of high environmental significance, depending on the invasive plant species that occur in the area. The application of effective mitigation measures is critical in ensuring an impact of low environmental significance post-mitigation.

Direct loss (injury/mortality) of fauna species via roadkill

Increased vehicular traffic in the study area during the operation of the photovoltaic plant is likely to result in increased incidences of road kill, particularly at night. Magnitude in this case refers to the number of wildlife road deaths, which is considered to be potentially high. The impact would be long-term and would affect wildlife on a local scale with an estimated high probability of occurrence, resulting in an impact of moderate significance.

Although the application of mitigation measures would reduce the number of road kill deaths (magnitude) and the probability of vehicle-animal collisions happening, the impact remains one of moderate significance post-mitigation.

Disturbance of faunal species of conservation concern – site lighting

Based on observations of the Bokpoort I facility made during the field work conducted in September 2015, the Bokpoort II facility will be well-lit at night. In addition, frequent security patrols of the boundary throughout the day were observed. These, together with on-going operation and maintenance activities at the facility, are expected to cause disturbance to faunal species of conservation concern in surrounding areas, particularly at night time. The magnitude of the effects is expected to be moderate given the extent of lighting observed at the existing facility. The predicted impact is thus considered to be of moderate significance prior to mitigation.

Once the recommended mitigation measures are applied, the magnitude of effects on bats and the probability of effects on other faunal species (some of the more adaptable fauna species e.g. foxes may become accustomed to a certain level of disturbance over time) can be reduced, reducing the significance of the overall impact to low.

Disturbance of faunal species of conservation concern – barrier to movement

Security fencing on the perimeter of the development compound will present a barrier to movement for mammal species of conservation concern such as Aardvark, Bat-eared Fox and Honey Badger, as well as larger reptiles. This may reduce mammal movement capability through the landscape, forcing affected species to make longer, more energetically-expensive journeys to get around the fenced areas. The magnitude of potential effects is considered moderate, as no direct mortality or injury to species of conservation concern is anticipated. The effects would be long-term, occur at a local scale and have a moderate likelihood of occurrence, given the relatively sparse mammal population within the study area. The overall significance of impact is considered to be moderate. It is difficult to mitigate the presence of the security fence during the lifetime of the Project; effects would only be reduced following closure and decommissioning.

Therefore, the potential impacts remain of moderate significance for the lifetime of the Project.

Nature	Spread of invasive plant species	
	Before Mitigation	*After Mitigation*
Probability	4 (Highly probable)	3 (Medium probability)
Duration	5 (Permanent)	2 (Short-term)
Scale	2 (Local)	1 (Site only)
Magnitude	6 (Moderate)	2 (Minor)
Significance	52 (Moderate)	15 (Low)
Nature	Direct loss (injury/mortality) of fauna species via roadkill	
	Before Mitigation	*After Mitigation*
Probability	5 (Definite)	4 (Highly probable)
Duration	4 (Long-term)	4 (Long-term)
Scale	2 (Local)	2 (Local)
Magnitude	8 (High)	4 (Low)
Significance	70 (Moderate)	40 (Moderate)
Nature	Disturbance of faunal species of conservation concern – site lighting	
	Before Mitigation	*After Mitigation*
Probability	5 (Definite)	2 Low probability)
Duration	4 (Long-term)	4 (Long-term)
Scale	2 (Local)	2 (Local)
Magnitude	6 (Moderate)	4 (Low)
Significance	60 (Moderate)	20 (Low)

Nature	Disturbance of faunal species of conservation concern – barrier to movement	
	Before Mitigation	*After Mitigation*
Probability	4 (Highly probable)	3 (Medium probability)
Duration	4 (Long-term)	4 (Long-term)
Scale	2 (Local)	2 (Local)
Magnitude	6 (Moderate)	6 (Moderate)
Significance	48 (Moderate)	36 (Moderate)

18.2.3 CLOSURE/DECOMMISSIONING PHASE

Predicted impacts on biodiversity during the decommissioning and closure phase of the project relate to the spread of invasive species as a result of large-scale ground works, and contamination of surface water systems with resultant effects on aquatic species of conservation concern; in particular frogs and fish of conservation concern.

Spread of invasive plant species

The spread of invasive species, particularly invasive plant propagules by heavy machinery and earth works could cause an impact of high environmental significance, depending on the invasive plant species that occur in the area. The application of effective mitigation measures is critical in ensuring an impact of low environmental significance post-mitigation.

Soil erosion and sediment loading of surface water runoff

Relics of the operational and decommissioning phases of the project could potentially cause unintended changes in surface water run-off that might cause and contribute to conditions that are conducive for soil erosion. Similarly, poorly vegetated areas might be subjected to wind, which will contribute to surface erosion. The impact significance is predicted to be medium prior to mitigation, due to the limited extent and duration of predicted effects which would be greatest during seasonal rains.

With the application of recommended mitigation measures, the duration, extent and probability of impact can all be reduced; reducing the resulting impact to one of low environmental significance post-mitigation.

Nature	Spread of invasive plant species	
	Before Mitigation	*After Mitigation*
Probability	5 (Definite)	3 (Medium probability)
Duration	4 (Long-term)	2 (Short-term)
Scale	3 (Regional)	1 (Site only)
Magnitude	6 (Moderate)	4 (Low)
Significance	65 (Moderate)	21 (Low)

Nature	Soil erosion and sediment loading of surface water runoff	
	Before Mitigation	*After Mitigation*
Probability	3 (Medium probability)	1 (Improbable)
Duration	5 (Permanent)	5 (Permanent)
Scale	2 (Local)	3 (Regional)
Magnitude	6 (Moderate)	6 (Moderate)
Significance	39 (Moderate)	14 (Low)

18.3 CUMULATIVE IMPACTS

The Project is located adjacent to the existing Bokpoort I development. In addition, the proposed SolAfrica Sanddraai 75 MW PV Project in !Kheis LM is situated on the farm directly adjacent to the Project, and the proposed Kheis Solar Park 1 PV project is located in similar habitat approximately 20 km north of the Project (refer **Figure 14**).

Potential residual (post-mitigation) impacts of the Bokpoort II PV Project that may contribute to the cumulative effects of other proposed and permitted solar developments in the region relate to potential indirect impacts on fauna and exacerbation of the loss of remaining areas of natural habitat. The Project may contribute to cumulative impacts on fauna through increased incidences of road kill as a result of increased vehicular traffic and the creation of a barrier to normal movement of medium-large mammals and reptiles due to the physical barrier that will be created by the site security fencing. Incremental losses of remaining areas of natural (untransformed) habitat is anticipated due to the continual increase of human/ industrial related activities on a regional scale.

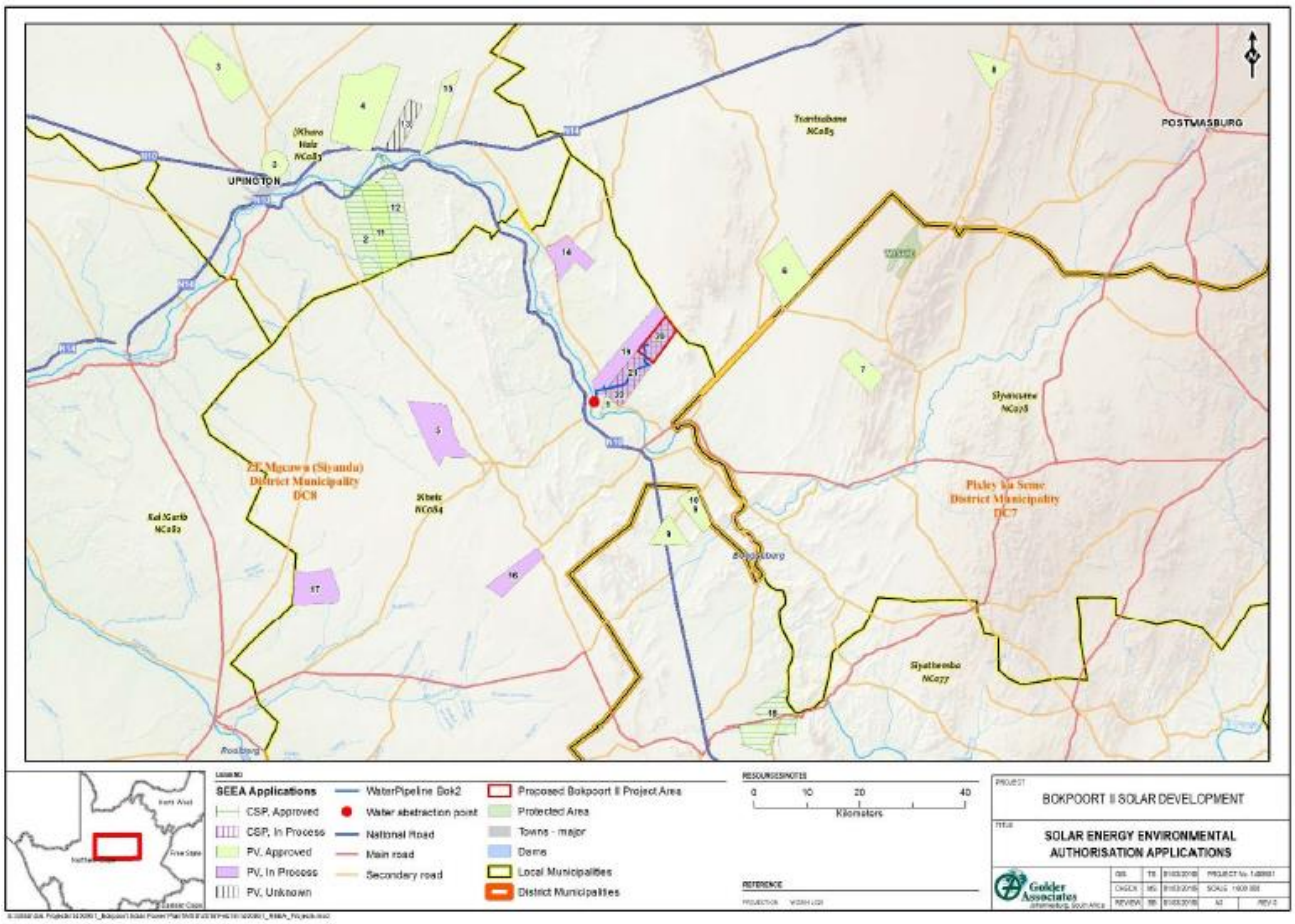


Figure 14: Proposed and authorised solar developments that may contribute to cumulative impacts

18.4 IMPACT SUMMARY (DEVELOPMENT FOOTPRINT)

Summary table for the impact significance on the ecological receiving environment (before and after mitigation)		
Nature	*Before Mitigation*	*After Mitigation*
Construction Phase - Loss of extent of modified habitats within the Project footprint (direct impacts on natural vegetation)	50	35
Construction Phase - Introduction/spread of exotic invasive species	52	15
Construction Phase - Loss/disturbance of flora and fauna species of conservation concern	56	36
Construction Phase - Loss/disturbance of other fauna species	55	27
Construction Phase - Reduction in extent of natural habitats, systems of conservation concern	42	18
Construction Phase - Soil erosion and sediment loading of surface water runoff	40	12
Operational Phase - Spread of invasive plant species	52	15
Operational Phase - Direct loss (injury/mortality) of fauna species via roadkill	70	40
Operational Phase - Disturbance of faunal species of conservation concern – site lighting	60	20
Operational Phase - Disturbance of faunal species of conservation concern – barrier to movement	48	36
Decommissioning Phase - Spread of invasive plant species	65	21
Decommissioning Phase - Soil erosion and sediment loading of surface water runoff	39	14

18.4.1 LINEAR INFRASTRUCTURE SERVITUDE (ACCESS ROAD, WATER PIPELINE AND POWER LINE)

The servitude that will contain the linear infrastructure are spatially placed outside, albeit directly adjacent to, the proposed development footprint (refer **Figure 3**), notably the power line (south and east), access road (south) and the water pipeline (south). The placement of the linear infrastructure in a single 'servitude' will minimize impacts on the natural environment. Furthermore, as the linear infrastructure is also placed directly adjacent to the existing CSP footprint, potential impacts upon the natural receiving environment is further limited.

Natural habitat that will be affected by the linear infrastructure exhibit similar characteristics to those contained within the development footprint (refer **Section 15.4**). Taking cognisance of the nature of impacts associated with construction and operation of linear infrastructure, the nature and extent of impacts associated with these infrastructures are similar in significance than the principal development footprint, albeit with limited physical extent. As the linear infrastructure is indelibly linked to the PV development, a similar impact significance is therefore estimated, and a similar mitigation approach is recommended.

19 RECOMMENDED MITIGATION APPROACH

19.1 MITIGATION HIERARCHY BACKGROUND

Mitigation aims to eliminate or reduce negative biodiversity impacts. Mitigation options should generally be considered in the following order of preference:

1. Avoidance of impacts altogether;
2. Reduction of impacts where unavoidable;
3. Restoration of habitats to their original state;
4. Relocation of affected species or habitats; or
5. Compensation for any residual, unavoidable damage.

The mitigation of negative impacts on biodiversity and ecosystem services is a legal requirement for authorisation purposes and must take on different forms, depending on the significance of the impact and the area being affected. Mitigation requires proactive planning that is enabled by following the mitigation hierarchy, illustrated in Figure 15. Its application, is intended to strive to first avoid disturbance of ecosystems and loss of biodiversity, and where this cannot be avoided altogether, to minimise, rehabilitate, and then finally offset any remaining significant residual negative impacts on biodiversity, where:

Avoiding or preventing impacts – refers to considering options in project location, siting, scale, layout, technology and phasing to avoid impacts on biodiversity, associated ecosystem services, and people. This is the best option but is not always possible if development/ construction is to take place. However, there are areas where the environmental and social constraints are too high, and development should not take place. Such areas are best identified early in the development life cycle, so that impacts can be avoided, and authorisations refused. In the case of areas where environmental constraints might be limiting, this includes some ecosystems, habitats, ecological corridors, or areas that provide essential ecosystem services and are of such significant conservation value or importance that their loss cannot be compensated for (i.e. there is no substitute). In such areas, it is unlikely to be possible or appropriate to rely on the latter steps in the mitigation hierarchy (e.g. rehabilitating or offsetting impacts) to provide effective remedy for impacts on biodiversity or ecosystem services. Information about the location of many such areas is available, often making it possible to avoid them.

Reduction of impacts where unavoidable – refers to considering alternatives in the project location, siting, scale, layout, technology and phasing that would minimise impacts on biodiversity and ecosystem services. Even in areas where the environmental and social constraints are not particularly high for development to proceed/take place every effort should still be made to minimise impacts.

Restoration of habitats to their original state – refers to the rehabilitation of areas where impacts were unavoidable, and measures are taken to return impacted areas to a condition ecologically similar to their 'pre-development natural state' or an agreed land use after closure. Although rehabilitation is important and necessary, unfortunately even with significant resources and effort, rehabilitation is a limited process that usually falls short of replicating the diversity and complexity of a natural system. Instead, rehabilitation helps to restore some resemblance of ecological functioning in an impacted landscape, to avoid on-going negative impacts, and/or to provide some sort of aesthetic fix for a landscape. Rehabilitation should occur concurrently or progressively with the proposed activity, and/or on cessation of the activity.

Relocation of affected species or habitat – refers to the physical translocation of affected individuals within the footprint, or adjacent areas, where unavoidable and devastating effects are likely to occur. The translocation of individuals is generally subject to permitting requirements and should be based on a like-for like habitat, taking cognisance of potential impacts such as genetic populations, geographic isolation, etc. The relocation of habitat is generally in severely selective events where small, isolated and biologically significant habitat can be realistically relocated and

reproduced outside the affected footprint. This approach can also be augmented by propagation of certain species.

Offset impacts/ Compensation for any residual, unavoidable damage –refers to compensating for remaining and unavoidable negative effects on biodiversity. When every effort has been made to minimise and then rehabilitate remaining impacts to a degree of no net loss of biodiversity against biodiversity targets, biodiversity offsets can provide a mechanism to compensate for significant residual negative impacts on biodiversity.

The mitigation hierarchy is inherently proactive, requiring the on-going and iterative consideration of alternatives of project location, footprint siting, scale, layout, technology and phasing until the proposed development best 'suits' and can be accommodated without significant negative impacts in the receiving environment. In cases where the receiving environment cannot support the development (e.g. there is insufficient water) or where the project will eradicate unique biodiversity, the development may not be feasible; the earlier the developing company knows of these risks, and can plan to avoid them, the better. In cases where biodiversity impacts are likely to be severe, the guiding principle should therefore be to "anticipate and prevent" rather than "assess and repair".

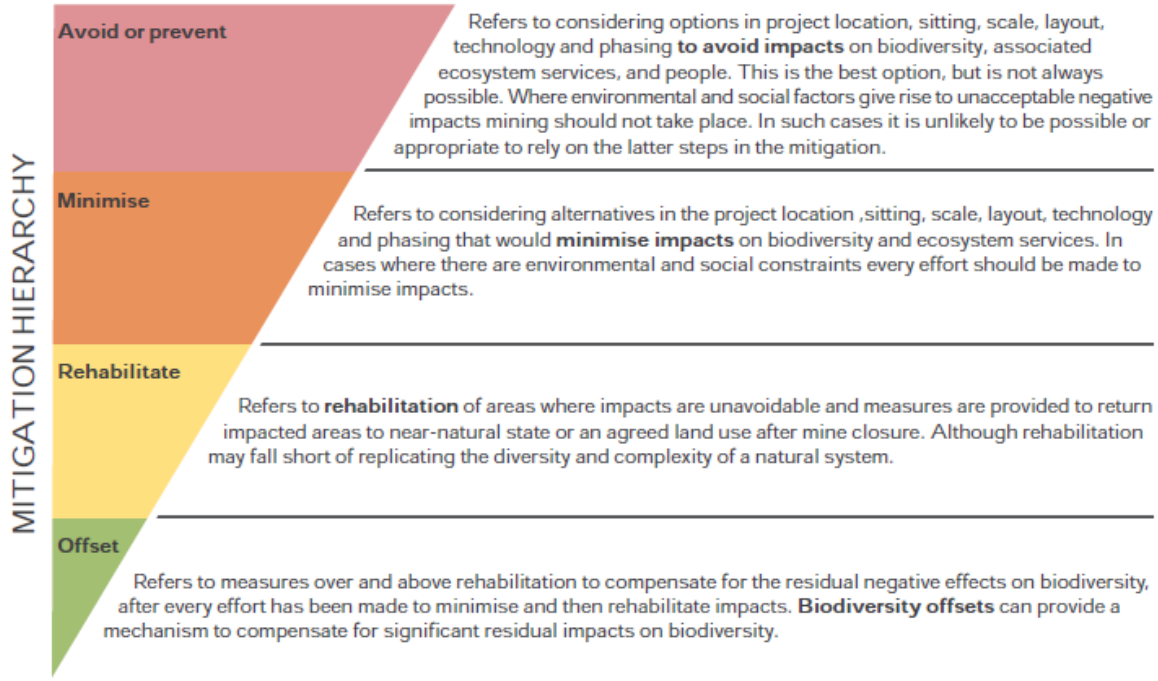


Figure 15: Mitigation hierarchy for dealing with negative impacts on biodiversity

The mitigation approach should be contained and elaborated in the Environmental Management Plan for the activity, notably for the construction phase, and should be regarded as a 'Living Document' that will be amended and updated as new information becomes available. The project should consider minimal disturbance and hazards to the surrounding natural environment. The proposed list of mitigation measures are not considered exhaustive and should be updated where additional or unprecedented impacts are noted during construction and operational phases, i.e. the document should be perceived as a 'living' document that addresses impacts, threats and issues as it becomes evident.

19.2 THE "NO-GO' OPTION

The 'No-Go' option is not regarded an appropriate recommendation for this development, based on the following key considerations:

1. The proposed development site comprises of limited natural savanna and Nama Karoo Biome habitat (Modified habitat, IFC PS6);

2. Natural habitat on the site does not exhibit any aspect of high biological or biodiversity sensitivity and was found to be in a moderately deteriorated condition;
3. Despite the presence of numerous protected tree species on the site, the loss of these species is not anticipated to trigger an exacerbation in the conservation status of any of these species; these species are abundantly encountered in the immediate surrounds;
4. No threatened plant or animal, or population, is anticipated to be affected by the proposed development; and
5. The implementation of a dedicated mitigation approach is anticipated to ameliorate expected and likely impacts to an acceptable level.

19.3 SUPPLEMENTING MITIGATION MEASURES

19.3.1 CONSTRUCTION AND SITE-CLEARANCE PHASE

Mitigation Measure 1 - An Environmental Officer (EO) shall be appointed prior to construction. The appointed Environmental Officer for the project should have an appropriate, not necessarily detailed, knowledge of ecological and biodiversity aspects of the site, surrounds and the general region. Responsibilities should include, but not necessarily be limited to:

a) Ensuring authorisation conditions, guidance of activities, planning and reporting;
b) Identifying species of concern and general flora and fauna species on the site and surrounds;
c) Establish communication with the ecologist/ suitable ecologist as soon as possible to communicate relevant project details and direct any questions in cases of uncertainties;
d) Supervise clearance and construction works;
e) Stop construction activities where necessary (e.g. a breeding/resting site of a species of conservation concern is discovered) so that the appropriate conservation measures can be undertaken.

Mitigation Measure 2 - The Project shall ensure that valid permits are obtained for the removal, destruction and/or transplant of protected and conservation important plant species from the development site:

a) Prior to site clearance, conduct a detailed 'walkthrough' of the proposed site to ascertain the number, abundance and physical conditions of all protected (NFA, 1998) tree species to assist with permit application (DAFF); and
b) Prior to site clearance, conduct a detailed 'walkthrough' of the proposed site to ascertain the number, abundance and physical conditions of all protected plant species (NCNCA, 2009) to assist with permit application (NCDENC).
c) Prior to site clearance, conduct targeted searches for less mobile animal species of conservation concern with high probability of occurring within the Project footprint (i.e. small mammals, medium mammals that may have dens/resting places/ roosts, burrows, etc. within the footprint) to allow relocation to take place where necessary, and avoid mortalities of these species;

Mitigation Measure 3 - Where possible, collection of propagules, including seeds, cuttings and seedlings of floral species of conservation concern, should be conducted to preserve genetic diversity and retain these species for specific conservation efforts. Where possible, these species should be replanted in areas of the study area that are proposed for rehabilitation. Specific plans for this should be outlined in a Biodiversity Management/Action Plan for the Project.

Mitigation Measure 4 - Under no circumstances shall any natural area on neighbouring properties (outside the approved development footprint) be impacted, degraded, cleared, or affected in any manner. The construction of a semi-permanent fence, which will prevent vehicle and personnel access to adjacent areas) shall be constructed.

Mitigation Measure 5 - Due to the type of development, the type and nature of fencing/ demarcation should not attempt to facilitate free movement of smaller/ medium-sized animals as this could lead to unwanted presence (and accidental killing) of animals within the development site.

Mitigation Measure 6 - The use of electric fences (particularly on ground level) is discouraged. Top wire strands should be grounded to avoid electrocution of perching birds.

Mitigation Measure 7 - No surface disturbance or vegetation clearance should occur in the rocky outcrop that consists of Natural Habitat as defined by IFC. This habitat, plus a 250 m buffer, should be demarcated and no construction activity should occur within the demarcated zone;

Mitigation Measure 8 - Areas proposed for vegetation clearance should be clearly marked and no heavy vehicles should travel beyond the marked works zone;

Mitigation Measure 9 - The retention of a vegetated buffer zone between the edge of the proposed infrastructure footprint and the outer boundary of the facility, within which the existing vegetation is retained, is recommended. This will reduce disturbance associated with construction activity (presence of people and heavy machinery, disturbance of faunal species of conservation concern), and will also contribute to the conservation of natural vegetation within the project boundary.

Mitigation Measure 10 - Cleared vegetation and debris that has not been utilised must be collected and disposed of at a suitable waste disposal site. Under no circumstances may it be burned on site.

Mitigation Measure 11 - No painting or marking of rocks or vegetation to identify locality or other information shall be allowed, as it will disfigure the natural setting. Marking shall be done by steel stakes with tags, if required. All temporary markings will be removed upon completion of the construction.

Mitigation Measure 12 - Collection of branches, wood (dead or alive), shrubs or any vegetation for fire making purposes is strictly prohibited.

Mitigation Measure 13 - Absolutely no animals may be hunted, trapped, snared or killed for any purpose whatsoever. Nests shall be protected, and no eggs shall be collected.

Mitigation Measure 14 - Develop and implement an Alien and Invasive Management Programme (flora and fauna). The aim of this programme should include (*inter alia*) the identification, control and eradication of invasive and exotic animals and plants from the site and immediate surrounds. The Environmental Officer shall compile relevant action plans to deal with the presence of alien and invasive species.

Mitigation Measure 15 - No domestic pets of any kind, with specific reference to feral cats, should be allowed on the development.

Mitigation Measure 16 - Site induction for contractors and workers should include a familiarization with all aspects relating to environmental components of the project, as well as potentially occurring dangerous animals of the area and the correct actions to take when encountering dangerous species, notably snakes and scorpions.

Mitigation Measure 17 - A competent person must be appointed to safely handle and remove any dangerous animal from the construction site.

Mitigation Measure 18 - Establish operational procedures for eventualities in dealing with snakebites.

Mitigation Measure 19 - Prevent all open fires on site.

Mitigation Measure 20 - The irresponsible use of welding equipment, oxy-acetylene torches and other naked flames, which could result in veld fires, or constitute a hazard should be guided by safe practice guidelines.

Mitigation Measure 21 - The burning of general waste material is not to be allowed.

Mitigation Measure 22 - Provide demarcated fire-safe zones, facilities and suitable fire control measures;

Mitigation Measure 23 - Develop an effective waste management plan to limit the exposure of natural biota to waste, creating artificial refuge areas, or providing access and food to opportunistic species, including feral cats, mongoose, Suricate, mice, rats, etc. Waste management should aim to develop a zero residual strategy whereby waste materials are immediately removed from site to an approved, central waste management facility. This also refers to on-site ablution facilities, temporary camps, and storage / laydown areas.

Mitigation Measure 24 - Prevent contamination of surrounding, natural habitat from any source of pollution, notably from hydrocarbon spillages, runoff end contamination from transformed areas. Ducts that facilitate

water flow underneath roads shall be kept clear of litter, debris and shall not be used to dispose of chemicals, unwanted effluent, etc.;

Mitigation Measure 25 - Traffic speed limits of a maximum of 40km/h should be imposed for all construction vehicles on all site rods and site access roads to reduce accidental animal road fatalities;

Mitigation Measure 26 - Minimize the use of floodlight and high intensity lighting during the night. Where unavoidable, lights should be mounted as low as possible and fully shielded where possible. Beams should be directed only to areas where it is needed (avoid peripheral light);

Mitigation Measure 27 - Use light bulbs that produces long wavelengths (ambers and reds).

19.3.2 OPERATIONAL PHASE

Mitigation Measure 1 - Absolutely no animals may be hunted, trapped, snared or killed for any purpose whatsoever. Nests shall be protected, and no eggs shall be collected. A periodic (weekly) monitoring survey of all fences shall be conducted to identify and remove snares when observed.

Mitigation Measure 2 - Nests of birds observed within infrastructure shall be discouraged during times when no breeding is taking place. If breeding takes place, the nests shall be removed when the chicks have left the nests.

Mitigation Measure 3 - Continue the Alien and Invasive Management Programme of declared and invasive plant species. The Environmental Manager shall compile relevant action plans to deal with the presence of alien and invasive species.

Mitigation Measure 4 - No domestic pets of any kind, with specific reference to feral cats and dogs, should be allowed on the development site, with specific reference to administrative offices and buildings.

Mitigation Measure 5 - The persistence of opportunistic animal species within the development footprint and appurtenant infrastructure should be monitored and discouraged.

Mitigation Measure 6 - Site induction for contractors and personnel should include a familiarization with all aspects relating to environmental components of the project, as well as potentially occurring dangerous animals of the area and the correct actions to take when encountering dangerous species, notably snakes and scorpions.

Mitigation Measure 7 - A competent person must be appointed to safely handle and remove any dangerous animal from the operational site.

Mitigation Measure 8 - Establish operational procedures for eventualities in dealing with snakebites.

Mitigation Measure 9 - Traffic speed limits of a maximum of 40 km/h should be imposed for all construction vehicles on all site rods and site access roads to reduce accidental animal road fatalities;

Mitigation Measure 10 - Information signs regarding animals that may crossroads, notably during nocturnal periods, should be erected at selected localities. Monitoring of road conditions will inform of sites where burrows are observed;

Mitigation Measure 11 - Develop an effective waste management plan to limit the exposure of natural biota to waste, creating artificial refuge areas, or providing access and food to opportunistic species, including feral cats, mongoose, Suricate, mice, rats, etc. Waste management should aim to develop a zero residual strategy whereby waste materials are immediately removed from site to an approved, central waste management facility. This also refers to on-site ablution facilities, temporary camps, and storage / laydown areas.

Mitigation Measure 12 - Prevent contamination of surrounding, natural habitat from any source of pollution, notably from hydrocarbon spillages, runoff end contamination from transformed areas. Ducts that facilitate water flow underneath roads shall be kept clear of litter, debris and shall not be used to dispose of chemicals, unwanted effluent, etc.;

Mitigation Measure 13 - Minimize the use of floodlight and high intensity lighting during the night. Where unavoidable, lights should be mounted as low as possible and fully shielded where possible. Beams should be directed only to areas where it is needed (avoid peripheral light);

Mitigation Measure 14 - Use light bulbs that produces long wavelengths (ambers and reds).

19.3.3 DECOMMISSIONING AND REHABILITATION PHASE

Mitigation Measure 1 - The use of locally indigenous plant species for landscaping and rehabilitation purposes is strongly recommended. In particular, the retention of trees (notably protected trees) should be assessed as part of the rehabilitation aspect.

Mitigation Measure 2 - Under no circumstances shall exotic and invasive plants be used for landscaping purposes.

Mitigation Measure 3 - An invasive species management plan for rehabilitation works should be developed. This will include the identification of target areas for invasive species control, and species-specific eradication methods and measures that will need to be enacted; and

Mitigation Measure 4 - Restoration/rehabilitation of the Project footprint must include consideration of compatible measures for biodiversity enhancement. Such measures should include planting of native species vegetation using the plants/propagules maintained since construction phase and demarcation of rehabilitated areas as conservation areas only i.e. no livestock grazing should take place in these areas.

19.3.4 SUGGESTED BIODIVERSITY MONITORING PROTOCOL

Constant and periodic monitoring of the following aspects are recommended:

Vegetation – the continuation of the AIP species management plan during all stages of the development. This should be developed by a qualified ecologist, implemented by the Environmental Manager. Ongoing monitoring should be conducted by the ECO and periodic monitoring (annual) by a qualified ecologist to ascertain the efficacy of the programme.

Vegetation – monitoring of rehabilitation success and management should be conducted after commencement of rehabilitation activities. Seasonal inspections of rehabilitation areas should be conducted by the ECO, based on criteria from the rehabilitation plan.

Vegetation and land use - an annual monitoring protocol shall be executed to assess the status and impacts of the development on areas of remaining natural habitat in the immediate surrounds of the development footprint. This shall include reference to botanical and faunal observations and diversity patterns and will advise the Project on adverse actions and effects of the Project outside the approved footprint.

Fauna – ongoing monitoring of the presence of animals within the site and immediate surrounds, including roads, shall be conducted by the ECO for the project. Voluntary contributions from personnel, by means of observations and photographic evidence is encouraged, with reference to a cautionary approach to potentially dangerous animals.

Fauna – a register shall be created for all observations relating to the ecological receiving environment.

20 CONCLUDING STATEMENT AND PROFESSIONAL OPINION

It is a regulatory requirement that the specialist provides a professional opinion in regards to the proposed development.

The various assessment of the ecological receiving environment that were accessed to compile this report revealed a moderate, at best, ecological sensitivity of remaining and untransformed portions of the site. The photovoltaic plant development will potentially affect biodiversity in three main ways; loss in extent of vegetation communities and loss and associated disturbance of species of conservation concern during construction; effects on fauna species of conservation concern as a result of site lighting, security fencing and increased road traffic during operation, and the spread of invasive species and potential contamination of remaining natural (surrounding) ecosystems during closure. Biological attributes of the site exhibit typical diversity and status of natural spaces in the region of the site, which is ultimately characterised by limited and low intensity, albeit long-term, anthropogenic impacts that have caused a moderate decline in the status and natural diversity. Despite a moderate to high correlation with regional ecological types, only a moderate diversity was recorded on the site, which provides an indication of the relentless nature of existing impacts, and surrounding developments.

A review of the anticipated impacts associated with this type of development on the ecological environment indicates that none of the anticipated impacts can be highlighted or construed to represent an unacceptable or severe threat to sensitive biological or biodiversity components within the study area and wider region. Ecological attributes and characteristics and biological components that were recorded on the site during the brief survey period are regarded common and typical of the larger region and are not restricted to the site, i.e. no plant or animal species or habitat type will be affected in such a manner that the conservation status (local, regional, global) will be affected adversely. Although several species of conservation concern have been recorded within the study area, no species were recorded that would trigger 'Critical Habitat' as defined by IFC. As with any type of anthropogenic development, the decimation of natural habitat is an unfortunate result and the reduction in the local abundance of animals and plants represent natural and anticipated consequences.

The Concluding Statement is based on the following key considerations:

⇒ It is recognised that the proposed site is situated within one of South Africa's eight renewable energy development zones, and has therefore been identified as one of the most suitable areas in the country for renewable energy development, in terms of a number of environmental impacts, economic and infrastructural factors;

⇒ Biological and biophysical attributes that characterises the study site are regarded common and are abundantly represented in the wider region;

⇒ A high number of protected tree species were recorded on the site and requires legislative authorisation prior to removal;

⇒ No threatened plant or animal species were recorded on the site during the site investigation;

⇒ It is regarded unlikely that any plant or animal species of a threatened status will persist on the site, other than possibly migratory or opportunistic purposes;

⇒ No habitat type that were recorded within the site are regarded restricted on a local or wider scale. The site also does not exhibit any significant biophysical feature of rarity or ecological importance;

⇒ The loss of natural habitat within the site is not expected to result in significant, or unacceptable, effects of provincial biodiversity conservation patterns or obligations. Similarly, the inclusion of this portion of remaining natural habitat as part of a conservation stewardship will not result in significant gains of conservation efforts on a local or regional scale. Particular reference is made to existing and planned developments in the immediate surrounds (cumulative impacts);

⇒ The loss of this portion of natural habitat is also not anticipated to cause severe or unacceptable changes to or disruptions of ecological processes or animal migratory patterns on a local or regional scale;

⇒ No impact was identified that would result in significant or unacceptable impacts on the ecological receiving environment;

⇒ The application of the recommended mitigation approach is expected to ameliorate anticipated impacts to an acceptable low level.

It is therefore the considered opinion of the specialist, based on results of the various ecological investigations, that no specific objection is raised to the proposed development. Although the proposed activity will result in unavoidable impacts on a local scale, these losses are within an acceptable range and significance.

APPENDIX 1: LIST OF PLANT SPECIES RECORDED WITHIN THE STUDY AREA

** denotes declared AIP species

Species Name	Family	Growth Form	Status/ Uses	Common Name
Acacia erioloba[4]	Fabaceae	Tree	Protected Tree (National Forest Act, 1998), edible parts, medicinal uses, firewood	Camel Thorn (e), Kameeldoring (a)
Acacia haematoxylon	Fabaceae	Tree	Kalahari Endemic, Protected Tree (National Forest Act, 1998)	Grey Camel (e), Vaalkameel (a)
Acacia mellifera	Fabaceae	Shrub	Declared indicator of encroachment, medicinal uses, poison source	Black Thorn (e), Swarthaak (a)
Adenium oleifolium	Apocynaceae	Succulent	Poisonous parts	Sand Quick (e)
Aloe claviflora	Asphodelaceae	Succulent	None	Kraalaalwyn (a)
Anacampseros albidiflora	Portulacaceae	Succulent	None	
Anacampseros ustulata	Portulacaceae	Succulent	Food preparation	
Anthephora pubescens	Poaceae	Grass	High grazing potential. Decreaser species	Wool grass (e), Borseltjiegras (a)
Aptosimum lineare Marloth & Engl.	Scrophulariaceae	Forb	None	--
Aptosimum procumbens	Scrophulariaceae	Forb	Medicinal uses (sheep)	
Aristida congesta subsp. *congesta*	Poaceae	Grass	Poor grazing potential, indicator of poor habitat, Increaser IIC	Tassel Three-awn (e), Katstertsteekgras (a)
Aristida species	Poaceae	Grass	None	--
Aristida stipitata	Poaceae	Grass	Poor grazing potential, indicator of poor habitat, Increaser IIC	Long-awned Three-awn (e), Langnaaldsteekgras (a)
Asparagus laricinus Burch.	Asparagaceae	Shrub	Edible parts	Cluster-leaved Asparagus (e), Bergkatbos (a)
Asparagus species	Asparagaceae	Shrub	None	Wild Asparagus (e), Katbos (a)
Barleria species	Acanthaceae	Forb	None	--
Berkheya species	Asteraceae	Forb	Weed	--
Blepharis species	Acanthaceae	Forb	None	--
Boscia albitrunca (Burch.) Gilg & Gilg-Ben.	Capparaceae	Tree	Protected Tree (National Forest Act, 1998), important fodder, traditional uses, traditional medicinal uses	Sheperd's Tree (e), Witgat (a), Matoppie (a), Mohlopi (ns)
Brachiaria glomerata	Poaceae	Grass	None	
Bulbostylis hispidula (Vahl) R.W.Haines subsp. *pyriformis* (Lye) R.W.Haines	Cyperaceae	Forb	None	--
Cadaba aphylla (Thunb.) Wild	Capparaceae	Succulent	Medicinal properties, potentially poisonous	Desert Spray (e), Bobbejaanarm (a)
Cenchrus ciliaris L.	Poaceae	Grass	Palatable grazing species, Decreaser	Blue Buffalo Grass (e), Bloubuffelgras (a)
Centropodia glauca	Poaceae	Grass	Palatable grazing species, Decreaser	

[4] [4] Note: Recently this genus has controversially been split into several genera, with Africa's indigenous *Acacia* now being either *Senegalia* or *Vachellia*. The author, however, do not accept the validity of the new nomenclature and therefore maintains the name *Acacia* in its broad sense.

Species Name	Family	Growth Form	Status/ Uses	Common Name
Ceratotheca triloba (Bernh.) Hook.f.	Pedaliaceae	Forb	Medicinal properties	Wild Foxglove (e), Vingerhoedblom (a)
Chascanum pumilum	Verbenaceae	Forb	None	--
Chrysocoma obtusata	Asteraceae	Forb	None	
Citrullus lanatus	Cucurbitaceae	Climber	Edible parts	Tsamma Melon (e), Tsamma (a), Bitterwaatlemoen (a) (Tsamma is the Khoisan word for 'speckled water')
Cleome angustifolia	Capparaceae	Forb	None	Yellow mouse-whiskers (e), Peultjiesbos
Cleome gynandra	Capparaceae	Forb	Edible parts	African Cabbage (e), Oorpeultjie (a)
Commelina species	Commelinaceae	Forb	None	Dayflower (e)
Crotalaria spartioides	Fabaceae	Shrub	None	
Croton gratissimus	Euphorbiaceae	Shrub	Medicinal uses, larval food for *Charaxes candiope candiope*	Lavender fever-berry (e), Laventelkoorsbessie (a)
Cucumis africanus L.f.	Cucurbitaceae	Forb	Edible parts	Wild Cucumber (e), Wildekomkommertjie (a)
Cymbopogon pospischilii	Poaceae	Grass	Aromatic grass, unpalatable, Increaser I	Narrow-leaved Turpentine Grass (e), Smalblaarterpentyngras (a)
Dicoma capensis	Asteraceae	Forb	Medicinal uses	Koorsbossie (a)
Digitaria eriantha Steud.	Poaceae	Grass	Weaving, palatable grazing grass, Decreaser	Finger grass (e), Finger gras (a)
Enneapogon desvauxii	Poaceae	Grass	Moderate grazing potential	Eight-day Grass (e), Haasgras (a)
Enneapogon scoparius Stapf	Poaceae	Grass	Moderate grazing potential, Increaser IIB	Bottlebrush grass (e), Kalkgras (a)
Eragrostis lehmanniana Nees var. *lehmanniana*	Poaceae	Grass	Indicator of overgrazing, valuable grazing grass,	Lehman Love Grass (e), Lehmann-eragrostis (a), Knietjiesgras (a)
Eragrostis obtusa	Poaceae	Grass	Indicator of poor habitat conditions and historic overgrazing	Dew Grass (e), Douvatgras (a)
Eragrostis porosa	Poaceae	Grass	None	
Eragrostis species	Poaceae	Grass	None	--
Eragrostis trichophora Coss. & Durieu	Poaceae	Grass	Moderate grazing potential	Hairy Love Grass (e), Harige Pluimgras (a)
Eragrostis truncata	Poaceae	Grass	None	
Eriocephalus spinescens	Asteraceae	Forb	None	Doringkapokbos (a)
Euphorbia species	Euphorbiaceae	Succulent	None	--
Felicia species	Asteraceae	Forb	None	--
Fingerhuthia africana Lehm.	Poaceae	Grass	Moderate grazing potential, Decreaser	Thimble grass (e), Vingerhoedgras (a)
Flaveria bidentis (L.) Kuntze**	Asteraceae	Forb	Declared Invader - Category 1B (NEM:BA, 2004. AIP, 2016)	Smelter's bush, Smelterbossie (a)
Geigeria ornativa O.Hoffm.	Asteraceae	Forb	Potentially poisonous, indicator of poor habitat conditions	Vermeerbos (a)
Geigeria species	Asteraceae	Forb	None	--
Gomphocarpus fruticosus (L.) Aiton f.	Apocynaceae	Shrub	Medicinal uses, common weed	Milkweed (e), Melkbos (a)

Species Name	Family	Growth Form	Status/ Uses	Common Name
Grewia flava DC.	Malvaceae	Shrub	Edible parts, weaving, traditional uses, declared indicator of encroachment	Velvet Raisin (e), Fluweelrosyntjiebos (a)
Heliotropium ciliatum Kaplan	Boraginaceae	Forb	None	Kalahari String-of-stars (e), Vergeet-my-nietjie (a)
Hermannia tomentosa (Turcz.) Schinz ex Engl.	Malvaceae	Shrub	None	Lusernbos (a)
Hermbstaedtia fleckii	Amaranthaceae	Forb	None	
Hermbstaedtia odorata	Amaranthaceae	Forb	None	Rooiaarkatstert (a)
Hirpicium gazanioides	Asteraceae	Forb	None	
Hoffmannseggia burchellii subsp. *burchellii*	Fabaceae	Forb	None	= Pomaria burchellii (DC.) B.B.Simpson & G.P.Lewis subsp. burchellii
Indigofera alternans	Fabaceae	Forb	None	Skaap-ertjie (a), Springbokopslag (a)
Indigofera charlieriana var. *charlieriana*	Fabaceae	Forb	None	
Indigofera species	Fabaceae	Forb	None	--
Kleinia longiflora DC.	Asteraceae	Succulent	Traditional uses	Sjambokbos (a)
Kyphocarpa angustifolia (Moq.) Lopr.	Amaranthaceae	Forb	None	Silky Burweed (e)
Lebeckia linearifolia	Fabaceae	Shrub	None	
Leucas capensis (Benth.) Engl.	Lamiaceae	Forb	None	
Leucosphaera bainesii	Amaranthaceae	Shrub	None	
Limeum fenestratum (Fenzl) Heimerl var. *fenestratum*	Molluginaceae	Forb	None	Lintblommetjie (a)
Limeum sulcatum	Molluginaceae	Forb	None	Klosaarbossie (a)
Limeum viscosum	Molluginaceae	Forb	None	Klosaarbossie (a)
Lycium bosciifolium	Solanaceae	Shrub	None	Slapkriedoring (a)
Lycium horridum	Solanaceae	Shrub	None	Slangbessie (a), Boksdoring (a)
Lycium species	Solanaceae	Shrub	None	--
Melinis repens	Poaceae	Grass	Poor grazing potential, Increaser IIC	Natal Red Top (e), Natal-rooipluim (a)
Momordica balsamina L.	Cucurbitaceae	Climber	Edible parts, medicinal uses	Balsam Pear (e), Laloentjie (a), Balsam Peer (a)
Monechma divaricatum (Nees) C.B.Clarke	Acanthaceae	Forb	None	Wild lucern (e), Wilde Lusern (a)
Monechma genistifolium subsp. *australe*	Acanthaceae	Forb	Medicinal uses	Medicinal uses, traditional uses
Monechma incanum	Acanthaceae	Shrub	Palatable grazing	
Monsonia angustifolia E.Mey. ex A.Rich.	Geraniaceae	Forb	None	Crane's Bill (e), Angelbossie (a)
Nerine laticoma	Amaryllidaceae	Geophyte	None	Gifbol (a), Vleilelie (a), Misrybol (a)
Nolletia arenosa	Asteraceae	Forb	South-western Kalahari endemic	
Oxalis semiloba Sond.	Oxalidaceae	Geophyte	Edible parts	Transvaal Sorrel (e), Transvaal Suring (a)
Oxygonum dregeanum	Polygonaceae	Forb	None	--
Parkinsonia africana	Fabaceae	Tree	Grazing potential, edible parts	Green-hair thorn (e), Groenhaardoring (a)

Species Name	Family	Growth Form	Status/ Uses	Common Name
Pentarrhinum insipidum E.Mey.	Apocynaceae	Climber	Edible parts, Non-endemic	African Heartvine (e), Donkieperske (a)
Pentzia calcarea	Asteraceae	Forb	None	Meerkatkaroo (a)
Pergularia daemia	Apocynaceae	Climber	Medicinal uses	Bobbejaankambro (a), Kgaba
Plinthus sericeus	Aizoaceae	Shrub	None	--
Plumbago zeylanica L.	Plumabaginaceae	Shrub	None	
*Prosopis glandulosa***	Fabaceae	Tree	Declared Invader - Category 1B in EC, FS, NE, WC. Category 3 in NC (NEM:BA, 2004. AIP, 2014)	Honey Mesquite (e), Duitswesdoring (a)
Ptycholobium biflorum	Fabaceae	Forb	None	--
Requinea sphaerosperma	Fabaceae	Forb	None	--
Rhigozum trichotomum	Bignoniaceae	Shrub	Declared indicator of encroachment	Three Thorn (e), Driedoring (a)
Rhynchosia species	Fabaceae	Forb	None	--
Salsola etoshensis	Chenopodiaceae	Shrub	None	
Salsola tuberculatiformis	Chenopodiaceae	Shrub	None	
Schmidtia kalihariensis	Poaceae	Grass	Moderate grazing potential, indicator of overgrazing & drought, Increaser IIC	Sour Grass (e), Suurgras (a)
Searsia burchelli	Anacardiaceae	Shrub	Edible parts	
Searsia species	Anacardiaceae	Shrub	None	--
Senna italica	Fabaceae	Forb	Medicinal uses	Wild senna (e), Elandsertjie (a)
Setaria verticillata (L.) P.Beauv.	Poaceae	Grass	Edible parts, palatable grazing	Bur Britle Grass (e), Klitsgras (a)
Solanum supinum Dunal	Solanaceae	Dwarf shrub	Medicinal uses	
Stipagrostis amabilis	**Poaceae**	**Grass**	**Kalahari endemic, weaving**	**Dune bushman grass (e), Duinsteekriet (a)**
Stipagrostis ciliata (Desf.) De Winter var. *capensis* (Trin. & Rupr.) De Winter	Poaceae	Grass	Palatable grazing, Decreaser	Tall Bushman Grass (e), Langbeenboesmangras (a)
Stipagrostis obtusa	Poaceae	Grass	Palatable grazing, Decreaser	Small Bushman Grass (e), Kortbeenboesmangras (a)
Tapinanthus oleifolius	Loranthaceae	Parasite	None	Mistletoe (e), Voëlent (a), Vuurhoutjies (a)
Tephrosia species	Fabaceae	Forb	None	--
Thesium species	Santalaceae	Forb	None	--
Tribulus terrestris L.	Zygophyllaceae	Forb	Medicinal uses	Common Dubbeltjie (e), Gewone Dubbeltjie (a)
Tribulus zeyheri	Zygophyllaceae	Forb	Medicinal uses, grazed but potentially poisonous	Devil-thorn Weed (e), Dubbeltjiedoring (a)
Ziziphus mucronata Willd. subsp. *mucronata*	Rhamnaceae	Tree	Edible parts, traditional medicinal uses, traditional uses	Buffalo-thorn (e), Blinkblaar-wag-'n-bietjie (a)

APPENDIX 2: LIST OF PROTECTED TREE SPECIES UNDER THE NATIONAL FOREST ACT, 1998 (ACT NO. 84 OF 1998)

Binomial name	*Common Name (English)*	*National Tree Number*
Acacia erioloba	**Camel thorn**	**168**
Acacia haematoxylon	**Grey camel thorn**	**169**
Adansonia digitata	Baobab	467
Afzelia quanzensis	Pod mahogany	207
Balanites maughamii subsp. *maughamii*	Torchwood	251
Barringtonia racemosa	Powder-puff tree	524
Boscia albitrunca	**Shepherd's tree**	**122**
Brachystegia spiciformis	Msasa	198.1
Breonadia salicina	Matumi	684
Bruguiera gymnorrhiza	Black mangrove	527
Cassipourea swaziensis	Swazi onionwood	531.1
Catha edulis	Bushman's tea	404
Ceriops tagal	Indian mangrove	525
Cleistanthus schlechteri var. *schlechteri*	False tamboti	320
Colubrina nicholsonii	Pondo weeping thorn	453.8
Combretum imberbe	Leadwood	539
Curtisia dentata	Assegai	570
Elaeodendron transvaalensis	Bushveld saffron	416
Erythrophysa transvaalensis	Bushveld red balloon	436.2
Euclea pseudebenus	Ebony guarri	598
Ficus trichopoda	Swamp fig	54
Leucadendron argenteum	Silver tree	77
Lumnitzera racemosa var. *racemosa*	Tonga mangrove	552
Lydenburgia abotti	Pondo bushman'sTea	407
Lydenburgia cassinoides	Sekhukhunibushman's tea	406
Mimusops caffra	Coastal red milkwood	583
Newtonia hildebrandtii var. *hildebrandtii*	Lebombo wattle	191
Ocotea bullata	Stinkwood	118
Ozoroa namaquensis	Gariep resin tree	373.2
Philenoptera violacea	Apple-leaf	238
Pittosporum viridiflorum	Cheesewood	139
Podocarpus elongates	Breede River yellowwood	15
Podocarpus falcatus	Outeniqua yellowwood	16
Podocarpus henkelii	Henkel's yellowwood	17
Podocarpus latifolius	Real yellowwood	18
Protea comptonii	Saddleback sugarbush	88
Protea curvata	Serpentine sugarbush	88.1
Prunus africana	Red stinkwood	147
Pterocarpus angolensis	Wild teak	236
Rhizophora mucronata	Red mangrove	526
Sclerocarya birrea subsp. *caffra*	Marula	360
Securidaca longepedunculata	Violet tree	303
Sideroxylon inerme subsp. *inerme*	White milkwood	579
Tephrosia pondoensis	Pondo poison pea	226.1
Warburgia salutaris	Pepper-bark tree	488
Widdringtonia cedarbergensis	Clanwilliam cedar	19
Widdringtonia schwarzii	Willowmore cedar	21

21 LEGISLATIVE AND POLICY CONTEXT

21.1 APPLICABLE SOUTH AFRICAN LEGISLATION AND POLICY

This report is written in accordance with the terms of reference for specialist investigations to be conducted during the impact assessment phase, as set out in the NEMA EIA Regulations 2014. In addition, the biodiversity-related legislative instruments and policies discussed in the following sections are addressed in this report.

21.1.1 NATIONAL ENVIRONMENTAL MANAGEMENT ACT: BIODIVERSITY ACT (2004)

The over-arching government policy on natural resource conservation in South Africa is provided for in the National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004). The relevant constitutional provisions in the Act include the following:

⇒ Chapter 3 - Biodiversity Planning and Monitoring: Provides for integrated and co-ordinated biodiversity planning, including the National Biodiversity Framework (see below); Bioregional plans, Biodiversity management plans and agreements, monitoring of the conservation status of various components of South Africa's biodiversity, and promotion of research on biodiversity conservation including the sustainable use, protection and conservation of indigenous biological resources; and

⇒ Chapter 4 - Threatened or Protected Ecosystems and Species: Provides for the protection of ecosystems and species that are threatened or in need of protection; gives effect to South Africa's obligations under international agreements regulating trade in endangered species; and ensures that utilisation of biodiversity is managed in an ecologically sustainable way.

Project Relevance

The Project must demonstrate that it has taken appropriate measures to avoid/minimise any potential impacts on biodiversity within the Study Area, and where necessary, implement an invasive species management plan as part of the mitigation actions for potential effects on biodiversity within the Study Area. In addition, it should avoid significant effects on areas identified as Endangered within the Study Area, such as those linked to the riparian zone of the Orange River.

21.1.2 SOUTH AFRICA'S NATIONAL BIODIVERSITY FRAMEWORK (2008)

South Africa's National Biodiversity Framework (NBF) is a requirement of the National Environmental Management Act: Biodiversity Act, 2004. The NBF is informed by the National Biodiversity Strategy and Action Plan (NBSAP) and the National Spatial Biodiversity Assessment (NSBA), and provides a framework for implementation of the conservation and development objectives of the NBSAP and the NSBA.

Project Relevance

The NBF defines five major pressures on South Africa's biodiversity, including loss and degradation of natural habitat, spread of invasive alien species, over-harvesting of species, over-abstraction of water and climate change. Solar power is an industrial sector whose activities could contribute substantially to over-abstraction of water and invasive species introduction and spread through site clearance and earthworks prior to construction. The Project must therefore demonstrate that it has taken appropriate measures to avoid/minimise any potential impacts on baseline water quality and quantity in the Orange River, and where necessary, implement an invasive species management plan as part of the mitigation actions for potential effects on vegetation communities within the Study Area.

21.1.3 South Africa's National Biodiversity Strategy and Action Plan (2005)

The NBSAP is a long-term (20 year) strategy for the conservation and sustainable use of South Africa's biodiversity. The overall goal of the NBSAP is to conserve and manage terrestrial and aquatic biodiversity to ensure sustainable and equitable benefits to the people of South Africa. It identifies five Strategic Objectives (SO) required to achieve that goal, of which SO1, SO3 and SO5 directly relate to biodiversity management and conservation:

⇒ SO1: An enabling policy and legislative framework integrates biodiversity management objectives into the economy;

⇒ SO3: Integrated terrestrial and aquatic management across the country minimises the impacts of threatening processes on biodiversity, enhances ecosystem services and improves social and economic security; and

⇒ SO5: A network of conservation areas conserves a representative sample of biodiversity and maintains key ecological process across the landscape.

The NBSAP is a useful policy guide for addressing South Africa's concerns in biodiversity conservation and the utilisation of its components, as well as for implementation of the requirements of the Convention on Biological Diversity.

Project Relevance

The NBSAP promotes integrated terrestrial and aquatic management in order to minimise the impacts of threatening processes on biodiversity, enhance ecosystem services and improve social and economic security, sustainable use of biological resources, and maintenance of a network of conservation areas to conserve a representative sample of biodiversity and maintain key ecological process across the landscape. Through appropriate biodiversity survey, impact assessment and management, the Project can contribute to achieving the National biodiversity conservation aims outlined in the NBSAP.

21.1.4 National Spatial Biodiversity Assessment (2004)

The NSBA was the first comprehensive spatial assessment of biodiversity throughout South Africa, intended to inform policies and plans of both public and private-sector bodies with reference to biodiversity issues. It focusses on mainstreaming biodiversity priorities throughout the economy and making links between biodiversity and socio-economic development; with the intention of enabling these to reinforce each other so that conserving biodiversity strengthens the economy and contributes to social development.

Project Relevance

The spatial assessment generated several map products including terrestrial ecosystem status, priority conservation areas and protected areas. These maps will be viewed in the context of the Project to determine any potential impacts the Project may have on terrestrial and riparian ecosystems and ensuing effects on ecosystem service supply by those systems.

21.1.5 Northern Cape Nature Conservation Act (2009)

The Northern Cape Nature Conservation Act (NCNCA, 2009) provides for the sustainable utilisation of wild animals, aquatic biota and plants, and the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), to which South Africa is a signatory. Schedule 1 to the act lists 'specially protected animals' and Schedule 2 lists 'protected animals' for which certain activities are restricted. The main difference between 'specially protected' and 'protected species' is that 'protected' species can be 'possessed' without a specific permit, and hunting is allowed under certain conditions (permits, seasons, bag limits), whereas 'specially protected' species cannot be possessed or hunted except under exceptional circumstances.

21.1.6 NATIONAL FOREST ACT (ACT NO 84 OF 1998)

According the Act (National Forests Act (Act no 84 of 1998)), the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister.

The National Forest Act:

⇒ Promotes the sustainable management and development of forests for the benefit of all;
⇒ Creates the conditions necessary to restructure forestry in State Forests;
⇒ Provide special measures for the protection of certain forests and protected trees;
⇒ Promotes the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes; and
⇒ Promotes community forestry.

Project Relevance

The known presence of protected tree species within the proposed footprint requires legislative compliance through the completion and submission of permit application for the removal of these trees from the footprint. The Project will need to demonstrate alignment with this Act.

21.2 CONVENTIONS AND INTERNATIONAL AGREEMENTS

South Africa is a signatory to the following international conventions and agreements:

⇒ Convention on Biological Diversity: Under the convention, each contracting party is expected to develop national strategies, plans or programs for the conservation and sustainable use of Biological diversity;
⇒ Convention on International Trade in Endangered Species (CITES);
⇒ Convention on the Conservation of Migratory Species of Wild Animals, (the Bonn Convention):
⇒ South Africa is a Contracting Party to the African-Eurasian Water-bird Agreement (AEWA).
⇒ Convention on Wetlands of International Importance (the Ramsar Convention); and
⇒ UNESCO World Heritage Commission.

Project Relevance

The Project will need to demonstrate alignment with the provisions of the conventions and agreements in order to satisfy Government obligations as a signatory to these. This can be achieved through identifying biodiversity value of the Study Area, and in particular restricting impacts on CITES-listed species, migratory species and wetlands by ensuring that internationally recognised practices for the protection, field-based study, and documentation of these biodiversity components are implemented throughout the ESIA and the lifetime of the Project.

21.3 IFC PERFORMANCE STANDARDS 2012

At the project financing level, the assessment and management of biodiversity is largely dealt with in Performance Standard 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012); the PS is briefly summarised as follows.

PS 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources

Performance Standard 6 (PS6), and the associated Guidance Note (GN6) relates to:

⇒ The protection and conservation of biodiversity;
⇒ Maintenance of ecosystem services; and
⇒ Sustainable management of living natural resources.

The requirements set out in PS6 have been guided by the Convention on Biological Diversity. PS6's main priority is that the Project should seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimise impacts and restore biodiversity and ecosystem services should be implemented.

However, when a project occurs in critical habitat supporting exceptional biodiversity value, a net gain in biodiversity value is required.

PS6 sets specific biodiversity protection and conservation standards relating to potential project impact. The specific requirements that may apply to this Project are summarised below according to the PS6 categories:

⇒ Modified Habitat: Areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. PS6 relates to areas of modified habitat that have significant biodiversity value, and requires that impacts on such biodiversity must be minimised, and mitigation measures implemented as appropriate;

⇒ Natural Habitat: Viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. In such areas, the conservation outcome required by PS6 is no-net-loss of biodiversity value achieved using biodiversity offsets;

⇒ Critical Habitat: Areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes. When a project occurs in critical habitat, a net gain in biodiversity value is required by PS6. This is achievable through appropriate biodiversity offsets;

⇒ Legally Protected Areas: Such areas often have high biodiversity value; when this is the case these areas are likely to qualify as critical habitat and, as such, the conservation outcome required by PS6 is also a net gain in biodiversity value, as well as obtaining the relevant legal permits, following standard governmental regulatory procedures, and engagement of affected communities and other stakeholders;

⇒ Invasive Alien Species: The development project should not intentionally introduce any new alien species (unless carried out within the appropriate regulatory permits) and should not deliberately introduce any alien species with a high risk of invasive behaviour under any circumstance. The project should implement measures to avoid the potential for accidental or unintended introductions; and

⇒ Management of Ecosystem Services: Where a project is likely to adversely impact ecosystem services, an ecosystem service review to identify priority ecosystem services is required. For a full assessment of ecosystem services within the Study Area, see Golder Associates (2016).

Project Relevance

In the case of its direct investments (including project and corporate finance provided through financial intermediaries), the IFC requires its clients to apply the Performance Standards to manage environmental and social risks and impacts so that development opportunities are enhanced. Together, the Performance Standards establish standards that the Project is to meet throughout the life of an investment by IFC. As stated above, Performance Standard 6 requires that Projects seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimise impacts and restore biodiversity and ecosystem services should be implemented. Therefore, in order to secure Project funding from IFC or associated lending institutions, the Project must demonstrate that it is in compliance with the requirements of PS 6.

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23 DECLARATION OF INDEPENDENCE

I, the undersigned, acting in a capacity as specialist biodiversity consultants, declare that:

- ⇒ I acted as independent specialist consultant conducting these biodiversity assessments and preparing the results and reports;
- ⇒ As professional and active members, I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);
- ⇒ Neither I in my personal capacity, nor Bathusi Environmental Consulting cc (BEC), are subsidiaries, legally or financially, of either Mills & Otten Environmental Consultants, or the Client;
- ⇒ At the time of completing this report, I did not have any interest, hidden or otherwise, in the proposed development or activity as outlined in this document, other than fair financial compensation for work performed in a professional capacity as specified by the 2014 National Environmental Management Act (No 107 of 1998) Regulations GNR 983 and GNR 986, as amended in 2017;
- ⇒ Neither I in my personal capacity, nor BEC, shall be affected in any manner by the outcome of the environmental process of which this report and biodiversity assessments form part of, other than being part of the general public;
- ⇒ I do not necessarily object to or endorse the proposed development, but aim to present facts and recommendations based on scientific data and relevant professional experience;
- ⇒ I do not have any influence over decisions made by the governing authorities;
- ⇒ I undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2005; and
- ⇒ Upon request, I shall provide the competent authority with access to all information at our disposal regarding the study/ application, whether such information is favourable to the applicant or not.

Should I consider myself in conflict with any of the above declarations, I shall formally submit a Notice of Withdrawal to all relevant parties and register as an Interested and Affected Party.

Riaan A. J. Robbeson (Pr.Sci.Nat.)
on behalf of Bathusi Environmental Consulting cc (CK1999/052182/23)
8th February 2020

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25 INDEMNITY & LIMITATIONS OF THIS PROJECT AND REPORT

⇒ Findings, results, observations, conclusions and recommendations presented in this report are based on the authors' best scientific and professional knowledge as well as the interpretation of information available to him at the time of compiling this report.

⇒ Due care and diligence was exercised by the author in rendering services, preparing this document and executing his responsibilities as an ecologist.

⇒ Results presented in this report are based on a snapshot investigation of the study area and not on detailed and long-term investigations of all environmental attributes and the varying degrees of biological diversity that may be present in the study area. Specifically, no discipline-specific, long-term and scientific survey methods were employed in the collation of data from the site. Although as much as possible data was obtained from opportunistic observations and a detailed walk-through of the entire site during the brief survey period, these (EIA) surveys are customarily limited by budgetary and time constraints – results presented in this report need to be interpreted with these limitations in mind.

⇒ Notably, rare and endemic species normally do not occur in great densities and, because of customary limitations in the search and identification of Red Listed species, the detailed investigation of these species was not possible. Results are ultimately based on estimations and specialist interpretation of imperfect data.

⇒ To obtain a comprehensive understanding of the dynamics of ecological associations in an area, as well as the status of endemic, rare or threatened species in an area, ecological surveys should consider investigations at different time scales (across seasons/ years) and through replication.

⇒ This report should always be considered in its entirety. Reading and representing portions of the report in isolation could lead to incorrect conclusions and assumptions. In case of any uncertainty, the authors should be contacted to clarify any viewpoints, recommendations and/ or results.

⇒ It is emphasised that information, as presented in this document, only have bearing on the site as indicated on accompanying maps. This information cannot be applied to any other area, however similar in appearance or any other aspect, without proper investigation.

⇒ Furthermore, additional information may become known during a later stage of the process or development. The authors therefore reserve the right to modify aspects of the report, including findings and recommendations, should new information become available from ongoing research or additional work performed in the immediate region of this specific site, or any forthcoming information pertaining to this investigation after the submission of this report.

⇒ Neither BEC (the company), neither the Mr. Robbeson (the specialist/ ecologist that conducted the surveys and compiled the report) will accept any liability for conclusions, suggestions, limitations and recommendations made in good faith, based on available information, or based on data that was obtained from surveys of a brief nature.

⇒ The client, by accepting this document and submitting it as part of the application procedure, indemnifies BEC, its members, consultants and/or specialist investigators against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from, or in connection with, services rendered, directly or indirectly by BEC and by the use of the information contained in this document.

26 CURRICULUM VITAE OF RIAAN A. J. ROBBESON (PR.SCI.NAT.)

Date of Birth: [redacted]
Nationality:
Address:
Cellular Contact:
Telephone Contact:
Email:

Consulting experience: 22 years
Name of Firm: Bathusi Environmental Consulting cc
Position: Member, Specialist Investigator (Ecology and Botany)
Years with BEC: 20 years
Profession: Environmental Scientist, Ecologist, Botanist

Education

DEGREE / DIPLOMA	FIELD	INSTITUTION
B.Sc.	Botany and Zoology (major subjects), Geography, Chemistry, Genetics	University of Pretoria (1987 – 1991)
B.Sc. (Hons)	Botany	University of Pretoria (1992)
M.Sc.	Plant Ecology	University of Pretoria (1994 – 1998)
Visual Basic Programming	Programming	Unischool (University of Pretoria), 1999

Affiliations

CLASS	PROFESSIONAL SOCIETY	YEAR OF REGISTRATION
Pr.Sci.Nat.	South African Council of Natural Scientific Professions (SACNASP) (Ecological Scientist & Botanical Scientist, Reg no: 400005/03)	2003

Key Attributes

Riaan has been always been a passionate ecologist. Since a very young age his interest in ecology and his natural love and understanding of the natural environment has guided him towards a lifelong commitment to a profession in the natural sciences. After obtaining his B.Sc. degree, with zoology and botany as major subjects in 1990, he committed to post-graduate studies, ultimately obtaining his Masters degree in Plant Ecology at the University of Pretoria in 1998, while working as a research assistant and team member of the National Grassland Biome Project between 1994 and 1998. His involvement in specialist environmental studies followed naturally after graduation in 1998, and he has since been passionately involved in numerous ecological studies with the main emphasis on botanical assessments as part of environmental applications.

Between 1997 and 1999 Riaan was a co-founder of EkoInfo cc and contributed to the general management and consulting responsibilities. In 1999 Riaan, as the sole member, established Bathusi Environmental Consulting cc with the objective of conducting ecological studies with a holistic approach and a strong emphasis of the inclusion of faunal disciplines. Towards this objective, the development of working relations with numerous other specialists was, and still remains, a major priority. Inter-disciplinary collaboration on numerous projects enabled Riaan to acquire a working knowledge of these disciplines, including invertebrates, mammals, herpetofauna and birds.

During his career that spans 20 years, Riaan has acquired extensive experience in the evaluation of the status and reaction of the natural environment to development, across the ecological spectrum of plants, animals and biophysical attributes of the receiving environment. In addition to pure scientific investigations and ecological investigations, he has also successfully developed and implemented several biodiversity monitoring programmes on mining areas. In addition to a vast knowledge of the Grassland and Savanna Biomes, Riaan also utilises every possible opportunity to expand his knowledge of other biomes of southern Africa; he also contributed to international projects in Botswana, Lesotho and Mozambique. Riaan displays an enthusiastic, always willing and 'can do' approach to projects and is able to work either as part of a team environment, or in isolation.

Apart from being committed to his professional career, other personal interests of Riaan include wildlife and sports photography, birding (currently at 506 species), and a life-long passion for sport. He is the holder of five Comrades bronze medals between 2005 and 2010. He is also a frequent competitor in ultra-endurance mountain bike events across South Africa and socially plays golf and squash.

Relevant Computer Skills

⇒ MS Word
⇒ MS Excel
⇒ MS Access
⇒ GIS Arcview 3.2 (a)
⇒ Google Earth
⇒ Adobe Photoshop CS & Lightroom 2.6
⇒ Visual Basic Programming

Employment Record

POSITION	COMPANY	JOB DESCRIPTION	DURATION
Research Assistant	University of Pretoria	Botanical surveys, plant identifications, data capturing, data analysis, report compilation, phytosociological descriptions, Post graduate Masters Publications	1994 - 1998
Member	EkoInfo cc	Project acquisition, site investigations, data analysis, report compilation, GIS mapping, selected peer review for publications and specialist reports	1995 - 1999
Member	Bathusi Environmental Consulting	Project acquisition, project management, site investigations, data analysis, report compilation, GIS mapping, selected peer review for publications and specialist reports, financial administration	1999 - present

Experience & Project Contributions

The development of accurate and comprehensive biodiversity studies that forms an integral part of successful environmental applications for a wide range of clients represents a major focus of BEC. To achieve this objective Riaan is committed to effective acquisition of projects, involvement and management of other specialist investigators as well as the ecological integration and interpretation of biodiversity data and reports to present a holistic overview of the ecological receiving environment.

Riaan has contributed to more than 400 environmental projects and reports that include a range of specialist fields, including biodiversity impact assessments and scoping reports, biodiversity Fatal Flaw assessments, environmental audits, ecological screening assessments, botanical assessments, vegetation sampling, classification, description and mapping, the development and implementation of environmental monitoring programmes, Red Data flora assessments, invasive species management programmes, compilation of Environmental Management Programme Reports, etc.

The range of clients that are assisted by BEC include environmental companies, private developers, mining houses (gold, diamond, iron, coal, sand), parastatals, traditional coal-energy producers, alternative energy producers (coal-fired, UCG, solar), property developers, etc.

Languages

English: RWS - Excellent
Afrikaans: RWS – Excellent

Selected Reports and Projects

The following projects are presented as a brief selection of the contributions to more than 400 projects and reports between 1999 and 2019.

⇒ Biodiversity Impact Assessments (EIAs):

- Terrestrial Biodiversity (flora, fauna, avifauna) Impact Assessments of the proposed NEO 1 20MW Solar PV Plant that will be situated in the Mafeteng District of the Kingdom of Lesotho. 2018. For Royal HaskoningDHV. In collaboration with Pachnoda Consulting and Ecocheck Environmental Services.
- Terrestrial Biodiversity (flora, fauna, avifauna) Impact Assessments for the proposed Mutsho Power Project near Makhado, Limpopo Province. 2018. For Savannah Environmental. In collaboration with Pachnoda Consulting and Ecocheck Environmental Services.
- Biodiversity Impact Assessment and development of the biodiversity EMP for the proposed Kalkaar Solar Project in the Northern Cape Province. 2014. For SLR Consulting on behalf of SolarReserve, South Africa.
- Terrestrial biodiversity Impact Assessments of the proposed Tshivhaso Power Station near Lephalale in the Limpopo Province (Savanna Environmental). 2016. For Savannah Environmental. In collaboration with Pachnoda Consulting and Ecocheck Environmental Services.
- Terrestrial biodiversity Impact Assessments of the proposed expansion of the existing Kao Diamond Mine in the Kingdom of Lesotho (EIMS). 2016. For Savannah Environmental. For Environmental Impact Management Services (EIMS). In collaboration with Ecocheck Environmental Services.
- Biodiversity Impact Assessments of the Medupi Power Station near Lephalale in the Limpopo Province. 2006. For Royal HaskoningDHV, previously Bohlweki Environmental. In collaboration with Ecocheck Environmental Services.
- Impact Assessment for a proposed holiday destination in the Okavango Delta in the Republic of Botswana (@Land Landscape Architects). 1997. In collaboration with Ekotrust cc.
- Terrestrial Impact Assessment for a proposed hunting concession in the Okavango Delta in the Republic of Botswana (Ekotrust). 1997.
- Terrestrial Biodiversity Impact Assessment for the GOPE Diamond Mine in the Central Kalahari Game Reserve in the Republic of Botswana. 2008. For Marsh Vikela. In collaboration with Ecocheck Environmental Services.
- Botanical Assessments for the proposed expansion of a holiday destination in Mozambique (EkoInfo cc). 2005. In collaboration with EkoInfo cc and Ecocheck Environmental Services.
- Terrestrial biodiversity Impact Assessments of the proposed Steelpoort Pumped Storage Scheme. 2007. For Royal HaskoningDHV, previously Bohlweki Environmental. In collaboration with Ecocheck Environmental Services.

⇒ Biodiversity Scoping Assessments:

- Terrestrial Biodiversity (flora, fauna, avifauna) Scoping Assessments of the proposed NEO 1 20MW Solar PV Plant that will be situated in the Mafeteng District of the Kingdom of Lesotho. 2018. For Royal HaskoningDHV. In collaboration with Pachnoda Consulting and Ecocheck Environmental Services.
- Terrestrial Biodiversity (flora, fauna, avifauna) Scoping Assessments for the proposed Mutsho Power Project near Makhado, Limpopo Province. 2018. For Savannah Environmental. In collaboration with Pachnoda Consulting and Ecocheck Environmental Services.

⇒ Biodiversity Screening Assessments:

- Ecological Screening Assessments of 14 K-Routes for the Gauteng Province Department of Roads and Transport as part of the road expansion project. 2018. For Royal HaskoningDHV. In collaboration with Feathers Environmental Services.
- Terrestrial biodiversity screening assessment of the proposed Enviroblast Titanobel development in Gauteng Province. 2016. For Mills & Otten Environmental Consultants.
- Ecological Screening Assessment of the proposed Waterberg Heavy Haul railway project. 2015. For Royal HaskoningDHV

⇒ Environmental Management Programme Reports (EMPR's):

- Development of an Environmental Management Report for the Alkantpan Runway as part of the Copperton Wind Energy Project in the Northern Cape Province (fauna and avifauna). For Terramanzi Group. 2019. In collaboration with Pachnoda Consulting and Ecocheck Environmental Services.
- Development of Animal Conflict Resolution approach for the Alkantpan Runway as part of the Copperton Wind Energy Project in the Northern Cape Province (fauna and avifauna). For Terramanzi Group. 2019. In collaboration with Pachnoda Consulting and Ecocheck Environmental Services.

- Development of Biodiversity Action Programme report for the Matla Mine in the Mpumalanga Province. 2014. For Groundwater Consulting Services (GCS). In collaboration with Pachnoda Consulting and Ecocheck Environmental Services.
- Development of an Environmental Management Programme for the proposed Aspen Lakes residential development in Gauteng Province. 2014. For Mills & Otten Environmental Consultants.
- Development of Off-Site Mitigations recommendations for the proposed Majuba Power Station Ashing Expansion Project in the Mpumalanga Province. 2014. For Eskom. In collaboration with Ecocheck Environmental Services.
- Environmental Management Programme for the Vygeboom Power Line. 2019. For Royal HaskoningDHV (previously SSI).

⇒ Biological/ Biodiversity Monitoring Reports:

- Deployment of a biological monitoring programme to ascertain the breeding status of Grey-headed Gulls at the proposed Zenprop Skymall Property near O.R. Tambo International Airport in Gauteng Province. 2017. For Mills and Otten Environmental Consulting cc. In collaboration with Pachnoda Consulting.
- Development and deployment of a biennial faunal monitoring programme for the Letšeng Diamond Mine in the Kingdom of Lesotho (Letšeng Diamonds). Since 2015, ongoing. For Letšeng Diamonds. In collaboration with Pachnoda Consulting, Ecocheck Environmental Services and Enviro-Insight.
- Development and deployment of biodiversity monitoring programme at the Woestalleen Colliery properties in the Mpumalanga Province (Woestalleen Colliery, NuCoal). 1997 – 2008. In collaboration with EkoInfo cc.
- Floristic monitoring surveys within the Blesbokspruit river in the Gauteng Province to determine the effect of acid mine drainage. In collaboration with EkoInfo cc.
- Development and implementation of a biodiversity monitoring programme for the Ghaghoo Diamond Mine in Botswana. 2013. For VDDB Engineers, Marsh Vikela, Ghagoo Diamond Mine. In collaboration with Ecocheck Environmental Services.

⇒ Biodiversity Basic Assessment Reports:

- Terrestrial biodiversity Basic Assessment report for the proposed Etna – Trade powerline in the Gauteng Province (Eskom). 2016. In collaboration with Ecocheck Environmental Services.
- Ecological Basic Assessment of the proposed expansion of the Rietspruit Dam near Ventersdorp in the North-West Province. 2015. For Royal HaskoningDHV.

⇒ Species at Risk Assessments and Studies:

- Ecological status of the (Near Threatened) *Trachyandra erythrorrhiza* community in Esther Park from 2011 (ongoing) as part of compliance for the Bombela Concession Company. 2018. For Bombela Concession Company.
- Final walkdown and marking of protected tree species within the Thabametsi Power Project development footprint, the Medupi-Thabametsi 400 kV line, the Matimba-Thabametsi 400kV Line and the Thabametsi 33 kV line. 2018. For Savannah Environmental. In collaboration with Feathers Environmental Services and Ecocheck Environmental Services.
- Medicinal plants survey on a portion of the Farm Vlakfontein 30-IR in the Gauteng Province. 2017. For Mills & Otten Environmental Consultants.
- Final walkdown and marking of protected tree species within the Masa – Selomo 400 kV lines in the Limpopo Province. 2016. For Babcock International. In collaboration with Ecocheck Environmental Services.
- Search and rescue operation of medicinal plants at the proposed Vorna Valley development in Midrand, Gauteng Province. 2016. For Abland Developers.
- Protected species survey for the proposed water facility expansion at Giyani in the Limpopo Province. 2015. For EIMS.
- Red Data flora investigation for the proposed Irene Development within the Gauteng Province. 2004. For Mills & Otten Environmental Consultants.

⇒ Alien and Invasive Species Management Programmes:

- Development of a management plan for invasive fauna species at the Duvha Power Station in Gauteng Province. 2018. For Eskom. In collaboration with Ecocheck Environmental Services.
- Development of a management plan for alien and invasive plants at the Duvha Power Station in Mpumalanga Province. 2017. For Eskom.
- Development of a management plan for alien and invasive plants at the Majuba Power Station in Mpumalanga Province. 2017. For Eskom.
- Development of a management plan for alien and invasive plant at the Mercedes Benz (South Africa) Plant in Centurion, Gauteng Province. 2017. For Ingen Engineers.