Final Basic Assessment Report for the Proposed Veld PV South Solar Energy Facility and associated infrastructure near Aggeneys in the Northern Cape

Veld PV South (Pty) Ltd

DEA Reference: 14/12/16/3/3/1/2103

Revision: 2

2020-02-25

aurecon

Bringing ideas to life

This page was intentionally left blank

Document control record

Document prepared by:

Aurecon South Africa (Pty) Ltd
Reg No 1977/003711/07
Suite 201
2nd Floor
Bloemhof Building
65 York Street
George 6529
PO Box 509
George 6530
South Africa

T +27 44 874 2165
F +27 44 873 5843
E george@aurecongroup.com
W aurecongroup.com

Document control						
Report title		Final Basic Assessment Report for the Proposed Veld PV South Solar Energy Facility and associated infrastructure near Aggeneys in the Northern Cape				
Document code		12299	**Project number**		113087	
File path		N:\Data\PROJECT\ENVIRO\PROJECTS\113087~Veld Copperton 300MW Solar\Final BARS Veld 2020\FINAL PV SOUTH 2020\0_Final BAR Veld PV South 20022020_CN.docx				
Client		Veld PV South (Pty) Ltd				
Client contact		Jason Cope	**Client reference**		Veld PV South	
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
0	2019-07-30	Draft BAR	Corlie Steyn	Charles Norman	Charles Norman	Charles Norman
1	2019-11-29	Draft BAR	Corlie Steyn	Charles Norman	Charles Norman	Charles Norman
2	2020-02-13	Final BAR	Corlie Steyn	Charles Norman	Charles Norman	Charles Norman
Current revision		**2**				

Approval			
Verifier signature		Approver signature	
Name	Corlie Steyn	Name	Charles Norman
Title	Senior Consultant, Environment and Planning	Title	Manager

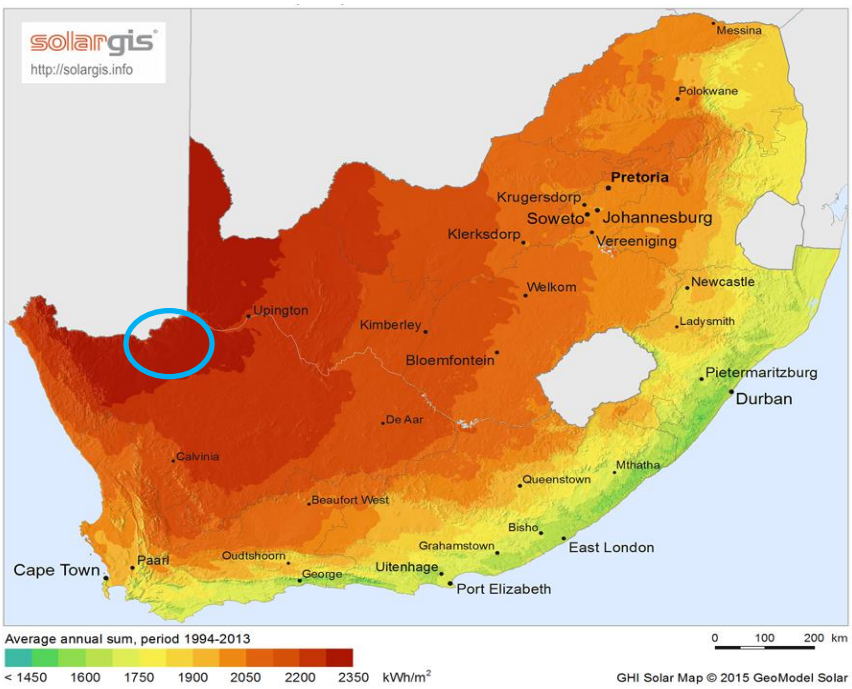
This page was intentionally left blank

NEMA requirements for Basic Assessment Reports		aurecon
Appendix 1	**Content as required by NEMA**	**Section**
3(1)	**A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include –**	
a	(i) details of the EAP who prepared the report; and	Section 2.3 Annexure A
	(ii) details of the expertise of the EAP to carry out scoping procedures.	
b	the location of the activity, including-	Section 1.2 Annexure B
	(i) the 21 digit Surveyor General code of each cadastral land parcel;	
	(ii) where available, the physical address and farm name;	
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	N/A
c	a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is-	Section 1, Table 1 Annexure F
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	N/A
d	a description of the scope of the proposed activity, including-	Section 1.2
	(i) all listed and specified activities triggered and being applied for; and	Section 3.2
	(ii) a description of the activities to be undertaken, including associated structures and infrastructure;	Section 5
e	a description of the policy and legislative context within which the development is proposed including -	Section 3
	(i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and	
	(ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	
f	a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section 5.7
g	a motivation for the preferred site, activity and technology alternative;	Section 5
h	a full description of the process followed to reach the proposed preferred alternative within the site, including:	Section 4
	(i) details of all the alternatives considered;	
	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 4.2 and Annexure C
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	
	(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 7
	(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	Section 7
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Section 4.3
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 7 EMPr
	(viii) the possible mitigation measures that could be applied and level of residual risk;	
	(ix) the outcome of the site selection matrix;	Section 6
	(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and	
	(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	Section 8
i	a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including -	Section 7
	(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	

	(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	
j	an assessment of each identified potentially significant impact of risk, including -	Section 7
	(i) cumulative impacts;	
	(ii) the nature, significance and consequences of the impact and risk;	
	(iii) the extent and duration of the impact and risk;	
	(iv) the probability of the impact and risk occurring;	
	(v) the degree to which the impact and risk can be reversed;	
	(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	
	(vii) the degree to which the impact and risk can be avoided, managed or mitigated;	
k	where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the Final report;	Section 8
l	an environmental impact statement which contains -	Section 8
	(i) a summary of the key findings of the environmental impact assessment;	
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	Section 8
	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 8
m	based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;	Section 8
n	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	
o	a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 4.4
p	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 8
r	an undertaking under oath or affirmation by the EAP in relation to-	Annexure A
	(i) the correctness of the information provided in the report;	
	(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and	
	(iii) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	
s	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	N/A
t	any specific information that may be required by the competent authority; and	N/A
u	any other matter required in terms of section 24(4)(a) and (b) of the Act.	N/A

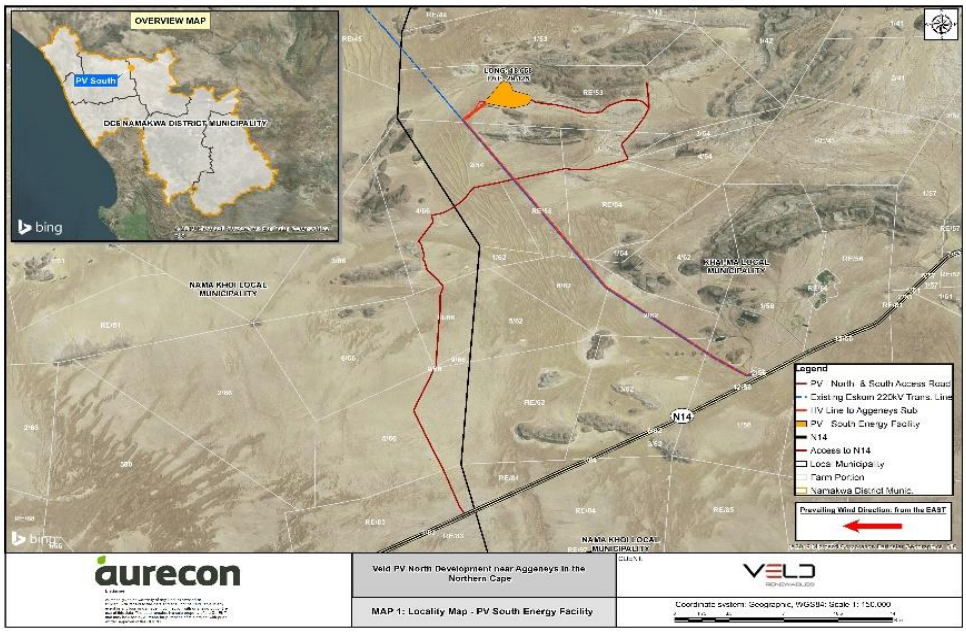
Pertinent information to this application

REF: -29.124801°, 18.658334°

No.	Project aspect	Description
1	**Description of the activity**	Veld PV South (Pty) Ltd (Veld PV South) proposes developing a 75 MW Photovoltaic (PV) solar energy facility on Haramoep (Remainder of Farm 53) in the Namakwa District Municipality approximately 20 km north-west of Aggeneys in the Northern Cape. The development has been designed with the intention that the Veld PV South solar facility would form part of a consolidated solar development which will consist of the proposed Veld PV South (75 MW) and the proposed Veld PV North (75 MW) PV facilities. These proposed facilities would utilise shared infrastructure where possible to minimise their overall footprint. To evacuate the power generated by the proposed Veld PV South (and North), a grid connection is required between the solar farm project area and the Aggeneys substation. **This Basic Assessment Report specifically relates to Veld PV South application.** The site was selected as it falls within an area considered to have some of the highest solar resource in South Africa. Two alternatives are proposed for the grid connection namely: (i) The proposed grid connection for Veld PV South will either consist of a 132 kilovolt (kV) overhead powerline, approximately 27 km in length that would feed into the national electricity grid at the Aggeneys substation. A 35m servitude will be required for the construction of the powerline and it will run adjacent to the existing 220 kV powerline that runs past the site, comprising single circuit steel monopoles with bird perches, or (ii) Veld PV South would connect via a 220 Kv Loop-in, Loop-out (LILO) line between the facility and an existing 220 kV transmission line, with the line being approximately 2100 m in length  Furthermore, the site also falls within the Springbok Renewable Energy Development Zone (REDZ) which was identified as part of a Strategic Environmental Assessment (SEA). The purpose of this 'zone' was to identify the most suitable areas from both an environmental and socio-economic perspective where large scale wind and solar PV energy facilities should be developed. In addition, an Electricity Grid Infrastructure (EGI) SEA was commissioned in 2014 to identify power corridors that will enable the efficient and effective expansion of key strategic transmission infrastructure designed to satisfy national transmission requirements up to 2040. The gazetting of the outputs of these two SEAs was approved by Cabinet on 17 February 2016 (CSIR, 2016). These areas would direct future grid expansion and allow for regulatory processes therein to be streamlined.

Pertinent information to this application

REF: -29.124801°, 18.658334°

No.	Project aspect	Description
		
2	**Municipality**	Khai-Ma Local Municipality within the Namakwa District Municipality
3	**Applicant**	Veld PV South (Pty) Ltd
	Property details	**Name of landowner** / **Erf number** / **21-digit SG code** / **Name of farm** / **Farm Size (ha)** **Veld PV South** Mr A De Waal / RE/53 / C05300000000005300000 / Haramoep / 9830.33
4	**Size of the farm**	Haramoep 9830.33 ha
5	**Development footprint**	277 ha
6	**Capacity of the facility (in MW)**	75 MW
7	**Type of technology**	A Solar Energy Facility comprising of numerous rows of PV modules (fixed or single axis).
8	**Structure heights**	• Solar PV panels: approximately 5 m height; • Collector (on-site) substation approximately 5 m height; • On-site 220 kV transmission line approximately 32 m above ground level; and • New 220 kV or 132 kV powerline
9	**Type of grid connection (substation to which project will connect)**	• Either the proposed LILO grid connection with a 33 kV/220 kV substation on site, or • A grid connection at the Aggeneys substation, with a 33 kV/132 kV substation on site, and a 132-kV transmission line along the 220 kV line from the site to the Aggeneys substation. Eskom will determine the option to be implemented at the time of construction
10	**Power line/s (e.g. number of overhead power line/s required, route/s, voltage, height, servitude width, etc.)**	• Existing 220 kV Aggeneys/Harib Eskom transmission line; and • On-site 220 kV transmission line approximately 32 m above ground level.
11	**Other infrastructure (e.g. additional infrastructure, details of access roads, extent of areas required for laydown of materials and equipment, etc.)**	• A photovoltaic component, comprising of numerous arrays of PV solar panels mounted on steel tracking mounts and footings with associated support infrastructure to generate up to 75 MW of renewable energy • On-site substations, including amongst others • Inverters, to convert the direct current (DC) generated by the PV modules into alternating current (AC)

No.	Project aspect	Description
		• Transformers, to step up the 33-kV power generated by the inverters to 132 kV to connect to the new 132 kV overhead transmission line or the optional 220 kV LILO • Internal cabling laid underground when feasible to connect the PV modules to the on-site substation and inverters • Internal access roads for servicing and maintenance of the site • Stormwater infrastructure • Temporary construction areas for use during construction • Buildings, including an operations and maintenance building, a connection building, control building, guard cabin • Weather stations within and along the fenced perimeter of the site; and • Perimeter fencing.

Contents

Annexures

Figures

Tables

Abbreviations

Acronym	Abbreviation
AC	Alternating current
BA	Basic Assessment
BAR	Basic Assessment Report
BID	Background information Document
BLSA	Birdlife South Africa
BW	Bidding Window
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Areas
CPV	Concentrated photovoltaic
COP	Convention of the Parties
CRR	Comments and Response Report
CSP	Concentrated Solar Power
DC	Direct Current
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning (Western Cape)
DENC	Department of Environment and Nature Conservation
DM	District Municipality
DoE	Department of Energy
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
ECPHRA	Eastern Cape Provincial Heritage Resources Authority
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
GA	General Authorisation
GNR	General Notice Number
HV	High Voltage
I&AP	Interested and Affected Party
IBA	Important Bird Area
IDP	Integrated Development Plan
MCDM	Multiple-Criteria Decision-Making Model
MV	Medium Voltage
NFEPA	National Freshwater Ecosystems Priority Areas
NEMA	National Environmental Management Act (Act No 107 of 1998)

NHRA	National Heritage Resources Act (Act No 25 of 1999)
NMBM	Nelson Mandela Bay Municipality
NWA	National Water Act (Act No. 36 of 1998)
PPP	Public Participation Process
SANBI	South African National Biodiversity Institute
SABAP	Atlas of Southern African Birds
SDF	Spatial Development Framework

Glossary of Terms

Activity: An action either planned or existing that may result in environmental impacts through resource use. For this report, the terms 'activity' and 'development' are used interchangeably.

Alternatives: Different means of meeting the general purpose and requirements of the activity, which may include site or location alternatives; alternatives to the type of activity being undertaken; the design or layout of the activity; the technology to be used in the activity and the operational aspects of the activity.

Basic Assessment Report (BAR): A report as required in terms of the 2014 EIA Regulations, as amended, of the National Environmental Management Act, No. 107 of 1998 (NEMA), as amended, that describes the proposed activities and their potential impacts.

Biodiversity: The diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.

Biophysical: The biological and physical components of the environment.

Buffer: A buffer is an area that protects adjacent communities and sensitive areas from unfavourable conditions. In the context of this project, a buffer has been applied to a preferred alignment for the proposed overhead powerline to cover an area that the specialists have assessed.

Construction: The building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.

Cumulative Impact: The impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Development: The building, erection, construction or establishment of a facility, structure or infrastructure, that is necessary for the undertaking of a listed or specified activity, including any associated post development monitoring, but excludes any modification, alteration or expansion of such a facility, structure or infrastructure, and excluding the redevelopment of the same facility in the same location, with the same capacity and footprint.

Ecosystem: A dynamic system of plant, animal (including humans) and micro-organism communities and their non-living physical environment interacting as a functional unit. The basic structural unit of the biosphere, ecosystems are characterised by interdependent interaction between the component species and their physical surroundings. Each ecosystem occupies a space in which macro-scale conditions and interactions are relatively homogenous.

Environment: In terms of the National Environmental Management Act (NEMA) (Act No 107 of 1998) (as amended), "Environment" means the surroundings within which humans exist and that are made up of:

i. the land, water and atmosphere of the earth;

ii. micro-organisms, plants and animal life;

iii. any part or combination of (i) and (ii), and the interrelationships among and between them; and

iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Assessment Practitioner (EAP): The individual responsible for the planning, management and coordination of the environmental impact assessments, strategic environmental assessments, environmental management plans and/or other appropriate environmental instruments introduced through regulations of NEMA.

Environmental Authorisation: An authorisation issued by the competent authority in respect of a listed activity, or an activity which takes place within a sensitive environment.

Environmental Impact: An environmental change caused by some human act.

Environmental Impact Assessment (EIA): A study of the environmental consequences of a proposed course of action via the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental Management Programme (EMPr): A detailed plan of action to organise and co-ordinate environmental mitigation, rehabilitation and monitoring during the implementation and maintenance of the proposed development such that positive impacts are enhanced, and negative impacts are avoided/minimised.

Expansion: The modification, extension, alteration or upgrading of a facility, structure or infrastructure at which an activity takes place in such a manner that the capacity of the facility or the footprint of the activity is increased.

Indigenous Vegetation: Vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.

Interested and Affected Parties (I&APs): People and organisations that have interest(s) in the proposed activities, also referred to as stakeholders.

Maintenance: The replacement, repair or the reconstruction of an existing structure within the same footprint, in the same location, having the same capacity and performing the same function as the previous structure ('like for like').

Mitigation: Actions to reduce the impact of a particular activity.

Public Participation Process (PPP): A process of involving the public in order to identify issues and concerns and obtain feedback on options and impacts associated with a proposed project, programme or development. Public Participation Process in terms of NEMA refers to: a process in which potential interested and affected parties are given an opportunity to comment on or raise issues relevant to specific project matters.

This page was left blank intentionally

1 INTRODUCTION AND BACKGROUND

1.1 Solar Energy in South Africa

Due to concerns such as climate change, and the on-going exploitation of non-renewable resources, there is growing international pressure on countries to increase their share of renewable energy generation. As a result, the South African Government has set a target to supply 17.8 GW of the electricity supply from renewable energy sources, of which 8.4 GW will be solar energy, over a 20-year period from 2010 to 2030 (Department of Energy, 2010). The proposed PV project is expected to contribute positively towards climate change mitigation.

Renewable energy is recognised internationally as a major contributor in protecting the climate, nature and the environment, as well as providing a wide range of environmental, economic and social benefits that can contribute towards long-term global sustainability.

Solar energy is a source of "green" electricity as for every unit of "green" electricity used instead of traditional coal powered stations, the following benefits area realised:

- Saving water
- Avoiding Sulphur Dioxide (SO2) emissions
- Avoiding Carbon Dioxide (CO2) emissions
- Avoiding transmission losses
- Avoiding ash production
- Contributing to social upliftment
- Less expensive than a newly built coal operated power station

On 24 February 2016 a press release from the Department of Environmental Affairs (DEA) stated the following:

- "Cabinet on Wednesday, 17 February 2016, approved the gazetting of 8 Renewable Energy Development Zones (REDZ) and 5 Power Corridors
- These Renewable Energy Development Zones and Power Corridors are geographical areas where wind and solar Photovoltaic technologies can be incentivized and where 'deep' grid expansion can be directed and where regulatory processes will be streamlined
- The REDZs act as energy generation hubs and provide anchor points for grid expansion thereby allowing for strategic and proactive expansion of grid into these areas. This will ensure that the grid expansion does not hamper the progress of the renewable energy power purchase agreement process
- The REDZs and Power Corridors support 2 of the 18 Strategic Integrated Projects (SIPs) which were identified in the Infrastructure Development Plan which is aimed at promoting catalytic infrastructure development to stimulate economic growth and job creation
- To ensure that when required, environmental authorisations are not a cause for delay, the Department of Environmental Affairs (DEA) embarked on a program of Strategic Environmental Assessments (SEAs) for large-scale developments to support the SIPs. The intention of undertaking Strategic Environmental Assessments is to pre-assess environmental sensitivities within the proposed development areas at a regional scale to simplify the site-specific environmental impact assessments (EIA) when they are undertaken, and to focus the assessment requirements to addressing the specific sensitivity of the site.
- The REDZs and Power Corridors were identified through the development of 3 Strategic Environmental Assessments as part of the Departments Strategic Environmental Assessment programme. The outputs of these 3 SEAs must now be gazetted to allow them to be implemented
- The outputs of the SEAs directly relate to several government priorities including:
  - *Contributing to reducing present current energy constraints by facilitating renewable energy development in strategic areas in South Africa;*
  - *Addressing the major objectives of the National Development Plan, namely transitioning to a low carbon economy, developing infrastructure to create jobs and reducing the regulatory burden and the cost of doing business;*
  - *Contributing to achieving the renewable energy target identified in the Integrated Resource Plan and implementing the renewable energy independent power producers' program (REI4P) implemented by the Department of Energy and National Treasury;*
  - *Promoting the green economy and sustainable development; and*

- *Promoting intergovernmental coordination and integrated authorisations*

The outcome of the gazetting process means that wind and solar PV activities within the 8 Renewable Development Zones and electricity grid expansion within the 5 Power Corridors will be subjected to a Basic Assessment and not a full EIA process.

This reduces the review and decision-making time and the level of assessment required for each project based on the fact that scoping level pre-assessment was already undertaken in those areas. From an application for Environmental Authorisation taking 300 days it will now be completed in 147 days."

1.2 Introducing the Project

Veld PV South (Pty) Ltd (Veld PV South) proposes developing a 75 MW Photovoltaic (PV) solar energy facility either on Farm Haramoep (Remainder of Farm 53) in the Namakwa District Municipality (DM) near Aggeneys in the Northern Cape. This Basic Assessment Report specifically relates to Veld PV South application. Aurecon South Africa (Pty) Ltd (hereafter referred to as Aurecon) has been appointed to undertake the requisite Basic Assessment (BA) process for Veld PV South as required in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), as amended, on behalf of the Proponent.

The Haramoep farm is located in the Khai-Ma Local Municipality (LM) which falls within the Namakwa DM, 100 km north-east of Springbok and 75 km north-west of Pofadder in the Northern Cape. The site can be accessed via the N14 from the south or the Pofadder/Concordia road from the north (Refer to Figure 1).

The proposed project's footprint would be approximately 277 ha.

The proposed project also requires a grid connection. Two alternatives are proposed.

(i) The proposed grid connection for Veld PV South will either consist of a 132 kilovolt (kV) overhead powerline, approximately 27 km in length that would feed into the national electricity grid at the Aggeneys substation. A 35m servitude will be required for the construction of the powerline and it will run adjacent to the existing 220 kV powerline that runs past the site, comprising single circuit steel monopoles with bird perches, or

(ii) Veld PV South would connect via a 220 kV Loop-in, Loop-out (LILO) line between the facility and an existing 220 kV transmission line, with the line being approximately 2100 m in length

The property details are listed below in Table 1.

Table 1: Farm details for Veld PV South project

Landowner:	**Erf number:**	**Name of farm:**	**Farm size:**
Mr A De Waal	**RE/53**	**Haramoep**	**9830.33**

Farm property 21-digit SG code																				
C	0	5	3	0	0	0	0	0	0	0	0	0	0	5	3	0	0	0	0	0
1	**2**			**3**				**4**								**5**				

Gridline 21-digit SG code																				
C	0	5	3	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	0
C	0	5	3	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	2
C	0	5	3	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0
C	0	5	3	0	0	0	0	0	0	0	0	0	0	6	2	0	0	0	0	2
C	0	5	3	0	0	0	0	0	0	0	0	0	0	6	2	0	0	0	0	6
C	0	5	3	0	0	0	0	0	0	0	0	0	0	6	2	0	0	0	0	3
C	0	5	3	0	0	0	0	0	0	0	0	0	0	5	6	0	0	0	0	1
1	**2**			**3**				**4**								**5**				

The proposed grid connection will consist of a 132 kilovolt (kV) overhead powerline, approximately 27 km in length that would feed into the national electricity grid at the Aggeneys substation. A 35m servitude will be required for the construction of the powerline and it will run adjacent to the existing 220 kV powerline that runs past the site, comprising single circuit steel monopoles with bird perches.

The following components would be required for the solar farm and to evacuate the power generated by the proposed Veld PV South.

- A photovoltaic component, comprising of numerous arrays of PV solar panels mounted on steel tracking mounts and footings with associated support infrastructure to generate up to 75 MW of renewable energy
- Inverters, to convert the direct current (DC) generated by the PV modules into alternating current (AC)
- On-site substations, including amongst others:
    - Transformers, to step up the 33-kV power generated by the inverters to 132 kV to connect to the new 132 kV overhead transmission line
    - Internal cabling laid underground when feasible to connect the PV modules to the on-site substation and inverters
- Internal access roads for servicing and maintenance of the site
- Stormwater infrastructure
- Temporary construction areas for use during construction
- Buildings, including an operations and maintenance building, a connection building, control building, guard cabin
- Weather stations within and along the fenced perimeter of the site; and
- Perimeter fencing.

The Applicant (or its successor in title) will be responsible for the construction phase of the development. After construction is complete, ownership of the grid connection infrastructure will be transferred to Eskom, where appropriate (as per Eskom's requirements), and Eskom will then be responsible for the operation and maintenance of the infrastructure that falls under their ownership, as well as decommissioning should the need to decommission the infrastructure arise. The plant itself will be owned and operated by the applicant or its successor, and operation and maintenance of the plant, and any required decommissioning at the end of the plant's life, will fall to them.

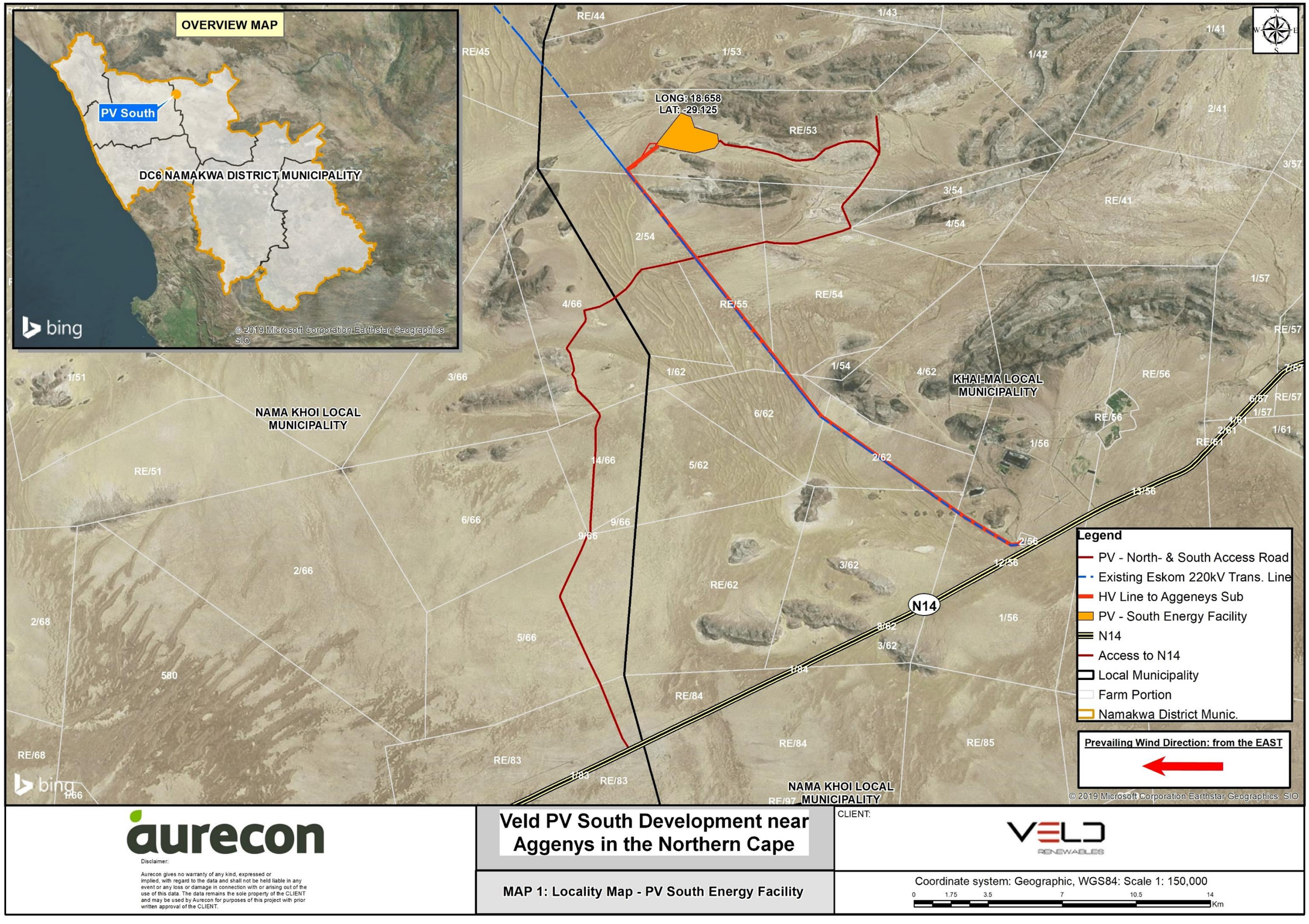


Figure 1: Location of the farm portions for the proposed Veld PV South near Aggeneys in the Northern Cape

1.3 Purpose of the Basic Assessment Report

The purpose of this BAR is to apply for environmental authorisation (EA) in terms of the EIA regulations (GN R982 of 2014, as amended) pursuant to the National Environmental Management Act (Act 107 of 1998) (NEMA), as amended, for the proposed solar facility on the farm Haramoep. Since the project is associated with energy generation, and energy projects are dealt with by the national authority, the competent authority for this project is the National Department of Environmental Affairs (DEA).

To meet the requirements of the EIA regulations (GN R982 of 2014, as amended) pursuant to NEMA, this Final Basic Assessment Report includes the following sections.

- **Section 1 – Introduction:** introduces the project in the context of the renewable energy industry in South Africa and provides an indication of the environmental process to be undertaken for the project.
- **Section 2** – Role-players: introduces the different role-players involved in the environmental authorisation process.
- **Section 3 – Legal and planning context:** provides an outline and analysis of the legal framework and policies relevant to the project.
- **Section 4 – BA methodology:** provides an overview of the basic assessment process, highlighting the various phases that have been undertaken for this project; outlines the public participation process; and defines the assessment methodology used in the impact assessment, as well as highlighting the assumptions, limitation and gaps in knowledge.
- **Section 5 – Consideration of alternatives**: provides a summary of the detailed screening process that was undertaken for this project as well as a motivation as to why no alternatives, beyond the No-Go alternative, have been assessed in this BAR.
- **Section 6 – Description of the proposed project:** outlines the nature of the proposed activities, specific to the proposed Veld PV South facility, and then considers the need for the proposed project.
- **Section 7 – Biophysical and socio-economic impact assessment:** separated by environmental aspects, this section explores the current state of the receiving environment, identifies and assesses the impact that the proposed project will have on the landscape, and provides mitigation measures to address these impacts. Each aspect also explores the potential cumulative impact that may occur, considering the other linear projects in the area. Each section concludes with a specialist impact statement on the proposed Veld PV South facility.
- **Section 8 – Conclusions and way forward**: summarises the potential environmental issues and impacts that could arise from the project, provides the recommendations and opinion of the EAP highlighting the level of confidence in the assessment, and concludes with the way forward.

2 ROLE-PLAYERS

2.1 Introduction

There are several role-players involved in the environmental application process. The details of each are briefly set out below, based on the definitions and requirements within GN R982 (2014 as amended) of NEMA.

2.2 Proponent

The proponent "means a person intending to submit an application for environmental authorisation and is referred to an applicant once such application for environmental authorisation has been submitted".

Veld PV South (Pty) Ltd (hereafter referred to as Veld PV South) is the proponent and applicant for this proposed project.

2.3 The Environmental Assessment Practitioner

The Environmental Assessment Practitioner (EAP) means "the individual responsible for the planning, management, coordination or review of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instruments introduced through regulations".

It is the role of the independent EAP to manage and undertake the application for environmental authorisation for the project on behalf of the applicant, as required in terms of NEMA (as amended). Mr Charles Norman form Aurecon is the responsible EAP and has relied on inputs from a selected team of highly experienced specialists and multi-disciplinary practitioners to execute the project in a professional and unbiased manner. Neither Aurecon nor any of its sub-consultants are subsidiaries of Veld PV South. Furthermore, all these parties do not have any interest in downstream developments that may arise out of the authorisation of the proposed project.

The contact details of the EAP are provided in Table 2, and the expertise of the individuals responsible for the process are presented in Table 3.

Table 2: Contact details of EAP

EAP	Mr Charles Norman
Company	Aurecon South Africa (Pty) Ltd
Postal address	PO Box 509, George 6530 South Africa
Telephone number	044 8055433
Email address	Charles.Norman@aurecongroup.com

Aurecon's environmental management systems policy provides a quality management system which includes a number of tiers with various responsibilities for each job grade level based on experience in the environmental field. This requires environmental practitioners to prepare reports and gain experience whilst being guided by a senior colleague. The EAP is ultimately responsible for reviewing the reports and signing off on the requisite reports and declarations and taking responsibility for a BA or EIA process. Refer to Annexure A for the signed declaration of interest of the EAP as well as full CVs of the EAPs involved in this BA process.

Table 3: Details of EAP experience

EAP	Charles Norman	Corlie Steyn
Role	EAP; Technical lead	Support staff
Qualifications	Master's Degree in Environmental Law	Master's Degree Environmental Management
Years of experience	30	15
Environmental management experience	Environmental and socio-economic impact assessment (ESIA), Scoping and environmental impact assessment (S&EIA) reports, Basic assessment reports (BARs), Environmental management plans and programmes (EMPs/EMPrs), Screening studies and constraints analyses / feasibility assessments, and Public participation processes	Scoping and environmental impact assessment (S&EIA) reports, Basic assessment reports (BARs), Environmental management plans and programmes (EMPs/EMPrs), Screening studies and constraints analyses / feasibility assessments, and Public participation processes
Industries of experience	Energy (renewable, gas, and transmission), mining, roads and bridges and urban regeneration projects	Renewable energy, powerlines, wetland rehabilitation, roads, sustainable infrastructure
Countries of experience	South Africa, Namibia, Mozambique, Nigeria, DRC, Australia, Kenya	South Africa, Namibia, DRC, Zambia Australia
Professional Registration and Memberships	International Association for Impact Assessment South Africa (IAIAsa), and	EAPASA International Association for Impact Assessment South Africa (IAIAsa), and

2.4 Specialists

A specialist means "a person that is generally recognised within the scientific community as having the capability of undertaking, in conformance with generally recognised scientific principles, specialist studies or preparing specialist reports, including due diligence studies and socio-economic studies".

Several specialist disciplines have been identified as relevant to the nature of the proposed development and the receiving environment. Specialists have been appointed to undertake the necessary studies specific to their discipline and their inputs have been a key informant to the iterative alignment process undertaken to date. The details of the specialists can be found in Table 4 below.

Table 4: Details of specialists

Role	Consultant	Company
Agriculture	Johann Lanz	Private Consultant
Aquatic ecology	Toni Belcher	BlueScience (Pty) Ltd
Avifauna	Chris van Rooyen	Chris van Rooyen Consulting
Botany	Dave Macdonald	Bergwind Botanical Surveys &Tours CC
Heritage (incl. archaeology)	Jayson Orton	ASHA Consulting (Pty) Ltd
Palaeontology	Dr John Almond	Natura Viva
Socio-economic	Marcel Theron	Urban Econ Development Economists Pty Ltd

Stormwater management	Martin Kleynhans	Aurecon South Africa (Pty) Ltd
Visual	Stephen Stead	Visual Resources Management (VRM) Africa

The EIA Regulations set out the content requirements for Specialist Reports (Appendix 6 of GN R982). These have been applied to the assessment reports undertaken to date.

2.5 Interested and Affected Parties

Interested and Affected Party (I&AP), "for the purposes of Chapter 5 of the NEMA and in relation to the assessment of the environmental impact of a listed activity or related activity, means an interested and affected party contemplated in Section 24(4)(a)(v), and which includes –

- Any person, group of persons or organisation interested in or affected by such operation or activity; and
- Any organ of state that may have jurisdiction over any aspect of the operation or activity."

Details of the principles and processes for stakeholder engagement are set out in Annexure C, which includes a database of all I&APs involved in the Basic Assessment Phase thus far.

2.6 Competent Authority

A competent authority, "in respect of a listed activity or specified activity, means the organ of state charged by this Act with evaluating the environmental impact of that activity and, where appropriate, with granting or refusing and environmental authorisation in respect of that activity".

In this case, the competent authority is the Department of Environmental Affairs (DEA) and their details are set out in Table 5 below, whilst their duties are further described in Section 4.

Table 5: Competent authority details

Name	Department of Environmental Affairs (DEA): Integrated Environmental Authorisations	
Contact	Mr Thando Booi	
Postal Address	Private Bag X447, Pretoria, 0001	
Physical Address	473 Steve Biko Road, Arcadia, Pretoria, 0001	
Telephone Number	012 399 9387	012 399 9406
Fax Number	012 359 3625	
Email Address	TBooi@environment.gov.za	

3 LEGAL AND PLANNING CONTEXT

There are a host of legal and policy documents and guidelines to consider in undertaking such a Project. These have been detailed in the following sections below.

3.1 Relevant Legislation

An overview of the relevant legislation is provided in Table 6.

Table 6: Relevant legislation, policies and guidelines considered in preparation of the BAR

Title of legislation, policy or guideline	Applicability to the project	Administering authority
National Legislation		
Conservation of Agricultural Resources Act, No. 43 of 1983 (CARA)	The purpose of this Act is to ensure that natural agricultural resources of South Africa are conserved through maintaining the production potential of land, combating and preventing erosion, preventing the weakening or destruction of water sources, protecting vegetation, and combating weeds and invader plants. Veld PV South together with the relevant farmers should also ensure the control of any undesired aliens, declared weeds, and plant invaders listed in the Regulations that may pose a problem as a result of the proposed project. Measures to mitigate this potential impact will be included in the EMPr that will form an annexure to the Final BAR.	Department of Agriculture, Forestry & Fisheries
Electricity Regulation Act, No. 4 of 2006 National Energy Act, No. 34 of 2008	The proposed Veld PV South facility would facilitate new generation capacity through renewable technologies, namely solar, as listed in the IRP and all REIPPPP which will be undertaken in accordance with the specified capacities and technologies as listed in the IRP.	Department of Energy (DoE)
National Environmental Management Act, No. 107 of 1998 (NEMA), as amended	Several listed activities (detailed in Section 2.2 below) have been triggered by the proposed Veld PV South facility in terms of the 2017 EIA Regulations (GN R326, as amended).	Department of Environmental Affairs
National Environmental Management: Biodiversity Act, No. 10 of 2004 (NEM:BA)	The Act calls for the management of all biodiversity within South Africa. As a number of listed species may occur on the site, it is imperative to ensure their long-term survival and conservation. The Threatened or Protected Species Regulations (2007) provides such protection through a permit system as well as through the identification of restricted activities. There is no part of the main Veld PV South that has any 'red flags' except for the requirement to relocate plants *Hoodia gordonii*. In addition, along the southern boundary of the site, care should be taken to avoid impact on trees of *Boscia albitrunca*. This should be possible because the trees are mostly within the area excluded due to freshwater ecological constraints. However, if disturbance of any *Boscia albitrunca* trees is unavoidable, a permit for disturbance or removal of such trees would be required from the Department of Environment, Forestry and Fisheries (DEFF). (Refer Botanical Impact Assessment, 2019)	Department of Environmental Affairs (DEA)
National Environmental Management: Waste Management Act, No. 59 of 2008 (NEM: WA)	During construction, the aim is to prevent and reduce pollution and ecological degradation by implementing waste management measures. By adhering to the regulations and schedules in terms of this Act, waste generated on site will be minimised and reused where possible and a waste licence will be obtained if any listed activities are triggered.	Department of Environmental Affairs (DEA)
National Forests Act, No. 84 of 1998, as amended (NFA)	There is no part of the main Veld PV South that has any 'red flags' except for the requirement to relocate plants *Hoodia gordonii*. In addition, along the southern boundary of the site, care should be	Department of Agriculture, Forestry & Fisheries (DAFF)

	taken to avoid impact on trees of *Boscia albitrunca*. This should be possible because the trees are mostly within the area excluded due to freshwater ecological constraints. However, if disturbance of any *Boscia albitrunca* trees is unavoidable, a permit for disturbance or removal of such trees would be required from the Department of Environment, Forestry and Fisheries (DEFF). (Refer Botanical Impact Assessment, 2019).	
National Heritage Resources Act, No. 25 of 1999 (NHRA)	The proposed project will change the character of the site and will exceed 5,000 m^2 in extent. The proposed roads will exceed 300 m in length. Section 38 of the NHRA is thus applicable. As such, it was proposed that a Heritage Impact Assessment (including an archaeological and palaeontological assessment) be undertaken for approval by SAHRA. The heritage study undertaken during the BA process found that heritage resources are very rare on the development site. Palaeontology was also not an issue for the proposed site.	South African Heritage Resources Agency (SAHRA)
National Water Act, No. 36 of 1998 (NWA)	Section 21 of the NWA recognises water uses that require authorisation by DWS before they commence. Water uses may be triggered by the following project activities: • Construction of infrastructure within 32 m of a drainage lines; and • The relevant approvals are being sought from DWS in parallel through a WULA process.	Department of Water and Sanitation (DWS)
Occupational Health and Safety Act (No. 85 of 1993) (the OHS Act)	The health and safety of all people involved in the project before and after construction will be protected.	Department of Labour

3.2 Listed Activities in terms of NEMA

The National Environmental Management Act 107 of 1998 (NEMA) as amended, provides the framework for environmental decision-making in the country and specifically the EIA Regulations (GN No. R982 in the Government Gazette of 8 December 2014, as amended) serve as the instrument through which development decisions are made.

South Africa has rigorous and comprehensive environmental legislation aimed at preventing degradation of the environment. Section 28(1) of NEMA places a "*duty of care and remediation of environmental damage*" on every person who causes, has caused, or may cause, significant environmental degradation. This is a far-reaching obligation, and accordingly, those parties responsible for the degradation of the environment have a legal duty to avoid, minimise or mitigate such impacts.

This has resulted in a set of Listed Activities that can be triggered by developments taking place in sensitive environments, e.g. watercourses. If a development triggers a Listed Activity, it is required to undergo an Environmental Impact Assessment (EIA) or BA process in terms of the EIA Regulations (GN R982, as amended). The following listed activities, as shown in Table 7, have been identified as being applicable to this project:

Table 7: Listed activities triggered by the proposed Veld PV South facility

Activity No.	Relevant listed activity	Aspect of the project (Describe the portion of the proposed project to which the applicable listed activity relates).
Listing Notice 1: GN R983 of 8 December 2014 as amended on 7 April 2017 (GN R327)		
11	The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more;	The proposed grid connection will consist of a 132 kilovolt (kV) overhead powerline, approximately 27 km in length. The bulk of the power line will run in length within a rural and agricultural area, or alternatively would connect via a 220 kV LILO line between the facility and an existing 220 kV transmission line, with the line being approximately 2100 m in length.

Activity No.	Relevant listed activity	Aspect of the project (Describe the portion of the proposed project to which the applicable listed activity relates).
12	The development of – (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback exists, within 32 m of a watercourse, measured from the edge of a watercourse; -	A few drainage lines are scattered across the proposed property and one or more roads and / or other infrastructure will cross these lines and be within 32 m thereof.
19	The infilling or depositing of any material of more than 10 m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 m^3 from (i) a watercourse;	The infilling or depositing of any material of more than 10 m^3 into a watercourse will likely be triggered with the construction of internal service roads or cables across drainage lines as well as the widening of the existing access road which crosses numerous small drainage lines.
28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 1 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 ha.	The farm on which the project is proposed is still being used for livestock grazing (mostly sheep).
Listing Notice 2: GN R984 of 8 December 2014 as amended on 7 April 2017 (GN R325)		
1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs —- (a) Within an urban area; or (b) on existing infrastructure;	The proposed project would have a maximum generation capacity of 75 MW.
15	The clearance of an area of 20 hectares or more of indigenous vegetation.	Physical alteration of undeveloped land for industrial use would take place. The total area to be transformed is approximately 277 ha.
Listing Notice 3: GN R985 of 8 December 2014 as amended on 7 April 2017 (GN R324)		
4	. The development of a road wider than 4 metres with reserve less than 13,5 metres. g. Northern Cape ii. Outside urban areas: (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	The construction of a road wider than 4 m with a reserve less than 13.5 m (no reserve) might be required outside the urban area and within an area containing indigenous vegetation, as the existing road will need extension in some places. The project is located within a National Protected Area Expansion Strategy Focus as well as areas designated as Critical Biodiversity Areas. The project is also located within an Important Bird Area.
12	The clearance of an area of 300 square metres (m^2) or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. g. Northern Cape: (ii) Within critical biodiversity areas identified in bioregional plans;	The clearance of more than 300 m^2 of indigenous vegetation will likely be required for the project. The total area to be transformed is approximately 277 ha. The project is located within areas designated as Critical Biodiversity Areas.
14	The development of — (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; g. Northern Cape ii. Outside urban areas:	Associated infrastructure (eg, fencing, substation, transmission lines, buildings, roads etc) may be located within or within proximity to a watercourse. The project is located within a National Protected Area Expansion Strategy Focus as well as areas designated as Critical Biodiversity Areas. The project is also located within an Important Bird Area.

Activity No.	Relevant listed activity	Aspect of the project (Describe the portion of the proposed project to which the applicable listed activity relates).
	(bb) National Protected Area Expansion Strategy Focus areas; (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	
18	The widening of a road by more than 4 metres, or the lengthening of a road by more than1 kilometre. g. Northern Cape ii. Outside urban areas: (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	Access roads of approximately 6 to 8 m in width would be required to develop the proposed project, the combination of which would exceed 1 km. Existing roads will be used as far as practically possible and feasible but would require widening by more than 4 m and new roads greater than 1 kilometre in length are likely to be required in some areas. The project is located within a National Protected Area Expansion Strategy Focus as well as areas designated as Critical Biodiversity Areas. The project is also located within an Important Bird Area.

3.3 Relevant Policies

In South Africa, the national utility company, Eskom, sources up to 86.97% of its electricity needs from fossil-fuels (World Atlas, 2017). Against the backdrop of heightened climate change awareness and a growing concern around the reliance and environmental impacts of using fossil fuels, as well as an increasing projected electricity demand in the country, a number of policies were developed that aim at diversifying the electricity generation mix for South Africa. These include the White Paper on the Energy Policy of the Republic of South Africa (1998), the White Paper on Renewable Energy (2003) and the National Climate Change Response Policy White Paper (2011) (see Figure 2).

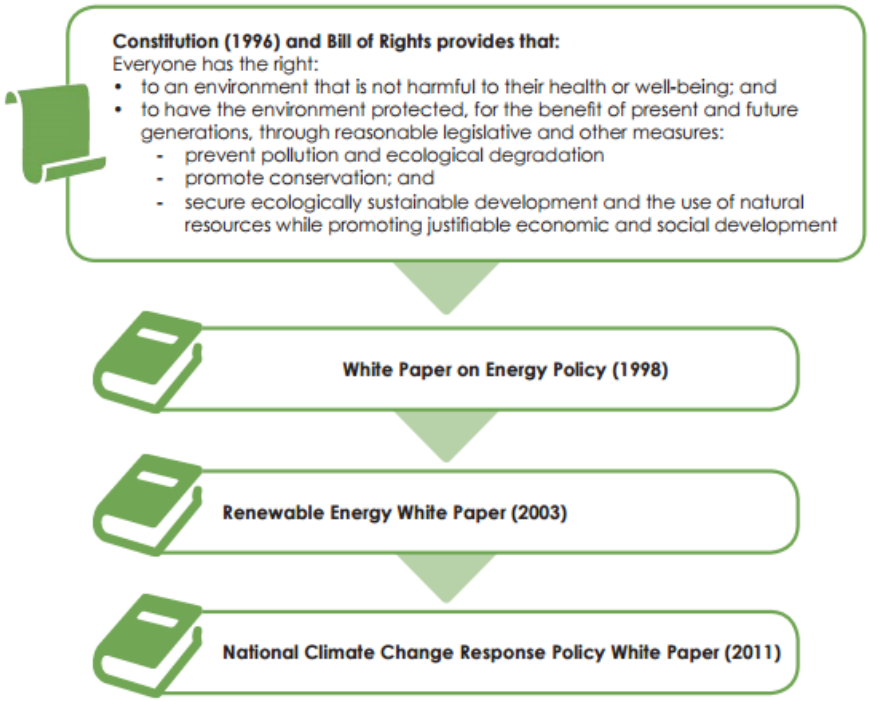


Figure 2: Key policies for initiating renewable energy in South Africa (DoE, 2015)

However, despite the proactive policy stance from the early 2000s, by the end of the decade there was an electricity shortage that resulted in rolling black outs in 2008. In direct response to these electricity shortages, the Integrated Resource Plan (IRP) (2010) was issued as a medium-term strategy which set the target for renewable energy supply to 17.8 GW over a 20-year period from 2010 to 2030. An update to the IRP was Drafted by the Department of Energy (DoE) and circulated for a 60-day public comment period in August 2018. This updated IRP indicates that the expected electricity demand for South Africa has decreased and that no new nuclear will be planned until at least after 2030. Of the new build planned by 2030, 52% (18,746 MW) will come from renewable energy, half of which will be wind energy (9,462 MW). These renewable energy targets are procured through a competitive tendering process called the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) run by the DoE. The success of this programme has been internationally recognised, with the United Nations Environmental Programme (UNEP) 2014 Report placing South Africa among the top-10 countries in respect to renewable energy investment.

In South Africa, renewable energy forms an important part of our energy mix. 32 700 GWh of energy[5] has been generated by renewable energy sources procured under the REIPPPP since the first project became operational. It has also led to substantial foreign direct investment flowing into South Africa through the Renewable Energy Independent Power Producer projects and by December 2018 this amounted to about R42.8 billion[1]. Additionally, beyond the foreign investment, localised socio-economic benefits have also been realised through job creation, skills development, funding of enterprise development and socio-economic development projects as well as the establishment of Community Trusts. Approximately 38,701 job years[2] for South African citizens have been created

[1] IPPPP Quarterly Report, 31 December 2018. Downloaded from: **https://ipp-projects.co.za/Publications**.

[2] A job year is the equivalent of a full-time employment opportunity for one person for one year.

to date[1], R779 million spent on socio-economic development contributions and R250.3 million on enterprise development. Over and above this carbon emission reductions of 33.2 Mton CO_2 and water savings of 39.2 million kilolitres have been achieved.

The proposed Veld PV South would therefore have both national and global significance as it aligns with national policy direction as well as contributing to South Africa being able to meet some of its international climate change obligations, by aligning domestic policy with internationally agreed strategies and standards as those set by the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, as well as the recent Convention of the Parties (COP) 21 in Paris 2015, to all of which South Africa is a signatory. The Veld PV South facility which is proposed in this application is an important component of realising the benefits of the proposed PV facility. For without it, the energy produced at the proposed site would not be able to connect to the National Electricity Grid. It is these potential positive impacts and the alignment with government policy of this development that needs to be weighed up against its potential negative environmental impacts.

3.4 Planning Context

The renewable energy industry has substantial support in the South African planning context, which is detailed in the following national and provincial plans:

- National Development Plan;
- National Integrated Energy Plan (2016)
- National Integrated Resource Plan for Electricity (2010-2013);
- National Infrastructure Plan;

An evaluation of the 'need and desirability' of the project (Section 5.2) considers the strategic context of the project with regard to the municipal Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs) as follows:

- The Nama Khoi IDP (2012-2017, second revision 2014/205)
- Khai-Ma LM IDP (2012 – 2017)
- Namakwa DM SDF (2016-2017)
- The Northern Cape SDF (2017)
- The Namakwa IDP (2016-2017)

3.5 Integrated Resource Plan (IRP) 2010

The theory and enabling environment that the polices provide, was a catalyst for the Integrated Resource Plan for electricity (IRP) (2010) and Update Report (2013) to be published under the Electricity Regulation Act (Act 4 of 2006). This document aims to give effect to national policy and provides a planning framework for the management of electricity demand in South Africa for the period between 2010 and 2030[3].

3.6 Renewable Energy Development Zones (REDZ) as part of a Strategic Environmental Assessment (SEA)

Reference to the IRP 2010 is made in the National Infrastructure Plan (2012) which identifies Strategic Infrastructure Project (SIP 8) as 'Green energy in support of the South African economy'. In response, "the DEA has committed to contribute to the implementation of the National Infrastructure Plan by undertaking Strategic Environmental Assessments (SEAs) to identify adaptive processes that integrate the regulatory environmental requirements for Strategic Integrated Projects (SIPs) while safeguarding the environment" (CSIR, 2016)[4].

The SEA was to identify the most suitable areas from both an environmental and socio-economic perspective where large scale wind and solar PV energy facilities should be developed, referred to as Renewable Energy Development Zones (REDZs). In addition, an Electricity Grid Infrastructure (EGI) SEA was commissioned in 2014

[3] Department of Energy. 2015. State of Renewable Energy in South Africa. Department of Energy, Pretoria.

[4] CSIR. 2016. SEA for wind and solar PV energy in South Africa - Renewable Energy Development Zones (REDZs), Available at https://redzs.csir.co.za/, Accessed 31 July 2019.

to identify power corridors that will enable the efficient and effective expansion of key strategic transmission infrastructure designed to satisfy national transmission requirements up to 2040. The gazetting of the outputs of these two SEAs for comment was approved by Cabinet on 17 February 2016 (CSIR, 2016). These areas would direct future grid expansion and allow for regulatory processes therein to be streamlined.

According to DEA (2016)[5], the outputs of the SEAs directly relate to several government priorities including:

- Contributing to reducing present current energy constraints by facilitating renewable energy development in strategic areas in South Africa;
- Addressing the major objectives of the National Development Plan, namely transitioning to a low carbon economy, developing infrastructure to create jobs and reducing the regulatory burden and the cost of doing business;
- Contributing to achieving the renewable energy target identified in the Integrated Resource Plan and implementing the renewable energy independent power producers' program (REI4P) implemented by the Department of Energy and National Treasury;
- Promoting the green economy and sustainable development; and
- Promoting intergovernmental coordination and integrated authorisations.

This project is located within the Draft Springbok Renewable Energy Development Zone (REDZ) and within the Northern Powerline Corridor. As the environmental and social characteristics of the area have been pre-assessed at a strategic level and found to be favourable, in future a project such as this would only be subject to a Basic Assessment and not a full EIA process, with a reduced review and decision-making time and the level of assessment required (DEA, 2016). An application for Environmental Authorisation taking 300 days would be completed in 147 days.

However, a second iteration of the wind and solar PV SEA has recently been commissioned by DEA in order to identify additional REDZ and to review the existing REDZ at national scale. This process will aim to provide additional anchor points for grid expansion and provide dedicated energy generation areas from which electricity must be collected, thereby allowing strategic investment (CSIR, 2016). There is currently no indication when this will be gazetted and therefore this project would not benefit due to the timeframes.

3.7 Relevant Guidelines

This BAR process is informed by the series of national Environmental Guidelines where applicable and relevant:

- EIA Guideline for Renewable Energy Projects (DEA, 2015)
- Integrated Environmental Information Management (IEIM), Information Series 5: Companion to the NEMA EIA Regulations of 2010 (DEA, 2010)
- IEIM, Information Series 2: Scoping (Department of Environmental Affairs and Tourism (DEAT), 2002).
- IEIM, Information Series 3: Stakeholder Engagement (DEAT, 2002)
- IEIM, Information Series 4: Specialist Studies (DEAT, 2002)
- IEIM, Information Series 11: Criteria for determining Alternatives in EIA (DEAT, 2004)
- IEIM, Information Series 12: Environmental Management Plans (DEAT, 2004)
- IEM Guideline Series 7: Public Participation in the Environmental Impact Assessment Process (DEA, 2012)
- Birds and Solar-Energy Best-Practice Guidelines: Third Edition (BirdLife SA and EWT, 2015)
- Environmental, Health, and Safety Guidelines for Solar Energy (World Bank Group, 2015)
- Good Practice Guidelines for Surveying Bats and Solar Energy Facility Developments – Pre-construction 4th edition (Sowler et al. 2016)
- The following guidelines from the Department of Environmental Affairs and Development Planning (Western Cape) (DEA&DP) were also taken into consideration, even though the project is situated in the Northern Cape:
- Guideline for involving biodiversity specialists in EIA process (Brownlie, 2005)

[5] Department of Environmental Affairs. 2006. Cabinet approves gazetting of Renewable Energy Development Zones, Media Release 24 February 2016, available at: **https://www.environment.gov.za/mediarelease/cabinet_gazetting_redz**, Accessed 31 July 2019.

- Guideline for involving heritage specialists in the Environmental Impact Report process (Winter & Baumann, 2005)
- Guideline for involving visual and aesthetic specialists in the Environmental Impact Report process (Oberholzer, 2005)
- Guideline for Environmental Management Plans (Lochner, 2005)
- Guideline for determining the scope of specialist involvement in EIA Processes (Munster, 2005)
- Guideline for the review of specialist input into the EIA Process (Keatimilwe & Ashton, 2005)
- Guideline on Alternatives, EIA Guideline and Information Document Series (DEA&DP, 2011)
- Guideline on Need and Desirability, EIA Guideline and Information Document Series (DEA, 2012)
- Guideline on Public Participation, EIA Guideline and Information Document Series (DEA&DP, 2011)

4 BA METHODOLOGY

The objective of the basic assessment process is to, through a consultative process -

a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
b) identify the alternatives considered, including the activity, location, and technology alternatives;
c) describe the need and desirability of the proposed alternatives;
d) through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine –

   i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and;
   ii) the degree to which these impacts -

- (aa) can be reversed;
- (bb) may cause irreplaceable loss of resources; and
- (cc) can be avoided, managed or mitigated;

e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to-

   i) identify and motivate a preferred site, activity and technology alternative;
   ii) identify suitable measures to avoid, manage or mitigate identified impacts; and
   iii) identify residual risks that need to be managed and monitored.

The proposed Veld PV South facility is a complex project as it forms part of a combined development with Veld PV South. As such, the proposed approach to the BA process has been designed intentionally to adequately assess the potential environmental impacts and goes beyond the minimum requirements provided for by the NEMA. This methodology is further described in the sub-sections that follow.

4.1 Approach to the Project

The project team have actively sought to identify the best practical environmental option possible for the proposed PV South project and transmission line through a rigorous, iterative and multi-disciplinary process, that has drawn on the considerable body of existing knowledge and specialist expertise relating to the study area. This approach aligns with the NEMA principles advocating for sustainable development through the adoption of the mitigation hierarchy as set out in Section 2 of NEMA and depicted below in Figure 3. Through application of this hierarchy, 'avoidance' of environmental impacts was then the basis for the approach to this process.

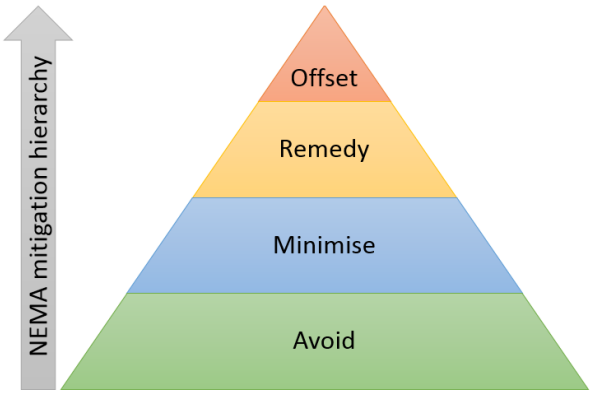


Figure 3: Mitigation hierarchy

The regulated EIA and BA processes are tightly bound by legislative timeframes in terms of NEMA, and thus provide limited opportunity to incorporate and respond to issues raised by interested and affected parties (I&APs).

Three distinct phases in this BA process, namely Screening Phase, Application Phase, and the BAR Phase. A description of the activities which have been, and will be, undertaken during each phase is provided in the following sections. Note that this report covers the third phase, *viz.* the BAR Phase.

4.1.1 The Screening Phase

A Scoping and EIA process was initiated for this project in 2016 but was stopped due to the withdrawal of the initial funders and insecurity of the future frame conditions for renewable energy projects. No application was submitted at the time, but a pre-application meeting was held with DEA.

The process has now changed to a Basic Assessment (this application) due to the site being within the Springbok REDZ.

Therefore, detailed screening assessment was undertaken during the Scoping and EIA phase of the project to allow environmental and socio-economic impacts to be considered early in the project lifecycle and evaluated in an integrated manner with the engineering design considerations.

Designs based on screening input are therefore sensitive to environmental and socio-economic constraints, reducing project risks and supporting application of the mitigation hierarchy (as advocated in the principles of the NEMA, section 2).

Refer to Section 6 for a description of the alternatives that were considered and illuminated during the screening phase in the form of avoidance and minimisation of impacts. By adopting this precautionary approach, all parties (proponent, engineers, specialists, authorities, I&APs, etc.) This approach ensured that it is more likely that once the project is subject to the detailed and time restricted legislated BA process, potential significant impacts have already been identified and avoided (where practicable) which reduces the likelihood of significant issues needing to be dealt with during the time restricted legislated BA process. Therefore, the precautionary approach leads to a more robust impact assessment which allows for DEA to make a more informed decision.

4.1.2 The Application Phase

An Application Form and Annexures was submitted to DEA on 11 July 2019.

4.1.3 The Basic Assessment Phase

Stakeholder engagement is an important aspect of sustainable development. In order to meet the ecological, social and economic needs of present generations without comprising the needs of future generations, one needs to understand what those needs are. It is important that this occurs at a local level, as communities such as farmers, or families who have lived in small towns for a long time often understand the landscape well.

This Final BAR has been produced from an initial Scoping Report by considering and incorporating comments that were received during the pre-application public comment period. The submission of the application for EA with the DEA in June 2019 triggers the start of a 90-day period within which the Final BAR must be submitted to DEA for decision-making, having undergone a further 30-day public comment period.

After the submission of the Final BAR and EMPr, the DEA must in writing -

a) grant EA in respect of all or part of the activity applied for; or
b) refuse environmental authorisation.

4.2 Stakeholder Engagement (Public Participation)

Stakeholder engagement has been described by the International Finance Corporation (IFC) of the World Bank Group as a broad, inclusive and continuous process of communication between a Proponent of a project, and those potentially affected by the activities of the proposed development. This can include a wide range of activities that are relevant to the entire life of a project. The aim of stakeholder engagement differs at different stages of the project lifecycle. During the BA process, the aim is to provide an opportunity for stakeholders to be informed of projects occurring in their area and that may affect them directly or indirectly. It also aims to provide an accessible and meaningful opportunity for people to ask questions, raise concerns or grievances and to ensure that these are used to guide the new development, and ongoing operations, in a responsible manner that complements the local socio-economic environment and enhances the benefit of a given project.

South African legislation and guidelines have formalised stakeholder engagement in the BA (and EIA) process and refer to it as the Public Participation Process (PPP). PPP therefore forms an integral component of this investigation and enables I&APs to identify their issues, concerns, and suggestions during the BA process. This PPP has been structured to provide I&APs with an opportunity to gain more knowledge about the proposed project, to provide input through the review of documents/ reports, and to voice any issues of concern at various stages throughout the BA process. These stages are described below.

4.2.1 The following tasks were included in the PPP

Please note the same procedure were followed for the Pre-App PPP and for the BAR process. Two PPP processes were therefore conducted for this application.

Notifications about the BAR process for Veld PV South were circulated via:

- Newspaper advertisements: advertisements in English and Afrikaans were placed in a local newspaper, Die Plattelander, notifying the broader public of the initiation of the BA process and inviting them to register as I&APs.
- Site notices: posters in English and Afrikaans were erected at the entrance of the proposed site, and at Pofadder Public Library.
- Written notification: letters and/ or emails were issued to all identified stakeholders informing them of the proposed project including a notification of the availability of the Draft Basic Assessment Report for comment. Further notifications of the BA were sent to registered I&APs at that stage of the process.

Meetings:

- A pre-application meeting for the original proposed project was undertaken with DEA on 18 November 2016. The applicant liaised telephonically with DEA who indicated that a pre-application meeting for this new application was not necessary.

The initial database of I&APs includes the landowners, the adjacent landowners, relevant district and local municipal officials, relevant national and provincial government officials, and organisations in the area. This database will be augmented via chain referral during the EIA process, and will be continually updated as new I&APs are identified throughout the project lifecycle.

Authority involvement commences at the start of the project with the pre-application meeting with DEA to notify them of the proposed project. The following national, provincial and regional authorities were identified as I&APs:

Where the need arises, focus group meetings will be arranged with representatives from the relevant national and provincial departments and local authorities. The purpose of these meetings will be to ensure that the authorities have a thorough understanding of the need for the project and that Aurecon has a clear understanding of the authority requirements.

A Public Participation Report has been included as an annexure to the Final Basic Assessment Report, which will include proof of the full PPP that was undertaken as well as a Comments and Response Report (CRR).

4.3 Assessment Methodology

4.3.1 Specialist Assessments

To provide a scientific assessment that is transparent and robust, a clear methodology is required. Although each specialist required a methodology that was specific to their investigation (detailed in their reports in Annexure D), they were each required to comply with the following general requirements:

4.3.1.1 General Specialist Report Requirements

All reports prepared by the Specialist shall include the following information:

- Details of the individual/s who prepared the report, and details of the project team members who undertook or contributed to the specialist studies informing the report, including their responsibilities, relevant expertise to undertake the specialised study or specialist process, as well as a Declaration of Independence;
- An indication of the scope of, and the purpose for which the report was prepared;
- A description of the methodology adopted in preparing the report or undertaking the specialist process, including the consideration of the latest specialist guidelines;
- A description of any assumptions made and any limitations to the study, as well as uncertainties or gaps in knowledge;
- A description of any consultation processes that were undertaken during the course of undertaking the study; and
- When considering the impact to species, consider and assess the potential impact to any species that is important in providing vital ecosystem services. I.e. do not only talk to Species of Conservation Concern.

All specialist reports were updated in June - July 2019 (prior to the circulation of the Draft BAR for public comment) to take account of input from the I&AP's to date, further assessment by the specialists and changes to the corridor alignment.

4.3.2 Assessment Methodology

4.3.2.1 Overview

For each predicted impact, criteria are ascribed, and these include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale), as well as the probability (likelihood). The methodology is quantitative and generated through a spreadsheet but requires professional judgement in the application of the criteria. There is provision for comment on the significance if the specialists disagree with the level that is auto-calculated.

When assessing impacts, broader considerations are to also be taken into account, these include the confidence with which the assessment was undertaken, the reversibility of the impact and the resource irreplaceability.

IMPACT ASSESSMENT METHODOLOGY
The assessment of the significance of impacts for a proposed development is by its nature, a matter of judgement. To deal with the uncertainty associated with judgement and ensure repeatable results, Aurecon rates impacts using a standardised and internationally recognised methodology adhering to ISO 14001 and World Bank/IFC requirements. For each predicted impact, criteria are applied to establish the **significance** of the impact based on likelihood and consequence, both without mitigation being applied and with the most effective mitigation measure(s) in place. The criteria that contribute to the **consequence** of the impact are **intensity** (at the indicated spatial scale), which also includes the **type** of impact (being either a positive or negative impact); the **duration** (length of time that the impact will continue); and the **extent** (spatial scale) of the impact. The sensitivity of the receiving environment and/or sensitive receptors is incorporated into the consideration of consequence by appropriately

adjusting the thresholds or scales of the intensity, duration and extent criteria, based on expert knowledge. For each impact, the specialist applies professional judgement to ascribe a numerical rating for each criterion according to the examples provided in Table 8.The consequence is then established using the formula:

Consequence = type x (intensity + duration + extent).

Depending on the numerical result, the impact's **consequence** would be defined as either extremely, highly, moderately or slightly detrimental; or neutral; or slightly, moderately, highly or extremely beneficial. These categories are provided in Table 8.

To determine the significance of an impact, the **probability** (or likelihood) of that impact occurring is also taken into account. In assigning probability, the specialist takes into account the likelihood of occurrence but also takes cognisance of uncertainty and detectability of the impact. The most suitable numerical rating for probability is selected from Table 9 below and applied with the consequence according to the following equation:

Significance = consequence x probability

When assigning **probability** to an impact, it is vitally important to distinguish this from the concepts of **frequency and confidence,** with which it is sometimes confused.

- **Probability** refers to the likelihood that an impact will occur.
- **Frequency** refers to the regularity with which an impact occurs. To illustrate the difference between frequency and probability, it must be considered that something that happens infrequently may still be a certainty (i.e. have a high probability). For instance, Halley's Comet only comes close to the sun every 75 to 76 years (i.e. it has a very low frequency), but it is still a certainty.
- **Confidence** (see Table 12) refers to the degree of certainty of a prediction. Confidence may be related to any of the impact assessment criteria (extent, intensity, duration or probability) and is not necessarily only related to probability. Confidence may be influenced by any factors that introduce uncertainty into a prediction.

Depending on the numerical result of this calculation, the impact would fall into a **significance category of very low, low, moderate or high**, and the type would be either positive or negative. Examples of these categories are provided in Table 11.

Once the significance of an impact occurring without mitigation has been established, the specialist must apply his/her professional judgement to assign ratings for the same impact after the proposed mitigation has been implemented.

Lastly, a further point is important when applying these criteria to impacts:

- Specialists need to assess the impact, **not** the source or origin of the impact (i.e. the activity that causes the impact). For instance, although the activity that causes a specific impact may take place over a long period of time, this does not necessarily imply that the impact itself will persist for the same length of time. The assessment must focus on the impact (the change in the environment) rather than on the activity that causes an impact.

The tables on the following pages show the scales used to classify the above variables and define each of the rating categories.

The following tables show the scales used to classify the above variables and define each of the rating categories.

Table 8: Definition of extent, intensity, duration (Consequence criteria)

Criteria	Category	Description	Rank
Extent or spatial influence of impact	**National**	Beyond a 20km radius of the site	4
	Regional	Within a 20 km radius of the site	3
	Local	Within a 2 km radius of the centre of the site	2
	Site specific	On site or within the boundaries of the property	1

Criteria	Category	Description	Rank
	None	None	0
Intensity of impact (at the indicated spatial scale) Note: this incorporates whether the type of impact is negative (-1) or positive (+1)	**High**	Natural and/ or social functions and/ or processes are *severely* altered	4 or -4
	Medium	Natural and/ or social functions and/ or processes are *notably* altered	3 or -3
	Low	Natural and/ or social functions and/ or processes are *slightly* altered	2 or -2
	Very Low	Natural and/ or social functions and/ or processes are *negligibly* altered	1 or -1
	None	Natural and/ or social functions and/ or processes remain *unaltered*	0
Duration of impact	**Permanent**	More than 10 years (after operation)	4
	Long Term	5- 10 years (after operation)	3
	Medium Term	0-5 years (after operation)	2
	Short Term	Up to 18 months	1
	None	Zero time	0

Table 9: Definition of probability criteria

Criteria	Category	Description	Rank
Probability	**Definite**	Estimated greater than 95 % chance of the impact occurring.	4
	Very likely	Estimated 50 to 95% chance of the impact occurring	3
	Fairly likely	Estimated 5 to 50 % chance of the impact occurring.	2
	Unlikely	Estimated less than 5 % chance of the impact occurring.	1
	None	Definitely no chance of occurrence	0

Table 10: Application of consequence ratings

Range		Consequence Rating
-12	-11	**Extremely detrimental**
-10	-9	**Highly detrimental**
-8	-7	**Moderately detrimental**
-6	-5	**Slightly detrimental**
-4	4	**Negligible**
5	6	**Slightly beneficial**
7	8	**Moderately beneficial**
9	10	**Highly beneficial**
11	12	**Extremely beneficial**

Table 11: Application of significance ratings

Range		Significance Rating
-48	-37	**High – negative**
-36	-25	**Moderate - negative**
-24	-13	**Low – negative**
-12	-3	**Very low – negative**
-2	2	**Neutral**
3	12	**Very Low - positive**
13	24	**Low – positive**
25	36	**Moderate – positive**
37	48	**High – positive**

Despite attempts at ensuring objectivity and impartiality, environmental assessment remains an act of judgement and can never escape the subjectivity inherent in attempting to define significance. The determination of the significance of an impact depends on context (spatial and temporal) and intensity of that impact. Since the rationalisation of context and intensity will ultimately be prejudiced by the observer, there can be no wholly objective measure by which to judge the components of significance, let alone how they are integrated into a single comparable measure.

This notwithstanding, in order to facilitate informed decision-making, environmental assessments must endeavour to come to terms with the significance of the environmental impacts. Recognising this, Aurecon has attempted to address potential subjectivity in the current Basic Assessment process as follows:

- Being explicit about the difficulty of being completely objective in the determination of significance, as outlined above;
- Developing an explicit methodology for assigning significance to impacts and outlining this methodology in detail. Having an explicit methodology not only forces the specialist to come to terms with the various facets that contribute to significance (thereby avoiding arbitrary assessment), but also provides the reader with a clear summary of how the specialist derived the significance; and
- Utilising a team approach and internal review of the assessment to facilitate a rigorous and defendable system.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts.

The specialists appointed to contribute to this impact assessment have empirical knowledge of their respective fields and are thus able to **comment on the confidence** they have in their findings based on the availability of data and the certainty of their findings (example provided in Table 12).

During the assessments specialists are requested to note the **Reversibility** of the impacts and **Irreplaceability** of the resource being assessed (refer to Table 13 and Table 14, respectively).

Table 12: Definition of confidence ratings

Rating	Criteria
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

Table 13: Definition of reversibility ratings

Rating	Criteria
Irreversible	The activity will lead to an impact that is permanent.
Reversible	The impact is reversible, within a period of 10 years.

Table 14: Definition of irreplaceability ratings

Rating	Criteria
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere
High	The resource is irreparably damaged and is not represented elsewhere

4.3.1 Assessment of Cumulative Effects

Cumulative impact, in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may be significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities (NEMA EIA Reg 1).

Cumulative impacts have been assessed by each of the specialist studies as part of their assessments.

4.4 Assumptions, Limitations and Gaps in Knowledge

Various methods and sources were used to identify the potential social and environmental aspects associated with the proposed project and used to develop the Terms of References (ToRs) for the specialist studies.

The sources of information for the preparation of this report include, *inter alia*, the following:

- Collection of information specific to the project, as provided by the Proponent:
  - Project description;
  - Methodology for construction of the various project components;
  - Methodology during operations and decommissioning;
  - Expected timeframe for project development;
  - Maps and figures, outlining the proposed facilities; and
  - Technical information relating to design.
- Other relevant BARs/ EIRs prepared for Bas/EIAs undertaken in the area;
- Environmental baseline literature and desktop spatial surveys for this site and surrounding areas;
- Environmental baseline surveys for this site and surrounding areas from site visits undertaken by the specialists;
- Consultation with the project team (including specialists); and
- Consultation with I&APs, including authorities.

In undertaking the investigation and compiling the BAR, the following has been assumed:

- The information provided by the Proponent is accurate and unbiased, and no information that could change the outcome of the BA process has been withheld.
- The scope of this investigation is limited to assessing the environmental impacts associated with the proposed solar facility and grid connection infrastructure.
- The BA process is based on Best Practice Guidelines which were available at the time of writing this report.
- Additional linear infrastructure, such as roads, will use existing access tracks as far as possible.
- The proposed solar facility and grid connection infrastructure is unlikely to be decommissioned, however, the potential impacts associated with the decommissioning phase are anticipated to be similar to the construction phase.

Limitations and gaps in knowledge pertaining to the BA process include:

- No indication of commencement date of construction phase.
- Type of solar panels – fixed axis or single axis tracking

Any limitations and gaps in knowledge that have been encountered by the specialists are identified in their respective assessments (Annexure D).

The assumptions, limitations and gaps in knowledge will not undermine the EAPs assessment or findings of the proposed solar facility and grid connection infrastructure.

5 DESCRIPTION OF THE PROPOSED VELD PV SOUTH

5.1 Site Location and Extent

The proposed Veld PV South site is located approximately 23 km and 35 km (original site) north-west of Aggeneys, 90 km east of Springbok and 75 km north-west of Pofadder in the Northern Cape, respectively. The site can be reached either via the N14 by the existing farm access or from the Pofadder/ Concordia road (Refer Figure 1). The project footprint is approximately 277 ha. The general locality is in the Khai-Ma Local Municipality, Namaqua District Municipality, Northern Cape Province north west of Aggeneys and in the area between Pella in the east and Goodhouse in the west.

5.2 Technical Description of the Project

5.2.1 Components of the Facility

The proposed Veld PV South project will consist of the following:

- **A photovoltaic component**, comprising of numerous arrays of PV solar panels mounted on steel tracking mounts (Figure 4) and footings with associated support infrastructure to generate up to 75 MW of renewable energy (**Figure 5**)

Figure 4: Solar panel arrays (http://www.popularmechanics.co.za)

- **400 V-33kV transformers** in each block

- **On site Substation** containing a step-up transformer the 33-kV power to 132 kV to connect to the new 132 kV overhead transmission line, or 220 kV connecting directly to the existing transmission line through a LILO connection
- **Internal cabling** laid underground when feasible to connect the PV modules to the on-site substation and inverters;
- **Internal access roads** for servicing and maintenance of the site;
- **Stormwater infrastructure**;
- **Temporary construction areas** for use during construction;
- **Buildings**, including an operations and maintenance building, a connection building, control building, guard cabin;
- **Weather stations** within and along the fenced perimeter of the site; and
- **Perimeter fencing**

5.3 Description of PV Technology

Photovoltaic facilities use light energy from the sun, known as solar irradiation, to generate electricity through a process known as the photovoltaic effect. The PV effect is the creation of voltage or electric current, which occurs when photons of light energise electrons into a higher state of energy, thereby allowing them to act as charge carriers for an electric current.

5.3.1 Photovoltaic components

The size of the PV modules varies between different PV technology types but can typically be between two to four square metres (m^2) each and sufficiently durable to last in excess of 20 years. These modules are arranged in arrays. The solar panels produce Direct Current (DC) electricity that runs through an inverter to produce Alternating Current (AC) electricity. The electricity can then be evacuated to a substation to supply to the National Grid.

.

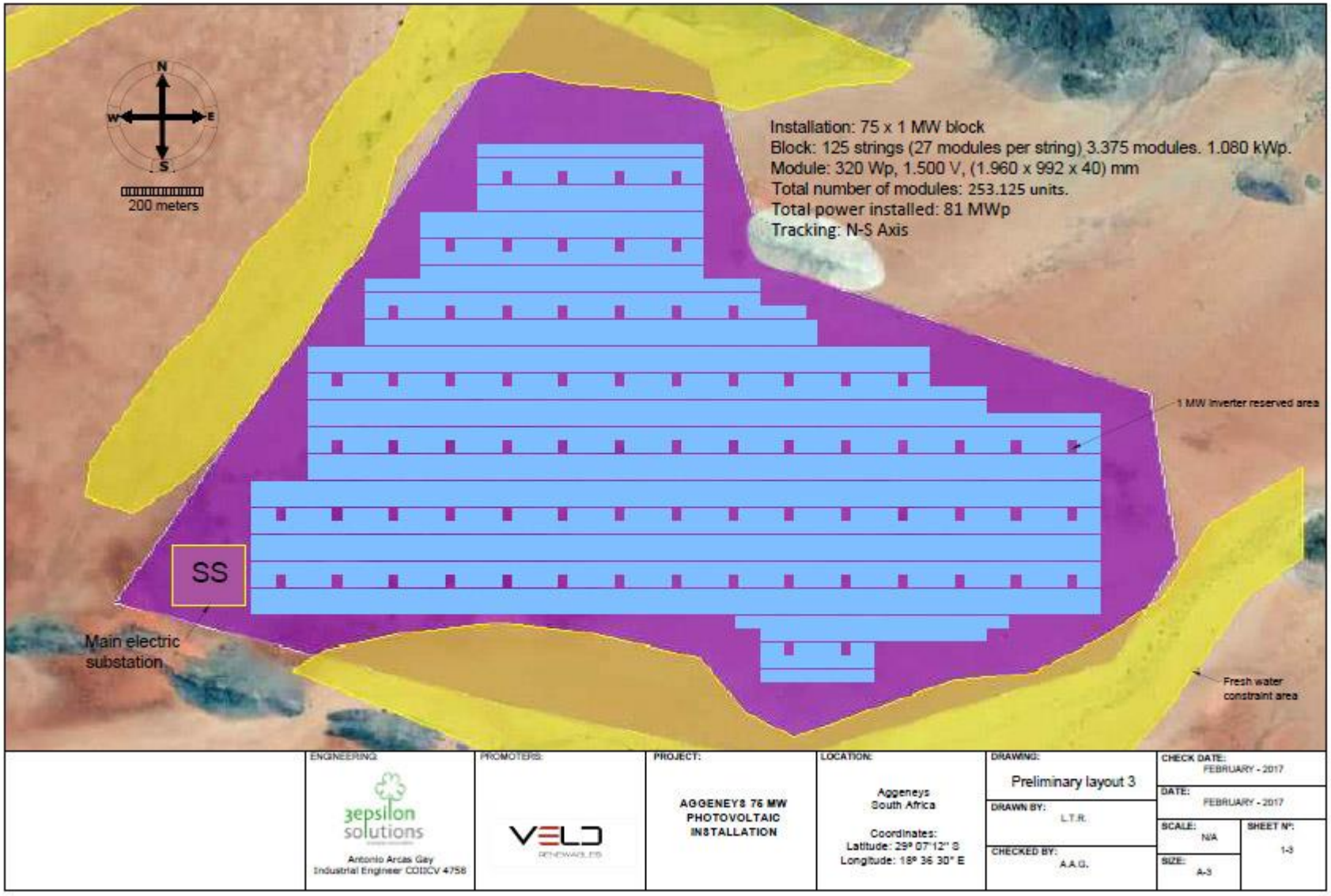


Figure 5: Veld PV South module layout (purple area is the solar panels, yellow the solar focus area)

5.4 Transmission and Distribution

For the electricity generated by the Project to be used, it needs to be collected, transformed and then distributed through the national grid. The following components outlined below are required:

5.4.1 On-site Substation and Transformer

Energy produced by the PV panels will be transmitted to the local 400V to 33 kV transformers from where the energy is transmitted to the step-up transformer. This substation is comprised partly of a control room which will measure power voltage, input, output, power fluctuation and other performance information. The remainder of the substation is comprised of facilities and infrastructure typical of a substation, including an area with a subterranean earthing mat, onto which a number of concrete plinths are constructed. This, together with a number of earthing rods, will provide an earth for lighting and possible short circuit currents. Switching gear, step-up transformers and protection equipment are also mounted on concrete plinths within the collector station. The entire substation facility will cover an area of approximately 1 ha (approximately 100m X 100m).

The area will be levelled and compacted. If required, imported material will be sourced or excess material from the foundations will be used as fill. The area could then be covered with a permeable geotextile and earthing mat and surfaced with approximately 50 mm crushed stone. This would serve as a fire protection measure and prevent erosion and dust production. The control room will be fitted with a remote monitoring system to monitor both unauthorised access and technical aspects associated with the operation of the project.

The purpose of this transformer and substation is to increase (“step-up”) the voltage of the electricity from 33 kV to the proposed 132Kv line to the Aggeneys substation or the 220 kV to loop into the existing Eskom 220 kV line.

5.4.2 Grid Connection

The proposed facility will connect to the grid via one of the following options:

- Either a LILO grid connection with a 33 kV/220 kV substation on site and a transmission line of 2100 m, connecting to the existing 220kV line that runs past the west of the site, or
- A grid connection with a 33 kV/132 kV substation on site, and a 132 kV transmission line of 27km in length that runs up to and directly alongside the existing 220 kV line to the west of the site to the Aggeneys substation. If this option is chosen, this infrastructure will be shared with the proposed PV North facility being applied for under DEA Reference No. 14/12/16/3/3/1/2051.

Eskom will determine the option to be implemented at the time of construction.

5.4.3 Cabling

Each block of panels will contain a 400-33Kv transformer from where it be connected to the substation via medium voltage cables (~33 kV lines). Where feasible, these cables will be laid underground in trenches running generally alongside internal roads. Where burying of cables is not possible due to technical, geological, environmental or topographical constraints, then overhead powerlines will be erected. For subterranean cabling, should the on-site excavated material be unsuitable to be used as cable bedding within the trenches, imported bedding material may be needed which will be sourced off-site. This will be obtained from a registered, commercial source.

5.5 Additional Infrastructure

5.5.1 Access, Service Roads and Sidings

The proposed southern access from the N14 would follow an unsurfaced road which runs in a northerly direction from the farm entrance south west of Aggeneys.

Access and service roads will be required to access the project area and associated infrastructure. It is proposed that the existing farm roads be upgraded and used.

Where necessary, slight road deviations may be required on the layout to ensure that the corners are opened, and gradients are reduced to accommodate the delivery to the site.

Internal access roads will be up to 8 m wide, including stormwater channels alongside the road, as needed. During construction, internal access roads may need to be widened to accommodate haulage of large loads and vehicles, and to accommodate the stockpiling of soil material. However, these roads will be rehabilitated after construction. The internal access roads will remain in place for the lifespan of the Project to facilitate operational and maintenance activities. Provided that water is not permitted to concentrate by running along the length of the road but rather discharged immediately to roadside through appropriate cambering of the surface, no significant erosion issues are expected. Stormwater control measures would likely be limited to occasional cross drain / berms. On longer sections of road, additional storm water control measures may be required, and these will be designed together with the road.

Access roads will be shared with the proposed PV North facility being applied for under DEA Reference No. 14/12/16/3/3/1/2102.

5.5.2 Fencing

A security gate and associated guardhouse will be placed at the entrance to the project site to prevent unauthorised vehicular access to the project.

Existing fencing will remain around the perimeter of the properties. This will enable livestock and wild fauna to continue to utilise the area underneath the modules as rangeland or a migratory corridor. Fencing will be erected around the onsite substation and operations and maintenance buildings for security and safety reasons. Construction phase fencing will be brought on where needed in consultation with land owners.

5.5.3 Water and Electricity

A preliminary approximation of the water requirements for the construction phase of the proposed project are as follows:

During the construction period (12 months) the water requirement varies from 5 to 30 kℓ per day. This water will largely be used for the following: road construction; cleaning equipment after concrete pours and dust suppression on roads.
During the operational phase (approximately 20 years) the water requirement would be an estimated 10 kℓ per month for 11 months of the year, increasing to approximately 300 kℓ for 1 month of the year for annual road maintenance. Water will also be required bi-annually for cleaning of panels at approximately 250 kℓ.
Basic sanitation will be provided on site during the construction and operational phases in the form of portable toilets and conservancy tanks. Wastewater will be collected at regular intervals and transported to the Municipal Waste Water Treatment Works.

Electricity for construction could be obtained from temporary diesel generators and possibly small-scale mobile photovoltaic units. The Khai-Ma Municipality indicated in a letter dated 15 May 2019 that bulk water for the proposed Veld PV South Facility should be purchased from Sedibeng Water (Refer Annexure C). Sendibeng Water has confirmed that they will be able to supply water for the proposed project during the construction and operational phases (Refer Annexure C)

5.6 Project Phases

5.6.1 Pre-construction Phase Activities

Pre-construction activities involve tasks that establish the site, both in terms of the construction activities, as well as the social and environmental management systems. During this time, all effort should be made to ensure that the planning of the project is completed effectively to ensure that there are no delays to the project and that no unnecessary environmental degradation occurs.

During this period, the footprint boundaries will be demarcated, and no-go areas will be identified. Site clearance will occur for the formal construction areas, module array footprints, access routes, construction camps and on-site substation. Storage areas for materials and spoil and topsoil piles should be identified.

Within the formal construction area, a maintenance and storage building along with a guard cabin will be established for the duration of the construction period.

A significant percentage of the solar components are likely sourced locally where possible but may need to be imported into South Africa. Thus, the origin of the transportation routes to site nationally would start at one of either one of the main industrial hubs and/or the ports in Southern Africa (most likely the Port of Saldanha).

It is also important to ensure that social risk is insured during the construction period by ensuring that an appropriate grievance mechanism is in place. Furthermore, all of the Contractors' staff must undergo training to ensure they understand the environmental sensitives of the site. Refer to the EMPr in annexure E.

5.6.2 Construction Activities

Assuming all necessary authorisations are obtained, and the project is selected under Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) construction of the proposed 75 MW PV facility would likely be planned to be implemented and operational by the end of 2024.

The construction phase of a typical 75 MW facility would last approximately 12 to 15 months. Accommodation would be provided for the local and non-local construction workforce within relatively close proximity to the site given the remoteness of the site.

During construction, equipment laydown areas and storage facilities would be required for all the PV facility components, including construction materials and water. In addition, a construction camp would house the batching plant, waste and recycling area, site offices, canteen, kitchen, parking area and ablutions. These facilities would be established on the project site.

The waste and recycling area will include:

- **Construction waste materials:** These would be stored in suitable containers, likely both closed and open skips;
- **Wastewater and sewerage:** This would be stored in suitable conservancy tanks; and
- **Valuable recyclables:** This would be kept in a separate lockable container.

All containers and tanks containing waste and recyclables will be serviced by an appointed service provider, who would be contracted for frequent servicing as agreed/required to dispose and/or recycle the waste at suitably licensed facilities. Another option would be to have an agreement in place with Verdana Zinc international at Aggeneys for collection, disposal and recycling of domestic waste with their waste management.

Construction vehicles would make use of the existing roads, namely the N14, to transport equipment and material to the site. Approximately 600 truckloads, which will carry 530 containers (a combination of 6 foot and 12-foot containers), will be required during construction of the 75 MW. Ten truckloads will be required for the buildings and substation. These deliveries would be most intense at the beginning of the construction period

5.6.3 Operational Activities

The Power Purchase Agreement (PPA) is for a 20-year period which is considered the proposed PV facility's lifespan. During this time, the remainder of the farm portions will either continue to be used for agriculture or may become a conservation area. The farm is currently in process of being purchased by Verdana Zinc international as a biodiversity offset.

An estimated 20-25 employment opportunities would be created through the 75 MW project during the operational phase.

Less than 80 m^3 of fuel and lubrication oil would be stored on site. This volume falls below the triggers of any listed activities in terms of NEMA. However, the necessary precautionary measures would be put in place and will be included in the Environmental Management Programme (EMPr).

To ensure maximum energy generation by the PV panels it is important to undertake regular cleaning. Dust, dirt, pollen, and bird droppings can significantly reduce the efficiency of PV panels. Although the frequency of panel cleaning would depend on weather conditions, panels would need to be washed approximately two times a year. Some softeners may be added to the washing water. A typical PV facility requires approximately 10 m^3 of water per megawatt peak (MWp). Thus, cleaning of the PV modules would require approximately 20 m^3/ MWp of water, which equates approximately 4,600 m^3 of water per annum. Water is proposed to be brought in by bowser and either supplied by municipality under the Verdana Zinc international supply at Aggeneys under agreement by both or by a private contractor.

5.6.4 Decommissioning Phase

The PV facility's PPA with DoE would be for a 20-year period. It is likely that a new PPA agreement would be negotiated with the possibility of upgrading the proposed facility to more advanced technologies, to extend its operational lifespan. However, this would only be investigated towards the end of this period. Should the facility undergo expansion or significant upgrading, an environmental authorisation may be required in accordance with the prevailing legislation at the time.

Should decommissioning be considered, it would potentially take between 6 to 12 months to complete. The impacts associated with the decommissioning phase generally correlate closely with impacts identified for the construction phase. After disconnecting the PV infrastructure from the electricity network, the PV module components would be removed and recycled / resold as far as possible. The structures would be dismantled and the concrete pile foundations (if used) would be removed. All underground cables would be excavated and removed, and buildings would be demolished and removed.

The rehabilitation of the disturbed areas would form part of the decommissioning phase. The aim would be to restore the land to its original substratum characteristics (or as near as possible). The restoration activities would include the following:

- Removal of all foreign materials and debris;
- Reshaping of the land to conform with the natural topography, if necessary;
- Breaking up compaction (ripping / scarifying) where required, loosening the soil and the redistribution of topsoil;
- Replanting with a suitable indigenous grass seed mix;
- Potentially Light irrigation to re-establish a biological soil crust and trigger germination and early growth if required by a rehabilitation specialist; and
- Removal of alien vegetation for a period of no less than 1 year, or as otherwise prescribed by a rehabilitation specialist.

Veld PV South will undertake a high-level closure liability assessment to confirm what funds will be necessary for rehabilitation of the site during decommissioning.

5.7 Project Need and Desirability

5.7.1 Overview of Need and Desirability

The 'need and desirability' of the project should be evaluated against the strategic context of the development proposal along with the broader societal needs and the public interest. According to the DEA Guideline on Need and Desirability (DEA, 2010[6]), the concept of 'need and desirability' relates to the nature, scale and location of development being proposed, as well as the wise use of land. The concept of 'need and desirability' can be explained in terms of the broader meaning of its two components, need primarily refers to time, and desirability refers to place. It is acknowledged that 'need and desirability' are interrelated and the two components collectively should be considered in an integrated and holistic manner.

According to the DEA Guideline (DEA, 2010), the strategic context for the need and desirability of an activity can be reviewed in light of what is envisioned for a specific area, specifically what has been proposed in a municipal Integrated Development Plan (IDP) and Spatial Development Framework (SDF). These planning tools provide direction as to the desired spatial form of a municipality. Similarly, municipal Environmental Management Frameworks (EMFs) also provide the desired spatial form in terms of the environmental context of an area. Furthermore, the DEA Guideline (DEA, 2010) states that the need and desirability of an activity should be evaluated against the principles of "*promoting justifiable economic and social development*" as well as the

[6] DEA. 2010. Guideline on Need and Desirability, Integrated Environmental Management Guideline Series 9, Department of Environmental Affairs (DEA), Pretoria, South Africa.

principles of "*securing ecological sustainable development and use of natural resources*" as set out set out in the bill of rights in the Constitution.

The strategic context for the project is described below, thereafter Table 16 provides more specific responses to to questions included in the Needs and Desirability Guideline[7].

5.7.2 Strategic Context

The need for renewable energy is well documented and reasons for the desirability of solar energy include:

Utilising the most abundant natural resource available to South Africa;
Meeting nationally appropriate emission targets in line with global climate change commitments;
Enhancing energy security by diversifying generation; and
Creating a more sustainable economy.

5.7.3 Utilising resources available to South Africa

As illustrated in Figure 6, the study area received between 2,275 kW/ annum/ m^2 and 2,350 kW/ annum/ m^2 radiation in the period from 1994 to 2013. The proposed site is therefore considered to have considerable solar resource potential.

South Africa generates most of its electricity from coal, of which there is currently a ready supply. However, the 2010 Integrated Resource Plan (Department of Energy, 2010) has highlighted the need for rapid expansion of renewable energy power generation.

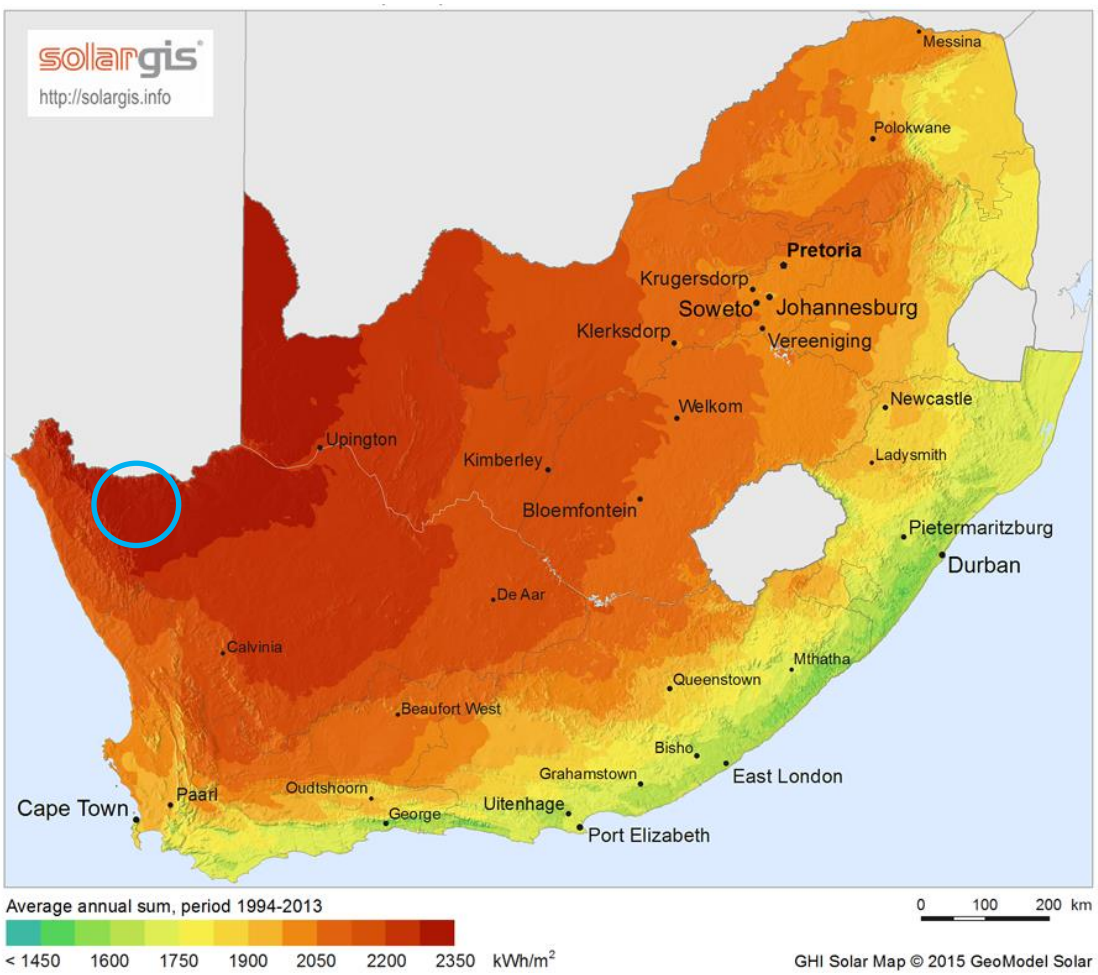


Figure 6: Global Horizontal Irradiation for South Africa (source: Solargis, 2015[8]). Project site in the blue circle.

[7] DEA&DP. 2011. Needs and Desirability Guideline.

[8] Solargis. 2015, Available at http://solargis.info/doc/free-solar-radiation-maps-GHI, Accessed on 8 September 2015.

5.7.4 Meeting nationally appropriate Emission Targets in line with Global Climate Change Commitments

As can be seen by the numerous policies and legislation described in Section 5.7.8 the need for renewable energy is well-documented. Due to concerns such as climate change, and the on-going exploitation of non-renewable resources, there is increasing international pressure on countries to increase their share of renewable energy generation. As a result, the South African Government has set a target to supply 17.8 GW of the electricity supply from renewable energy sources, of which 8.4 GW will be solar energy, over a 20 year period from 2010 to 2030 (Department of Energy, 2010). The proposed PV project is expected to contribute positively towards climate change mitigation.

Renewable energy is recognised internationally as a major contributor in protecting the climate, nature and the environment, as well as providing a wide range of environmental, economic and social benefits that can contribute towards long-term global sustainability.

5.7.5 Renewable Energy Development Zone

On 24 February 2016 a press release from the Department of Environmental Affairs (DEA) stated:

"Cabinet on Wednesday, 17 February 2016, approved the gazetting of 8 Renewable Energy Development Zones (REDZ) and 5 Power Corridors.

These Renewable Energy Development Zones and Power Corridors are geographical areas where wind and solar Photovoltaic technologies can be incentivized and where 'deep' grid expansion can be directed and where regulatory processes will be streamlined.

The REDZs act as energy generation hubs and provide anchor points for grid expansion thereby allowing for strategic and proactive expansion of grid into these areas. This will ensure that the grid expansion does not hamper the progress of the renewable energy power purchase agreement process.

The REDZs and Power Corridors support 2 of the 18 Strategic Integrated Projects (SIPs) which were identified in the Infrastructure Development Plan which is aimed at promoting catalytic infrastructure development to stimulate economic growth and job creation.

To ensure that when required, environmental authorisations are not a cause for delay, the Department of Environmental Affairs (DEA) embarked on a program of Strategic Environmental Assessments (SEAs) for large-scale developments to support the SIPs. The intention of undertaking Strategic Environmental Assessments is to pre-assess environmental sensitivities within the proposed development areas at a regional scale to simplify the site-specific environmental impact assessments (EIA) when they are undertaken, and to focus the assessment requirements to addressing the specific sensitivity of the site.

The REDZs and Power Corridors were identified through the development of 3 Strategic Environmental Assessments as part of the Departments Strategic Environmental Assessment programme. The outputs of these 3 SEAs must now be gazetted to allow them to be implemented.

The outputs of the SEAs directly relate to several government priorities including:

- *Contributing to reducing present current energy constraints by facilitating renewable energy development in strategic areas in South Africa;*
- *Addressing the major objectives of the National Development Plan, namely transitioning to a low carbon economy, developing infrastructure to create jobs and reducing the regulatory burden and the cost of doing business;*
- *Contributing to achieving the renewable energy target identified in the Integrated Resource Plan and implementing the renewable energy independent power producers' program (REI4P) implemented by the Department of Energy and National Treasury;*
- *Promoting the green economy and sustainable development; and*
- *Promoting intergovernmental coordination and integrated authorisations*

The outcome of the gazetting process will mean that wind and solar PV activities within the 8 Renewable Development Zones and electricity grid expansion within the 5 Power Corridors will be subjected to a Basic Assessment and not a full EIA process.

This reduces the review and decision-making time and the level of assessment required for each project based on the fact that scoping level pre-assessment was already undertaken in those areas. From an application for Environmental Authorisation taking 300 days it will now be completed in 147 days."

All of the proposed sites fall within the proposed Phase 1 Springbok Renewable Energy Development Zone (Figure 6). However, although approved to be gazetted by the cabinet, the protocols / minimum requirements and streamlined environmental authorisation process will only be gazetted once the REDZ demarcation is

5.7.6 Enhancing Energy Security by Diversifying Generation

The establishment of the proposed PV facility would strengthen the existing electricity grid for the area by providing additional electricity supply during peak period when demand for electricity is highest. Moreover, the project would contribute towards meeting the national energy target for the introduction of renewable energy into South Africa, as set by the Department of Energy (DoE).

The proposed project would also have international significance as it contributes to South Africa being able to meet some of its international obligations, by aligning domestic policy with internationally agreed strategies and standards as those set by the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, to both of which South Africa is a signatory.

5.7.7 Creating a more Sustainable Economy

The need to improve the quality of life for all, and especially for the poor, through job creation is critical in South Africa. It is expected that the proposed project would contribute directly to the upliftment of the individuals involved with the construction and operation of the project. Skills development, and the transfer thereof, and local community involvement would be two of the priorities. Community involvement would either be through direct employment or indirectly through service industries. This would be enhanced as far as possible and this will be explored further through a socio-economic assessment. It is anticipated that job opportunities amounting to approximately between 800,000 to 1,000,000 hours would be created during the construction phase, depending on the procurement method and the primary contractor.

Additional potential benefits include:

Reducing the demand on scarce resources such as water, as the generation of energy from PV facilities uses less water per MW/h than coal-fired facilities;
Reducing pollution, as the generation of energy from PV facilities produces far less pollution per MW/h than coal-fired facilities;
Local economic development (see Table 15); and
Local skills development.
Numerous studies and reports have attempted to quantify the employment creation potential of renewable energy per unit of power installed or generated. AGAMA Energy (2003)[9] established that solar PV has the largest employment creation potential of all the renewable technologies, as indicated in Table 15.

Table 15: Renewable energy employment potential in terms of the gross direct jobs created per GWh for the various technologies (Agama Energy, 2003)

Employment per Gigawatt Hour (GWh)						
Technology	**Fuel**	**Manufacture**	**Installation**	**O&M**	**Other**	**Total**
	/GWh	**/GWh**	**/GWh**	**/GWh**	**/GWh**	**/GWh**
Solar thermal	0	3	7	0.4	0	10.4

[9] Agama Energy. 2003. Employment Potential of Renewable Energy in South Africa.

Solar PV	0	32.9	21.2	4.4	3.5	62
Wind	0	8.4	1.3	2.6	0.3	12.6
Bio-energy	0	3.55	3.55	7.2	0	14.3
Hydro	0	8.4	1.3	2.6	0.3	12.6

Furthermore, the Northern Cape Provincial Development and Resource Management Plan / Provincial Spatial Development Framework (PSDF) (2012) provides direction for the future spatial form of the Province. Specifically, an effective, competitive and responsive surface infrastructure network is identified as crucial for ongoing economic development of the province. Renewable energy infrastructure is a component thereof and therefore the PSDF provides objectives in this regard. These include, inter alia, policy regarding the following (Northern Cape, Office of the Premier. 2012):

(C7.3) b) *Renewable energy sources (e.g. wind, solar thermal, biomass, and domestic hydroelectricity generation) are to comprise 25% of the province's energy generation capacity by 2020.*

(C8.2.3) a) Promote the development of renewable energy supply schemes. Large-scale renewable energy supply schemes are strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimizing detrimental environmental impacts.

d) Develop and institute innovative new energy technologies to improve access to reliable, sustainable and affordable energy services with the objective to realize sustainable economic growth and development. The goals of securing supply, providing energy services, tackling climate change, avoiding air pollution and reaching sustainable development in the province offer both opportunities and synergies which require joint planning between local and provincial government as well as the private sector.

e) Develop and institute energy supply schemes with the aim to contribute to the achievement of the targets set by the White Paper on Renewable Energy (2003). This target relates to the delivery of 10 000 GWh of energy from renewable energy sources (mainly biomass, wind, solar, and small-scale hydro) by 2013.

At the district level, the Namakwa DM SDF identifies a number of major infrastructure projects, which includes "*the promotion of domestic and large-scale solar energy usage and projects such as wind and solar farms subject to appropriate guidelines and siting principles*" (Namakwa DM, 2012). The plan specifically lists wind and solar farm siting principles based on slope, geology, soils, surface hydrology, ground water and vegetation. The Namakwa DM Local Economic Development Strategy also acknowledges the potential for renewable energy within the context of sustainable development and "going green" and that the DM has the opportunity to position itself strategically as "South Africa's District of Renewable Energy production" (Urban-Econ, 2009).

This framework provides context and justification for the Need and Desirability of the project, which is detailed further through application of the checklist in Table 16 below.

5.7.8 Need and Desirability Checklist

The project specific responses to to questions included in the Needs and Desirability Guideline[10] are provided in Table 16 below.

Table 16: Need and Desirability of the Proposed ProjectResponses through Application of the Need and Desirability Guideline

Need and Desirability	
Need (Timing)	
Question	Response
1. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority i.e. is the proposed development in	The Northern Cape SDF and the Namakwa DM SDF both identify renewable energy projects as a contributor to the regional and local economies at present and in the future. Such projects are considered as 'green infrastructure' thereby meeting developmental and energy needs in a sustainable manner. The Namakwa IDP (2016-2017) identifies renewable

[10] DEA&DP. 2011. Needs and Desirability Guideline.

Need and Desirability	
Need (Timing)	
Question	Response
line with the projects and programmes identified as priorities within the Integrated Development Plan (IDP)?	energy as a focus area within their programme of action, specifically in relation to economic development and the "optimal utilization of natural resources in a sectoral manner". Khai-Ma LM IDP (2012 – 2017) has recognised the potential that renewable energy developments has in achieving the spatial objective of 'creating sustainable urban and rural settlements', especially in terms of facilitating the development of SMMEs. Renewable energy development is one of the spatial strategies of the LM and the LM aims to ensure that infrastructure is available for investors (e.g. tarred roads and storm water, sanitation and water), to encourage and support such developments. Similarly, the SDF identifies the 'employment of renewable energy technology' as a spatial strategy with projects that include 'Policy on development of sustainable solar energy farms' with the Department of Energy being the implementing agent. These plans indicate that the solar resource at the provincial and local level is recognised and included in spatial planning objectives and strategies. The area proposed is currently zoned as Agricultural land. The respective landowners have signed an option for a long-term lease agreement with the Proponent. The leased land has very low agricultural potential and grazing could continue amongst the modules and as such it would not negatively affect the economic viability of the farm. The additional income would safeguard the economic sustainability of the farms.
2. Should development, or if applicable, expansion of the town/ area concerned in terms of this land use (associated with the activity being applied for) occur at this point in time?	Yes. The area is identified as being within a REDZ and therefore has been earmarked for future renewable energy developments that could be awarded in terms of the Renewable Energy Independent Power Producer Procurement Process (REIPPPP) which is currently underway.
3. Does the community/ area need the activity and the associated land use concerned (is it a societal priority)?	Yes. Current challenges in the Khai-Ma LM are poverty, unemployment, and service delivery backlogs. Renewable energy developments will assist with broadening the economic base and creating job opportunities for local people. The current land use in the Khai-Ma LM is sheep farming and although livestock grazing is one of the two main economic activities (along with mining), the IDP identifies renewable energy as an emerging sector in terms of employment. Therefore, broadening the economic base through 'green energy development' along with job opportunities and SMME potential will be of immediate benefit to the local communities. Secondary economic benefits may include an increase in service amenities through an increase in contractors and associated demand for accommodation and other services.
4. Are there necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	The necessary services are appropriate. The proposed grid connection will either consist of a 132 kilovolt (kV) overhead powerline, approximately 27 km in length that would feed into the national electricity grid at the Aggenys substation. A 35m servitude will be required for the construction of the powerline and it will run adjacent to the existing 220 kV powerline that runs past the site, comprising single circuit steel monopoles with bird perches, or Veld PV South would connect via a 220 kV Loop-in, Loop-out (LILO) line between the facility and the existing 220 kV transmission line, with the line being approximately 2100 m in length. However, the remote location means that water infrastructure is not in place and would need to form a component of the project. Anecdotal evidence indicates that there is a surplus of water in Aggeneys hence the provision of water is unlikely to be a limiting factor.
5. Is this development provided for in the infrastructure planning of the municipality, and if not, what will the implication be on the infrastructure planning of the municipality (priority and placements of services)?	Yes. Although the project is not specifically mentioned in the municipal planning reports reference is made of solar energy projects and the need to upgrade infrastructure to accommodate renewable energy developments. For example, the Khai-Ma LM aims to ensure that infrastructure is available for investors (e.g. tarred roads and storm water, sanitation and water), to encourage and support such developments.

Need and Desirability	
Need (Timing)	
Question	Response
	Water, sanitation and electrical services required for the construction and operation of Veld PV South will be provided by the appointed contractor, and additional municipal services are not expected to be required for the proposed development (e.g. potable water will be trucked to site for the mine or private contractor, waste water will be collected in conservancy tanks and transported to an appropriate wastewater treatment site, and on-site generators will be utilised etc.). Once the proposed project is operational, there would be a very limited requirement for municipal services. Hence the project is anticipated to have minimal implications for municipal infrastructure planning.
6. Is this project part of a national programme to address an issue of national concern or importance?	Yes. The establishment of the proposed facilities would strengthen the existing electricity grid for the area. Moreover, the project would contribute towards meeting the national energy targets as set by the DoE, of a share of all new power generation being derived from IPPs. The 2010 Integrated Resource Plan (IRP) developed by the DoE for the 2010 to 2030 period aims to achieve a "*balance between an affordable electricity price to support a globally competitive economy, a more sustainable and efficient economy, the creation of local jobs, the demand on scarce resources such as water and the need to meet nationally appropriate emission targets in line with global commitments*". The IRP provides for an additional 20,409 MW of renewable energy in the electricity mix in South Africa by 2030.

Table 17: Need and Desirability of the Proposed ProjectResponses through Application of the Need and Desirability Guideline

Need and Desirability	
Desirability (Placing)	
Question	Response
1. Is the development the best practicable environmental option for this land/ site?	Yes. The project is located within a very arid region of the Northern Cape where agricultural potential is very low. Low intensity sheep farming forms the predominant land use. The agricultural scoping study detailed in Chapter 7.1 identified that the agricultural potential of the study areas is low and the remote location means that there are few other potential land uses that could be supported in this location.
2. Would the approval of this application compromise the integrity of the existing approved Municipal IDP and SDF as agreed to by the relevant authorities?	No. The Project is in line with the Khai-Ma LM IDPs which recognise the need for the development of renewable energy. The Namakwa DM IDP further identifies renewable energy in their programme of action as an area of economic development. The Namakwa DM SDF identifies the spatial planning category for the area as an 'extensive agricultural area (grazing)' and the proposed site will not be permanently transformed and can be returned to full agricultural use should the facility be decommissioned.
3. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in Environmental Management Frameworks (EMFs)), and if so, can it be justified from in terms of sustainability considerations?	Yes. The Namakwa LM EMF (2011) shows that the study area is in an area of high sensitivity which is mapped at a broad scale. However, much of the district that corresponds with this high potential also corresponds with the most favourable location in terms of solar resource. This is supported by the REDZ in which the project falls. To justify the pursuit of solar energy within this region would require ground-truthing of the study to obtain more detailed information on the environmental sensitivities and potential associated impact. The vegetation on the site has low sensitivity and given that and other attributes of the site the impact on the vegetation and habitat would be Low negative (pre- and post-mitigation). There is no part of the main Veld PV South that has any 'red flags' except for the requirement to relocate plants *Hoodia gordonii*. In addition, along the southern boundary of the site, care should be taken to avoid impact on trees of *Boscia albitrunca*. This should be possible because the trees are mostly within the area excluded due to freshwater ecological constraints. However, if disturbance of any *Boscia albitrunca* trees is unavoidable, a permit for disturbance or removal of such trees would be required from the Department of Environment, Forestry and Fisheries (DEFF).

Need and Desirability	
Desirability (Placing)	
Question	Response
4. Do location factors favour this land use (associated with the activity applied for) at this place?	Yes. Suitability of the site includes the solar resource and the availability of grid connection to evacuate power from the Project into the national grid; the accessibility of terrain from a construction and access perspective; the topographical features; the low agricultural potential of the site; the support of the landowners concerned; the avoidance of environmental sensitivities as well as various economic considerations which include the feasibility of the project in terms of financial and technical perspective.
5. How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/ natural environment)?	The impacts on the natural and cultural areas have been assessed in Chapter 7 and it has been found most of the project's impacts are considered to have a lower significance. The vegetation on the site has low sensitivity and given that and other attributes of the site the impact on the vegetation and habitat would be Low negative (pre- and post-mitigation). There is no part of the main Veld PV South that has any 'red flags' except for the requirement to relocate plants *Hoodia gordonii*. In addition, along the southern boundary of the site, care should be taken to avoid impact on trees of *Boscia albitrunca*. This should be possible because the trees are mostly within the area excluded due to freshwater ecological constraints. However, if disturbance of any *Boscia albitrunca* trees is unavoidable, a permit for disturbance or removal of such trees would be required from the Department of Environment, Forestry and Fisheries (DEFF).
6. How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?	The socio-economic impacts have been assessed and it has been found that the areas are extremely remote with very few receptors close enough to the projects to be impacted negatively.
7. Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?	No. The opportunity cost of the proposed project is the loss of future agricultural production (grazing) on the site during the operational lifespan of the project. The current low agricultural potential of the land and it should also be considered that there is the possibility that grazing could continue upon decommissioning and rehabilitation in the longer term. On this basis, the opportunity costs are not considered unacceptable.
8. Will the proposed land use result in unacceptable cumulative impacts?	Potential cumulative impacts associated with the proposed project have been assessed in the respective specialist studies. Whilst negative cumulative impacts are expected, none are considered unacceptable.

6 CONSIDERATION OF ALTERNATIVES

The NEMA requires that alternatives are considered during the EIA process. An alternative can be defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004).

The DEA&DP Guideline on Alternatives (2013)[11] states that: "every EIA process must identify and investigate alternatives, with feasible and reasonable alternatives to be comparatively assessed. If, however, after having identified and investigated alternatives, no feasible and reasonable alternatives were found, no comparative assessment of alternatives, beyond the comparative assessment of the preferred alternative and the option of not proceeding, is required during the assessment phase. What would, however, have to be provided to the Department in this instance is proof that an investigation was undertaken and motivation indicating that no reasonable or feasible alternatives other than the preferred option and the no-go option exist."

The 2014 EIA Regulations (GN R982) provide the following definition: "*Alternatives*", in relation to a proposed activity, means different ways of meeting the general purpose and requirements of the activity, which may include alternatives to the -

(a) property on which or location where the activity is proposed to be undertaken;

(b) type of activity to be undertaken;

(c) design or layout of the activity;

(d) technology to be used in the activity;

(e) operational aspects of the activity; and

(f) includes the option of not implementing the activity ("No-Go" alternative).

In addition to the list above, the 2013 DEA&DP Guidelines on Alternatives also considers the following as alternatives:

(a) **Demand alternative:** Arises when a demand for a certain product or service can be met by some alternative means (e.g. the demand for electricity could be met by supplying more energy or using energy more efficiently by managing demand).

(b) **Input alternative:** Input alternatives are applicable to applications that may use different raw materials or energy sources in their process (e.g. Industry may consider using either high sulphur coal or natural gas as a fuel source).

(c) **Routing alternative:** Consideration of alternative routes generally applies to linear developments such as power line servitudes, transportation and pipeline routes.

(d) **Scheduling and timing alternative:** Where a number of measures might play a part in an overall programme, but the order in which they are scheduled will contribute to the overall effectiveness of the end result.

(e) **Scale and Magnitude alternative:** Activities that can be broken down into smaller units and can be undertaken on different scales (e.g. for a housing development there could be the option of 10, 15 or 20 housing units. Each of these alternatives may have different impacts).

An important function of the Scoping Phase is to screen alternatives to derive a list of feasible alternatives that need to be assessed in further detail in the EIA Phase. The following types of alternatives are the most pertinent to the proposed project and are detailed further below:

- Location alternatives;
- Layout alternatives;
- Technology alternatives; and
- The "no-go" alternative.

[11] This guideline has been used as a best practice tool since it is the most recent guideline on alternatives.

6.1 Location Alternatives

The location for Veld PV South project sites were selected based on the following parameters:

- Highest solar resource;
- Proximity to an existing Eskom line;
- Very flat site, which makes construction easier and less invasive than on an undulating site;
- Very remote site and unpopulated site (anticipated lower visual, noise and dust impacts);
- Landowner support;
- Accessibility via existing farm roads;
- The land has a low agricultural potential and can only be used for low intensity livestock grazing;
- Based on high level discussions with the specialists pre-EIA, the site was expected to have relatively low sensitivity; and
- Review of the REDZs reveals that the site falls within the Springbok REDZ which is considered to be in an area which poses the least environmental impact whilst maximising socio-economic benefits of such a project.

Based on the consideration above and to avoid high visual impacts, insufficient solar resources, grid capacity constraints or the inability to secure the land into lease agreements, the site was identified as the most suitable area to develop for the solar facility. The Veld PV South site has been selected as the preferred alternative as it was most suited in terms of the favourable factors listed above. Other sites that were considered were discarded during early phase feasibility assessments due to high environmental sensitivities (e.g. visual & aquatic impacts). The initial screening process was done during the Scoping and EIA process that was initiated for this project in 2016 but was stopped due to the withdrawal of the initial funders and insecurity of the future frame conditions for renewable energy projects, as explained in Section 4.1.1 above.

6.2 Design and Layout Alternatives

A single site layout will be compiled and presented in the EIR based on *inter alia* the following criteria:

- Technical constraints:
  - Spatial orientation requirements of solar modules and associated infrastructure (e.g. roads); and
  - Layout relative to other existing infrastructure, such as powerlines and the farm boundaries and access roads.
- Environmental constraints:
  - Solar resource profile (this has significant technical constraints as well);
  - Topographical constraints, including surface and groundwater;
  - Biophysical constraints (presence of sensitive or protected plant or faunal communities);
  - Required setbacks from property boundaries; and
  - Socio-economic constraints (such as aesthetics, sensitive heritage areas).

The Veld PV South site layout already took cognisance of the environmental, social and technical sensitivities identified through initial specialist assessments during the previous Scoping and EIA process referred to in Section 4.1.1 above. The layout presented in this application has responded to the constraints identified by the Aquatic and visual specialists and avoids buffer areas and sensitive sites they identified.

6.3 Technology Alternatives

In terms of the mounting alternatives, fixed tilt mounting systems versus single axis tracking have been considered. The preference for single axis tracking is based on the economic viability, water requirements, land requirements,

efficiency and potential environmental impacts of the proposed solar panel mounting types. Two alternatives where compared:

Alternative B1: Fixed

Alternative B2: Tracking

In a fixed tilt system the PV panels are installed at a set tilt and cannot move, whereas in a single axis tracking system the panels follows the sun's vertical or horizontal movement (dual axis tracking systems are also available, in which the sun is tracked both horizontally and vertically), the potential difference in power generation are indicated in Figure 7 . Notably the dual axis tracking is the best option in terms of generation, but are exceedingly costly and substantial structures are required, this is followed by single axis tracking systems and last fixed mountings. Track options are able to take advantage of early morning and late afternoon sun positions and achieve a more optimal interception of the sun rays throughout the day and throughout the seasons.

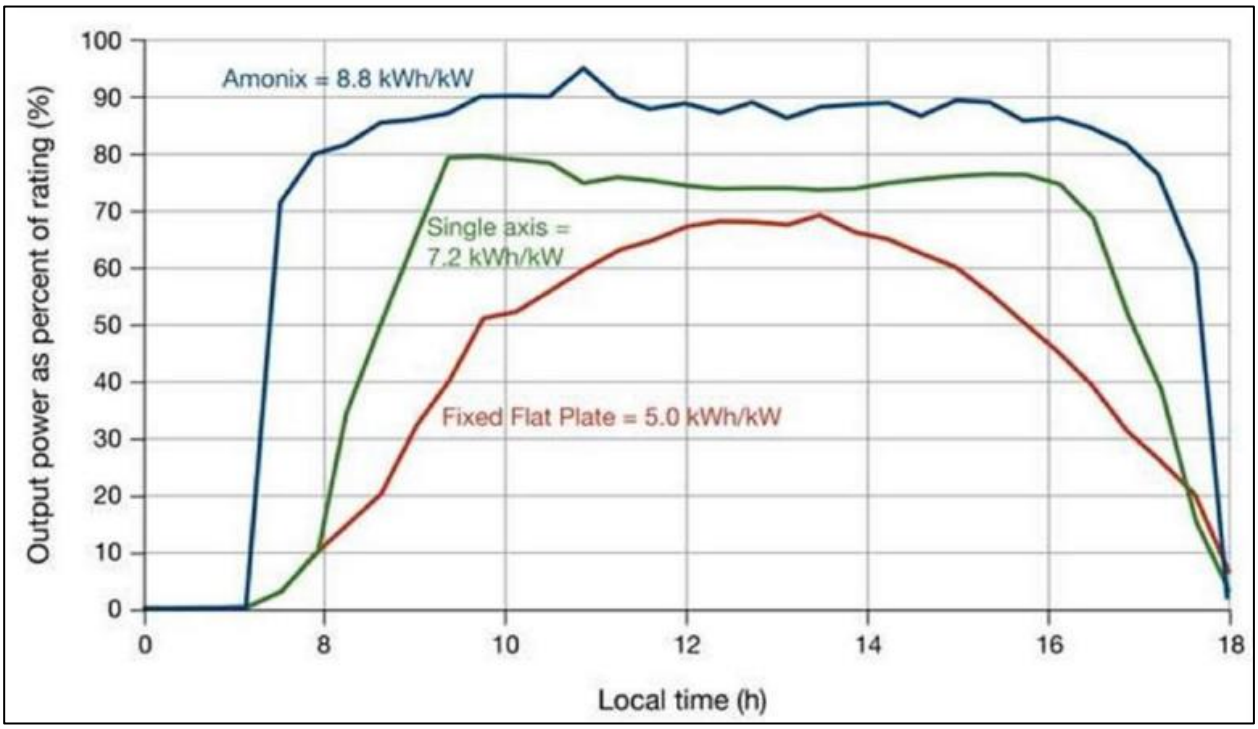


Figure 7: Principle behind fixed, single and dual axis tracking systems (Smith, 2011)

Fixed tilt and single axis tracking systems have similar heights at approximately 5 m above the natural ground level, while dual axis tracking systems could be up to 8 m above the natural ground level, increasing their visual presence.

Single access tracking has emerged as the preferred technology alternative because it provides higher energy yield than a fixed tilt system of the same maximum instantaneous capacity by producing more power during morning and evening times. In addition, single axis systems are not as complex and currently cost intensive as a dual axis system nor does it have the increased visual aspects associated with the taller structures of dual axis systems. Therefore, dual axis tracking was not deemed feasible at this site and was not assessed.

6.4 Routing Alternative for Linear Activities

Transmission Lines

Veld PV South would connect to the grid via a 132 kilovolt (kV) overhead powerline, approximately 27 km in length that would feed into the national electricity grid at the Aggenys substation or alternatively to a 2100 m long 220 kV LILO line to the existing Eskom 220kV line close to the site. Which of these options is implemented will be determined by Eskom at the time of construction. A 35m servitude will be required for whichever option is implements, each comprising single circuit steel monopoles with bird perches, with the 132kV powerline route running adjacent to the existing 220 kV powerline that runs past the site,

The transmission line route has been revised in response to the Aquatic specialist's recommendation to avoid drainage lines and aquatic buffers.

Roads

The access road will follow the existing farm access road off the N14 before Aggeneys. The access road within the site boundary has been realigned to avoid drainage lines and aquatic buffers as recommended by the Aquatic specialist, as well as a sensitive site identified by the Visual specialist.

No-Go Alternative

The assessment of alternatives must at all times include the “no-go” option as a baseline against which all other alternatives must be measured. The option of not implementing the activity must always be assessed and to the same level of detail as the other feasible and reasonable alternatives. The “no-go” option is taken to be the existing rights on the property, and this includes all the duty of care and other legal responsibilities that apply to the owner of the property. The “no-go” option will see the status quo farming activities persist without the construction of Veld PV South on the proposed site.

Conclusion on Alternatives

The EAP in consultation with the DEA and specialists determined what impacts are likely to constitute potentially significant impacts and commissioned specialists to assist with the assessment of those impacts.

The specialists were also asked to identify potential impacts, to undertake a preliminary collective impact assessment (these assessments refer to the respective specialist reports attached hereto and to rank the alternatives in order of preference

The NEMA requires that alternatives are considered during the EIA/BA process. An alternative can be defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004).

7 BIOPHYSICAL AND SOCIO-ECONOMIC IMPACT ASSESSMENT

The description of the affected environment provided below draws on existing knowledge from published data, previous studies, site visits to the site and surrounding area and discussions with various role-players.

Several environmental aspects have been identified that may be impacted upon by the proposed Veld Solar North and associated infrastructure.

For each impact assessed, mitigation measures have been proposed to further avoid, reduce (negative) or enhance (positive) the impacts. These mitigation measures have also been incorporated into the l EMPr to ensure that they are implemented during the pre-construction, construction, operational and decommissioning phases. The EMPr forms part of this BAR (Annexure F), and as such, its implementation will become a binding requirement should this project be authorised.

The following environmental aspects are further described in the following subsections:

- Agriculture
- Aquatic ecology
- Avifauna
- Botany
- Heritage archaeology and palaeontology
- Hydrology
- Socio-economic
- Visual landscape

7.1 Agriculture

The Agricultural specialist, Johan Lanz was appointed to conduct the Impact Assessment Report for Veld PV South and associated infrastructure. The report has been included in Annexure D.

7.1.1 Study methods and criteria

The assessment was based largely on existing soil and agricultural potential data for the site. The source of this data was the online Agricultural Geo-Referenced Information System (AGIS), produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated). Satellite imagery of the site was also used for evaluation.

The AGIS data was supplemented by a field investigation. This was aimed at ground-proofing the AGIS data and achieving an understanding of specific soil and agricultural conditions, and the variation of these across the site. The field investigation involved a drive and walk over of the site, assessing of surface conditions and existing excavations and burrows. The field assessment was done on 2 November 2016.

Soils were classified according to the South African soil classification system (Soil Classification Working Group, 1991) as per the Agricultural Impact Report, 2019.

7.1.2 Description of the environment

The proposed development is located on a terrain unit of level plains at an altitude of between 800 and 850 meters. Slope is approximately 1%. The geology is sandy pedi-sediment, with quartz desert pavement in places, overlying gneissic granite of the Namaqualand Metamorphic Complex. The land type classification is a nationwide survey that groups areas of similar soil, terrain and climate conditions into different land types. There are two land types on each of the northern (original) and southern (new) alternative sites. Soils of these land types are predominantly very sandy, red coloured soils on an underlying dorbank or calcrete hardpan or rock. They are of the Garies, Knersvlakte and Hutton soil forms, although in the old classification system, in use when the land types were described, the soils would have been described as Hutton soil form. The soils fall into the Silicic, Calcic and Oxidic soil groups according to the classification of Fey (2010). The field investigation confirmed that the soils on site are very sandy soils of varying depth on an underlying hardbank.

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 to produce 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. Details of this land capability scale is shown in Table 18.

The project area is classified with a predominant land capability evaluation value of 4, although it varies from 1 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. This renders the site unsuitable for any kind of mainstream cultivation and limits it to low density grazing only. The long-term grazing capacity of the site is very low at 60 hectares per large stock unit and can thus only sustain low stocking densities.

Table 18: 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	

The farm is located within a sheep farming agricultural region and currently used only for grazing. There has never been any cultivation on the farm. There is no agricultural infrastructure on the site, other than fencing around grazing camps and stock watering points. There is a farmstead on another part of the farm, outside the study area. Road access to the site is by way of gravel farm roads that will require upgrading.

The biome classification for the site is Bushmanland Arid Grassland. The vegetation is grazed and very sparse due to low rainfall, but there is no evidence of significant erosion or other land degradation on the site. The site is totally unsuitable for cultivated crops (Refer Figure 8) and viable agricultural land use is limited to low intensity grazing only.

Figure 8: Conditions of the proposed site.

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. In terms of the sensitivity categories used in the REDZ sensitivity analysis, this site was assessed as low sensitivity (DEA, 2015).

7.1.3 Impact assessment with mitigation measures

The proposed PV South facility and grid connection infrastructure is likely to have potential direct and indirect impacts on agricultural potential. These are likely to include *inter alia:*

- Loss of agricultural land use (-) construction, operational and decommissioning
- Soil degradation (-) (construction, operational and decommissioning
- Increased financial security for farming operations (+) operational

Overhead transmission lines have no agricultural impact because all agricultural activities that are viable in this environment (grazing) can continue completely unhindered underneath transmission lines. The only possible source of impact is minimal disturbance to the land during construction and decommissioning. This single agricultural impact is therefore a direct, negative impact that applies to two of the phases of the development (construction and decommissioning)

- Minimal soil and land degradation (erosion and topsoil loss) as a result of land disturbance (-)

Impacts associated with the Veld PV South facility:

Table 19: Loss of agricultural land use: PV facility

Phase	Construction	Operational	Decommissioning
Impact description	Agricultural grazing land directly occupied by the development infrastructure, which includes roads and hardstands, will become unavailable for agricultural use. However, only a very small proportion of the total land surface is impacted in this way.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	On-going		On-going
Extent	Limited		Limited
Intensity	Very low		Very low
Significance	**LOW (-)**		**LOW (-)**
Probability	Certain		Certain
Confidence	Medium		Medium
Reversibility	Medium		Medium
Irreplaceability	Low		Low
Mitigation measures			
Construction phase • Implement an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. 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. • If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. **Operational phase** • Maintain the storm water run-off control system. Monitor erosion and remedy the storm water control system in the event of any erosion occurring. **Decommissioning** • Implement an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. 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. • Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.			

- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.

Table 20: Soil degradation: PV Facility

Phase	Construction	Operational	Decommissioning
Impact description	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.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term		Short term
Extent	Limited		Limited
Intensity	Very low		Very low
Significance	**VERY LOW (-)**		**VERY LOW (-)**
Probability	Probable		Probable
Confidence	Medium		Medium
Reversibility	Medium		Medium
Irreplaceability	Low		Low
Mitigation measures			
Construction phase • Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion. • If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. **Operational phase** • Maintain the storm water run-off control system. Monitor erosion and remedy the storm water control system in the event of any erosion occurring. • Facilitate re-vegetation of denuded areas throughout the site. **Decommissioning** • Implement an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. 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. • Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion. • If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.			

Impacts associated with the grid connection, substation and access routes:

Table 21: Loss of agricultural land use: Grid connection, substation and access routes

Phase	Construction	Operational	Decommissioning
Impact description	Agricultural grazing land directly occupied by the development infrastructure, which includes roads and hardstands, will become unavailable for agricultural use. However, only a very small proportion of the total land surface is impacted in this way.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	On-going		On-going
Extent	Limited		Limited
Intensity	Very low		Very low
Significance	**LOW (-)**		**LOW (-)**
Probability	Certain		Certain
Confidence	Medium		Medium
Reversibility	Medium		Medium
Irreplaceability	Low		Low
Mitigation measures			

Construction phase

- Implement an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. 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.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.

Operational phase

- Maintain the storm water run-off control system. Monitor erosion and remedy the storm water control system in the event of any erosion occurring.

Decommissioning

- Implement an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. 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.
- Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.

Table 22: Soil degradation: Grid connection, substation and access routes

Phase	Construction	Operational	Decommissioning
Impact description	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.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term		Short term
Extent	Limited		Limited
Intensity	Very low		Very low
Significance	**VERY LOW (-)**		**VERY LOW (-)**
Probability	Probable		Probable
Confidence	Medium		Medium
Reversibility	Medium		Medium
Irreplaceability	Low		Low
Mitigation measures			

Construction phase

- Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.

Operational phase

- Maintain the storm water run-off control system. Monitor erosion and remedy the storm water control system in the event of any erosion occurring.
- Facilitate re-vegetation of denuded areas throughout the site.

Decommissioning

- Implement an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. 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.
- Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.

Impacts associated with the Veld PV South facility:

Table 23: Increased security for farms

Phase		Operational	D
Impact description	Reliable rental income from energy facility will increase cash flow and financial security		
	Without mitigation		**With mitigation**
Nature	Positive		Positive
Duration	Ongoing		Ongoing
Extent	Limited		Limited
Intensity	Very low		Very low
Significance	**LOW (+)**		**LOW (+)**
Probability	Probable		Probable
Confidence	Medium		Medium
Reversibility	Medium		Medium
Irreplaceability	Low		Low
Mitigation measures			
• None proposed			

7.1.4 Cumulative impacts

There are 21 renewable energy project applications, with their associated transmission lines, within 30km of the proposed site. In quantifying the cumulative impact, the area of land taken out of agricultural grazing as a result of all of the projects above will amount to a total of approximately 3,742 hectares.

This is calculated using the industry standards of 2.5 and 0.3 hectares per megawatt for solar and wind energy generation respectively, as per DEA (2015). The 21 applications listed in Appendix 2 amount to a generation capacity of 1,884 megawatts. As a proportion of the area within a 30km radius (approximately 283,000 ha), this amounts to only 1.3% of the surface area. That is well 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. Therefore, if the cumulative impact is considered only for the node, it leads to a false impression of the magnitude of that impact because of the concentrated development within the node, and the absence of development surrounding it. When averaged over a greater area, the magnitude becomes much less.

Due to all the considerations discussed above, the cumulative impact of loss of agricultural land use is assessed as having **Minor (-)** significance.

7.1.5 No Go Alternative

The significance for the No-Go Alternative will be **Neutral**.

7.1.6 Agriculture conclusion and impact statement

The proposed development is on land zoned and used for agriculture (grazing). 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 extremely low agricultural potential and is not suitable for cultivation.

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

Due to the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development and 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.

7.2 Aquatic Ecology

The Aquatic specialist, Toni Belcher of BlueScience CC was appointed to conduct the Impact Assessment Report which has been included in Annexure D.

7.2.1 Study methods and criteria

The specialist report was informed by a combination of desktop assessments of existing freshwater ecosystem information for the study area and catchment, as well as by a more detailed assessment of the freshwater features along the proposed routes. The study area was visited in November 2016. During the field visit, the mapping, characterisation and integrity assessments of the freshwater features were undertaken. Mapping of the freshwater features was undertaken using PlanetGIS and Google Earth Professional. The SANBI Biodiversity GIS website was also consulted to identify any constraints in terms of fine-scale biodiversity conservation mapping as well as possible freshwater features mapped in the Freshwater Ecosystem Priority Areas maps. This information/data was used to inform the resource protection related recommendations.

7.2.2 Description of the environment

The annual average rainfall for the area is low and highly variable. The overlying soils on the plains tend to be shallow and stony. They are freely drained structure-less soils with excessive drainage, high erodibility and low fertility. The study area lies within the Nama Karoo, Succulent Karoo and Desert Biomes. The study area is situated within the lower Orange River and the main freshwater features within consist of the following:

- A network of ephemeral streams that drain the inselbergs to form larger tributaries that drain northwards into the Orange River and
- Wide wash-like systems that drain the plains

The ephemeral streams are still in a largely natural ecological condition, with a modification of the habitat occurring as a result of the surrounding farming activities (livestock grazing) and direct habitat disturbance as a result of roads and other infrastructure development. The Orange River within the study area is in a largely natural to moderately modified condition, largely due to upstream impacts on flow and water quality. Current land and water use impacts on the ephemeral streams are low. Due to the ephemeral character of these surface water systems, they are also slow to recover from any impacts.

Figure 9: A view of the typical topography of the site with an isolated ridges or inselberg in the background (BlueScience, 2019)

The ecological importance and sensitivity of the ephemeral streams are considered to be moderate, while the Orange River within the study area is considered of a high ecological importance and sensitivity. This is due to the fact that the river provides a 'green' corridor within an arid environment and provides an important aquatic habitat.

The Orange River and its tributaries in the north of the study area have been identified as Freshwater Ecosystem Protected Area (FEPA) Rivers while the Orange River is also considered a Fish FEPA. The valley bottom wetlands along the Orange River are also mapped as FEPA wetland areas. The only aquatic feature identified as part of the Namakwa CBA mapping, as being of biodiversity conservation importance, is the valley bottom wetland areas associated with the Orange River. The ecological corridors that are associated with the smaller tributaries within the unique terrestrial vegetation associated with the inselberg in the study area, are included in the terrestrial CBAs.

The only aquatic feature identified as part of the Namakwa Critical Biodiversity Areas mapping as being of biodiversity conservation importance is the valley bottom wetland areas associated with the Orange River. The ecological corridors that are associated with the smaller tributaries within the unique terrestrial vegetation associated with the inselberg are included in the terrestrial CBAs are where the vegetated cover should be maintained in a natural state with no further biodiversity loss (only game farms and livestock production allowed). The surrounding terrestrial landscape is seen as an ecological support area (ESA) which should be managed for limited loss of ecological functioning.

The proposed PV facility as well as most of the proposed transmission line and the northern portions of access roads are located with a river FEPA and within terrestrial ESAs. A smaller portion of the transmission line and access road is located with terrestrial CBAs.

Smaller streams occur to the west and south-east of the proposed PV area. It is recommended that a buffer of approximately 100m from these streams be allowed for. There are not likely to be any constraints associated with the stream and its buffer to the west of the PV area. However, the stream to the south-east is wide and unconfined. It is recommended at the modules in this area be placed further away from the stream. The proposed access road and the powerline for PV South occur within this buffer and should be slightly realigned.

Provided the PV facility is located outside of the freshwater features and recommended buffers, the technology alternatives would have limited potential freshwater impact. It is recommended that 1 in 50 year and 1 in 100 floodlines be determined for the site to ensure that the proposed infrastructure is located outside of these flood risk areas.

7.2.3 Impact assessment with mitigation measures

The proposed PV facility and grid connection infrastructure is likely to have potential direct and indirect impacts on freshwater ecology. These are likely to include *inter alia:*

- Clearance of natural vegetation adjacent to the ephemeral streams and drainage lines during the construction phase (-)
- Maintenance activities during the operational and decommissioning phases (-)
- Potential disturbance of aquatic habitat (-)

Impacts associated with the Veld PV South facility:

Table 24: Clearance of natural vegetation adjacent to the ephemeral streams and drainage lines

Phase	Pre-Construction	Construction	Operational
Impact description	1. Activities during the construction phase of the project could thus be expected to result from the clearing of natural vegetation cover and construction activities adjacent to the ephemeral streams and drainage lines.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term		Short term
Extent	Local		Local
Intensity	Moderate		Moderate
Significance	**MODERATE (-)**		**LOW (-)**
Probability	Probable		Probable
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			

- Smaller streams occur to the west and south-east of the proposed PV area. It is recommended that a buffer of approximately 100mfrom these streams be allowed for. There are not likely to be any constraints associated with the stream and its buffer to the west of the PV area. However, the stream to the south-east is wide and unconfined. It is recommended at the modules in this area be placed further away from the stream.
- On-site stormwater management to minimise the potential impact of modified stormwater runoff on the adjacent freshwater features;
- Limiting disturbance within freshwater features and buffers: The PV facilities should be moved to ensure that they are located outside of the freshwater features and recommended buffers.
- Construction activities should as far as possible be limited to the footprint of the proposed solar energy facilities
- The proposed buffers adjacent to the delineated freshwater features as indicated in the previous section should be adhered to.
- Rehabilitation of the cleared areas and control of alien vegetation growth within the site
- All materials on the construction sites should be properly stored and contained. Disposal of waste from the sites should also be properly managed.
- Construction workers should be given ablution facilities at the construction sites that are located at least 100m away from the drainage lines/ephemeral streams and regularly serviced. These
- Due to the wide and unconfined nature of the stream to the north of the site, it is recommended that a buffer of approximately 175m from top of bank of the stream, (narrowing down to about 100m in the downstream extent at the site where the watercourse becomes less significant) be allowed for as a development setback (green polygons as per the Specialist Report). This riparian buffer zone of the stream contains a number of Shepherd trees, particularly on the stream's northern bank, that should also preferably remain. Some modules may need to be moved slightly to accommodate the recommended buffer.
- The smaller stream to the east of the PV site is much smaller in extent and a buffer of approximately 100m is recommended from the stream. The proposed access road and the powerline for PV South occur within this buffer and should be slightly realigned.
- Provided the PV facility is located outside of the freshwater features and recommended buffers, the technology alternatives would have limited potential freshwater impact. It is recommended that 1 in 50 year and 1 in 100 floodlines be determined for the site to ensure that the proposed infrastructure is located outside of these flood risk areas.

Table 25: Maintenance activities

Phase	Pre-Construction	Operational	Decommissioning
Impact description	The facilities are designed to operate continuously, largely unattended and with low maintenance requirements over the medium to long term. There would be basic operation and maintenance activities on site. The site should be decommissioned and cleared once the life-span of the technology is exceeded.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Long term		Long term
Extent	Local		Local
Intensity	Low to Very Low		Low to Very Low
Significance	**MODERATE (-)**		**VERY LOW (-)**
Probability	Probable		Probable
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• Operational activities should as far as possible be limited to the delineated site for the proposed development and the identified access routes. • Invasive alien plant growth should be monitored on an ongoing basis to ensure that these disturbed areas do not become infested with invasive alien plants. Should any erosion features develop they should be stabilised as soon as possible.			

Impacts associated with the grid connection, substation and access routes:

Table 26: Potential disturbance of aquatic habitat during construction phase

Phase	Pre-Construction	**Construction**	
Impact description	The proposed Veld PV South powerline routes are located within the buffer areas adjacent to watercourses and should be realigned to remain outside of the buffers. The transmission line to Aggenys will need to cross a number of small drainage lines. It is however relatively easy to place the pylons of the line such that there is very limited disturbance of aquatic habitat. All the proposed access routes are established gravel roads or farm roads. The major impacts associated with the access roads relate to some potential loss of habitat within the streams or drainage lines and the potential invasive alien plant growth as well as the potential for flow and water quality impacts and the direct impacts on the soil (erosion of drainage channels). Due to the fact that the habitat and riparian vegetation associated with the ephemeral streams is negligible, as well as the frequency of flow in the stream, the impact can be expected to be minimal.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term		Short term
Extent	Local		Local
Intensity	Very Low		Very Low
Significance	**VERY LOW (-)**		**VERY LOW (-)**
Probability	Low		Low
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• The Veld PV South powerline routes should be realigned to remain outside of the buffers. The pylons for the Aggenys transmission line should be placed at least 30m outside of the delineated stream channels. • Where the access route for transmission lines needs to be constructed through the drainage channels, disturbance of the channels should be limited. These areas should be rehabilitated after construction is complete and the areas monitored for growth of invasive alien plants. • Existing road infrastructure should be utilized as far as possible to minimize the overall disturbance created by the proposed project. Where crossings associated with the access routes need to be constructed through ephemeral streams, disturbance of the channel should be limited. • All crossings over drainage channels or stream beds should be such that the flow within the drainage channel is not impeded. Road infrastructure and transmission lines should coincide as much as possible to minimize the road network and impact of these activities. • Any disturbed areas should be rehabilitated to ensure that these areas do not become subject to erosion or invasive alien plant growth.			

Table 27: Potential disturbance of aquatic habitat during operational phase

Phase	Pre-Construction	Operational	
Impact description	An impact of very limited significance is expected on the ephemeral streams after the construction phase. An impact of very low significance is expected. The major impacts associated with the access roads during the operation phase relate to disturbance to the instream and riparian habitat of the freshwater ecosystems along the designated routes.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term		Short term
Extent	Local		Local
Intensity	Very Low		Very Low
Significance	**VERY LOW (-)**		**VERY LOW (-)**
Probability	Probable		Probable
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• All crossings over drainage channels or stream beds after the construction phase should be rehabilitated and maintained such that the flow within the drainage channel is not impeded. Maintenance of transmission lines should only take place via the designated access routes. Invasive alien plant growth should be controlled within the site. • Maintenance of infrastructure related to the project should only take place via the designated access routes. Disturbed areas along the access routes should be monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth.			

7.2.4 Cumulative impacts

Land use in the study area currently consists of primarily of livestock (sheep) farming with natural areas. Due to the arid nature of the area, the carrying capacity of the land is low and livestock numbers in general are low. The land and climate are also not conducive to the cultivation of crops and pastures. Current land and water use impacts on the ephemeral streams are low. Due to the ephemeral character of these surface water systems, they are also slow to recover from any impacts.

The nature of the power projects allows them to have minimal impact on the surface water features with the correct mitigation measures (as are recommended in this report). Erosion and sedimentation from the project activities, together with the potential for invasive alien plant growth and the possible modification of surface water runoff and water quality may lead to additional impacts on the freshwater habitats within the study area. It is recommended that the proposed activities for this project are placed outside of the identified freshwater features. Provided the construction and operation activities of the projects remain contained within the allocated areas and any disturbed areas within the freshwater features rehabilitated, the overall impact should be limited and of a **Low (-)** significance.

7.2.5 No Go Alternative

The site is likely to remain available to the farmers as rangeland or retained as wilderness area. These activities are all largely at a small scale and have a low impact on the freshwater features in the study area. The tributaries of the Orange River within the study area can therefore be expected to remain in their current state of largely natural under the existing land use activities. There are however patches of relatively dense invasive alien mesquite growth that should be monitored and managed. The No-Go alternative will be of **Very Low (-)** significance to being I**nsignificant**.

7.2.6 Aquatic conclusion and impact statement

The nature of the proposed solar energy project allows it to have minimal impact on the surface water features with the correct mitigation measures (as are recommended in the specialist report (Annexure D). Erosion and sedimentation from the project activities, together with the potential for invasive alien plant growth, and the possible modification of surface water runoff and water quality, may lead to additional impacts on the freshwater habitats within the study area. The proposed activities for this project are recommended to be located outside of the identified freshwater features.

7.3 Avifauna

The Avifaunal specialist, Chris van Rooyen of Chris van Rooyen Consulting, was appointed to conduct the Impact Assessment Report which has been included in Annexure D.

7.3.1 Study methods and criteria

A desktop investigation was conducted to source information on the impacts of solar facilities on avifauna. The results of habitat modelling conducted by BirdLife South Africa for the Red Lark was consulted to establish the potential suitability of the assessment area for Red Larks (BLSA 2019).

An initial visit to the site and general area was conducted on 24 January 2017. This was followed up by on-site surveys during the following periods:

- 30 January - 04 February 2017
- 27 March - 01 April 2017
- 19 - 20 March 2019
- 6-8 May 2019
- 4-6 June 2019.

Surveys were conducted according to the best practice guidelines for avifaunal impact studies at solar developments, compiled by BirdLife South Africa (BLSA) in 2017 (Jenkins *et al*. 2017). Please see Appendix 1 of the Avifauna Specialist Report appended in Annexure D for the methodology used in conducting the surveys.

7.3.2 Description of the environment

The development is situated in the Haramoep and Black Mountain Mine (SA035) Important Bird Area (IBA) (Refer to Figure 10). This IBA is one of only a few sites protecting the globally threatened Red Lark, which inhabits the red sand dunes and sandy plains with a mixed grassy dwarf shrub cover; and the near-threatened Sclater's Lark, on the barren stony plains. It also holds 16 of the 23 Namib-Karoo biome-restricted assemblage species as well as a host of other arid-zone birds. Ludwig's Bustard and Kori Bustard are regularly seen. Martial Eagle, Secretarybird, Verreauxs' Eagle, Booted Eagle, Cape Eagle-Owl and Spotted Eagle-Owl are present (Marnewick et al. 2015).

The following species are classified as trigger species for the IBA: Globally threatened birds

- Red Lark;
- Sclater's Lark;
- Martial Eagle;
- Kori Bustard
- Ludwig's Bustard and
- Secretarybird.

Regionally threatened birds

- Karoo Korhaan and
- Verreauxs' Eagle.

Restricted-range and biome-restricted birds

- Stark's Lark;
- Karoo Long-billed Lark;
- Black-eared Sparrow-lark
- Tractrac Chat;
- Sickle-winged Chat;
- Karoo Chat;
- Sociable Weaver;
- Pale-winged Starling;
- Black-headed Canary

- Karoo Eremomela;
- Layard's Tit-Babbler Sylvia layardi;
- Cinnamon-breasted Warbler Euryptila subcinnamomea; and
- Namaqua Warbler Phragmacia substriata;

Several of the IBA trigger species could potentially occur at the proposed development area.

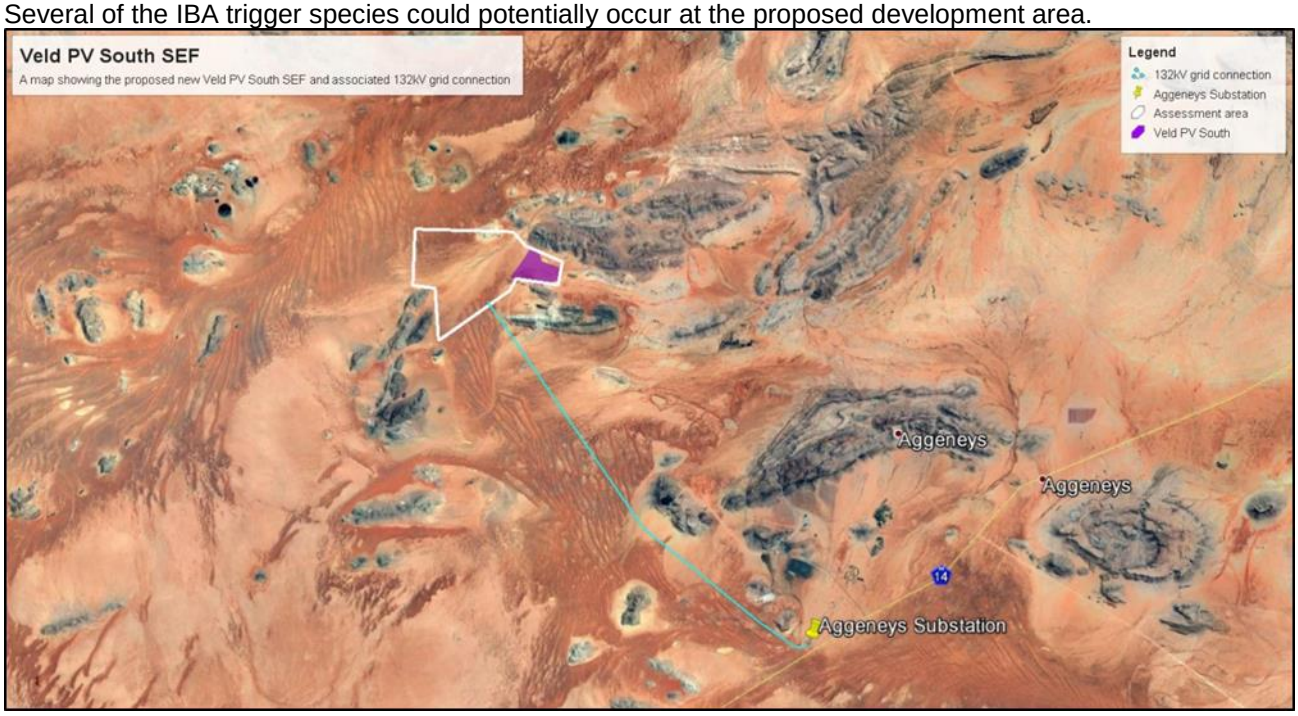


Figure 10: The location of the proposed Veld PV South solar energy facility

The SABAP1 and SABAP2 data indicates that a total of 174 bird species could potentially occur within the study area. Of these, 68 species are classified as priority species.

The overall abundance of avifauna at the site was very low high during the periods when the surveys were conducted. Interestingly, no Red Larks were recorded during five surveys, spanning two years. The SABP data for the greater area likewise do not contain any Red Lark records, despite the BLSA habitat model predicting high numbers of the species. The most likely explanation for the absence of the species in the assessment area, and the general low numbers of birds recorded during the surveys, is the degraded state of the vegetation. Red Larks require multi-layered vegetation, with scattered emergent bushes to provide perches and shade, and perennial large seeded grasses (Hockey et al. (2005). In the case of the assessment area, the virtual absence of grass (and the sparse vegetation in general) is striking, indicating long term sustained grazing pressure (Namakwa Solar PV South Avifauna Impact Assessment Report, June 2019)

Table 28 and Table 29 the priority species potentially occurring at the assessment site as well as the IBA priority species potentially occurring at the assessment site.

Table 28: Solar priority species potentially occurring at the assessment site.

Species	Taxonomic name	Status		Endemic - South Africa	Endemic - Southern Africa	IBA trigger species	Solar priority species	Powerline priority species	Possibility of occurrence in assessment area	Recorded during surveys	Habitat					Potential impacts		
		Global status	Regional status								Sandy dunes and plains	Gravel plains	Inselbergs	Surface water	Powerlines	Displacement: disturbance and habitat transformation	Collisions with the PV panels	Entrapment in perimeter fences
Martial Eagle	*Polemaetus bellicosus*	VU	EN			x	x	x	High	x	x	x	x	x	x			
Greater Kestrel	*Falco rupicoloides*						x	x	High	x	x	x	x	x	x			
Lanner Falcon	*Falco biarmicus*	LC	VU				x	x	High	x	x	x	x	x	x		x	
Verreaux's Eagle	*Aquila verreauxii*	LC	VU			x	x	x	High	x			x	x	x			
Rock Kestrel	*Falco rupicolus*						x		High	x			x	x	x			
Spotted Eagle-Owl	*Bubo africanus*						x	x	High	x	x	x	x		x		x	
Layard's Tit-Babbler	*Parisoma layardi*			Near endemic	Endemic	x	x		High	x	x	x	x					
Southern Double-collared Sunbird	*Cinnyris chalybeus*			Near endemic	Endemic		x		High	x	x	x	x					
Cinnamon-breasted Warbler	*Euryptila subcinnamomea*			Near endemic	Endemic	x	x		High	x			x					
Sickle-winged Chat	*Cercomela sinuata*			Near endemic	Endemic	x	x		Medium			x	x			x	x	
Cape Eagle-Owl	*Bubo capensis*						x	x	High	x			x					
Kori Bustard	*Ardeotis kori*	NT	NT			x	x	x	Medium		x	x		x		x		x
Sclater's Lark	*Spizocorys sclateri*	NT	NT	Near endemic	Endemic	x	x		Low			x		x		x	x	
Black-eared Sparrowlark	*Eremopterix australis*			Near endemic	Endemic	x	x		High	x	x	x				x	x	
Karoo Korhaan	*Eupodotis vigorsii*	LC	NT		Endemic	x	x	x	High	x	x	x				x		x
Namaqua Warbler	*Phragmacia substriata*			Near endemic	Endemic	x	x		Medium		x					x	x	
Red Lark	*Calendulauda burra*	VU	VU	Endemic	Endemic	x	x		Low		x					x	x	
Secretarybird	*Sagittarius serpentarius*	VU	VU			x	x	x	Low		x					x		x
Pygmy Falcon	*Polihierax semitorquatus*						x		High	x	x	x					x	
Ludwig's Bustard	*Neotis ludwigii*	EN	EN		Near endemic	x		x	High		x	x		x		x		x

Table 29: IBA priority species potentially occurring at the assessment site

Species	Taxonomic name	Status		Endemic - South Africa	Endemic - Southern Africa	IBA trigger species	Solar priority species	Powerline priority species	Possibility of occurrence in assessment area	Recorded during surveys	Habitat					Potential impacts					
		Global status	Regional status								Sandy dunes and plains	Gravel plains	Inselbergs	Surface water	Powerlines	Displacement: disturbance and habitat transformation	Collisions with the PV panels	Entrapment in perimeter fences	Powerline collisions	Electrocutions: Substation	Displacement due to construction of powerline &
Black-eared Sparrowlark	*Eremopterix australis*			Near endemic	Endemic	x	x		High	x	x	x				x	x				
Black-headed Canary	*Serinus alario*			Near endemic	Endemic	x			High		x	x	x	x		x					
Cinnamon-breasted Warbler	*Euryptila subcinnamomea*			Near endemic	Endemic	x	x		High	x			x								
Karoo Chat	*Cercomela schlegelii*				Near-endemic	x			High	x		x	x			x	x				
Karoo Eremomela	*Eremomela gregalis*			Near endemic	Endemic	x			Medium		x	x	x			x	x				
Karoo Korhaan	*Eupodotis vigorsii*	LC	NT		Endemic	x	x	x	High	x	x	x				x		x	x		
Karoo Long-billed Lark	*Certhilauda subcoronata*				Endemic	x			High	x		x	x			x	x				
Kori Bustard	*Ardeotis kori*	NT	NT			x	x	x	Medium		x	x		x		x		x	x		
Layard's Tit-Babbler	*Parisoma layardi*			Near endemic	Endemic	x	x		High	x	x	x	x								
Ludwig's Bustard	*Neotis ludwigii*	EN	EN		Near endemic	x		x	High		x	x		x		x		x	x		
Martial Eagle	*Polemaetus bellicosus*	VU	EN			x	x	x	High	x	x	x	x	x	x				x		x
Namaqua Warbler	*Phragmacia substriata*			Near endemic	Endemic	x	x		Medium		x					x	x				
Pale-winged Starling	*Onychognathus nabouroup*				Near-endemic	x			High	x			x	x							
Red Lark	*Calendulauda burra*	VU	VU	Endemic	Endemic	x	x		Low		x					x	x				
Sclater's Lark	*Spizocorys sclateri*	NT	NT	Near endemic	Endemic	x	x		Low			x		x		x	x				
Secretarybird	*Sagittarius serpentarius*	VU	VU			x	x	x	Low		x					x		x	x		
Sickle-winged Chat	*Cercomela sinuata*			Near endemic	Endemic	x	x		Medium			x	x			x	x				
Sociable Weaver	*Philetairus socius*				Endemic	x			High	x	x	x		x	x	x	x				
Tractrac Chat	*Cercomela tractrac*				Near-endemic	x			High	x	x	x				x	x				
Verreaux's Eagle	*Aquila verreauxii*	LC	VU			x	x	x	High	x			x	x	x				x		

7.3.3 Impact assessment with mitigation measures

The proposed PV facility and grid connection infrastructure is likely to have potential direct and indirect impacts on avifauna. These are likely to include *inter alia:*

- Displacement due to disturbance and habitat transformation associated with the construction of the solar PV plant and associated infrastructure (-)
- Collisions with the solar panels (-)
- Entrapment in perimeter fences (-) and
- Collisions with the associated power lines resulting in mortality (-)

Impacts associated with the Veld PV South facility:

Table 30: Displacement due to disturbance and habitat transformation associated with the construction and operation phases of the solar PV plant and associated infrastructure

Phase	Pre-Construction	**Construction**	**Operational**
Impact description	During the construction phase of the project, there will be an increase of vehicular and personnel movement which may disturb the resident avifauna. Construction activities could be a source of disturbance and could lead to a temporary or even permanent abandonment of nests. If the construction interrupts breeding cycles at a critical time, this could harm the slower reproducing species (such as large eagles) more so than faster reproducing species (e.g. passerines). During the Operational phase similar impacts might occur.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term		Short term
Extent	Site Specific		Site Specific
Intensity	High-		Moderate
Significance	**MODERATE (-)**		**MODERATE (-)**
Probability	Probable		Probable
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Medium		Medium
Mitigation measures			
• Construction and decommissioning activity should be restricted to the immediate footprint of the infrastructure. • Measures to control noise should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. Applicable to both the construction and operational phase: • The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.			

Table 31: Collisions with solar panels

Phase	Pre-Construction	Construction	**Operational**
Impact description	During the operational phase of the project collisions of priority avifauna may result in the mortality of priority species		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Permanent		Permanent
Extent	Site Specific		Site Specific
Intensity	Very low -		Very low -
Significance	**VERY LOW (-)**		**VERY LOW (-)**
Probability	Fairly likely		Fairly likely
Confidence	Unsure		Unsure
Reversibility	Irreversible		Irreversible
Irreplaceability	Low		Low
Mitigation measures			
• Construction and decommissioning activity should be restricted to the immediate footprint of the infrastructure. • Measures to control noise should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. <u>Applicable to both the construction and operational phase:</u> • The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.			

Table 32: Entrapment in parameter fences

Phase	Pre-Construction	Construction	Operational
Impact description	During the operational phase of the project the priority avifauna may be entrapped in fences and mortality may be the result		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Permanent		Permanent
Extent	Site Specific		Site Specific
Intensity	Very low -		Very low -
Significance	**LOW (-)**		**VERY LOW (-)**
Probability	Fairly likely		Fairly likely
Confidence	Unsure		Unsure
Reversibility	Irreversible		Irreversible
Irreplaceability	Low		Low
Mitigation measures			
• The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.			

Impacts associated with the grid connection, substation and access routes:

Table 33: Displacement due to disturbance and habitat transformation associated with the construction phase of the grid connection and substation

Phase	Pre-Construction	**Construction**	**Operational**
Impact description	During the construction phase of the project, there will be an increase of vehicular and personnel movement which may disturb the resident avifauna. Construction activities of the grid connection and substation could be a source of disturbance and could lead to a temporary or even permanent abandonment of nests. If the construction interrupts breeding cycles at a critical time, this could harm the slower reproducing species (such as large eagles) more so than faster reproducing species (e.g. passerines).		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term		Short term
Extent	Regional		Regional
Intensity	High-		High-
Significance	**LOW (-)**		**VERY LOW (-)**
Probability	Very likely		Unlikely
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• Construction activity should be restricted to the immediate footprint of the infrastructure. • Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance to the avifauna. • Measures to control noise should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. • A walk through must be conducted with an avifaunal specialist to assess whether there are any Red Data species and/or large raptors breeding in the vicinity of the powerline which could be displaced. Should this be the case the appropriate measures must be put in place to prevent the displacement of the breeding birds, through the timing of construction.			

Table 34: Mortality due to electrocution

Phase	Pre-Construction	Construction	Operational
Impact description	Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components. The electrocution risk is largely determined by the pylon/ tower design and the size of the bird.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Permanent		Permanent
Extent	Site specific		Site specific
Intensity	High-		High-
Significance	**LOW (-)**		**VERY LOW (-)**
Probability	Fairly		Unlikely
Confidence	Unsure		Unsure
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• The pole design must be signed off by the bird specialist to ensure that there no electrocution risk is present for the priority species. • With regards to the infrastructure within the substation yard the hardware is too complex to warrant any mitigation for electrocution at this stage. It is rather recommended that if any impacts are recorded once operational, site specific mitigations are applied reactively.			

Table 35: Collisions of priority species with the earthwire of the proposed grid connection

Phase	Pre-Construction	Construction	Operational
Impact description	Collisions of priority species with the earthwire of the proposed grid connection		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Permanent		Permanent
Extent	Regional		Regional
Intensity	High-		High-
Significance	**HIGH (-)**		**LOW (-)**
Probability	Definite		Fairly likely
Confidence	Sure		Sure
Reversibility	Irreversible		Irreversible
Irreplaceability	Medium		Medium
Mitigation measures			
• A walk through must be conducted once the pole positions have been pegged to demarcate the sections requiring marking with Bird Flight Diverters.			

7.3.4 Cumulative impacts

Cumulative effects are commonly understood to be impacts from different developments that combine to result in significant change, which could be larger than the sum of all the individual impacts. The assessment of cumulative effects therefore needs to consider all renewable energy developments within at least a 35km radius of the proposed site. The six renewable projects, all solar PV projects, which are planned or authorised are displayed in Figure 11 and furthermore Appendix 4, of the Namakwa Solar PV South Avifauna Impact Assessment Report (June 2019), lists the projects together with the relevant recommended mitigation measures pertaining to birds.

Veld PV South

In the case of solar project, the potentially most significant impact from an avifaunal perspective is the transformation of the natural habitat. The total land parcel area taken up by the six proposed and planned solar energy projects are approximately 45 000ha. The Veld PV South assessment area will add another approximately 2 500ha to these. The total area of the 35km radius around the proposed projects equates to about 392 000ha. The total combined size of the land parcels taken up by solar facilities, including the assessment area of the Veld PV South project, equates to about 47 500ha, which is just over 12% of the available land in the 35km radius. However, the actual footprint of the solar facilities is typically much smaller that the land parcel area. The total area to be taken up by renewable energy developments will therefore most likely comprise less than 10% of the land surface within the 35km radius around the proposed Veld PV South project. The cumulative impact of the habitat transformation which will come about as a result of the proposed Veld PV South project should therefore be **Minor (-).**

Grid connection

In the case of the grid connections, the existing high voltage grid in the 35km radius around the proposed Veld PV South comes to about 112km. The Veld PV South will add another approximately 27km of sub-transmission line to this total. This translates into an 18% increase in the length of existing high voltage line within the 35km radius around the proposed Veld PV South project. The most significant potential impact of high voltage lines within the aforesaid 35km radius is bird collisions with the earth wires of the lines. An 18% increase in line length should represent a **Moderate (-)** increase in cumulative risk, which could be mitigated to a **Minor (-)** level with the application of appropriate mitigation measures i.e. the fitting of Bird Flight Diverters.

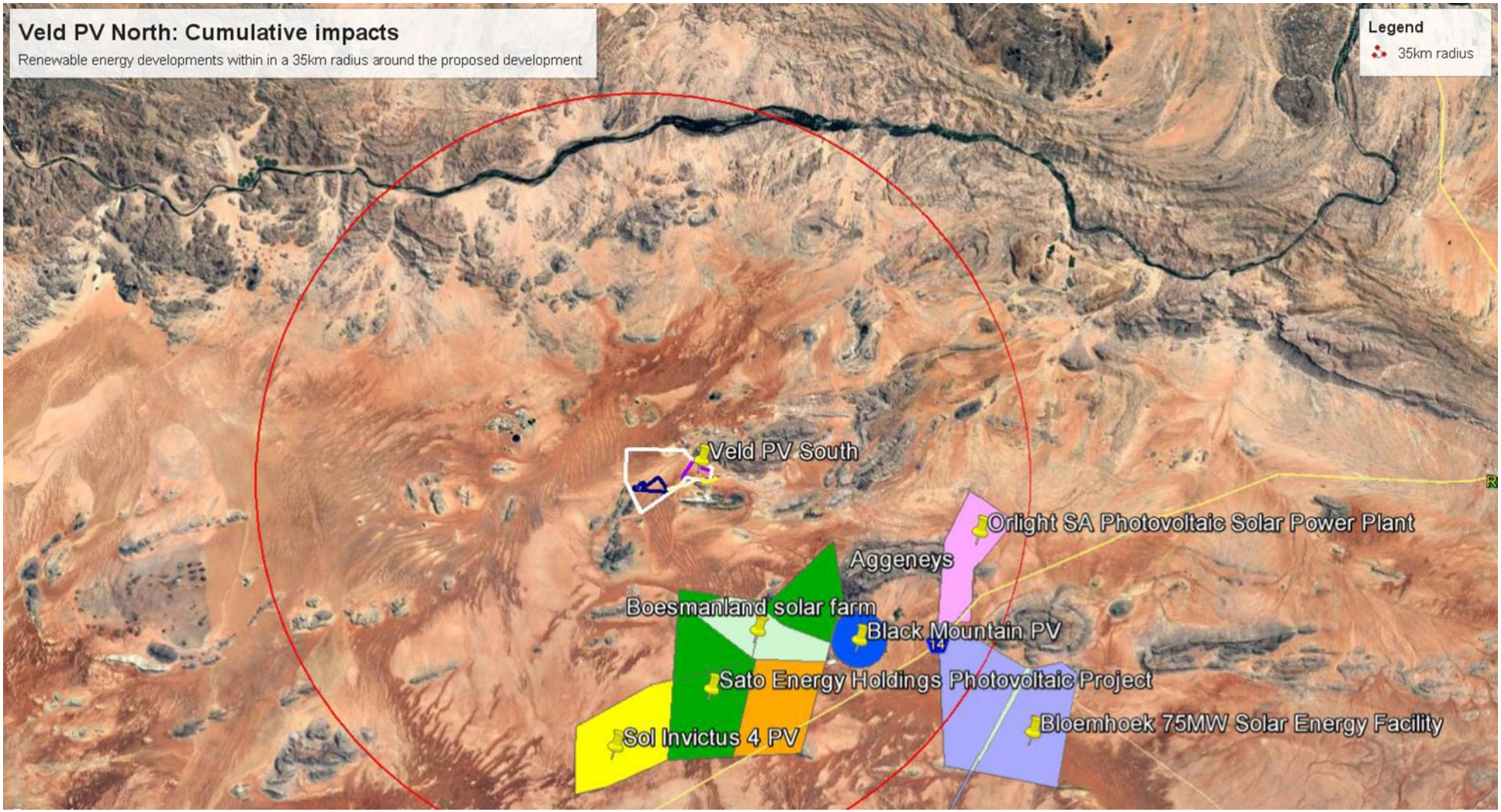


Figure 11: The locality of planned and authorised renewable energy projects within a 35km radius around the proposed Veld PV South facility

7.3.5 No Go Alternative

The no-go alternative will result in the current status quo being maintained as far as the avifauna is concerned. The low human population in the area is advantageous to avifauna. The no-go option would therefore eliminate any additional impact on the ecological integrity of the proposed development area as far as avifauna is concerned and the significance rated as **Neutral**.

7.3.6 Avifauna conclusion and impact statement

Veld PV South

The proposed Veld PV South facility and the associated grid connection will have some pre-mitigation impacts on priority and/or IBA trigger species at a site and regional level, which will be **Very Low (-)**.

The overall impact of the habitat transformation on priority and/or IBA trigger species in the PV footprint is limited by the already highly degraded state of the habitat in the assessment area. This existing impact has already had a significant negative impact on variety and abundance of priority species that could potentially have occurred there, if the habitat were in a less disturbed state. Within this context, the impact of displacement of priority and/or IBA trigger species due to habitat transformation associated with the operation of the plant and associated infrastructure is rated as **Low (-)**. This impact can be partially reversed through mitigation, but it will remain at a **Low (-)** level, after mitigation

The impact of displacement due to disturbance on priority and/or IBA trigger species in the PV footprint, during the construction phase, is rated as **Low (-)** and will remain at a **Low (-)** level after mitigation. It should be noted that the variety and abundance and variety of priority species have already been negatively affected by the existing impact of heavy grazing on the vegetation, resulting in depleted numbers of such species in the assessment area to start with.

The envisaged impacts of priority and/or IBA trigger species mortality due to collisions with the solar panels is rated as **Very Low (-)**. No mitigation is suggested for the impact due to the low significance.

Entrapment of priority and/or IBA trigger species in the perimeter fences of the proposed PV facility is rated as **Low (-)** pre-mitigation and could be further reduced with appropriate mitigation to **Very Low (-)**.

The cumulative impact of the proposed Veld PV South facility on priority and/or IBA trigger species is rated as **Low (-),** taking into account all planned and approved renewable energy facilities in a 35km radius around the proposed facility (Namakwa Solar PV South Avifauna Impact Assessment Report, June 2019).

Grid connection

The impact of displacement due to disturbance and habitat transformation associated with the construction of the proposed 132kV grid connection and substation on priority and/or IBA trigger species, is assessed to be **Low (-)** and can be mitigated to a **Very Low (-)** level.

The impact of collision related mortality on priority and/or some IBA trigger species with the 132kV grid connection is rated as **High (-)** and could be reduced to **Low (-)** with the application of mitigation measures.

The potential impact of electrocution related mortality on priority and/or some IBA trigger species is assessed to be **Low (-)** but it can be reduced to **Very Low (-)** with appropriate mitigation.

The cumulative impact of the proposed grid connections on priority and/or IBA trigger species within a 35km radius around the proposed development is rated as **Moderate (-)**, but it can be reduced to **Low (-)** with the application of appropriate mitigation measures (Namakwa Solar PV South Avifauna Impact Assessment Report, June 2019).

From an avifaunal impact perspective, there is no objection to the development of the proposed Veld PV South facility and associated grid connections, provided the proposed mitigation measures are strictly implemented.

7.4 Botany

The Botanical specialist, Dr Dave MacDonald of Bergwind Botanical Surveys & Tours CC, was appointed to conduct the Impact Assessment Report which has been included in Annexure D.

7.4.1 Study methods and criteria

Field-work for the assessment of the proposed Veld PV South project was carried out on 15 - 17 November 2016.

Contact was made with the landowners and permission obtained to enter their properties. They also volunteered valuable insights into the past history of land-use which directly affects the present-day condition of the vegetation. The survey was carried out mostly from a vehicle. Access roads were driven and where necessary short on-foot surveys were made to record the species composition of the vegetation and to obtain photographs.

The method used was a 'rapid-assessment technique' in which site observations and numerous photographs were taken for later 'desk-top' analysis. The recorded information was transferred to Google Earth ™ aerial-photo maps as well as Garmin Birdseye imagery and used for the preparation of maps.

No formal phytosociological analysis was conducted. The vegetation is described from the species and photographs recorded at the waypoints. The National Vegetation Map (SANBI, 2012) was used as a base map. The Critical Biodiversity Areas map of the Northern Cape Province (E. Oosthuysen) was also used as an informant for interpreting the potential impacts on the vegetation.

7.4.2 Description of the environment

The proposed Veld PV South site comprises of Bushmanland Arid Grassland. This vegetation type occurs over a wide expanse in the Northern Cape Province from the Bushmanland Basin in the south to the vicinity of the Orange River in the north and from Prieska in the east to Aggeneys in the west (Mucina et al. 2006b; McDonald, 2011; McDonald 2012a & 2012b). It is considered to be Least Threatened (Driver et al. 2012; Government Gazette, 2011). In the study area, it is found on sandy, well-drained yellow to red soils. The landscape is prone to sheet-wash at times of heavy rain. Bushmanland Sandy Grassland is described by Mucina et al. (2006) as occurring in the surround of Aggeneys and in a few isolated patches near Copperton in the Northern Cape Province. It occurs on red sands >300 mm deep mainly on the Af land-type (in this case Af20).

The Veld PV South focus area is covered with Open Plains Grassland (a sub-unit of Bushmanland Arid Grassland). It is described as semi-desert 'steppe' by Mucina *et al.* (2006b) and is typically dominated by Gha grass (*Centropodia glauca*) and 'white grasses' (*Stipagrostis* spp.) (Figures 15 – 18). This vegetation occurs on shallow red sandy soils. Due to the extremely dry conditions prevailing at the time of the site visit, only a few other plant species apart from the grasses were seen or identified in this vegetation type. The other species recorded are *Euphorbia* cf. *lignosa* (melkbos), *Hoodia gordonii* (ghaap) (Figure 15) that occurs as scattered multi-stemmed individuals, *Hermannia* sp. and *Rhigozum trichotomum* (driedoring) growing as scattered individuals and not in dense clusters as is often the case.

Hoodia gordonii is a protected plant species in the Northern Cape Province. A permit would therefore be necessary to translocate the plants occurring in the proposed Veld PV South focus area to a nearby suitable area that would not be affected by the proposed PV project (search & rescue). (Refer to Figure 12).

Figure 12 The Veld PV South 'focus area' (view southwards) with Hoodia gordonii in the foreground. The dry grass tufts are of Stipagrostis spp. (probably Stipagrostis obtusa). The grass tufts are heavily grazed and affected by drought.

In addition to the above plant species, Boscia albitrunca (shepherd' tree or witgatboom) a small tree (usually of great age), occurs along drainage line and occasionally in open areas (Figure 19). At the Veld PV South focus area this species is found along the southern boundary in the near the lower slopes of the low hills. This species is protected under the National Forests Act 1998 (Act 84 of 1998). Since the trees occur near the southern boundary of the proposed PV installation they could, and ideally should, be avoided. If for some reason any trees of this species must be removed or otherwise affected (e.g. prune a permit for such activity would be required from the Department of Agriculture, Forestry and Fisheries.

Figure 13 An example of an old specimen of *Boscia albitrunca* (shepherd's tree; witgatboom)

The layout of Veld PV South has been deliberately designed to exclude any drainage lines. This is positive since *Boscia albitrunca* (shepherd' tree or witgatboom) occurs along drainage lines north and immediately

west of the focus area (Figure 23). This species is protected under the National Forests Act 1998 (Act 84 of 1998). If, for some reason, any trees of this species must be removed or otherwise affected (e.g. pruned) a permit for such activity would be required from the Department of Agriculture, Forestry and Fisheries.

Figure 14 An example of an old specimen of Boscia albitrunca (shepherd's tree; witgatboom)

The map designates the Veld PV South 'focus area' as falling partly within a Critical Biodiversity 1 [CBA1] but mostly in Critical Biodiversity Area 2 [CBA2]. The definition and parameters of CBA 1[12] and CBA2 according to Desmet & Marsh (2008) are given in Appendix 1 of the Botanical Impact Assessment (2019). The Veld PV South 'focus area' has none of these attributes except for *Hoodia gordonii* and marginally *Boscia albitrunca*.

The rationale for assigning this area to CBA1 and CBA2 is not clear and no documentation is currently available that explains this designation. It is the Botanical Specialist's contention, based on observations, that the Veld PV South focus area should be assigned Ecological Support Area (ESA) status which still points to its ecological value but does not assign a 'critical' status to the area (Botanical Impact Assessment, 2019)

7.4.3 Impact assessment with mitigation measures

The proposed PV facility and grid connection infrastructure is likely to have potential direct and indirect impacts on the botanical environment. These are likely to include *inter alia:*

- Removal of Bushmanland Arid Grassland vegetation and minimal Bushmanland Sandy Grassland PV (-)
- Removal of Bushmanland Arid Grassland vegetation and minimal Bushmanland Sandy Grassland. Power line (-)
- Removal of Bushmanland Arid Grassland vegetation and minimal Bushmanland Sandy Grassland. Substation (Power Block) (-)

[12] CBA 1 sites are mainly irreplaceable sites with high levels of biodiversity sensitivity. CBA2 includes important areas that have endangered vegetation types, important habitat types and threatened species.

Impacts associated with the Veld PV South facility:

Table 36: Removal of Bushmanland Arid Grassland vegetation and minimal Bushmanland Sandy Grassland (PV)

Phase	Pre-Construction	**Construction**	
Impact description	located on Haramoep RE/53		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Long term		Long term
Extent	Local		Local
Intensity	Low-		Low
Significance	**LOW (-)**		**LOW (-)**
Probability	Probable		Probable
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Medium		Medium
Mitigation measures			
• Search and rescue of *Hoodia gordonii* • Care should be taken during the construction and operational phases to not introduce this invasive species into the PV area.			

Impacts associated with the grid connection, substation and access routes:

Table 37: Removal of Bushmanland Arid Grassland vegetation and minimal Bushmanland Sandy Grassland (Powerline and buffer)

Phase	Pre-Construction	**Construction**	
Impact description	The Veld PV South power-line and buffer is located on Haramoep RE/53		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Long term		Long term
Extent	Local		Local
Intensity	Low-		Low
Significance	**LOW (-)**		**LOW (-)**
Probability	Probable		Probable
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Medium		Medium
Mitigation measures			
• Search and rescue of *Hoodia gordonii*			

Table 38: Removal of Bushmanland Arid Grassland vegetation and minimal Bushmanland Sandy Grassland [Substation (Power block)]

Phase	Pre-Construction	**Construction**	
Impact description	Fixed axis PV or single axis tracking in the area designated as Veld PV South. In terms of impacts on botanical attributes of the site it is the footprint that is of importance since virtually all vegetation within the footprint would be removed or at least disturbed in some way.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Long term		Long term
Extent	Local		Local
Intensity	Low-		Low
Significance	**LOW (-)**		**LOW (-)**
Probability	Probable		Probable
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Medium		Medium
Mitigation measures			
• None required			

7.4.4 Cumulative impacts

Cumulative impacts from the construction of the Veld PV South Power Block are anticipated to be Low negative since Bushmanland Arid Grassland occurs over wide expanses in the Northern Cape Province and is not rich in plant species. Bushmanland Sandy Grassland is also not botanically sensitive. There would be very low irreplaceability of resources due to the construction and operation of the Veld PV South solar project despite other renewable energy projects in similar ecosystems elsewhere.

7.4.5 No Go Alternative

In the case of the 'No Go' alternative, the proposed Veld PV South would not be constructed, and the status quo would persist where current farming practices would continue. The impact of the 'No Go' alternative would be **Very Low** negative.

7.4.6 Botany conclusion and impact statement

A single vegetation type occurs in the Veld PV South Power Block area namely, Bushmanland Arid Grassland. This vegetation type is not endangered in any way and is therefore considered to be Least Threatened.

The vegetation on the site has low sensitivity and given that and other attributes of the site the impact on the vegetation and habitat would be **Low negative** (pre- and post-mitigation).

There is no part of the main Veld PV South that has any 'red flags' except for the requirement to relocate plants *Hoodia gordonii*. In addition, along the southern boundary of the site, care should be taken to avoid impact on trees of *Boscia albitrunca*. This should be possible because the trees are mostly within the area excluded due to freshwater ecological constraints. However, if disturbance of any *Boscia albitrunca* trees is unavoidable, a permit for disturbance or removal of such trees would be required from the Department of Environment, Forestry and Fisheries (DEFF).

No alien invasive plants were recorded in the Veld PV South 'focus area' but exotic mesquite (*Prosopis glandulosa* var. *torreyana*) was noted in the greater Veld PV South study area. Care should be taken during the construction and operational phases to not introduce this invasive species into the PV area.

All the infrastructure listed in the 'Background and Brief' section was considered in the assessment of impacts. This infrastructure would be contained within the site except for the loop-in, loop out power line. The latter would have negligible further impact than what has been described.

The development of the proposed Veld PV South is supported from a botanical viewpoint as long as the mitigation measure of relocating *Hoodia gordonii* is carried out.

The development of the proposed Veld PV South is supported from a botanical perspective.

7.5 Heritage, Archaeology and Palaeontology

The Heritage specialist, Jayson Orton of ASHA Consulting was appointed to conduct the Impact Assessment Report which has been included in Annexure D and Dr John Almond of Nature Viva conducted the Palaeontological Impact Assessment.

7.5.1 Study methods and criteria

A survey of available literature was carried out to assess the general heritage context into which the proposed Veld PV South, powerline and associated infrastructure would be set. Literature included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS). The 1:50 000 map was sourced from the Chief Directorate: National Geo-Spatial Information.

The south site was subjected to a detailed foot survey by two archaeologists (Dr Jayson Orton and Chester Kaplan) on 6th October 2016.

Despite the very low sensitivity of palaeontological heritage in this case, a desktop study has been produced by Dr John Almond of Natura Viva cc and submitted alongside the present report.

7.5.2 Description of the environment

This site is very flat with a sandy substrate and only very light vegetation cover. It is bordered to the west by a rocky ridge, while a short longitudinal sand dune bisects the eastern boundary. Two further longitudinal dunes end at the southern boundary of the site. There are no other landscape features on the site. Because most farms were settled quite late, most structures in the region date to the 20th century. At Pella, however, there were buildings by 1882, for we know from the writings of Bishop John Marie Simon (1959) that at that time the residents of Pella were, under his direction, making lime plaster from local rocks with which to plaster buildings. They also built a 'cathedral' in the early 1890s (Anonymous n.d.). Orton (2016a) found all structures in his survey area to the south to be 20th century.

Colonial occupation of the area commenced late and as a result, historical traces tend to be few and far between. Throughout much of the 19th century the region was a colonial frontier with Caucasian, small stock farmers moving through the region, but generally not living a settled lifestyle. The earliest settlements were mission stations that were located at springs. The nearest to the study area was at Pella, some 55 km to the east, which was founded as early as 1814 (anonymous n.d.). Conflict was frequent as competition for grazing land and access to water sources grew stronger, although this may have been more the case further south where better-quality grazing occurs (Penn 2005). It is notable, however, that Robert Moffat (Schaeffer 2008:58) found Wortel (a farm a short distance east of the present study areas) to be "one of the finest grazing places in Namaqualand". Survey diagrams of the area indicate that Haramoep 53 and Naroep 45 were first surveyed in 1894.

The entire study area and surrounds are underlain by geological deposits of low or zero palaeontological sensitivity (Refer to Figure 15). According to the SAHRIS Paleo sensitivity Map key, no palaeontological specialist studies should be carried out in such areas. Nevertheless, brief comment was sought from Dr John Almond and is included in Appendix 2 of the Heritage Impact Report. On the local geology, Almond (2016) notes the following:

The areas are underlain at depth by highly metamorphosed or igneous Precambrian basement rocks of the Namaqua-Natal Province. These bedrocks are of Precambrian (Mid Proterozoic) age and are entirely unfossiliferous (Almond & Pether 2008). They are overlain by a range of mostly unconsolidated Quaternary to Recent superficial sediments of Quaternary to recent age that are included within the Kalahari Group (Partridge et al. 2006). These include Quaternary to Recent sands and gravels of probable braided fluvial or sheet wash origin, as well as the veneer of downwasted surface gravels and colluvial (rocky scree) deposits that are not indicated separately on the geological maps. The youthful superficial sediments are locally overlain by unconsolidated aeolian (i.e. wind-blown) sands of the Quaternary Gordonia Formation (Kalahari Group) (orange dunes on satellite images). More consolidated alluvial sediments and pedocretes (e.g. calcrete) are

associated with shallow water courses and pans. All these superficial sediments are, at most, sparsely fossiliferous, although they may occasionally contain skeletal remains of vertebrates (e.g. mammalian bones, teeth) or calcretised trace fossils (e.g. termite nests).

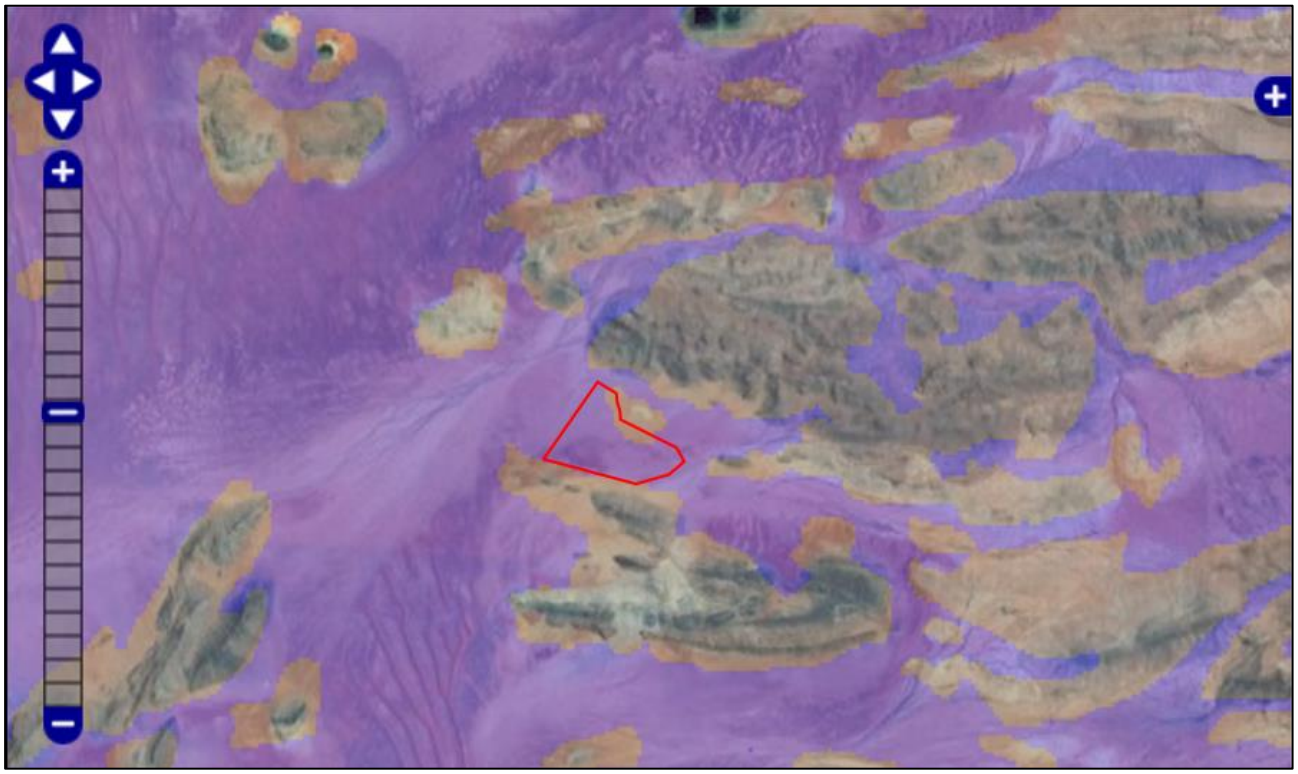


Figure 15*:* Extract from the SAHRIS Palaeosensitivity map showing the study area (red polygon) to be largely underlain by sediments of low palaeontological sensitivity (blue shading). Some parts of the site alongside the rocky hills are of zero sensitivity (grey shading).

7.5.3 Impact assessment with mitigation measures

The proposed PV facility and grid connection infrastructure is likely to have potential direct and indirect impacts on heritage. These are likely to include *inter alia:*

- Destruction or damage to archaeological materials and unmarked graves (-)
- Destruction or damage to palaeontological materials (-)
- Impacts to the cultural and natural landscape (-)

Impacts associated with the PV facility, grid connection, substation and access routes:

Table 39: Destruction or damage to archaeological materials and unmarked graves

Phase	Pre-Construction	**Construction**	**Operational**
Impact description	Destruction or damage to archaeological materials and unmarked graves during the construction phase		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Permanent		Permanent
Extent	Site specific		Site specific
Intensity	Low -		Very Low-
Significance	**LOW (-)**		**VERY LOW (-)**
Probability	Fairly likely		Unlikely
Confidence	Certain		Certain
Reversibility	Irreversible		Irreversible
Irreplaceability	High		High
Mitigation measures			
• The layout must be examined by an archaeologist and any potentially sensitive areas must be checked on site prior to construction (applies mainly to the grid connection). • If any archaeological material or human burials are uncovered during the course of development, then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.			

Table 40: Destruction or damage to palaeontological materials

Phase	Pre-Construction	Construction	Operational
Impact description	Destruction or damage to palaeontological materials during the construction phase		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Permanent		Permanent
Extent	Local		Local
Intensity	Medium -		Medium +
Significance	**VERY LOW (-)**		**VERY LOW (+)**
Probability	Unlikely		Unlikely
Confidence	Certain		Certain
Reversibility	Irreversible		Irreversible
Irreplaceability	High		High
Mitigation measures			
• Any fossils found during construction must be protected, recorded and reported using the fossil finds procedure.			

Table 41: Impacts to the cultural and natural landscape

Phase	Pre-Construction	Construction	Operational
Impact description	Impacts to the cultural and natural landscape during construction and operational phase		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Permanent		Permanent
Extent	Local		Local
Intensity	Very Low -		Medium +
Significance	**MODERATE (-)**		**LOW (-)**
Probability	Definite		Unlikely
Confidence	Certain		Certain
Reversibility	Irreversible		Irreversible
Irreplaceability	High		High
Mitigation measures			
• Minimise damage to areas not required during operation. • Minimise lighting at night. • Minimise litter and keep site tidy.			

7.5.4 Cumulative impacts

Due to their relative scarcity on the landscape, few impacts to heritage resources have occurred from other developments. The site is so remote that visual impacts to the cultural landscape would not overlap with those from other developments and this is not a concern. Provided the construction and operation activities of the projects remain contained within the allocated areas, the overall impact should be limited and of a **Neutral** significance.

7.5.5 No Go Alternative

The no-go alternative will result in the current status quo being maintained as far as the heritage is concerned. The no-go option would therefore eliminate any additional impact on the heritage and palaeontological aspects of the proposed development the significance rated as **Neutral.**

7.5.6 Heritage conclusion and impact statement

Conclusions and Recommendations

It is concluded that no significant direct impacts to heritage resources are expected at the proposed site.

The impact on Archaeological resources has been assessed as **Very Low (-)** significance for all proposed alternatives. Impacts to the cultural landscape will be **Low (-)** significance. It is clear that palaeontological resources are likely to be extremely rare and/or insignificant in the area and that impacts to palaeontology are considered to be of a **Very Low (-)** significance.

Due to the very limited and generally manageable heritage impacts that would occur, it is concluded that the proposed Veld PV South project is feasible, but that the preferred site alternative should be used. Any of the technology and access alternatives may be used.

7.6 Hydrology

Aurecon South Africa (Pty) Ltd was appointed to conduct the Hydrology Impact Assessment Report which has been included in Annexure D.

7.6.1 Study methods and criteria

The objective of the project inception report was to collect and review available data, agree on the interfaces with other specialist investigations, develop an understanding of the nature of the infrastructure being planned, and identify potential hydrological concerns related to the proposed development. Relevant data to support the hydrological analysis was collected and reviewed. A site visit was conducted on the 19th and 20th of October 2016 to familiarise the hydrologist with the topography, drainage network and general physical characteristics of the study site.

A baseline assessment was conducted that considered the drainage network, topography, land use, rainfall, soils and vegetation of the proposed development site for Veld PV South.

7.6.2 Description of the environment

The landscape of the proposed site is a desert grassland plain with scattered inselberg and currently used for grazing of sheep and cattle. The farm that constitute the proposed Veld PV South site experience low rainfall with a mean annual precipitation (MAP) of 90 mm. The rainfall gauge at Pella (56 km from the site) records a MAP of 73 mm. The information is from the Lynch (2004) rainfall database.

The Veld North site is flanked to the west by a large dry river bed and is bordered on the eastern side by a smaller dry river bed. The large intermittent watercourse adjacent to the site has a catchment area of 103 km2 and a channel width which ranges from 150 to 550 m (Refer to Figure X and Y). This watercourse rarely flows on the surface due to the deep alluvial deposit in the channel which causes large channel losses. The channels generally have a sandy bed and an increase in vegetation cover relative to the rest of the farm due to increased availability of water.

The smaller channel to the north east of the proposed site is fed by runoff directly from the nearby inselberg and has a catchment area of approximately 0.9 km2, this channel flows immediately after heavy rainfall, such as a thunderstorm, and then dissipates. Watercourse 3, with a catchment area of approximately 7 km2, is to the east of the site and has a channel width ranging from 50 m to 190 m.

Figure 16 Watercourse 1 upstream of farmhouses

Figure 17 Watercourse 1 adjacent to Veld PV South site

There is an existing Eskom transmission line and service road which runs along the eastern flank of the site. The connection from Veld PV South to the Eskom transmission lines can be made without crossing any watercourses.

The soils on site are sandy and have a rapid permeability which results in a low stormflow potential. The infiltration rate of this type of soil is well in excess of 20mm/hr (Schmidt and Schulze, 1987). A comparison of the design rainfall and the estimated infiltration of the sandy soils shows that there is low runoff potential.

The current natural drainage of the site should be retained. The natural vegetation is important in stabilising the soil structure and any permanent removal of the vegetation should be minimised in order to maintain soil structure. If the natural vegetation is not retained, then the site is likely to experience erosion of the soil by stormwater during heavy rainfall events like thunderstorms and wind erosion in the long dry periods.

7.6.3 Impact assessment with mitigation measures

The proposed PV facility and grid connection infrastructure is likely to have potential direct and indirect impacts on hydrology. These are likely to include *inter alia:*

- Impact of the PV technology alternatives – erosion (-)
- Impact of location alternatives (-)
- Impacts of roads (-)
- Impact of transmission line (-)

Table 42: Impact of PV technology alternatives in reference to erosion

Phase	Pre-Construction	Construction	Operational
Impact description	Fixed PV axis and single axis tracking PV		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Long term		Long term
Extent	Local		Local
Intensity	Medium -		Medium-
Significance	**LOW (-)**		**LOW (-)**
Probability	Definite		Definite
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• Mitigation measures should as far as possible mimic natural hydrology. • Use of non-structural techniques			

Table 43: Impact of location alternatives in reference to flow and erosion

Phase	Pre-Construction	Construction	Operational
Impact description	PV South located on Haramoep RE/53		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Long term		Long term
Extent	Local		Local
Intensity	Medium -		Medium-
Significance	**LOW (-)**		**LOW (-)**
Probability	Definite		Definite
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• Mitigation measures should as far as possible mimic natural hydrology. • Use of non-structural techniques			

Table 44:Increased runoff and erosion (roads)

Phase	Pre-Construction	Construction	Operational
Impact description	Hardened surface - increased runoff and possible erosion		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Long term		Long term
Extent	Local		Local
Intensity	Medium -		Medium-
Significance	**MODERATE (-)**		**MEDIUM (-)**
Probability	Definite		Definite
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• The gravel roads should have a crowned driving surface and a shoulder area that slopes directly away from the edge of the driving surface. • Drifts should be used at watercourse crossing • The drift should be designed so that the road surface follows the natural ground level, minimising the reduction in the cross- sectional area of the channel at the drift.			

Table 45:Localized erosion (powerline)

Phase	Pre-Construction	Construction	Operational
Impact description	Hardened surface - increased runoff and possible erosion		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Long term		Long term
Extent	Local		Local
Intensity	Medium -		Medium-
Significance	**MEDIUM (-)**		**MEDIUM (-)**
Probability	Definite		Definite
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• Pylons should be place outside of watercourses			

7.6.4 Cumulative impacts

Provided the construction and operation activities of the projects remain contained within the allocated areas, the overall impact should be limited and of a **Neutral** significance.

7.6.5 No Go Alternative

The significance for the No-Go Alternative will be Neutral.

7.6.6 Hydrology conclusion and impact statement

The mitigating measures should as far as possible result in the mimicking of the natural hydrology and can be achieved with the use of non-structural techniques. Stormwater management may be provided in a cost-effective manner by disconnecting each row of panels by providing adequate spacing between each row and thereby allowing runoff to infiltrate over the vegetated areas between the individual rows. This approach works best in undisturbed soils and vegetated areas should be retained. Allowing for infiltration of water between and underneath the panels is the key element. If a drainage network is designed for the site that concentrates flows and/or if a network of hardened road surfaces and/or large buildings are planned, then a stormwater study should be undertaken at design stage to determine whether interventions like detention ponds will be required to prevent erosion downstream of the site.

For the crossing of watercourses by access roads it is recommended that drifts be used. The drift should be designed so that the road surface follows the natural ground level, minimising the reduction in the cross-sectional area of the channel at the drift.

Erosion potential is a concern at the proposed site in relation to stormwater. The soil structure is generally intact and shows little sign of erosion by animals.

7.7 Socio-economic Aspects

The Socio-economic specialist, Marcel Theron of Urban-econ was appointed to conduct the Impact Assessment Report which has been included in Annexure D.

7.7.1 Study methods and criteria

The purpose of the socio-economic impact assessment was to determine the potential socio-economic implications of the proposed Veld PV South activities and associated infrastructure. The following methods were applied.

- Collection of information on the extent and magnitude of the socio-economic activities that will be directly or indirectly affected by the proposed Veld PV South
- Quantification of potential positive and negative effects of the proposed Veld PV South on socio-economic activities
- Evaluation of the change in size of the local and regional economies that will be stimulated by the proposed Veld PV South
- Evaluation of the potential positive and negative socio-economic impacts following the environmental specialists' methodology
- Undertook a comparative analysis of alternatives
- Provision of mitigation measures

7.7.2 Description of the environment

The proposed Veld PV South is located ±20km from Aggeneys, ±55km from Pofadder and ±35km from Pella. The N14 National Road runs past Aggeneys, connecting Springbok, Aggeneys, Pofadder, Kakamas, and Upington. Pofadder developed as an agricultural service centre and is the main seat of Khâi-Ma Municipality. Pofadder accommodates a few businesses and institutions such as the municipal offices, schools, a hospital, a clinic, a police station and a gravel airstrip. Aggeneys is a mining town, primarily accommodating the workers of the Black Mountain Mine. Aggeneys includes a primary and secondary school, a police station, a clinic, a golf course and a tarred airstrip. Pella originally functioned as a mission station, providing a sanctuary for Khoisan driven out of Namibia. Pella has limited infrastructure consisting of a primary school, police station, library, clinic, restaurants/taverns and the old cathedral, which is a tourist attraction.

The main economic activities within the Namakwa District Municipality are agriculture and mining. Stock farming in the Namakwa District Municipality includes sheep, cattle, goat and ostrich farming. Flower bulbs and wool production are important contributors to the agricultural sector. The Orange River plays a key role in the region's agricultural activities and alluvial diamond mining activities. In Khâi-Ma Municipality the grazing potential (measured in hectares required to sustain one large livestock unit) is relatively low, therefore necessitating large farming units, mainly used for livestock (cattle, sheep and antelope) and game farming (Khâi-Ma Municipality Integrated Development Plan 2012-2017). Khâi-Ma Municipality is also rich in minerals (i.e. sillimanite, zinc, copper, lead, granite, quartz and aventurine) and the Black Mountain Mine at Aggeneys mines copper, lead and zinc. There is also a gypsum mine located in Pofadder.

The main economic activities within the Namakwa District Municipality are agriculture and mining. Stock farming in the Namakwa District Municipality includes sheep, cattle, goat and ostrich farming. Flower bulbs and wool production are important contributors to the agricultural sector. The Orange River plays a key role in the region's agricultural activities and alluvial diamond mining activities (KMLM, 2012-2017). In Khai-Ma Municipality the grazing potential (measured in hectares required to sustain one large livestock unit) is relatively low, therefore necessitating large farming units, mainly used for livestock (cattle, sheep and antelope) and game farming (80%) (Khai-Ma Municipality Integrated Development Plan 2012-2017). Khai-Ma Municipality is also rich in minerals (i.e. sillimanite, zinc, copper, lead, granite, quartz and aventurine) and the Black Mountain Mine at Aggeneys mines copper, lead and zinc. There is also a gypsum mine located in Pofadder. The Orange River forms the northern boundary of the Khai-Ma Municipality. The river is an important source of water for agriculture and domestic use. Table grapes and dates are cultivated on the banks of the river, which are mainly produced for export purposes. Hoodia and Geranium are cultivated at Onseepkans and Pella for oils and medicinal purposes.

The main town of Nama Khoi Municipality is Springbok (± 92km from the proposed project), as it hosts the highest level of economic activity.

The population in Khai-Ma Municipality is 11 657 people, with a total of ± 3 900 households consisting of an average size of 2.9 individuals per household. Khai-Ma Municipality experienced an average population growth rate of -1.3% between 2005 and 2015, which is similar to the District's growth rate of -1.4% for the same period.

Table 46: Population and household totals (2018)

2018	South Africa	Northern Cape	Namakwa District	Khâi-Ma Municipality
Population Total	57 725 606	1 225 555	111 418	11 605
Average Population Growth (2008 - 2018)	1.6%	1.3%	0.0%	0.0%
Households Total	16 092 377	322 199	32 436	3 542
Average Household Size	3.6	3.8	3.4	3.3

The economic sectors that contributed the most to Khai-Ma Municipality's Gross Domestic Product Regional (GDP) in 2015 were:

The economic sectors that contributed the most to Khâi-Ma Municipality's GVA in 2018 were:

- Agriculture, forestry and fishing (19.8%)
- Mining and quarrying (36.4%)
- General government (12.4%)

The employment profile of the study area is an important indicator of human development, but also of the level of disposable income, and subsequently the expenditure capacity, of the residing population. The employment rate refers to those economically active people who are unemployed and looking for work, as well as persons who are unemployed and not looking for work but would accept work if it was offered to them. This category also includes those in the population who are not economically active, including people who are not working but are housewives, scholars/full-time students, pensioners, disabled people and people not wishing to work

7.7.3 Impact assessment with mitigation measures

The proposed PV facility and grid connection infrastructure is likely to have potential direct and indirect impacts on the social environment. These are likely to include *inter alia:*

- Impact on production and gross domestic product (Construction, Operation) (+)
- Impact on employment and skills development (Construction, Operation) (-)
- Impact on household income (Construction, Operation) (-)
- Impact on government revenue (Construction, Operation (-)
- Impact on in-migration (Construction) (-)
- Impact on basic services, social and economic infrastructure (Construction)
- Impact of Investment in Local Communities and Economic Development Projects as Part of the Social Economic Development and Enterprise Development Plan (Operation) (-)
- Impact on supply of electricity (Operation) (-)

Impacts associated with the Veld PV South facility:

Table 47: Impact on production and gross domestic product

Phase	Pre-Construction	Construction	Operational
Impact description	Construction phase: The biggest effects on production and Gross Domestic Product stimulated during construction activities, such as through the construction of the bulk infrastructure, retail, educational and medical facilities, etc, will be created through the multiplier effects, specifically through production and consumption induced effects. The former refers to the impacts generated along backward linkages when the project creates the demand for goods and services required for construction and this, in turn, stimulates the business sales of the suppliers of inputs that are required to produce these goods and services. The latter refers to the effects of household spending, which is derived from an increase in salaries and wages directly and indirectly stimulated by the project's expenditure. Besides the value added that could be generated by the local construction businesses through sub-contracting agreements and employment of free-lancers, the sectors that are expected to benefit the most from the production and consumption induced effects are tertiary services such as building and construction, real estate, business services and manufacturing. Operational phase: This impact is created through the production and consumption multiplier effect. The production effect refers to that which is created when demand for the goods generated requires construction which then creates business sales as developers require a supply of operational inputs. The consumption effect refers to the fact that the operational phase of the development leads to the increase in household incomes of those who receive a salary from permanent employment at the project. This then increases household spending. These two effects stimulate the economy and increase regional Gross Domestic Product.		
	Without mitigation		**With mitigation**
Nature	Positive		Positive
Duration	Short term-Construction		Short term-construction
	Permanent-Operational		Permanent-Operational
Extent	Regional		Regional
Intensity	High		High
Significance	**HIGH (+) -Construction**		**HIGH (+) - Construction**
	MODERATE (+) - Operation		**MODERTAE (+) - Operation**
Probability	Definite		Definite
Confidence	Certain		Certain
Reversibility	Irreversible		Irreversible
Irreplaceability	Low		Low
Mitigation measures			
Construction phase: • Establish a local skills desk in the study area to determine the potential skills that could be sourced in the area. • Recruit local labour as far as feasible. • Sub-contract to local construction companies where possible. • Knowledge sharing and on-the-job- training should be viewed as a prerequisite, where feasible, for all service contractors/service providers working on the development and employing local labour. Operational phase • Where possible, local labour should be considered for employment to increase the positive impact of the local economy. • If possible, goods and services should be procured from local small businesses, this will stimulate indirect job creation.			

Table 48: Impact on employment and skills development

Phase	Pre-Construction	Construction	Operational
Impact description	Construction phase: The local and national economies have high unemployment rates, and government has set a target to create 11 million jobs by 2030. Unemployment is high within the Khâi-Ma Municipality (14.2%) and the Namakwa District Municipality (10.3%) with the remainder within the district and the local municipality being not economically active (43.1% and 38.2%, respectively). In addition to direct jobs, jobs will also be created indirectly (among suppliers) and induced jobs will be created through greater income circulation. Due to the nature of work that needs to be performed, a significant amount of employment opportunities exists for unskilled and semi-skilled workers. Amongst others, construction involves activities that require unskilled labour for which locals could be employed. These include clearance of vegetation, digging trial pits at main foundation points, excavation of foundation where access is poor, mixing of concrete where access is poor, rehabilitation of land, site security, and other activities requiring labourers. It is important to ensure that most of the employment opportunities created as part of the development are allocated to the local communities. This would result in individuals gaining more skills (learning various building skills) and would then be able to search for other job opportunities relating to the same kind of building opportunities after the completion of the proposed Veld PV South. Operational phase: The local and national economies have high unemployment rates, and government has set a target to create 11 million jobs by 2030. Unemployment is high within the Khâi-Ma Municipality (14.2%) and the Namakwa District Municipality (10.3%) with the remainder within the district and the local municipality being not economically active (43.1% and 38.2%). The proposed Veld PV South will create 52 employment opportunities of which 13 will be direct, 18 will be indirect and 21 will be induced. It is important to note that these employment opportunities will be sustainable, compared to the employment opportunities created during construction that will fade away once construction is completed. Additionally, indirect jobs will be created at various businesses providing goods and services to the development activities when required.		
	Without mitigation		**With mitigation**
Nature	Positive		Positive
Duration	Short term -Construction		Short term - Construction
	Long term - Operational		Long term - Operational
Extent	Regional		Regional
Intensity	Medium		Mediun
Significance	**MEDIUM (+) Construction**		**MEDIUM (+) Construction**
	LOW (+) Operational		**LOW (+) Operational**
Probability	Probable		Probable
Confidence	Certain		Certain
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• Construction phase: • Establish a local skills desk in the study area to determine the potential skills that could be sourced in the area. • Recruit local labour as far as feasible. • Sub-contract to local construction companies where possible. • Knowledge sharing and on-the-job- training should be viewed as a prerequisite, where feasible, for all service contractors/service providers working on the development and employing local labour. Operational phase			

- Where possible, local labour should be considered for employment to increase the positive impact of the local economy.
- If possible, goods and services should be procured from local small businesses, this will stimulate indirect job creation.

Table 49: Impact on household income

Phase	Pre-Construction	Construction	Operational
Impact description	Construction phase: The proposed Veld PV South would have a positive impact on the household income as it will generate approximately R432 million across 3 298 employment positions. This increase in household income levels is due to the anticipated increase in unskilled to skilled employment opportunities (construction workers, site managers, security, engineers, builders, machine operators, etc) to be created as part of the construction phase of the development. Depending on the employment position, salaries and wages within low to high-income levels would be paid out. Although temporary, this increase in household earnings would have a positive effect on nutrition, living conditions, access to better health care, access to more options regarding education, and improved ability to make economic choices. Operational phase: The proposed Veld PV South will create employment opportunities in the long term (operational phase). It is important to note that these employment opportunities will be sustainable, compared to the employment opportunities created during construction that will fade away once construction is completed. The sustainable income generated because of the proposed Veld PV South operation will be approximately R9 million per annum which will have a positive impact for the 52 employment positions created. This in turn will positively affect the nutrition, living conditions, access to better health care, access to more options regarding education, and improved ability to make economic choices.		
	Without mitigation		**With mitigation**
Nature	Positive		Positive
Duration	Short term -Construction		Short term-Construction
	Long term -Operational		Long term -Operational
Extent	Regional		Regional
Intensity	High		High
Significance	**MEDIUM (+) Construction**		**MEDIUM (+) Construction**
	LOW (+) Operational		**MEDIUM (+) Operational**
Probability	Probable		Probable
Confidence	Certain		Certain
Reversibility	Irreversible		Irreversible
Irreplaceability	Low		Low
Mitigation measures			
Construction phase: • Recruit local labour as far as feasible. • Sub-contract to local construction companies where possible. • Use local suppliers where feasible for goods and services Operational phase • Where possible, the local labour supply should be considered for employment opportunities to increase the positive impact on the area's economy • When feasible local procurement of goods and services should be implemented to further increase the benefit of local communities			

Table 50: Impact on government revenue (Rates and taxes)

Phase	Pre-Construction	Construction	Operational
Impact description	Construction phase: The investment from the proposed Veld PV South will generate revenue for the local municipality through a combination of personal income tax, VAT, companies' tax, bulk infrastructure levies, etc. Due to a limited economic base and low-income levels, the local municipality's revenue base is limited, which in turn negatively impacts on its ability to provide services to its residents. Government earnings will be distributed by the local government to cover public spending, which includes amongst others, the provision and maintenance of transport infrastructure, health and education services, as well as other public goods. Operational phase: The proposed Veld PV South would contribute to the local municipality through payments for utilities used in the operation of the facility. Additionally. In addition to the above rates and taxes the following taxes could also be received: • Business income taxes, as well as personal income tax for those employed within the development, will also be collectable by the South African Revenue Services; and • The indirect impacts stem from the additional business sales and Gross Domestic Product, which supplies the authorities with increased taxes on personal and business incomes.		
	Without mitigation		**With mitigation**
Nature	Positive		Positive
Duration	Short term -Construction		Short term-Construction
	Long term -Operational		Long term -Operational
Extent	Regional		Regional
Intensity	Medium		Medium
Significance	**MEDIUM (+) Construction**		**MEDIUM (+) Construction**
	LOW (+) Operational		**LOW (+) Operational**
Probability	Definite		Definite
Confidence	Certain		Certain
Reversibility	Irreversible		Irreversible
Irreplaceability	Low		Low
Mitigation measures			
None			

Table 51: Impact on in-migration

Phase	Pre-Construction	Construction	
Impact description	Construction phase: The proposed Veld PV South would create many job opportunities during the construction phase, and should construction companies utilise labourers from different areas then this could potentially result in an influx of workers to the proposed site. The negative impact would be due to the increased usage of services such as water and electricity infrastructure. Although it would be difficult to ensure that contractors only employ labourers from the area (in order to minimise migration) it would be mandatory to manage this through a proposed labour desk. The migration of people to the area could result in social conflicts between the local population and the migrants, as the former could perceive the latter to steal the employment opportunities in the area that are already in short supply. An influx of people into the area, especially by job seekers, could further lead to a temporary increase in the level of crime, prostitution, and possibly deterioration of health amongst the people of the local communities due to the spread of sexually transmitted diseases. The issue of semi-skilled and unskilled construction workers and job seekers that decide to stay in the area after the project's establishment is also a concern. Left without income, these individuals could resolve to crime and contribute to the increase in the level of poverty in the local communities. Aside from the broader community issues, the presence of the workforce on site could lead to negative impacts in the surrounding area such as theft and burglaries, trespassing on adjacent properties, development of informal trading, and littering.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term		Short term
Extent	Regional		Regional
Intensity	Low		Low
Significance	**MEDIUM (-)**		**MEDIUM (-)**
Probability	Fairly likely		Fairly likely
Confidence	Certain		Certain
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
Construction phase: • Set up a recruitment office in the nearby towns and adhere to strict labour recruitment practices that would reduce the desire of potential job seekers to loiter around the properties in hope to find temporary employment. • Employ locals as far as feasible through the creation of the local skills database and recruitment of suitable candidates. • Control the movement of workers between the site and areas of residence to minimise loitering around the proposed facility by providing scheduled transportation services between the urban areas and the construction site. • Engage communities with respect to their possible involvement during construction in providing supporting services such as catering, temporary housing of workers, transportation, etc. • Establish a proper fencing around the property to reduce the desire of workers to trespass between the construction site and adjacent properties. • Set up a gate and controlled access system to monitor the movement of people to and from the property, as well as to reduce the influx of job seekers to the site itself. • Ensure that any damages or losses to the nearby farms that can be linked to the conduct of the construction workers are adequately reimbursed. • Assign a person to deal with complaints and concerns of the affected parties. Operational phase N/A			

Table 52: Impact on basic services, social and economic infrastructure

Phase	Pre-Construction	Construction	
Impact description	Construction phase: Should migrant workers come into the area they will be creating an additional demand for rental accommodation, social services, and access to water and electricity. Most of the Khâi-Ma Municipality's population has access to basic services (i.e. water, electricity, sanitation) but due to the arid nature of the area, surface and underground water supplies are insufficient to provide higher levels of infrastructure (such as waterborne sanitation). The proposed developer is envisioning to establish a construction camp on site, which means that construction workers coming from outside the area would not need to be accommodated in the nearby towns		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term		Short term
Extent	Regional		Regional
Intensity	Low		Low
Significance	**LOW (-)**		**LOW (-)**
Probability	Probable		Probable
Confidence	Certain		Certain
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• None			

Table 53: Impact of Investment in Local Communities and Economic Development Projects as Part of the Social Economic Development and Enterprise Development Plan

Phase	Pre-Construction	**Operation**
Impact description	The local economy lacks employment opportunities and opportunities to further skills development, which could be attributed to the area lacking community facilities and the lack in the number of businesses. The project will form part of the Independent Power Producer Procurement Programme. This implies that the operating company would allocate a certain percentage of the project's revenue to community development.	
	Without mitigation	**With mitigation**
Nature	Positive	Positive
Duration	Long term	Long term
Extent	Regional	Regional
Intensity	Medium	Medium
Significance	**MODERATE (+)**	**MODERATE (+)**
Probability	Probable	Probable
Confidence	Certain	Certain
Reversibility	Reversible	Reversible
Irreplaceability	Low	Low
Mitigation measures		
• None		

Table 54: Impact on supply of electricity

Phase	Pre-Construction	Operation	
Impact description	The proposed Veld PV South falls within the Springbok Renewable Energy Development Zone as well as one of the identified power corridors which will assist in enabling the efficient and effective expansion of key strategic transmission infrastructure designed to satisfy national transmission requirements up to 2040.		
	Without mitigation		**With mitigation**
Nature	Positive		Positive
Duration	Long term		Long term
Extent	National		National
Intensity	High		High
Significance	**MODERATE (+)**		**MODERATE (+)**
Probability	Definite		Definite
Confidence	Certain		Certain
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• None			

7.7.4 Cumulative impacts

The proposed PV facility and grid connection infrastructure is likely to have cumulative impacts on the social environment. These are likely to include *inter alia:*

- Impact on production and gross domestic product (Construction, Operation) (+)
- Impact on employment and skills development (Construction, Operation) (-)
- Impact on household income (Construction, Operation) (-)
- Impact on government revenue (Construction, Operation (-)
- Impact on in-migration (Construction) (-)
- Impact on basic services, social and economic infrastructure (Construction)
- Impact of Investment in Local Communities and Economic Development Projects as Part of the Social Economic Development and Enterprise Development Plan (Operation) (-)

The impact rating for all the cumulative impacts referring to the construction and operational phases are rated as **High -**. This could be high considering the potential for solar and other projects (such as mining) in Khâi-Ma Municipality, and the Northern Cape Province.

7.7.5 No Go Alternative

The no-go alternative will result in the current status quo being maintained as far as the socio-economic impact is concerned. The no-go option would therefore eliminate any additional impact on the heritage and palaeontological aspects of the proposed development and the significance is rated as **Neutral.**

7.7.6 Socio economic conclusion and impact statement

The proposed Veld PV South will have various social and economic impacts. The purpose of this study was to identify possible impacts that could occur as a result of activities, which will take place during the construction and operational phase of the proposed Veld PV South. There will be a general **Low to Medium (+)** impact during construction and operational phases of the proposed Veld PV South project.

7.8 Visual Landscape

The Visual specialist, Steven Stead of VRM was appointed to conduct the Impact Assessment Report which has been included in Annexure D

7.8.1 Study methods and criteria

The process that VRM Africa follows when undertaking a VIA is based on the United States Bureau of Land Management ‘s (BLM) Visual Resource Management Method This mapping and GIS-based method of assessing landscape modifications allows for increased objectivity and consistency by using standard assessment criteria (Refer Visual Impact Assessment, 2019).

A site visit was conducted on the 2nd and 3rd of November 2016.

7.8.2 Description of the environment

The proposed development site is in the Northern Cape Province, Nama Khoi Local Municipality and within the Namakwa District Municipality (Refer to Figure 18). The area is characterised by an arid landscape of extensive sandy and gravel plains, with sparse vegetation, surrounding inselbergs and rocky outcrops. Scenic features of this arid environment are sand dunes with their linear wind shaped landforms. The overall landscape in the surrounding areas is very picturesque, offering potential for eco-tourism.

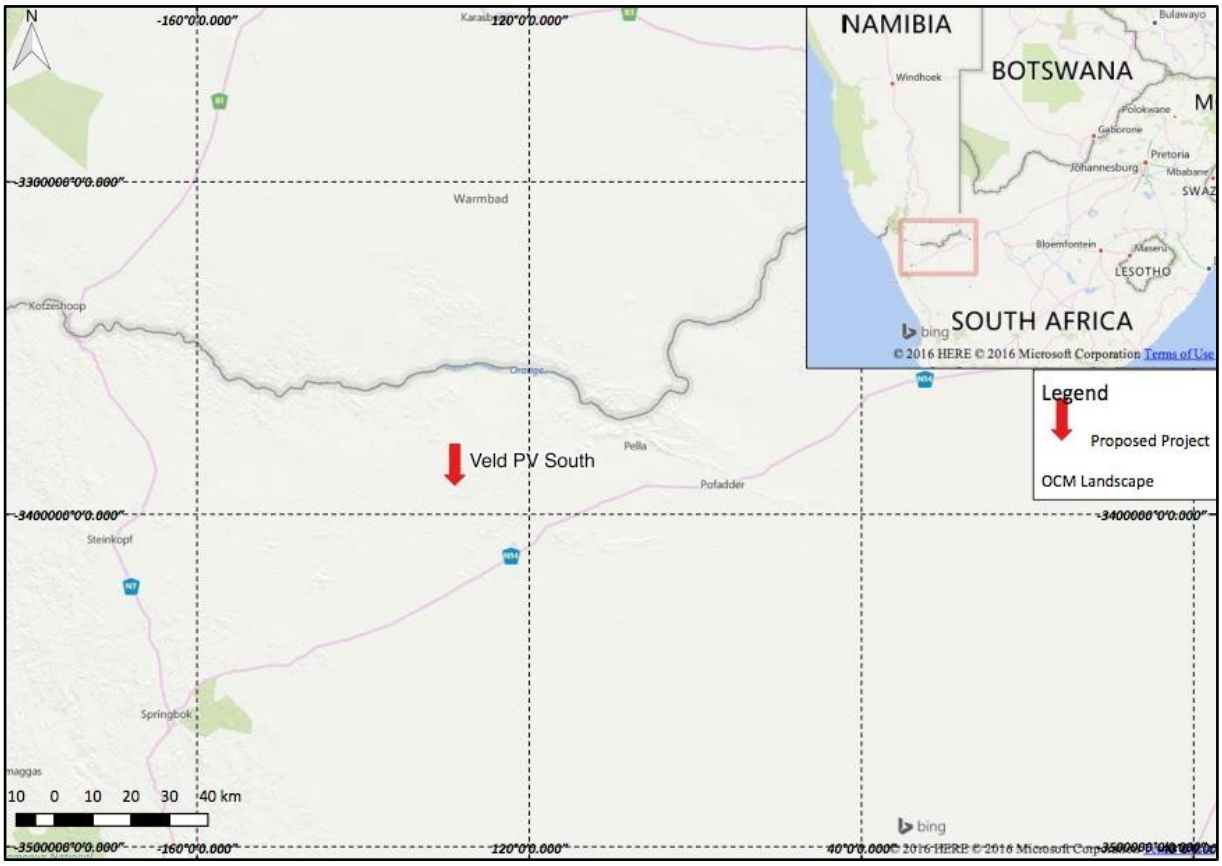


Figure 18*:* Regional locality map.

The Digital Elevation Model of the surrounding area (Figure 19) depicts the rugged and rocky terrain area along the Orange River which has been eroded to form Inselbergs and rocky outcrops that create interesting landforms. The gravel plains can be covered by sparse dwarf shrubs and short bushman grasses, and riverbeds support some woody vegetation. Scenic features of this arid environment are sand dunes with their linear wind shaped landforms. The overall landscape in the surrounding areas is very picturesque, offering potential for eco-tourism.

The key topographic feature in the region is the Orange River Valley which is located approximately 15 km to the north of the proposed site. The river system has cut away the surface geology exposing rough and textures

rocky outcrops on either side of the river valley. Some higher terrain is located to the southeast of the site which is strongly undulating and would limit visibility from south-eastern receptors. The overall terrain is relatively flat but with rocky outcrops and small hills defined as strong landforms.

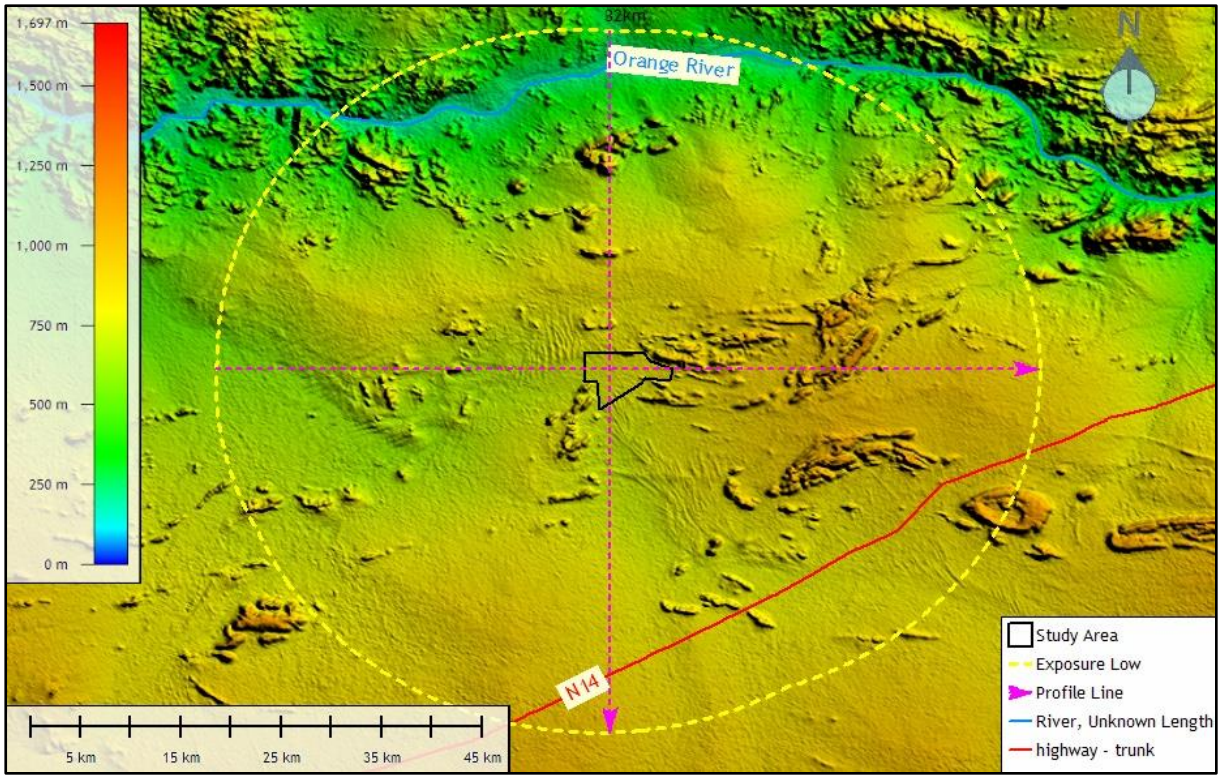


Figure 19 Surrounding area: Regional Digital Elevation Model Map.

As can be seen on the elevation map on Figure 20 below, the proposed preferred southern site is well topographically screened. Elevations range from 600 metres above mean sea level (mamsl) in the west, to a high of 1000 mamsl in the east.

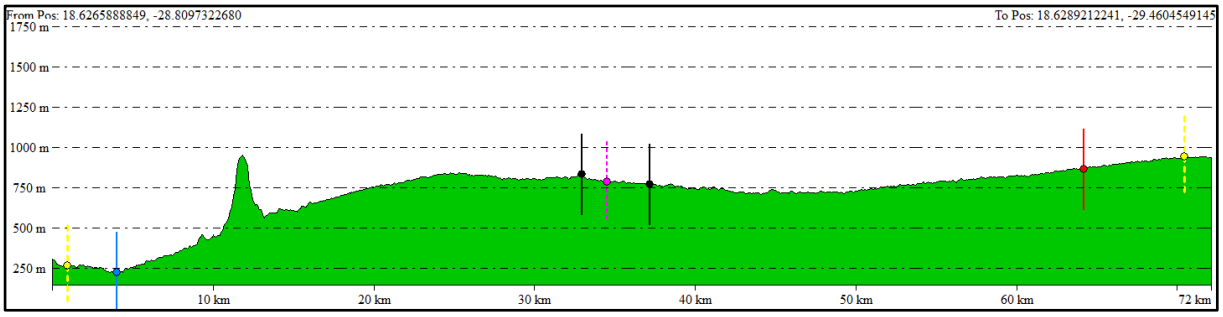


Figure 20: North to South Terrain Profile Graph.

Due to the arid climate and regional isolation, development in the surrounding areas has been limited and is mainly characterised by low intensity farming. The main road infrastructure is the N14 that is located approximately 55 km to the south-east of the proposed study area. This road is an important regional route, connecting the towns of Upington in the east, and Springbok in the west. The road was identified in the Local Municipality IDP as an important tourist development route. Due to the weighted importance of this road in the IDP, as well as the high scenic quality along the route, the N14 should be considered as a tourist view corridor.

Although the area does carry some modified landscapes such as the 220 kV Eskom power line (Figure 21) and the Black Mountain Mine, the Zone of Visual Influence of these man–made features is contained by the surrounding rocky outcrops.

Figure 21: Photograph of the Eskom 220kV power line as seen from the proposed Southern site.

Five farmsteads were identified in the surrounding landscapes. These landscapes usually comprised a few dwellings, some shade trees and water reservoirs. Located against the backdrop of the rocky outcrops and inselbergs, these cluster of dwellings make for an interesting farm setting and do not detract from the overall landscape character.

7.8.3 Impact assessment with mitigation measures

The proposed PV facility and grid connection infrastructure is likely to have potential direct and indirect impacts on the visual landscape. These are likely to include *inter alia:*

- Lights at night (Construction, Operation) (-)
- Windblown dust (Construction, Operation) (-)
- Landscape degradation (Construction, Operation) (-)
- Visual intrusion (Construction, Operation) (-)

Impacts associated with the Veld PV South facility:

Table 55: Lights at night (PV)

Phase	Pre-Construction	Construction	Operational
Impact description	Construction Phase Although construction phase lights at night have the potential to impact the current dark night sky sense of place, the impacts are moderated by the short time period of the construction phase. Operation Phase Due to the long-term duration of the operation phase lights at night impacts, without mitigation the potential impact is rated High-Negative. With mitigation that includes a detailed light spillage plan, the impacts can be reduced to Moderate-Negative and intrusion restricted to the local extent.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term -Construction		Short term -Construction
	Permanent - Operation		Permanent - Operation
Extent	Regional		Regional
Intensity	High (-)		Low (-) Construction
			Medium (-) Operation
Significance	**MODERATE (-) Construction**		**VERY LOW (-) Construction**
	MODERATE (-) Construction		**LOW (-) Construction**
Probability	Definite		Fairly likely -Construction
			Very likely - Operation
Confidence	Certain		Certain
Reversibility	Reversible		Reversible
Irreplaceability	Medium		Medium
Mitigation measures			
• For both the construction and operational phase generic light mitigations which limit the intensity and direction of lights at nigh spillage to the surrounding areas.			

Table 56: Windblown dust (PV)

Phase	Pre-Construction	Construction	Operational
Impact description	Construction Phase Since the arid area is already likely to be associated with windblown dust events, construction phase impacts from further windblown dust due to removal of vegetation is likely to be Low-Negative. With dust suppression mitigations, this impact can be reduced to Very Low-Negative. Operation Phase For operation the windblown dust effect could be exacerbated without mitigation and is rated Low-Negative. With the long-term management of un-vegetated surface areas with dust suppression methods, the impact is rated Neutral (likely to be similar to surrounding natural effects).		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term -Construction		Short term -Construction
	Permanent - Operation		Permanent - Operation
Extent	Local		Local
Intensity	Medium (-)		Very Low (-) Construction
			None
Significance	**LOW (-)**		**VERY LOW (-) Construction**
			NEUTRAL
Probability	Definite - Construction		Fairly likely - Construction
	Fairly likely - Operational		None
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Low		Low
Mitigation measures			
• Windblown dust suppression practice for both construction and operational phases.			

Table 57: Landscape Degradation (PV)

Phase	Pre-Construction	Construction	Operational
Impact description	Construction Phase The locality where the PV project is proposed is currently strongly associated with a natural / wilderness sense of place that has high levels of scenic quality. Changes to this current natural landscape from the contraction of the PV project are expected to by High but are moderated by the Short-term period of intensive activity on the site. This is no mitigation to change the nature of a large construction project and as such the impact remains un-mitigated. Operation Phase The resultant semi-industrial nature of the PV project in operation is likely to result in High-negative Magnitude impact over a long time period and is rated High-Negative without mitigation. As the landscape change is associated with the PV structures, no mitigation is provided and as such the impacts to *local* landscape character with remain High-Negative for the duration of the project. To ensure that landscape integrity remains after the project decommissioning, no natural features relating to dunes or rocky outcrops should be impacts. The dune area that extends into the south-western portion of the project area should be retained and the development footprint amended to exclude this area from the development footprint.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term -Construction		Short term -Construction
	Permanent - Operation		Permanent - Operation
Extent	Regional-Construction		Regional-Construction
	Local- Operation		Local- Operation
Intensity	High (-)		High (-)
Significance	**MODERATE (-)**		**MODERATE (-)**
	HIGH (-)		**HIGH (-)**
Probability	Definite		Definite
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Medium		Medium
Mitigation measures			
• Reduce southwest footprint which overlaps with a low dune that is banked up onto a rocky outcrop.			

Table 58: Visual intrusion (PV)

Phase	Pre-Construction	Construction	Operational
Impact description	Construction Phase Although the change to the landscape from construction phase related effects is likely to be strongly experienced by receptors (High-Negative Magnitude), the area is very remote. The rural area as a limited number of receptors falling within the project ZVI due to the topographic screening provided by the surrounding rocky outcrops. Construction impacts will be moderated by the short-term duration and likely to be Low Negative. As mitigation of the visual impacts from construction is limited, the rating for without mitigation remains Low Negative. Operation Phase Without mitigation, the visual intrusion is likely to have a High-Negative Magnitude to an area that exceeds two kilometres around the site. Medium-Negative Magnitude, as views of the resultant PV landscape will be in the background for the few receptors located in the area and is Very Likely to take place. To reduce the visual intrusion to existing and possible future tourist receptors accessing the area, it is recommended that the PV height should not exceed 5m above ground level. With this height mitigation, the visual intrusion can be further limited (this reduction in impact is not reflected by the impact criteria remain Medium-Negative.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term -Construction		Short term -Construction
	Permanent - Operation		Permanent - Operation
Extent	Local - Construction		Local - Construction
	Regional- Operation		Local - Operational
Intensity	High (-)		Medium (-)
Significance	**LOW (-) Construction**		**LOW (-) Construction**
	MODERATE (-) Operational		**MODERATE (-) Operational**
Probability	Very likely		Very likely
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Medium		Medium
Mitigation measures			
• Restrict height of PV structure to 5m above ground level for both construction and operational phases.			

Impacts associated with the grid connection (road and powerline):

Table 59: Landscape Degradation (road)

Phase	Pre-Construction	Construction	Operational
Impact description	Construction Phase Alignment changes to the existing road are limited and as such, the resultant changes to the local landscape character are limited and would mainly be associated with minor changes to the road routing, possible widening and a marked increase in the number of vehicles moving along the road during construction. As there is an existing road there is the expectation of vehicle movement and is rated Low-Negative without mitigation. As mitigation of the number of vehicles is not possible, post mitigation impacts remain the same. Operation Phase Without the visual intrusion of the many moving vehicles required for construction of the PV project, the landscape impacts from the road change are likely to be Low-Negative if the road is not maintained or kept in good condition. With road maintenance, the improved road could result in a Very Low-Positive impact for some road users.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative -Construction Positive -Operation
Duration	Short term - Construction		Short term -Construction
	Long term - Operation		Long term - Operation
Extent	Site specific		Site specific
Intensity	Medium (-)		Medium (-) Construction
			Low (+) Operation
Significance	**LOW (-)**		**LOW (-) (Construction)**
			VERY LOW (+) (Operation)
Probability	Very likely - Construction		Very likely - Construction
	Fairly likely - Operation		Fairly likely - Operation
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Medium		Medium
Mitigation measures			
Construction phase • Retain exiting alignment as much as possible and exclude any impacts to dunes. Operational phase • Continued maintenance of the road with ongoing water suppression.			

Table 60: Visual intrusion (road)

Phase	Pre-Construction	Construction	Operational
Impact description	Construction Phase Construction phase visual impacts are likely to be experienced strongly by the local receptors due to the very close proximity of the road to the farmsteads. For this reason, the Magnitude is rated High-Negative as dust from moving vehicles travelling along the road is Definitely going to influence the local farmsteads. As the impact is Short-term in Duration, the Significance before mitigation is rated Moderate-Negative. To reduce the (long-term) impacts of dust on the two remote homesteads, it is recommended that the portion of the road adjacent to the farmsteads be tarred (or capped with a suitable long-term dust suppressant alternative). Due to the remote location, water suppression methods to reduce dust from increased traffic is likely to be compromised by lack of access to water to spray on the road (arid region), as well as the long distances that trucks will have to travel to spray the roads. With an effective long-term dust suppressant strategy (not requiring transport of water) for the roads adjacent to the two farmsteads, the impact significance is reduced to Low-Negative. Operation Phase The impacts are similar to those of the Construction Phase, but with a longer Duration. The Impact Significance is also rated Moderate-Negative without mitigation, but with effective dust suppression, it is likely that the conditions of the existing gravel road will improve and impacts post mitigation are rated Low-Positive.		
	Without mitigation		**With mitigation**
Nature	Negative		Negative - Construction Positive - Operational
Duration	Short term -Construction		Short term -Construction
	Permanent - Operation		Permanent - Operation
Extent	Local -		Local
Intensity	High (-)		Medium (-) Construction
			Low (-) Operational
Significance	**MODERATE (-)**		**LOW (-) Construction**
			LOW (+) Operational
Probability	Very likely		Very likely
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Medium		Medium
Mitigation measures			
Construction phase • The sections of the road that pass in close proximity to the three isolated farm settlements need to be hard surfaced to ensure that dust can effectively mitigated for the duration of the project. Operational phase • The sections of the road that pass in close proxmity to the three isolated farm settlements need to be hard surfaced to ensure that dust can effectively mitigated for the duration of the project.			

Table 61: Visual intrusion and landscape degradation (powerline)

Phase	Pre-Construction	Construction	Operational
Impact description	Construction Phase The construction phase impacts associated with the raising of the monopoles and lines take place adjacent to an existing 132kV power line routing. While the visual intrusion is likely to be noticeable to the surrounding receptors, the landscape is already dominated by the existing power line context. As such, construction phase impacts are likely to be Low-Negative and Local in Extent. With mitigation and making use of the existing 132kV access road to access the new power line, construction phase impacts can be reduced to Very Low-Negative. Operation Phase Similar to construction phase impacts, the existing 132kV power line will absorb the visual intrusion to some degree. Impacts are thus rated Very Low-Negative for both scenarios		
	Without mitigation		**With mitigation**
Nature	Negative		Negative
Duration	Short term - Construction		Short term -Construction
	Permanent - Operation		Permanent- Operation
Extent	Local		Local
Intensity	Low (-)		Very Low (-) Construction
			Low (-) Operation
Significance	**LOW (-) Construction**		**LOW (-) Construction**
	VERY LOW (-) Operation		**VERY LOW (-) Operation**
Probability	Very likely - Construction		Very likely - Construction
	Unlikely - Operation		Unlikely - Operation
Confidence	Sure		Sure
Reversibility	Reversible		Reversible
Irreplaceability	Medium		Medium
Mitigation measures			
Construction phase Utilisation of exiting 132 kV access route **Operational phase132** Erosion maintenance			

7.8.4 Cumulative impacts

Impacts associated with the Veld PV South facility:

Cumulative impacts associated with the project include the change in landuse limiting other landuse opportunities within the project ZVI, as well as the precedent being set for PV projects in the area where currently there is only a precedent for natural / agricultural land uses. As the scenic quality of the region is high and does have value for eco-tourism, further construction and operation of PV project in the area is likely to have a High-Negative Magnitude. Some moderation of the loss of regional landscape character is provided by the large extent of similar visual resources in the region, and as such the Cumulative Landscape and Visual Effects is rated Medium-Negative.

Impacts associated with the grid connection (road and powerline):

Cumulative effects associated with the road relate to the road becoming a negative externality to the point that dust and vehicle movement in close proximity to remote farmsteads result in the residents leaving the houses. Due to the short time period of construction phase, this effect is unlikely to take place and is rated Very Low-Negative for both mitigation scenarios.

As only two houses could be impacted, the Extent is Local and although Magnitude is High-Negative, the significance is Low-Negative without mitigation. With mitigation and the long-term improvement of the road could open up opportunities for eco-tourism to the surrounding areas which could result in a positive impact of the local area. However, as the area is remote, the impact is rated Very Low-Positive.

Cumulative impacts associated with the power line construction relate to the landscape modification limiting other landuse opportunities within the project ZVI, as well as setting the precedent for further routings along the existing 132kV routing that has the potential to create a massing effect. As the corridor landscape character is already compromised to some degree, the probability of the short-term construction phases adding to this risk is unlikely and thus rated Very-Low Negative for both scenarios (as mitigation is limited).

7.8.5 No Go Alternative

The locality is already compromised by the existing 220kV power line and is rated Low-Negative for both scenarios. The assessment found that there is value in the No-Go Alternative, in terms of maintaining existing landscape resources in an area where the existing sense of place is strongly associated with a natural / wilderness sense of place.

However, the remoteness of the locality is likely to be a factor in limiting the full potential of the visual resources for eco-tourism. Mitigations have been defined to minimise the visual intrusion of the project and they should be implemented. Mitigation also requires the removal of the proposed power line should this infrastructure not be required post-closure. The dune area that extends into the south-western portion of the project area should be retained and the development footprint amended to exclude this area from the development footprint (Visual Impact Assessment, 2019).

7.8.6 Visual conclusion and impact statement

In conclusion, the landscape and Visual Impact Assessment found that there are advantages and disadvantages to the proposed landscape modification. Due to the remoteness of the proposed site that is well topographically screened, there are few receptors located in the project Zone of Visual Influence. Receptors that are exposed to the project will mainly have background views of the landscape modification. Advantages also include the location of the proposed project within the Renewable Energy Development Zones (REDZ). Potential benefits also include synergies with the Khâi-Ma Local Municipality IDP in terms of alleviating employment problems and shortage of appropriate labour skills. Disadvantages include a strong change to local landscape character, as well as the potential for strong lights at night and impacts to an existing dark-sky night-time landscape of not adequately mitigated.

The Impact Assessment found that while Visual Intrusion is likely to be **Low-Negative** with mitigation due to the remoteness of the location where there are few receptors with the rocky outcrops providing some visual screening. Visual intrusion can be further reduced with the reduction in the height of the PV structures to

below 5m above ground level. However, as the landscape change is associated with the PV structures, no mitigation is provided, and as such, the impacts to local Landscape Character are expected to remain **High-Negative** for the duration of the project

8 CONCLUSIONS AND WAY FORWARD

8.1 Summary of findings

The potential impacts associated with the proposed Veld PV South Facility, grid connection, access roads and associated infrastructure are summarised below in Table 62. With mitigation measures in place as set out in Chapter 7, post-mitigation impacts are anticipated to be mainly **Low (-)** to **Negligible (-)** significance, and up to **Moderately (+).** The only **High (-)** significance that remains **High (-)** after mitigation is the impact of land degradation (Visual). All the measures have been included in the EMPr that has accompanied this BAR during the Draft BAR phase.

Figure 27 and Figure 28 the proposed Veld PV South, grid connection, access routes and associated infrastructure and indicates the environmental sensitivities as well as areas that should be avoided, including buffers.

Table 62: Summary of impacts

Aspect	Impact	Without mitigation	With mitigation
Construction			
Agriculture	Loss of agricultural land use (PV)	Low (-)	Low (-)
	Soil degradation (PV)	Very Low (-)	Very Low (-)
	Loss of agricultural land use (Grid connection, substation and access routes)	Low (-)	Low (-)
	Soil degradation (Grid connection, substation and access routes)	Very Low (-)	Very Low (-)
Aquatic ecology	Clearance of natural vegetation adjacent to the ephemeral streams and drainage lines (PV)	Moderate (-)	Low (-)
	Potential disturbance of aquatic habitat during construction phase (Grid connection, substation and access routes)	Very Low (-)	Very Low (-)
Avifauna	Displacement due to disturbance and habitat transformation (PV)	Moderate (-)	Moderate (-)
	Displacement due to disturbance and habitat transformation (Grid connection, substation and access routes)	Low (-)	Very Low (-)
	Mortality due to electrocution (Grid connection, substation and access routes)	Low (-)	Very Low (-)
	Collisions of priority species with the earthwire of the proposed grid connection	High (-)	Low (-)
Botany	Removal of Bushmanland Arid Grassland vegetation and minimal Bushmanland Sandy Grassland (PV)	Low (-)	Low (-)
	Removal of Bushmanland Arid Grassland vegetation and minimal Bushmanland Sandy Grassland electrocution (Grid connection, substation and access routes)	Low (-)	Low (-)
Heritage archaeology and palaeontology	Destruction or damage to archaeological materials and unmarked graves (PV, grid connection, substation and access routes)	Low (-)	Very Low (+)
	Destruction or damage to palaeontological materials (PV, grid connection, substation and access routes)	Very Low (-)	Very Low (+)
	Impacts to the cultural and natural landscape (PV, grid connection, substation and access routes)	Moderate (-)	Low (-)
Hydrology	Erosion (PV, grid connection, substation and access routes)	Low (-)	Low (-)
	Increased runoff (access routes)	Moderate (-)	Moderate (-)
	Localized erosion (grid)	Moderate (-)	Moderate (-)

Aspect	Impact	Without mitigation	With mitigation
Socio-economic	Impact on production and gross domestic product	High (+)	High (+)
	Impact on employment and skills development	Moderate (-)	Moderate (-)
	Impact on household income	Moderate (+)	Moderate (+)
	Impact on government revenue (Rates and taxes)	Moderate (+)	Moderate (+)
	Impact on in-migration	Moderate (-)	Moderate (-)
	Impact on basic services, social and economic infrastructure	Low (-)	Low (-)
Visual landscape	Lights at night (PV)	Moderate (-)	Very Low (-)
	Windblown dust (PV)	Low (-)	Very Low (-)
	Landscape Degradation (PV)	Moderate (-)	Moderate (-)
	Visual intrusion (PV)	Low (-)	Low (-)
	Landscape Degradation (road)	Low (-)	Low (-)
	Visual intrusion (road)	Moderate (-)	Low (-)
	Visual intrusion and landscape degradation (powerline)	Low (-)	Low (-)
Operation			
Agriculture	Loss of agricultural land use (PV)	Low (-)	Low (-)
	Soil degradation (PV)	Very Low (-)	Very Low (-)
	Loss of agricultural land use (Grid connection, substation and access routes)	Low (-)	Low (-)
	Soil degradation (Grid connection, substation and access routes)	Very Low (-)	Very Low (-)
	Increased financial security for farming operations	Low (+)	Low (+)
Aquatic ecology	Maintenance (PV)	Moderate (-)	Very Low (-)
	Potential disturbance of aquatic habitat during operational phase (Grid connection, substation and access routes)	Very Low (-)	Very Low (-)
Avifauna (Birds)	Displacement due to disturbance and habitat transformation (PV)	Moderate (-)	Moderate (-)
	Collisions with solar panels	Very Low (-)	Very Low (-)
	Entrapment in parameter fences	Low (-)	Very Low (-)
	Collisions of priority species with the earthwire of the proposed grid connection	High (-)	Low (-)
Heritage archaeology and palaeontology	Impacts to the cultural and natural landscape (PV, grid connection, substation and access routes)	Moderate (-)	Low (-)
Socio-economic	Impact on production and gross domestic product	Moderate (+)	Moderate (+)
	Impact on employment and skills development	Low (+)	Low (+)
	Impact on household income	Low (+)	Low (+)
	Impact on government revenue (Rates and taxes)	Low (+)	Low (+)
	Impact of Investment in Local Communities and Economic Development Projects as Part of the Social Economic Development and Enterprise Development Plan	Moderate (+)	Moderate (+)
	Impact on supply of electricity	Moderate (+)	Moderate (+)
Visual	Lights at night (PV)	Moderate (-)	Low (-)
	Windblown dust (PV)	Low (-)	Neutral
	Landscape Degradation (PV)	High (-)	High (-)
	Visual intrusion (PV)	Moderate (-)	Moderate (-)
	Landscape Degradation (road)	Low (-)	Very Low (+)

Aspect	Impact	Without mitigation	With mitigation
	Visual intrusion (road)	Moderate (-)	Low (+)
	Visual intrusion and landscape degradation (powerline)	Very Low (-)	Very Low (-)
Decommissioning			
Agriculture	Loss of agricultural land use (PV)	Low (-)	Low (-)
	Soil degradation (PV)	Very Low (-)	Very Low (-)
	Loss of agricultural land use (Grid connection, substation and access routes)	Low (-)	Low (-)
	Soil degradation (Grid connection, substation and access routes)	Very Low (-)	Very low (-)
Aquatic ecology	Maintenance	Moderate (-)	Very Low (-)
Visual	Potential visual intrusion of construction activities on rural landscape and scenic resources	Moderate (-)	Moderate (-)

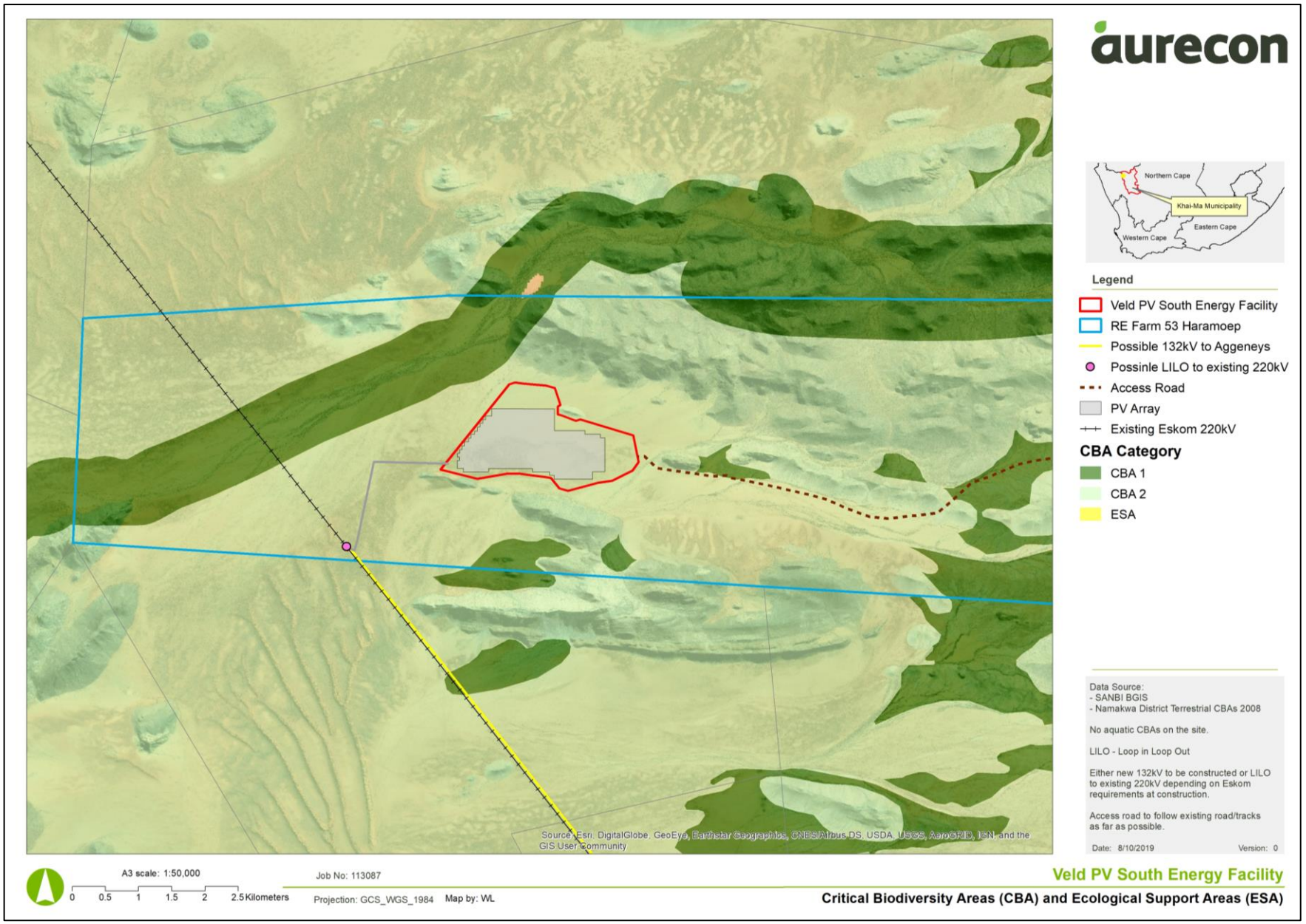


Figure 22: Map indicating Veld PV South, grid connection access routes and associated infrastructure in relation to Critical Biodiversity Areas (CBA's) and Ecological Support Areas (ESA)

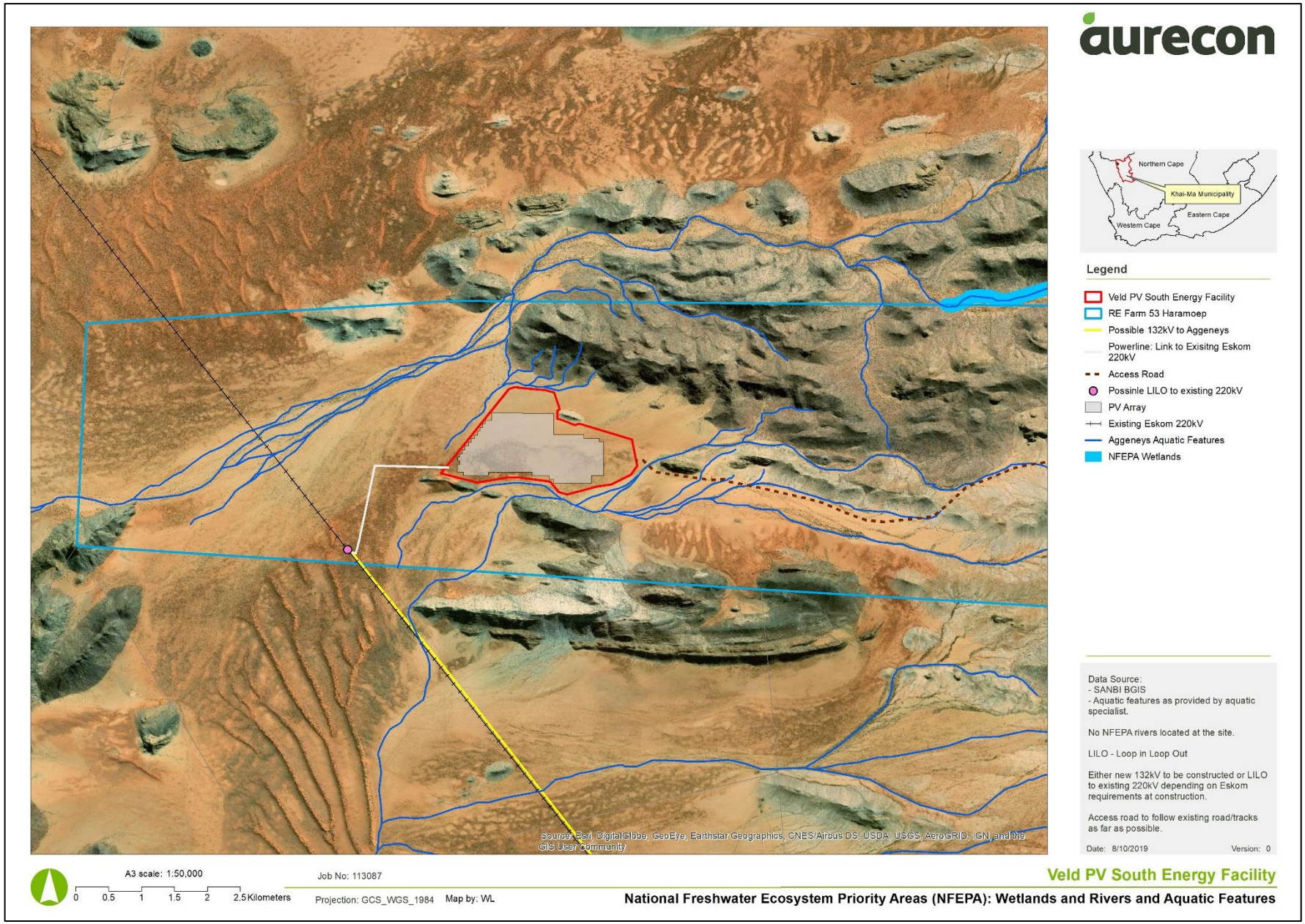


Figure 23: Map indicating Veld PV South, grid connection access routes and associated infrastructure in relation to National Freshwater Priority Areas (NFEPAs)

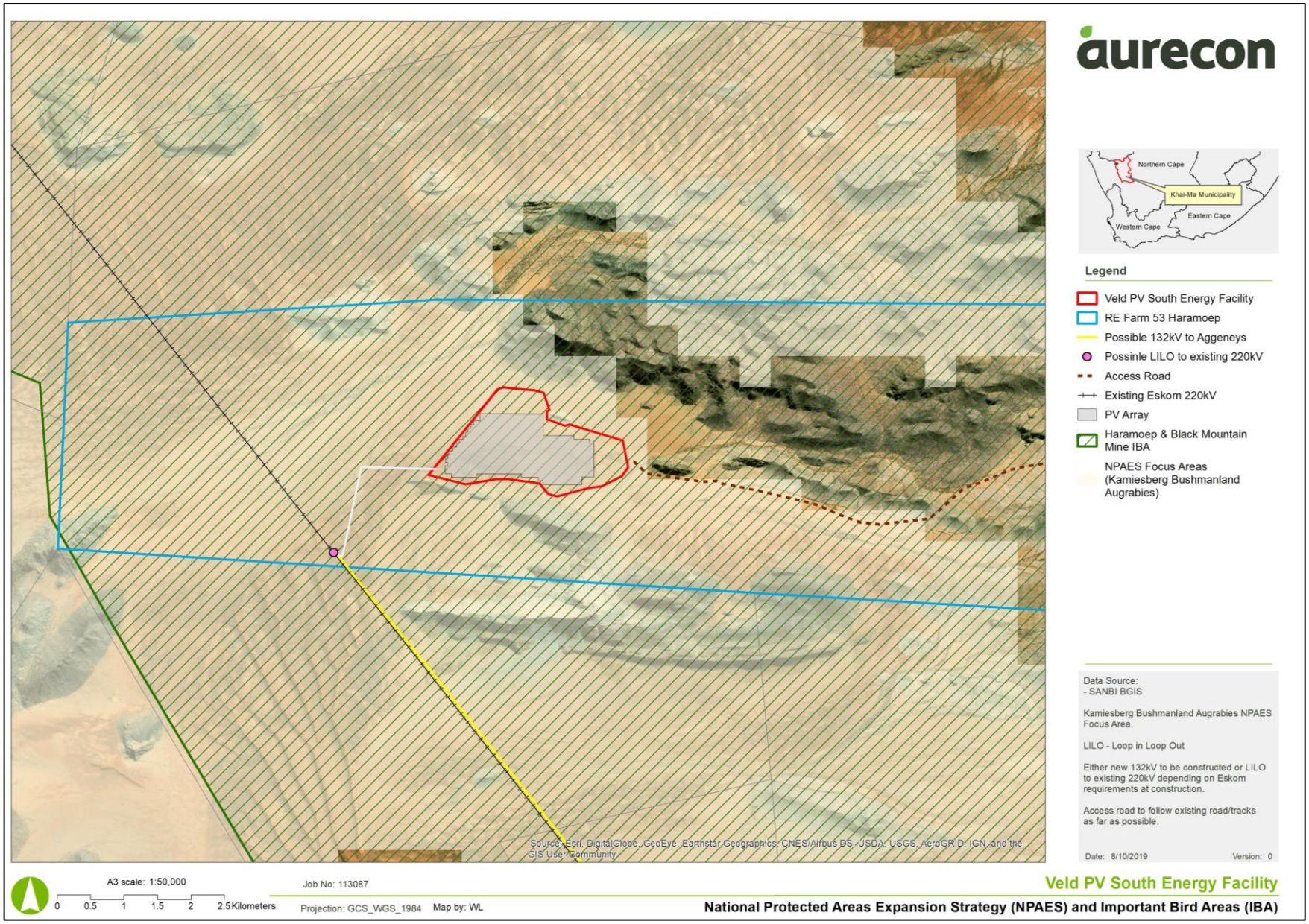


Figure 24: Map indicating Veld PV South, grid connection access routes and associated infrastructure in relation to National Freshwater Priority Areas (NFEPAs) and Important Bird Areas (IBA)

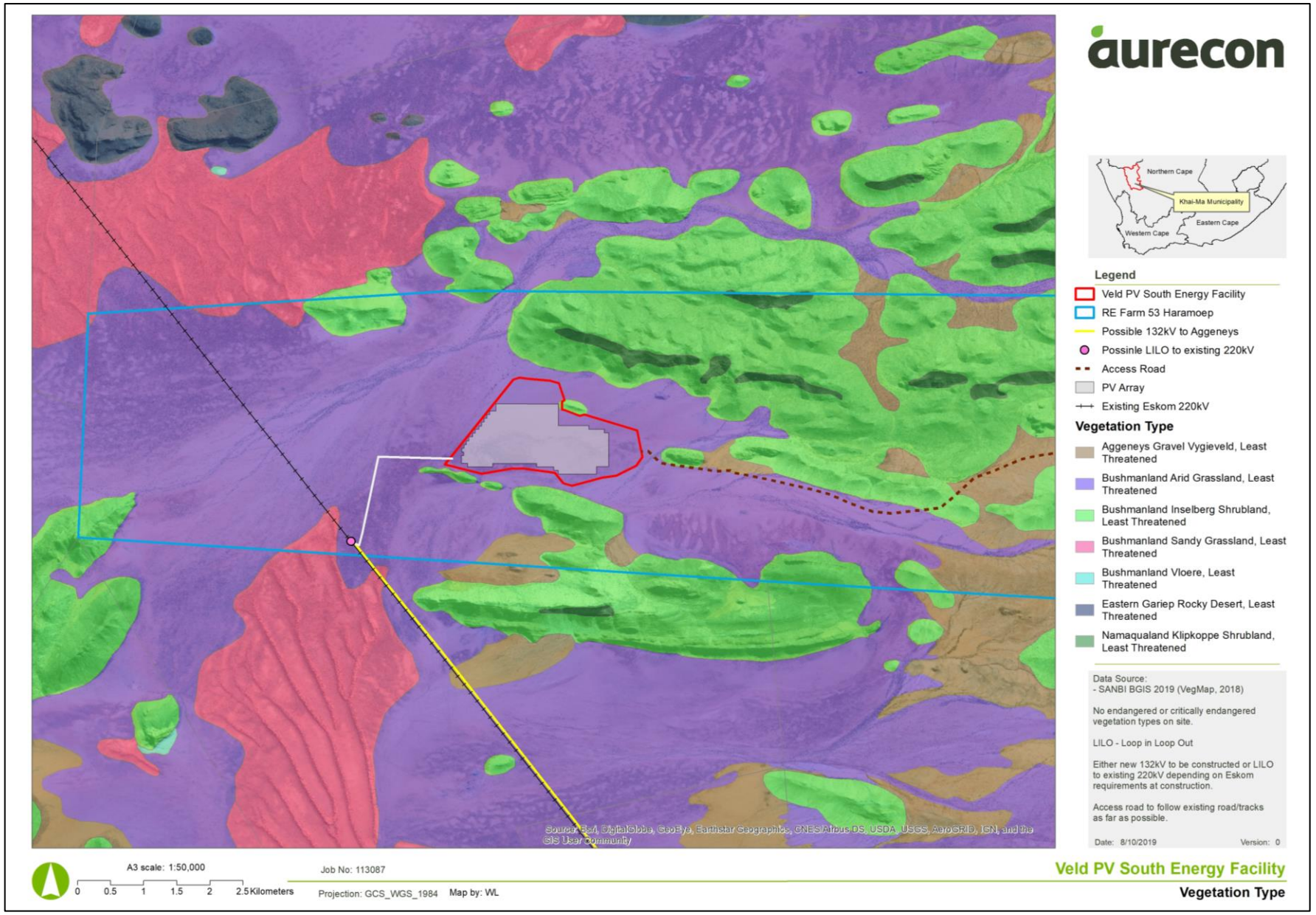


Figure 25: Map indicating Veld PV South, grid connection access routes and associated infrastructure in relation to vegetation types

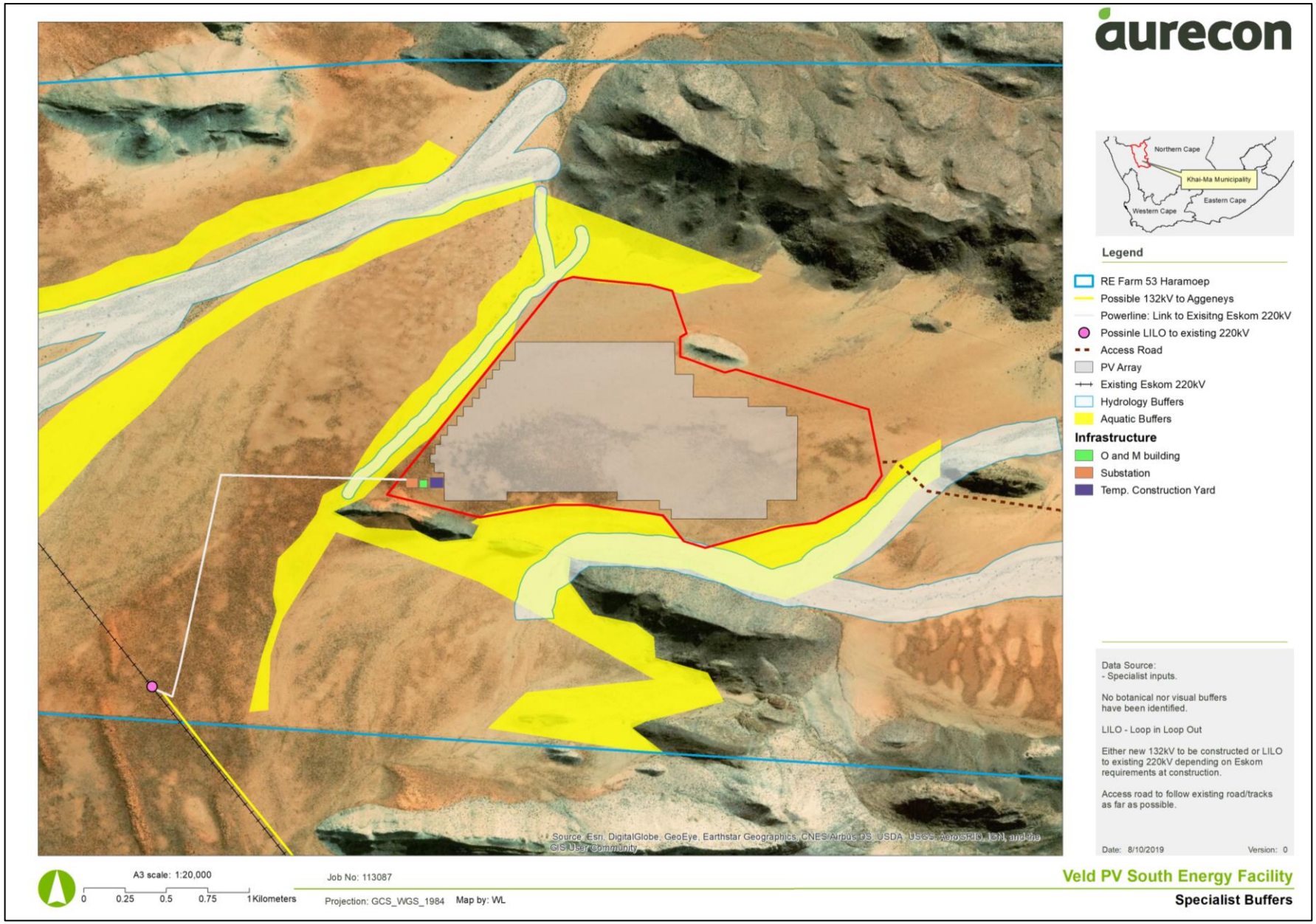


Figure 26: Map indicating all the specialist buffers and sensitivities relating to Veld PV South, grid connection access routes and associated infrastructure

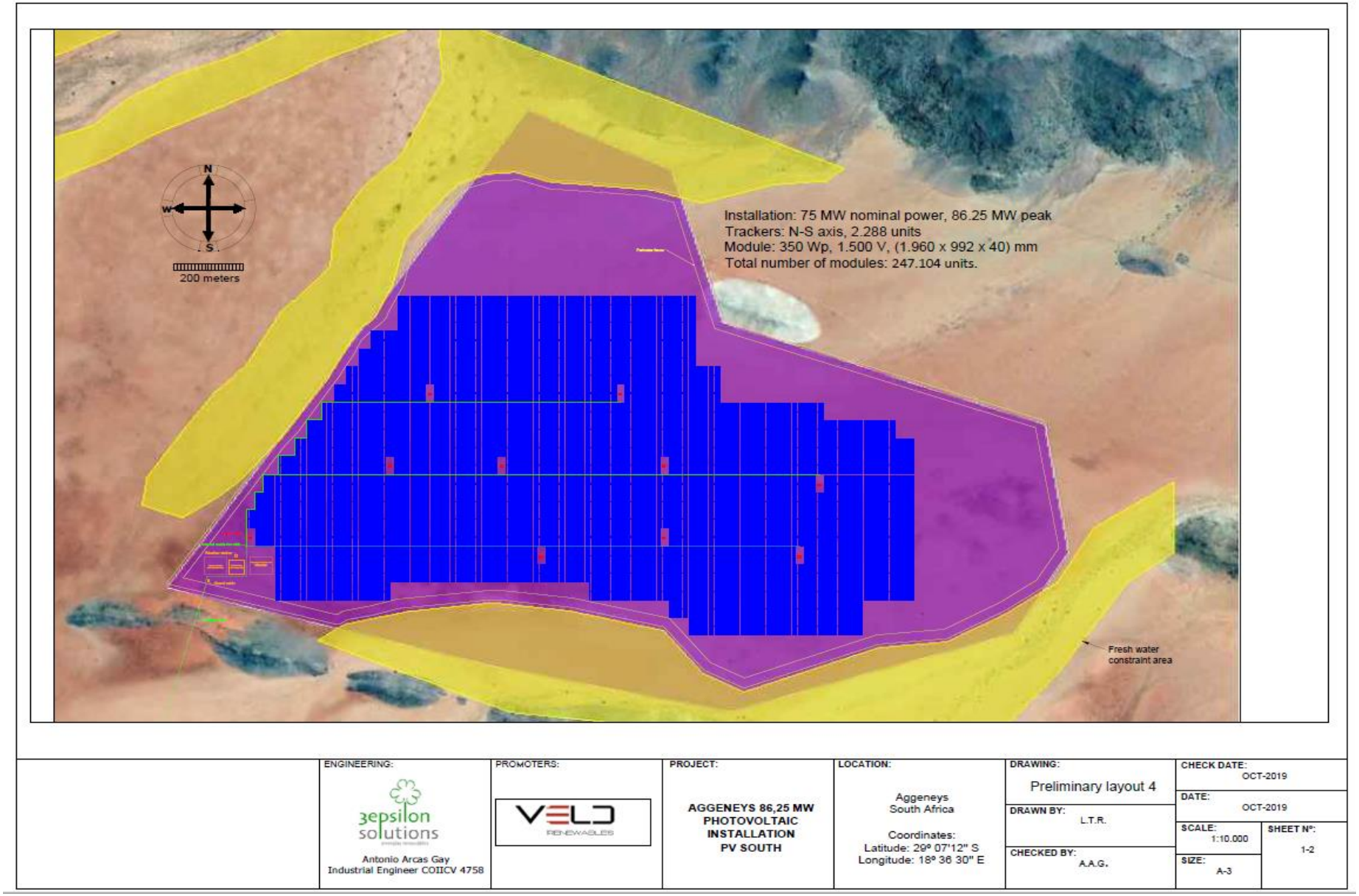


Figure 27: Revised final layout: PV South, inclusive of specialist buffers

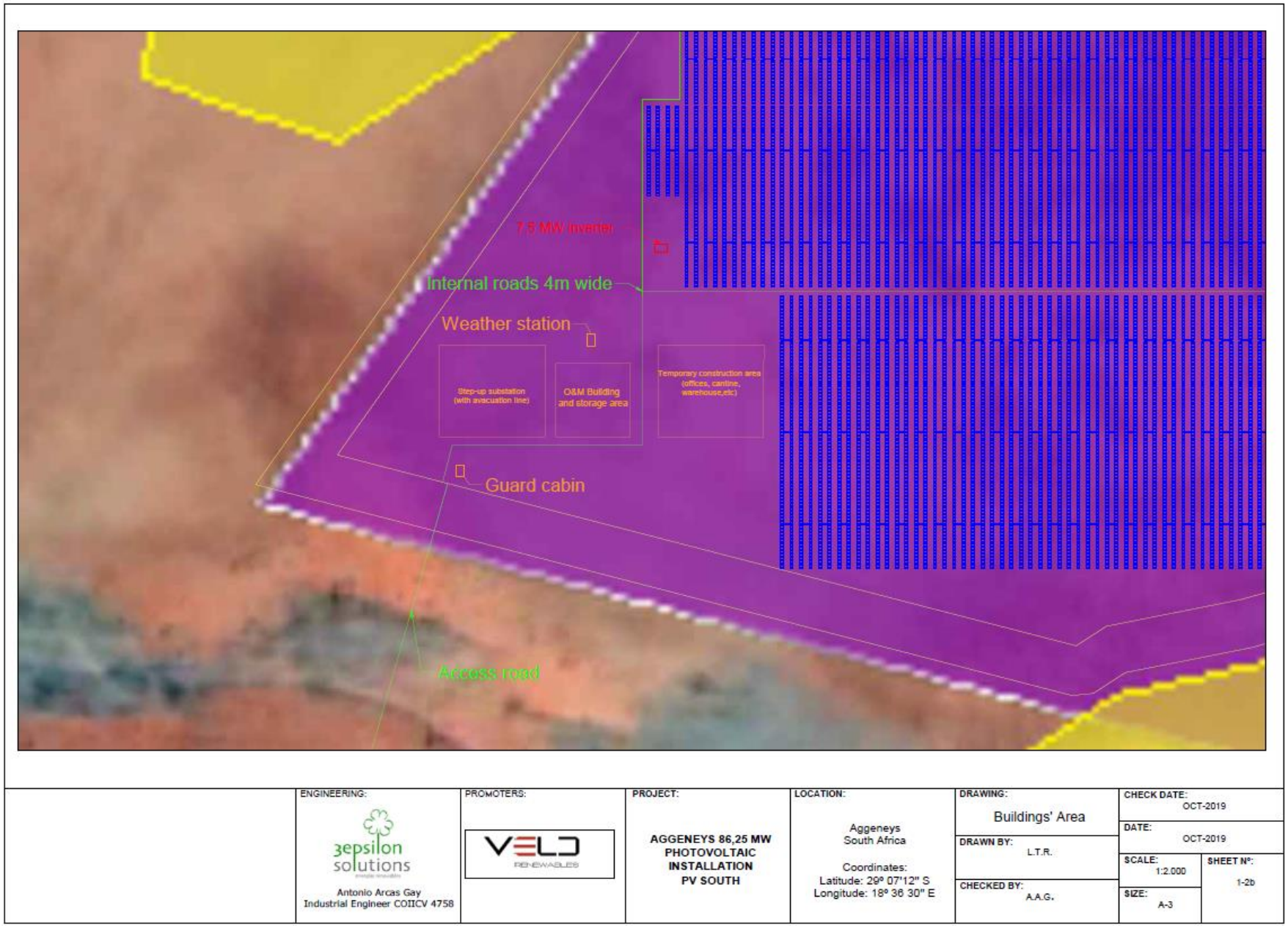


Figure 28: Zoomed -in Revised final layout, inclusive of specialist buffers

8.2 Recommendations and opinion of the EAP

It is the opinion of the EAP that no fatal flaws have been identified and No-Go areas have been identified by the relevant specialists and these will be avoided by the proposed alignment. The mitigation measures proposed by the EAP and relevant specialists (Section 7) are recommended to manage the identified impacts associated with the proposed PV Facility and Grid Connection infrastructure (including access and service roads and temporary construction footprint). We request that these be considered by the I&APs and competent and commenting authorities, and should the project be authorised in the future, that the following conditions be included in the EA.

- **Condition 1:** The holder of the EA shall appoint and Environmental Control Officer (ECO) for the construction phase of the development to monitor the implementation of the specified mitigation measures. The operator should appoint an environmental officer or other suitably qualified individual during the operational phase, to oversee and monitor the implementation of the specified management and mitigation measures. The holder of the EA remains ultimately responsible for ensuring the mitigation/ rehabilitation measures are implemented.
- **Condition 2:** A Plant, Rescue and Protection Plan which allows the maximum transplant of conservation important species from areas to be transformed must be developed prior to construction and be submitted to the Biodiversity Section (DEA).

8.3 Level of confidence in assessment

Assessment of potential environmental impacts requires prediction of the impacts of a defined activity against the collected baseline data, through application of professional judgement. It therefore depends on the level of information available describing the activity; the quality of the baseline data collected; and the skills and expertise of the specialists involved. The BA project team has been listed in Table 3 and CVs of the EAP are included in Annexure A, with CVs of the specialists included in Annexure D.

Each specialist study included at least one site visit to the area (in some cases more) and the time spent on site occurred in an appropriate season. Furthermore, many of the specialists have been involved in many other projects in the area. It is also assumed that the PPP provided for in this BA will encourage I&APs to provide input into the assessment with local social-ecological knowledge.

Given that the proposed development is within a REDZ which has been specifically identified to accommodate solar PV infrastructure and the applicant has amended the layout of the facility to avoid sensitive sites identified by the specialists, the EAPs confidence in the findings and the effectiveness of the proposed mitigations is high.

8.4 Way forward

An application for an BA process has been submitted to the DEA for which this Final BAR has been compiled. All comments received on the Draft BAR were collated, responded to and included in the updated and final Public Participation Report (Annexure C).

Following the closure of the 30-day public comment period, the Final updated report is being submitted to DEA for review and decision making whereby an Environmental Authorisation would be granted or refused. All registered I&APs will be notified of the outcome of the decision-making process.

ANNEXURES

Annexure A: EAP declaration and CVs

Annexure B: Landowner identification

Annexure C: Public participation report

Annexure D: Specialist reports

Annexure E: Environmental Management Programme

Annexure F: Original Specialist Declarations

Document preppared by

Aurecon South Afrca (Pty) Ltd
Reg No 1977/003722/07
Suite 201
2nd Floor
Boemhof Building
65 York Street
George 6529

A person using Aurecon documents or data accepts the risk of:
Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.
Using the documents or data for any purpose not agreed to in writing by Aurecon.

aurecon

Bringing ideas to life

Aurecon offices are located in:
Angola, Australia, Botswana, China, Ghana, Hong Kong, Indonesia, Kenya, Lesotho, Macau, Mozambique, Namibia, New Zealand, Nigeria, Philippines, Qatar, Singapore, South Africa, Swaziland, Tanzania, Thailand, Uganda, United Arab Emirates, Vietnam.