



Amended Consultation EIA Report 14/12/16/3/3/2/829

**PROPOSED RENEWABLE ENERGY GENERATION
PROJECT ON THE REMAINDER OF THE FARM EAST No.
270, KURUMAN RD, JOE MOROLONG LOCAL
MUNICIPALITY, JOHN TAOLO GAETSEWE DISTRICT
MUNICIPALITY, NORTHERN CAPE PROVINCE**

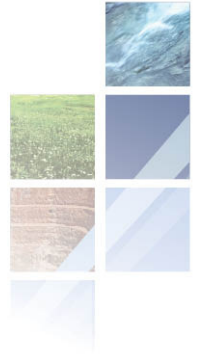
Short name: East 2 Solar Park

April 2016

Commissioned by: Palus Energy (Pty) Ltd
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Proposed Renewable Energy Generation Project on the Remainder Portion of the Farm East No. 270, Kuruman RD, Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province

Short name: East 2 Solar Park

April 2016

PROJECT APPLICANT

Company name: **PALUS ENERGY (Pty) Ltd - Reg. No: 2013/087976/07**
Contact Person: Ms Izel van Rooy (PlanWize)
Physical Address: 4th Floor Aloe Grove, Houghton Estate Office Park, 2 Osborn Road, Houghton 2198 - South Africa
Postal Address: P.O. Box 225, Highlands North 2037, South Africa
Telephone Number: +27 (0) 86 599 3858
Fax Number: +27 (0) 86 599 3858
S.A. Mobile Number +27 (0) 82 449 7626
E-mail: palusenergy@gmail.com

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Company Name: AGES Limpopo (Pty) Ltd (Reg: 2006/020831/07)
Contact Persons: Mr. Johan Botha / Ms. Engela Grobler
Physical Address: 120 Marshall Street, Polokwane, 0699, South Africa
Postal Address: P.O. Box 2526, Polokwane, 0700, South Africa
Telephone Number: +27 (83) 557 6494 / +27 0(15) 291 1577
Fax Number: +27 (15) 291 1577
E-mail: **jbotha@ages-group.com/egrobler@ages-group.com**

AGES (Pty) Ltd

J.H. Botha (Senior Environmental Scientist – M.Sc. Environmental Management (*PriSci Nat*))
E Grobler (Environmental Scientist – M.Sc. Environmental Management (Univ of Stellenbosch))

LIMPOPO PROVINCE: 120 Marshall Street Polokwane 0699, P.O Box 2526 Polokwane 0700

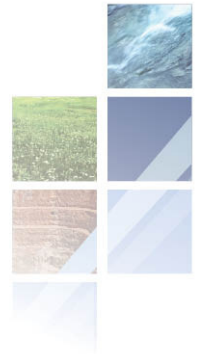
Tel: +27-15-291 1577 Fax: +27 (0)15 291 1577 www.ages-group.com

Offices: Eastern Cape Gauteng Limpopo Province Namibia North-West Province Western Cape Zimbabwe

***AGES Limpopo Directors:** JH Botha R Crosby SJ Pretorius*

***AGES (PTY) LTD Board of Directors:** JA Myburgh S Lerefolo R Crosby FN de Jager AS Potgieter*

***Advisory Board:** SJ Pretorius Z Pemba*



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Mr. M Ramakulukusha Ref.: NC/NAT/JTG/KUR/2014	Northern Cape Department of Environment and Nature Conservation (DENC)
Municipal Manager Mr. Tshepo Bloom	Joe Morolong Local Municipality
Municipal Manager: Mrs. M Bokgwathile	John Taolo Gaetsewe District Municipality
Mr. N Nongauza Mr. J Geeringh	Eskom
Dr. Sita	Department of Science and Technology (DST)
Dr. P Lochner	Council for Scientific and Industrial Research (CSIR)
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14/12/16/3/3/2/829	February 2016	1.0	Draft
14/12/16/3/3/2/829	April 2016	2.0	Draft

PROJECT MAIN FEATURES

Project main features - according to the EIA guidelines Summary of information included in the report

General site information

Site location	
Farm	EAST 270, KURUMAN RD
Portions	Remainder Portion
Surveyor-general 21-digit site	C0410000000027000000
Local Municipality	Joe Morolong
District Municipality	John Taolo Gaetsewe
Province	Northern Cape

Property details	
Extent	Remainder Portion: 964.2695 ha
Land Owners	PRETORIUS JACOBUS NICOLAAS, PRETORIUS HELETTA ROSIA
Diagram deed number	Remainder Portion: G25/1954
Title deed number	Remainder Portion: T791/2002
Registration date	Remainder Portion: 20020402
Current land use	Farming

Site data (Development Area)	
Latitude	27° 09' 50" S
Longitude	22° 56' 15" E
Altitude	1050 m a.m.s.l.
Ground slope	flat

Adjacent farm portions	
Farm Portion	EAST 270 KURUMAN RD Portion 2
Surveyor-general 21-digit site	C0410000000027000002
Land Owners	Pretorius Jacobus Nicolaas Pretorius Heletta Rosia
Diagram deed number	T993/1972
Title deed number	T3469/2013
Registration date	2013/10/30
Extent	856.5320 ha
Current land use	Farming
Farm Portion	RHODES 269 (Portion 0)
Surveyor-general 21-digit site	C0410000000026900001
Land Owners	HAUMAN FAMILIETRUST
Diagram deed number	G30/1947
Title deed number	T3472/2013
Registration date	20131030
Extent	1810.8314 hectares
Current land use	farming

Farm Portion Surveyor-general 21-digit site Land Owners Diagram deed number Title deed number Registration date Extent Current land use Registration date Extent Current land use	EAST 270 KURUMAN RD Portion 1 C0410000000027000001 SISHEN IRON ORE COMPANY PTY LTD T479/1958 T1998/2004 20040624 42.8266 hectares mining 20040624 42.8266 hectares mining
Farm Portion Surveyor-general 21-digit site Land Owner Diagram deed number Title deed number Registration date Extent Current land use	GASESA 272 KURUMAN RD (Portion 1) C0410000000027200001 Tsineng Communal Property Association T145/1931 T175/2010 20100203 966.9795 hectares Farming
Farm Portion Surveyor-general 21-digit site Land Owner Diagram deed number Title deed number Registration date Extent Current land use	N'CHWANING 267 KURUMAN RD Reminder Portion C0410000000026700000 REYNECKE ENGELA ELIZABETH G12/1940 T1492/1970 19701210 1574.2678 farming / mining
Farm Portion Surveyor-general 21-digit site Land Owner Diagram deed number Title deed number Registration date Extent Current land use	GLORIA266KURUMAN RD (Portion 1) C0410000000026600001 ASSMANG LTD T291/1941 T506/1966 19660804 2000.0001 hectares mining
Farm Portion Surveyor-general 21-digit site Land Owner Diagram deed number Title deed number Registration date Extent Current land use	GLORIA 266 KURUMAN RD (Remainder Portion) C0410000000026600000 ASSMANG LTD G9/1929 T1488/2011 20110606 448.3858 hectares mining
Farm Portion Surveyor-general 21-digit site Land Owner Diagram deed number Title deed number Registration date Extent Current land use	KIPLING 271 KURUMAN RD (Portion 0) C0410000000026600001 ASSMANG LTD G38/1955 T953/1968 19681022 1905.9203 hectares farming

PV power plant design specifications and connection to the Eskom grid

Project data	
Project name	EAST 2 SOLAR PARK
Technology	Photovoltaic power plant
Number of Phases	1
Maximum generating capacity at delivery point	up to 120 MW
Type of PV modules	Thin-film or Mono/Polycrystalline
Type of mounting system	fixed or horizontal single-axis trackers (SAT)
Average annual energy production (up to) (*)	up to 160GWh/year with fixed mounting system up to 190GWh/year with trackers
Load factor (*)	0.223 with fixed mounting system 0.251 with trackers
Full net equivalent hours (EOH) (*)	1950h/year (Wh/Wp/y) with fixed mounting systems 2200 h/year (Wh/Wp/y) with trackers
(*) calculated by PVSYST, simulation professional tool	
Technical specifications	
Installed power capacity - AC side	up to 77 MW
Installed power capacity - DC side	up to 86.4 MWp
Number of PV modules	up to 608,400 thin film modules of 135 Wp each up to 288,000 mono/polycrystalline modules of 300 Wp
Number of structures (PV arrays)	up to 15,600 mounting systems (fixed or trackers)
Minimum structure height above ground level	0.8 m
Maximum structure height above ground level	3.1 m
Other information	
Footprint, incl. internal roads (fenced area)	up to 250 ha
PV power plant lifetime	25 - 30 years
Construction camp (temporary)	10 ha
Construction timeframe	Approximately 15 months
Connection to the Eskom grid	
The connection to the Eskom grid will be done according to the Eskom connection solution which may require:	
<ul style="list-style-type: none"> (i) one small on-site high voltage substation with high-voltage power transformers, stepping up the voltage to the voltage of the Eskom's grid, a control building and one busbar with metering and protection devices (also called "switching station"); (ii) a new high-voltage power line, for the connection to the Eskom grid. 	
East 2 Solar Park may be connected either:	
<ul style="list-style-type: none"> a) to Eskom Hotazel distribution substation, 3.5 km south of project site, via Eskom Hotazel substation, 5.5 km south of project site, via a new 132 kV power line approximately 6.5 km long running parallel to existing Eskom "Hotazel - Heuningvlei" 132 kV power line (alternative connection 1) in a corridor of $\pm 1,4$ km long up to already approved power line corridor (DEA Ref. No. 14/12/16/3/3/1/1426) of East Power Line related to the approved East Solar Park (DEA Ref. No. 14/12/16/3/3/2/664); or b) To new Eskom Umtu substation, ± 8.5 km south-west of project site, via new 132 kV power line approximately 11,5 km long running parallel to existing Eskom "Hotazel - Heuningvlei" 132 kV power line (for 5.3 km) and to the Eskom "Hotazel - Umtu" 132 kV power line (for ± 6.2 km) (alternative connection 2). Not yet approved. 	
The connection solution may also entail intervention on the Eskom grid.	
Delivery point: voltage level	132 kV
New HV substation inside property - footprint	Approximately 4,000 m ²

Water requirements	
Water consumption	See paragraph 4.2.5 - water requirements

Site maps and GIS information

Status quo information - site	ESRI shapefiles
Site	Remainder Portion of East 270
Building and other structures	Borehole
Agricultural field	Not applicable
Natural and endangered vegetation areas	Vegetation and Sensitivity map
Cultural historical sites and elements	Not applicable
Contours with height references	2m contours
Slope analysis	2m contours
High potential agricultural areas	Not applicable
Existing Eskom infrastructure	Eskom Hotazel-Heuningvlei 132 kV power line, Eskom Hotazel-Umtu 132 kV power line, Eskom Umtu substation, Eskom Hotazel substation, Eskom Hotazel - Klipkop power line
Cadastrals	Cadastrals
Existing roads	existing roads
Railway lines and stations	Not applicable
Industrial areas	Not applicable
Harbours and airports	Not applicable
Critical Biodiversity Areas & Ecological Support Areas	Not applicable

Development proposal maps	ESRI shapefiles
Development Area	Fenced area (footprint)
Position of solar facilities	PV arrays
Permanent laydown area footprint	Fenced area (footprint)
Construction period laydown footprint	Construction site
Access road and internal roads	Access road, Internal roads
River, stream, water crossing	Gamagara Spruit
Substation and transformers	On-site HV substation
Connection routes	On-site LILO 132kV lines
Buildings	MV stations, On-site HV substation, control building, warehouses

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- EASP_00.2_r1 Locality Map with indication of the proposed Development area
- EASP_00.3_r3 Connection alternatives
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- EASP_01_r1 Layout plan - PV power plant up to 120 MW
- EASP_03_r0 Mounting System – Alternative option 1: fixed mounting systems
- EASP_04_r0 Mounting System – Alternative option 2: horizontal single-axis trackers
- EASP_05_r0 Medium-voltage stations
- EASP_06_r0 Control building and medium-voltage receiving station
- EASP_07_r0 On-site high-voltage substation
- EASP_08_r0 Warehouse

Annexure B Photos of the project site

Annexure C Public Participation Process

Annexure D Ecological Impact Assessment

Annexure E Avifauna Impact Assessment

Annexure F Agricultural Potential Assessment

Annexure G Wetland Delineation Study

Annexure H Heritage Impact Assessment

Annexure I Geo-technical and geo-hydrological Report

Annexure J Visual Impact Assessment

Annexure K Socio-economic Impact Assessment

Annexure L Services Report

Annexure M Draft Environmental Management Programme

Annexure M Rehabilitation and Revegetation Plan (Annexure 1 of the Draft EMPr)

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Annexure M Rescue and Protection Plan (Annexure 3 of the Draft EMPr)

ABBREVIATIONS AND ACRONYMS

AGES	Africa Geo-Environmental and Engineering Consultants (Pty) Ltd
BID	Background Information Document
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CSP	Concentrating Solar Power
DEA	Department of Environmental Affairs
DENC	Northern Cape Department of Environment and Nature Conservation
DEAT	Department of Environmental Affairs and Tourism
DoE	Department of Energy
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIR	Environment Impact Assessment Report
EMP	Environmental Management Plan
ESS	Environmental Scoping Study
FIT	Feed in Tariffs
GHG	Green House Gases
GIS	Geographic Information Systems
GN	Government Notice
GWh	Giga Watt hour
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IPP	Independent Power Producer
kV	kilovolt
MW	Mega Watt
MWp	Mega Watt peak
NCNCA	Northern Cape Nature Conservation Act - Act No. 9 of 2009
NEMA	National Environmental Management Act - Act no. 107 of 1998
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act - Act no. 25 of 1999
NWA	National Water Act - Act no. 36 of 1998
Palus Energy	Palus Energy (Pty) Ltd (applicant)
PoS	Plan of Study
Property	Remainder Portion of the Farm East 270, Kuruman RD
Project company	Palus Energy (Pty) Ltd (applicant)
Project site	Remaining Portion of the Farm East 270, Kuruman RD
PV	Photovoltaic
RD	Registration Division
REFIT	Renewable Energy Feed-in Tariffs
RFP	Request for Qualification and Proposals for New Generation Capacity under the IPP Procurement Programme
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited
SANS	South African National Standard
UPS	Uninterruptible Power Supply

1. INTRODUCTION

Palus Energy (Pty) Ltd (Reg. No. 2013/087976/07) is proposing the development of a renewable solar energy facility in a key strategic location in terms of the connection to the Eskom grid and in terms of the favourable solar irradiation.

The proposed site is **Remainder (964.2695 ha) of the Farm East 270 Kuruman RD** located in the **Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province**, 4 km North of Hotazel and 50 km North of Kathu. The total extent of the project site is 964.27 ha.

Site location: Remainder of East 270, Kuruman RD – Surveyor-general 21-digit site code:

C	0	4	1	0	0	0	0	0	0	0	0	0	2	7	0	0	0	0	0
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The name of the project is **EAST 2 SOLAR PARK** and it envisages a **photovoltaic (PV) power plant having a maximum generation capacity of 120 MW**. It was previously specified to be 75 MW but with the addition of 40 ha to the development footprint (from 210 ha to 250 ha) the PV plant can deliver energy into the Eskom grid a lot more efficiently than having a generating capacity of 75 MW.

East 2 Solar Park is planned on the **Remainder of the Farm East 270**, adjacent to the northern boundary of East Solar Park, developed by Osalus Energy and already authorised by the DEA (DEA Ref. 14/12/16/3/3/2/664).

The proposed PV plant development area is located:

- 1.5 km east from the **Assmang mine** on **Portion 1 of the Farm Gloria 266**;
- 8 km south-east from the **Assmang mine** on **Farm N' Chwaning 267**;
- 4.0 km north from the **Hotazel mine**, on the **Farm Hotazel 280**;
- 6 km north-east from the **Kalagadi Manganese mine**, under construction on **Farm Umtu 281** and **Olive Pan 282**.

The solar park is not expected to interfere negatively with the mining activities.

Access to the development area will be from the secondary road (coming from R31) running along the eastern boundary of Portion 2 of the Farm East 270. Two new access roads (of 4.6 km and 235 m respectively) will link the secondary road to the proposed development areas.

East 2 Solar Park will participate to the Renewable Energy IPP Procurement Programme (REIPPPP) issued on 3 August 2011 by the DoE (Department of Energy).

In order to develop the facility, Palus Energy must undertake an Environmental Impact Assessment (EIA) process and acquire environmental authorization from the National Department of Environmental Affairs (DEA), in consultation with the *Northern Cape Department of Environment and Nature Conservation*, in terms of the EIA Regulations (2010) published in terms of Section 24(2) and 24D of the National Environmental Management Act (NEMA, Act No. 107 of 1998). This project has been registered with the **DEA application reference number 14/12/16/3/3/2/829**.

The East 2 Solar Park may be connected either to:

- c) Eskom Hotazel distribution substation, 3.5 km south of the project site, via Eskom Hotazel substation, 5.5 km south of the project site, via a new 132 kV power line approximately 6.5 km long running parallel to the existing Eskom "Hotazel - Heuningvlei" 132 kV power line (alternative connection 1) within a corridor of ±1,4 km long up to an already approved power line corridor (DEA Ref. No. 14/12/16/3/3/1/1426) - East Power Line for the approved East Solar Park (DEA Ref. No. 14/12/16/3/3/2/664); or

- d) New Eskom Umtu substation, ± 8.5 km south-west of the project site, via a new 132 kV power line approximately 11,5 km long, running parallel to existing Eskom "Hotazel - Heuningvlei" 132 kV power line (for 5.3 km) and to Eskom "Hotazel - Umtu" 132 kV power line (for ± 6.2 km) (alternative connection 2). Not yet approved.

A new feeder bay will be commissioned and equipped at the **Eskom Hotazel distribution substation** and/or **Umtu distribution substation** and/or **planned Hotazel transmission substation**. The connection solution may also entail intervention on the Eskom's grid. Eskom is the entity which should assess the connection solutions described in this Scoping Report. Eskom also coordinates the necessary liaising between Palus Energy, Eskom Transmission, Eskom Distribution and Eskom Land & Rights Department.

The alternative connection assessed in this EIA Report and Annexures - for which environmental authorisation is applied for - is the *Alternative connection 1*.

With regard to **the alternative connections 2** whereby a new 132 kV power line may be erected outside the project site, **a separate Basic Assessment will be conducted by AGES**.

Eskom is the entity which should assess the connection solutions described in this EIA Report. Eskom also coordinates the necessary liaising between Palus Energy, Eskom Transmission, Eskom Distribution and Eskom Land & Rights Department.

All or part of the infrastructure required for the connection may be owned and/or operated by Eskom Distribution and this will depend on the Eskom grid code in relation to the IPPs (Independent Power Producers) and on Connection Agreement to be finalized prior to or simultaneously with the conclusion of the PPA (Power Purchase Agreement) in respect of options of retaining ownership of the connection works once completed.

The independent Environmental Assessment Practitioners (EAPs) which have been appointed for the undertaking of the detailed environmental studies in compliance with the 2010 EIA Regulations are **AGES Limpopo**.

With the aim of identifying and assessing all potential environmental impacts related to the development as well as suggesting possible mitigation measures and alternatives, AGES has appointed specialist sub-consultants to compile detailed reports and to study the activities necessary for the assessment of the specific impacts related to their field of expertise.

AGES and the other specialist consultants are in a position of independency from Palus Energy; therefore, they are not subsidiaries or affiliated to the latter. AGES and the specialist consultants have no secondary interest connected with the development of this project or of other projects which may originate from the authorization of the project.

The characteristics, the technology and the extent of the East 2 Solar Park are defined and evaluated in this EIA Report and its annexures.

2. MOTIVATION AND RATIONALE OF THE EAST 2 SOLAR PARK IN LIGHT OF THE REIPPPROUREMENT PROGRAMME REQUIREMENTS

2.1. THE CHOICE OF THE NORTHERN CAPE PROVINCE AND OF THE SITE LOCATION

East 2 Solar Park will be located in the Northern Cape Province. The Northern Cape Province has been identified by Palus Energy as an ideal macro area for establishing a solar PV plant on the basis of several important considerations:

- solar resource is exceptionally high: the *global horizontal irradiation* of the site is 2,126 kWh/m²/year;
- there are several green projects currently under development in the Northern Cape, because of the high solar resources and the availability of desolate lands with low ecological and agricultural value;
- The Northern Cape Province, Local Municipalities and Communities are eager to continue establishing an eco-green image in consideration of the burden of CO₂ emissions they have to bear.

In addition to these very favourable characteristics in terms of desirability of renewable solar energy projects in the Northern Cape Province, the site of East 2 Solar Park has been chosen by Palus Energy on the grounds of several considerations, in particular:

- the high need for electricity supply to the Hotazel area, due to the presence of several mines under operation and under construction, including the **Hotazel Manganese, Kalagadi Manganese, Gloria and Assmang mines**;
- the availability of several connection alternatives, due to the presence of Eskom "Hotazel - Heuningvlei" 132 kV power line, which crosses the project site, and of the Eskom Hotazel and Umtu substations, 3.5 km South and 4 km South-West of the project site respectively;
- the fact that Eskom is planning a new transmission substation to be built adjacent to the Eskom Umtu distribution substation (the Eskom Hotazel transmission substation);
- the flatness of the proposed project site;
- the medium ecological sensitivity and the low agricultural value of the proposed site.

The proposed PV plant development area is located:

- 1.5 km east from the **Assmang mine** on **Portion 1 of the Farm Gloria 266**;
- 8 km south-east from the **Assmang mine** on **Farm N' Chwaning 267**;
- 4.0 km north from the **Hotazel mine**, on the **Farm Hotazel 280**;
- 6 km north-east from the Kalagadi Manganese mine, under construction on Farm Umtu 281 and Olive Pan 282.

The solar park is not expected to interfere negatively with the mining activities. **The proposed solar park will help the Eskom grid to meet the high energy demand related to the mining activities conducted in the area. Furthermore, being a renewable energy plant, it doesn't generate CO₂ emissions while generating power to the National power grid.**

The project site is located in the **Joe Morolong Local Municipality**. The **Spatial Development Framework (SDF) 2012** of the Joe Morolong Local Municipality has three main nodes where relatively higher economic activity takes place, namely Vanzylsrus, Hotazel and Blackrock. The proposed solar park is situated near Hotazel and Blackrock. It is stated in the SDF that investment should be focused on these areas to expand the node into a more diverse economic centre. It is mentioned that a replacement economic activity should be found when the mineral resources are depleted for Hotazel and Blackrock. The proposed renewable energy project will contribute towards meeting this goal by introducing new economic activity and job opportunities to the area.

The SDF furthermore outlines Spatial Planning Categories. Spatial Planning Category F involves *Surface infrastructure and Buildings*, i.e. all surface infrastructure and buildings, including roads, railway lines, power lines, communication structures, etc.

The Sub-Category: F(i) includes *Renewable Energy Structures*: These include any wind turbine or solar photovoltaic apparatus, or grouping thereof, which captures and converts wind or solar radiation into energy for commercial gain irrespective of whether it feeds onto an electricity grid or not. It includes any appurtenant structure or any test facility which may lead to the generation of energy on a commercial basis.

Development Guidelines for Sub-Category: F(i) states that "*all surface infrastructure and buildings that are required for sustainable socio-economic development and resource use must be undertaken in accordance with site specific design and planning guidelines. All industry must be regulated and managed in accordance with sustainability standards (e.g. ISO 14001)*".

The East Solar Park will comply with the international standards and regulations for photovoltaic power plants.

The proposed solar park, situated nearby Hotazel and Blackrock, will aid the Municipality in the upliftment of these areas. It will a sustainable form of land development and will be developed in compliance with the Development Guidelines stipulated under Sub-Category F(i) of the SDF. The proposed Solar Park will comply with the SDF of the Joe Morolong Local Municipality.

Furthermore, in the light of the REIPP procurement Programme requirements, the **East 2 Solar Park** has been developed according to the following main characteristics:

- the installed capacity is within the "eligible capacity" defined by the rules of the RFP;
- the construction phase will last approximately 15 months and the PV plant will be able to begin commercial operation before the end of 2020.

With specific reference to East 2 Solar Park, Eskom has indicated that the project does not interfere with Eskom's present and future developments and do not negatively affect the voltage in the area. Eskom, as an interested and affected party, recognized the positive outcome of the project in terms of the possibility of meeting the local growth of energy consumption, expected.

2.2. NEED AND DESIRABILITY OF THE PROJECT

South Africa currently relies principally on fossil fuels (coal and oil) for the generation of electricity. At the present date, Eskom generates approximately 95% of the electricity used in South Africa. On the other hand, South Africa has a largely unexploited potential in renewable energy resources such as solar, wind, biomass and hydro-electricity to produce electricity as opposed to other energy types (fuel or coal).

South Africa's electricity supply still heavily relies upon coal power plants, whereas the current number of renewable energy power plants is very limited. In the last few years, the demand for electricity in South Africa has been growing at a rate approximately 3% per annum.

These factors, if coupled with the rapid advancement in community development, have determined the growing consciousness of the significance of environmental impacts, climate change and the need for sustainable development. The use of renewable energy technologies is a sustainable way in which to meet future energy requirements.

The development of clean, green and renewable energy has been qualified as a priority by the Government of South Africa with a target goal for 2013 of 10,000 GWh, as planned in the Integrated Resource Plan 1 (IRP1) and with the Kyoto Protocol. Subsequently the Department of Energy of South Africa (DoE) decided to undertake a detailed process to determine South Africa's 20-year electricity plan, called Integrated Resources Plan 2010-2030 (**IRP 2010**).

The IRP1 (2009) and the IRP 2010 (2011) outline the Government's vision, policy and strategy in matter of the use of energy resources and the current status of energy policies in South Africa. In particular, the IRP 2010 highlights the necessity of commissioning 1200 MW with solar PV technology by the end of 2015.

In order to achieve this goal, the DoE recently announced a renewable energy IPP (Independent Power Producers) Procurement Programme.

The IPP Procurement Programme, issued on 3rd August 2011, envisages the commissioning of 3725 MW of renewable projects (1450 MW with solar photovoltaic technology) capable of beginning commercial operation before the end of 2020.

Therefore, the development of photovoltaic power plants will represent a key feature in the fulfilment of the proposed target goal and the reduction of CO₂ emissions.

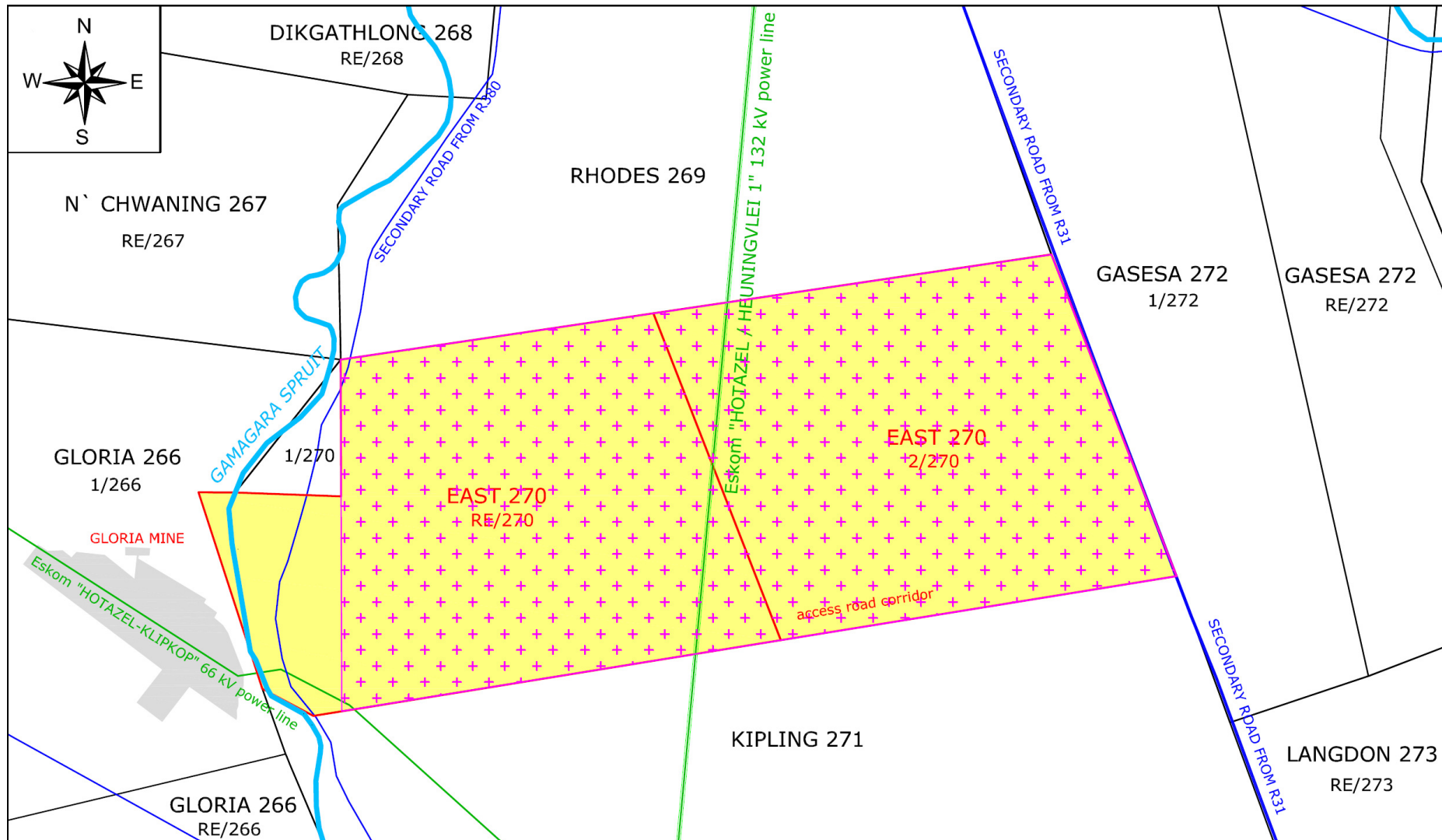
The purpose of East 2 Solar Park is to add new capacity for the generation of renewable electric energy to the national electricity supply in compliance with the IPP Procurement Programme and in order to meet the "sustainable growth" of the Northern Cape Province.

The use of solar radiation for power generation is considered as a non-consumptive use and a renewable natural resource which does not produce greenhouse gas emissions. The generation of renewable energy will contribute to the growth of South Africa's electricity market, which has been primarily dominated up to this date by coal-based power generation. With specific reference to photovoltaic energy, and the proposed project, it is important to consider that South Africa has one of the highest levels of solar radiation in the world.

The reasons for the location of the project in the selected area can be synthesized as follows:

- low requirement for municipal services;
- compliance with national and provincial energy policies and strategies;
- no impact on people health and wellbeing;
- no waste and noise;
- no impact on air quality;
- compatibility with the ecosystem and the surrounding landscape;
- likelihood of social and economic development of marginalized, rural communities; and
- attraction of environmentally aware (green) tourists to the area.

Figure 1: Locality map of the project site and study area for the EIA to include East 2 and East 3 Solar Parks



The power line corridors will be also included in the Study Area.

3. AUTHORITIES, LEGAL CONTEXT AND ADMINISTRATIVE REQUIREMENTS

The legislative and regulatory framework of reference for the solar power plant project includes statutory and non-statutory instruments by which National, Provincial and Local authorities exercise control throughout the development of the same project.

The development and the environmental assessment process of a solar power plant project involve various authorities dealing with the different issues related to the project (economic, social, cultural, biophysical etc.).

3.1. REGULATORY AUTHORITIES

3.1.1. National Authorities

At national level, the main regulatory authorities and agencies are:

- *Department of Energy (DoE)*: The Department is competent and responsible for all policies related to energy, including renewable energy. Solar energy is contemplated and disciplined under the White Paper for Renewable Energy and the Department constantly conducts research activities in this respect;
- *Department of Environmental Affairs (DEA)*: The Department is competent and responsible for all environmental policies and is the controlling authority under the terms of NEMA and EIA Regulations. The DEA is also the competent authority for the proposed project, and is entrusted with granting the relevant environmental authorisation;
- *National Energy Regulator of South Africa (NERSA)*: The Regulator is competent and responsible for regulating all aspects dealing with the electricity sector and, in particular, issues the licence for independent power producers;
- *South African Heritage Resources Agency (SAHRA)*: The Agency is responsible for the protection and the survey, in association with provincial authorities of listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes under the terms of the National Heritages Resources Act (Act no. 25 of 1999);
- *South African National Roads Agency Limited (SANRAL)*: The Agency is responsible for all National road routes.

3.1.2. Provincial Authorities

At provincial level, the main regulatory authority is the *Northern Cape Department of Environment and Nature Conservation*; this Department is responsible for environmental policies and is the Provincial authority in terms of NEMA and the EIA Regulations.

The Department is also the commenting authority for the proposed project.

The project should comply with the *Northern Cape Nature Conservation Act* (Act No. 9 of 2009).

3.1.3. Local Authorities

At a local level, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape Province, Municipalities and District Municipalities are involved in various aspects of planning and the environment related to solar energy facilities development. The Local Municipality is *Joe Morolong*, which is part of the *John Taolo Gaetsewe District Municipality*.

Under the terms of the Municipal System Act (Act no. 32 of 2000), all municipalities are deemed to go through an Integrated Development Planning (IDP) process in order to devise a five-year strategic development plan for the area of reference. The identification of priority areas for conservation and their positioning within a planning framework of core, buffer, and transition areas is the subject of bioregional planning. Priority areas are individuated and defined with reference to visual and scenic resources and their identification and protection is granted through visual guidelines drafted for the area included in bioregional plans.

The **Spatial Development Framework (SDF) 2012 of the Joe Morolong Local Municipality** has three main nodes where relatively higher economic activity takes place, namely Vanzylsrus, Hotazel and Blackrock. The proposed solar park is situated near Hotazel and Blackrock. It is stated in the SDF that investment should be focused on these areas to expand the node into a more diverse economic centre. It is mentioned that a replacement economic activity should be found when the mineral resources are depleted for Hotazel and Blackrock. The proposed renewable energy project will contribute towards meeting this goal by introducing new economic activity and job opportunities to the area.

The SDF furthermore outlines Spatial Planning Categories. Spatial Planning Category F involves *Surface infrastructure and Buildings, i.e.* all surface infrastructure and buildings, including roads, railway lines, power lines, communication structures, etc.

The Sub-Category: F(i) includes *Renewable Energy Structures*: These include any wind turbine or solar photovoltaic apparatus, or grouping thereof, which captures and converts wind or solar radiation into energy for commercial gain irrespective of whether it feeds onto an electricity grid or not. It includes any appurtenant structure or any test facility which may lead to the generation of energy on a commercial basis. Development Guidelines for Sub-Category: F(i) states that *"all surface infrastructure and buildings that are required for sustainable socio-economic development and resource use must be undertaken in accordance with site specific design and planning guidelines. All industry must be regulated and managed in accordance with sustainability standards (e.g. ISO 14001)"*.

The East Solar Park will comply with the international standards and regulations for photovoltaic power plants.

The proposed solar park, situated nearby Hotazel and Blackrock, will aid the Municipality in the upliftment of these areas. It will a sustainable form of land development and will be developed in compliance with the Development Guidelines stipulated under Sub-Category F(i) of the SDF. The proposed Solar Park will comply with the SDF of the Joe Morolong Local Municipality. Local authorities also provide specific by-laws and policies in order to protect visual and aesthetic resources with reference to urban edge lines, scenic drives, special areas, signage, communication masts etc.

Finally, there are also various non-statutory bodies and environmental groups, who are involved in the definition of various aspects of planning and the protection of the environment, which may influence in the development of the proposed project.

3.2. LEGISLATION, REGULATIONS AND GUIDELINES

A review of the relevant legislation involved in the proposed development is detailed in table 1.

Table 1: Review of relevant legislation

National Legislation	Sections applicable to the proposed project
Constitution of the Republic of South Africa (Act no. 108 of 1996)	<ul style="list-style-type: none"> • Bill of Rights (S2) • Rights to freedom of movement and residence (S22) • Environmental Rights (S24) • Property Rights (S25) • Access to information (S32) • Right to just administrative action (S33)
Fencing Act (Act no. 31 of 1963)	<ul style="list-style-type: none"> • Notice in respect of erection of a boundary fence (S7) • Clearing bush for boundary fencing (S17) • Access to land for purpose of boundary fencing (S18)
Conservation of Agricultural Resources Act (Act no. 43 of 1983)	<ul style="list-style-type: none"> • Prohibition of the spreading of weeds (S5) • Classification of categories of weeds & invader plants and restrictions in terms of where these species may occur (Regulation 15 of GN R0148)

	<ul style="list-style-type: none"> Requirement and methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R0148)
Environment Conservation Act (Act no. 73 of 1989)	<ul style="list-style-type: none"> National Noise Control Regulations (GN R154 dated 10 January 1992)
National Water Act (Act no. 36 of 1998)	<ul style="list-style-type: none"> Entrustment of the National Government to the protection of water resources (S3) Entitlement to use water (S4) - Schedule 1 provides the purposes which entitle a person to use water (reasonable domestic use, domestic gardening, animal watering, firefighting and recreational use) Duty of Care to prevent and remedy effects of water pollution (S19) Procedures to be followed in the event of an emergency incident which may impact on water resources (S20) Definition of water use (S21) Requirements for registration of water use (S26 & S34) Definition of offences in terms of the Act (S151)
National Forests Act (Act no. 84 of 1998)	<ul style="list-style-type: none"> Protected trees
National Environmental Management Act (Act no. 107 of 1998)	<ul style="list-style-type: none"> Definition of National environmental principles (S2): strategic environmental management goals and objectives of the government applicable within the entire RSA to the actions of all organs of state, which may significantly affect the environment NEMA EIA Regulations (GN R.982, R.983, R.984 and R.985 of 4 December 2014) Requirement for potential impact on the environment of listed activities to be considered, investigated, assessed and reported on to the competent authority (S24 - Environmental Authorisations) Duty of Care (S28): requirement that all reasonable measures are taken in order to prevent pollution or degradation from occurring, continuing and recurring, or, where this is not possible, to minimise and rectify pollution or degradation of the environment Procedures to be followed in the event of an emergency incident which may impact on the environment (S30)
National Heritage Resources Act (Act no. 25 of 1999)	<ul style="list-style-type: none"> SAHRA, with Minister and MEC of every province must establish a system of grading places and objects which form part of national estate (S7) Provision for protection of archaeological objects, paleontological sites, material & meteorites entrusted to provincial heritage resources authority (S35) Provision for the conservation and care of cemeteries and graves by SAHRA, where this is not responsibility of any other authority (S36) List of activities which require notification from the developer to responsible heritage resources authority, with details regarding location, nature, extent of proposed development (S38) Requirement for compilation of Conservation Management Plan and permit from SAHRA for presentation of archaeological sites for tourism promotion (S44)

National Environmental Management: Biodiversity Act (Act no. 10 of 2004)	<ul style="list-style-type: none"> • Provision for the MEC for Environmental Affairs/Minister to publish a list of threatened ecosystems and in need of protection (S52) • Provision for the MEC for Environmental Affairs/Minister to identify any process or activity which may threaten a listed ecosystem (S53) Provision for the Member of the Executive Council for Environmental Affairs/Minister to publish a list of: critical endangered species, endangered species, vulnerable species and protected species (S56(1) - see Government Gazette 29657 • Three government notices have been published up to date: GN R150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R151 (Lists of critically endangered, vulnerable and protected species) and GN R152 (Threatened Protected Species Regulations)
National Environmental Management: Air Quality Act (Act no. 39 of 2004)	<ul style="list-style-type: none"> • Provision for measures in respect of dust control (S32) • Provision for measures to control noise (S34)
National Environmental Management: Waste Management Act (Act no. 59 of 2008)	<ul style="list-style-type: none"> • Waste management measures • Regulations and schedules • Listed activities which require a waste licence
Northern Cape Nature Conservation Act (Act No. 9 of 2009)	<ul style="list-style-type: none"> • Indigenous flora protected under this act • No hunting to take place without a permit
Occupational Health and Safety Act (Act No. 85 of 1993)	<ul style="list-style-type: none"> • Health and safety of all involved before and after construction must be protected.

Guideline Documents	Sections applicable to the proposed project
South African National Standard (SANS) 10328, Methods for environmental noise impact assessments in terms of NEMA no. 107 of 1998	<ul style="list-style-type: none"> • Impact of noise emanating from a proposed development may have on occupants of surrounding land by determining the rating level • Noise limits are based on the acceptable rating levels of ambient noise contained in SANS 10103
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads	<ul style="list-style-type: none"> • The Guidelines outline rules and conditions related to transport of abnormal loads and vehicles on public roads and detailed procedures to be followed for the grant of exemption permits

Policies and White Papers	Sections applicable to the proposed project
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	<ul style="list-style-type: none"> • The White Paper supports investment in renewable energy initiatives, such as the proposed solar power plant project
The White Paper on Renewable Energy (November 2003)	<ul style="list-style-type: none"> • The White Paper outlines the Government's vision, policy, principles, strategic goals and objectives for the promotion and the implementation of renewable energy in South Africa
Integrated Resource Plan (IRP1) Integrated Resources Plan 2010-2030 (IRP 2010).	<ul style="list-style-type: none"> • First Integrated Resource Plan (IRP1) was released in late 2009. Subsequently the DoE decided to undertake a detailed process to determine South Africa's 20-year electricity plan, called Integrated Resources Plan 2010-2030 (IRP 2010). • The IRP1 and the IRP 2010 outline the Government's vision, policy and strategy in matter of the use of energy resources and the current status of energy policies in South Africa.

	<ul style="list-style-type: none"> • IRP 2010 highlights the necessity of commissioning 1200 MW with solar PV technology by end of 2015.
Request For Qualification and Proposals For New Generation Capacity under the IPP Procurement Programme (3 August 2011)	<ul style="list-style-type: none"> • The IPP Procurement Programme, issued on 3rd August 2011 by the DoE, envisages the commissioning of 3725 MW of renewable projects (1450 MW with Solar photovoltaic technology) capable of beginning commercial operation before the end of 2020.
Equator Principles (July 2006)	<ul style="list-style-type: none"> • The Equator Principles provide that future developments with total project capital costs of US\$10 million or more shall be financed only if socially and environmentally sustainable

3.3. LISTED ACTIVITIES IN TERMS OF NEMA

The “listed activities” in terms of sections 24 and 24D of NEMA involved (or *potentially* involved) in the proposed development are detailed in table 2 below.

Table 2: Listed Activities in terms of sections 24 and 24D of NEMA potentially involved in the proposed development

Relevant notice	Description
<p>GN R.983 Item 11 (i)</p> <p><i>The development of facilities or infrastructure for the transmission and distribution of electricity -</i></p> <p><i>(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.</i></p>	<p>East 2 Solar Park may be connected to:</p> <ul style="list-style-type: none"> a) Eskom Hotazel distribution substation, 3.5 km south of project site, via Eskom Hotazel substation, 5.5 km south of project site, via new 132 kV power line ± 6.5 km long, running parallel to existing Eskom “Hotazel - Heuningvlei” 132 kV power line (alternative connection 1) in a corridor of ± 1.4 km long up to already approved power line corridor (DEA Ref. No. 14/12/16/3/3/1/1426) of East Power Line related to approved East Solar Park (DEA Ref. No. 14/12/16/3/3/2/664); or b) To new Eskom Umtu substation, ± 8.5 km south-west of the project site, via a new 132 kV power line ± 11.5 km long, running parallel to existing Eskom “Hotazel - Heuningvlei” 132 kV power line (for 5.3 km) and to Eskom “Hotazel - Umtu” 132 kV power line (for ± 6.2 km) (alternative connection 2). Not yet approved. <p>The connection solution may also entail intervention on the Eskom’s grid.</p>
<p>GN R.983 Item 24 (ii)</p> <p><i>The development of –</i></p> <p><i>(ii) a road with a reserve wider than 13,5m, or where no reserve exists where the road is wider than 8m.</i></p>	<p>Access to East 2 Solar Park will be from a secondary road from R31. Two new on-site access roads, 8.0 m wide) and 235 m long (East 2) are envisaged. During the construction phase, the road reserve may be wider than 13.5 meters in order to allow the transportation of abnormal loads (e.g. the high-voltage step-up transformers of the new on-site high-voltage substation). Internal roads will be maximum 8.0 m wide with a road reserve maximum 12.0 m wide. At the turning points / intersection points, some internal roads may be wider than 8.0 m and the road reserve may be wider than 13.5 m, due to the shape of the intersection / turning points.</p>

<p>GN R.984 Item 1</p> <p><i>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 MW or more</i></p>	<p>Palus Energy (Pty) Ltd is proposing the establishment of East 2 Solar Park on the Remainder of East 270, Kuruman RD, measuring 964.3 ha, located in Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape.</p> <p>The project will consist of construction, operation and maintenance of a PV Power Plant with a maximum generation capacity of 120 MW with associated infrastructure and structures.</p>
<p>GN R.984 Item 15</p> <p><i>The clearance of an area of 20 ha or more of indigenous vegetation</i></p>	<p>The PV Power Plant with associated infrastructure and structures will be constructed and operated on a footprint bigger than 20 ha (250 ha). The required footprint will be cleared from existing indigenous vegetation.</p>

GN R.985, Item 12 is not applicable since the project is not affecting critically endangered or endangered ecosystem in terms of section 52 of the NEMBA or critical biodiversity areas identified in bioregional plans.

The closest watercourse is the *Gamagara Spruit*, which run parallel to the western boundary of the project site, but at a minimum distance of 600 m from the proposed development area.

A pan (endorheic depression) was found on the north-eastern corner of the Remainder Portion of the Farm East 270, at a minimum distance of 850 m from the proposed development area.

No infilling or depositing of any material or dredging, excavation, removal or moving of soil will take place in the proximity of the *Gamagara Spruit* or of the pan, considering that the construction activities will be restricted to the proposed PV plant fenced area / footprint. Therefore, **Activities 12 and 19 of GN R983 are NOT APPLICABLE.**

The alternative connection assessed in this EIA Report and Annexures - for which environmental authorisation is applied for - is the *Alternative connection 1*. With regard to **the alternative connections 2** whereby a new 132 kV power line may be erected outside the project site, **a separate Basic Assessment will be conducted by AGES.**

Eskom is the entity which should assess the connection solutions described in this EIA Report. Eskom also coordinates the necessary liaising between Palus Energy, Eskom Transmission, Eskom Distribution and Eskom Land & Rights Department. Furthermore, a part of the connection infrastructure (the 132 kV busbar of the on-site substation and the new 132 kV power line) may be executed, owned and operated by Eskom.

Final layout and site plans already drafted by Palus Energy will be completed once inputs, via public participation have been received, analysed and reviewed. Please note that the site lay out plans have been changed to accommodate for a change in the specifications of the proposed development. Previously the capacity of the proposed solar park was indicated to be 75mW but has now been changed to 120mW. To accommodate the change in capacity the footprint had to be increased from 210ha to 250ha. Further information acquired will be analysed in order to determine the proposed final development layout and site plans. Such approach will ensure a holistic view of future requirements of the site and that resources are utilised to their full availability in terms of social and environmental sustainability. This application and other development applications, in the area, are considered together in order to ensure general sustainability in the Local and District Municipal areas.

4. PROJECT DESCRIPTION AND FUNCTIONING

The project **previously** envisaged the establishment of a solar power plant with a maximum generation capacity at the delivery point of up to 75 MW. However, this was changed and the generation capacity was increased to 120 MW. The increase of the plant capacity will imply that the project would become economically more viable by using slightly more land but a more efficient energy output. The Tender Rules as drafted by the Department of Energy might change from originally being 75 MW to 120 MW.

The preferred technical solutions currently planned include:

- **thin-film PV modules or mono/polycrystalline PV modules,**
- **fixed mounting systems or horizontal 1-axis trackers.**

The energy generated by the East 2 Solar Park will reduce the quantity of pollutants and greenhouse gases emitted into the atmosphere. The reduced amount of CO₂ will be the emissions that would have been generated by a thermal power plant using fossil fuels for producing the same quantity of energy that it is produced by the East 2 Solar Park. The detailed description of the characteristic and functioning of the PV plant and its connection is given in the following paragraphs.

4.1. PROJECT LAYOUT

The layout of the proposed development is the result of a comparative study of various layout alternatives and had been defined in consideration of the results of some specialist studies conducted / under drafting during the scoping phase.

The PV plant is designed and conceived in order to minimize visual and noise impacts, as well as to operate safely and assuring a high level of reliability, with low water consumption and the need only for easy and quick maintenance and repair for approximately 25-30 years.

The footprint (fenced area) of the East 2 Solar Park was changed from 210 ha to 250 ha.

The main drives of the proposed layout are:

- to maximize the energy production and the reliability of the PV plant, by choosing proven solar technologies: thin-film or mono/polycrystalline solar modules mounted on single-axis horizontal trackers (SAT) or on fixed mounting systems;
- to develop the PV power plant on Remainder of the Farm East 270, as this part of the farm is flat, has a *medium* ecological sensitivity and is far away from the secondary road (from R31) running along the western boundary of Portion 2, so that the potential visual impact from this road would be negligible;
- to avoid the western boundary of the property, as it is affected by the *Gamagara Spruit* and sand dunes,
- to include as much as possible in the proposed footprint low ecological sensitivity areas, in order to reduce the extension of the medium ecological sensitivity areas to be cleared and as consequence the number of protected trees to be removed;
- the proposed footprint was located next to PV plants already approved:
 - **East 2 Solar Park** is preliminarily planned on **Remaining Extent of the Farm East 270**, south of the planned Rhodes 1 Solar Park, developed by Mira Energy and authorised by the DEA (DEA Ref. 14/12/16/3/3/2/614).

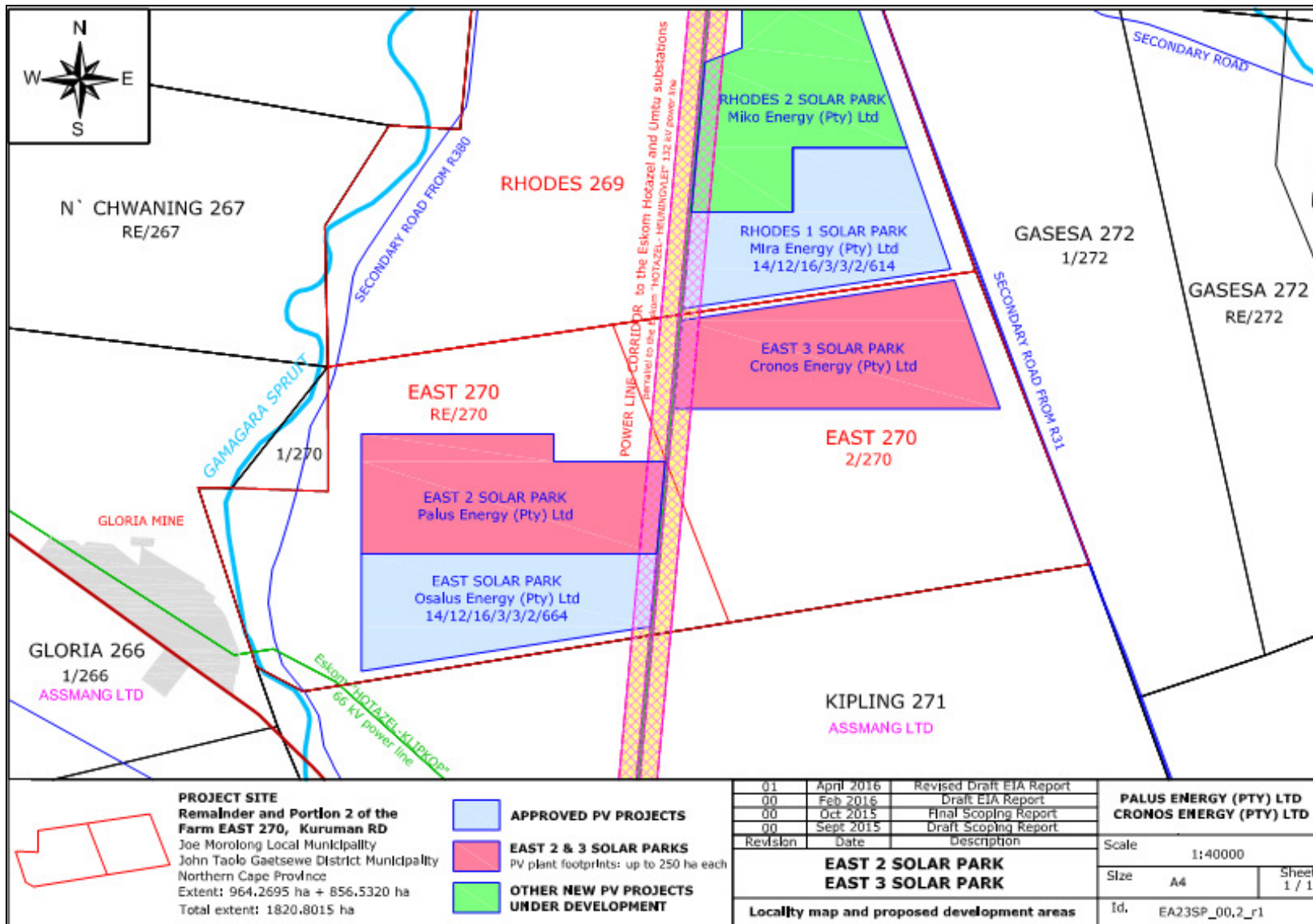
The proposed layout plan (attached as Annexure A and Figure 3 below) was drawn using PV modules mounted on trackers; in the case of PV modules mounted on fixed mounting systems, the layout plans do not change, except for orientation of PV arrays: East-West instead of North-South.

The required **footprint** - corresponding on the fenced area - **will not exceed 250 ha**, and the **maximum height of structures (PV modules and support frames) will be approximately 3.1 m above ground level. Impacts and mitigation measures will remain the same.**

The project layout and the other plant components are detailed in the following drawings:

- EASP_01_r1 Layout plan - PV power plant up to 120 MW
- EASP_03_r0 Mounting System – Alternative option 1: fixed mounting systems
- EASP_04_r0 Mounting System – Alternative option 2: horizontal single-axis trackers
- EASP_05_r0 Medium-voltage stations
- EASP_06_r0 Control building and medium-voltage receiving station
- EASP_07_r0 On-site high-voltage substation
- EASP_08_r0 Warehouse

Figure 2: Proposed Developable Area of the East 2 Solar Park



4.2. PRIMARY COMPONENTS

The Photovoltaic (PV) Power Plant together with its connection infrastructures and structures will require the installation of the following equipment:

- Photovoltaic modules (monocrystalline, polycrystalline or thin-film solar modules)
- Mounting systems (fixed or single-axis horizontal trackers) for the PV arrays and related foundations
- Internal cabling and string boxes
- Medium voltage stations, hosting DC/AC inverters and LV/MV power transformers
- Medium voltage receiving station(s)
- Workshop & warehouses
- one small **on-site high-voltage substation** with high-voltage power transformers, stepping up the voltage to the voltage of the Eskom's grid (132 kV) and a 132 kV busbar with metering and protection devices and a control building (also called "**switching station**") - to be located within the PV plant development area
- **two new small sections of 132 kV line** - 100 m long - allowing the Eskom "**Hotazel - Heuningvlei**" **132 kV power line** - crossing the project site - to loop in and out of the 132 kV busbar of the new on-site switching station (**Alternative connection 1**)
- Electrical system and UPS (Uninterruptible Power Supply) devices
- Lighting system
- Grounding system
- Access road and internal roads
- Fencing of the site and alarm and video-surveillance system
- Water access point and water extraction on-site borehole(s) point, water supply pipelines, water treatment facilities
- sewage system (*Ballam Waterslot* or *Lilliput* system).

The connection may also entail interventions on the Eskom grid according to Eskom's connection requirements/solution.

During the construction phase, the site may be provided with additional:

- water access point and water extraction on-site borehole(s) point, water supply pipelines, water treatment facilities;
- pre-fabricated buildings;

to be removed at the end of construction.

As *alternative connection solutions*, the East 2 Solar Park may be connected:

- a) to the Eskom Hotazel distribution substation, 3.5 km south of the project site, via To the Eskom Hotazel substation, 5.5 km south of the project site, via a new 132 kV power line approximately 6.5 km long and running parallel to the existing Eskom "Hotazel - Heuningvlei" 132 kV power line (alternative connection 1) within a corridor of $\pm 1,4$ km long up to the already approved power line corridor (DEA Ref. No. 14/12/16/3/3/1/1426) of the East Power Line related to the approved East Solar Park (DEA Ref. No. 14/12/16/3/3/2/664); or
- b) To the new Eskom Umtu substation, ± 8.5 km south-west of the project site, via a new 132 kV power line approximately 11,5 km long and running parallel to the existing Eskom "Hotazel - Heuningvlei" 132 kV power line (for 5.3 km) and to the Eskom "Hotazel - Umtu" 132 kV power line (for ± 6.2 km) (alternative connection 2). Not yet approved.

If a new 132 kV power line may be constructed outside the project site, **a separate Basic Assessment will be conducted by AGES.**

Table 3: Project components

Component	Description/ Dimensions
Property / Project site	Remainder of the Farm East 270 Kuruman RD Joe Morolong Local Municipality John Taolo Gaetsewe District Municipality Northern Cape Province LPI codes:C0410000000027000000 Latitude (Development Area on the Remainder) 27° 09' 50" S Longitude (Development Area on the Remainder) 22° 56' 15" E
PV plant footprint	PV plant footprint (fenced area): up to 250 ha on the western side of the property (Remainder Portion of East 270)
Site access	Access to the development area will be from the secondary road (coming from R31) running along the eastern boundary of Portion 2 of the Farm East 270. A new access road - approximately 4.0 km long and running parallel to the southern boundary of Portion 2 of the Farm East 270 - will link the secondary road to the proposed development area.
Generation capacity	up to 120 MW
Proposed technology	The preferred technical solutions are: PV solar modules: thin-film modules or monocrystalline or polycrystalline modules Mounting systems: fixed mounting systems or single-axis horizontal trackers (SAT)
Panel Dimensions	It depends on the technical solutions and electrical configuration. In any case the minimum and maximum height above the ground level will not exceed the values indicated at the item below.
Height of PV module supporting structures from ground level	maximum height (highest point of the PV arrays): 3.1 m above the ground level minimum height (lowest point of the PV arrays): 1.0 m above the ground level
Width and length of internal roads	The main internal road around the security fence is max. 8.0 m wide and approximately 6.7 km long. Secondary internal roads are 4.0 m wide (max. 5.0 m wide) and max. 7.4 km long
Height of Fencing	security fence around the footprint: maximum height: 3.0 meters above the ground level
New on-site high-voltage substation	<u>On-site high-voltage substation - within the fenced area</u> Substation Fence: 70 m x 70 m Substation Footprint: 0.4 ha
Loop-in loop-out lines (Alternative connection 1)	<u>Two new sections of 132 kV power line for the connection to the Eskom "Hotazel - Heuningvlei" 132 kV power line (Alternative connection 1)</u> Length: max. 100 m each

4.2.1. Project functioning and connection of the solar park to the Eskom grid

Solar energy facilities using PV technology convert sun energy to generate electricity through a process known as the Photovoltaic Effect, which consists of the generation of electrons by photons of sunlight in order to create electrical energy. The preferred technical solutions are:

- thin-film modules or mono / polycrystalline modules, mounted on:
- fixed mounting systems or mounted on horizontal 1-axis trackers,

which at present represent the best performing options in terms of reliability and costs/efficiency.

PV technology is in constant and rapid evolution, this means that the final choice of the type of solar modules (thin-film, mono-crystalline or polycrystalline) and mounting system (fixed or tracker) can be taken at the time of commission, on the basis of availability of PV modules and mounting systems, of the worldwide market and the cost-efficiency curve. The required footprint - corresponding on the fenced area - will not exceed 250 ha, and the maximum height of the structures (PV modules and support frames) will be approximately 3.1 m above the ground level. Therefore, the impacts and mitigation measures will not change. For further reference please refer to section 5.2.

The following description refers to examples of “thin-film PV modules on fixed mounting systems” and “polycrystalline modules on trackers”, but the combination of “thin-film PV modules on trackers” and “polycrystalline PV modules on fixed mounting systems” is also possible and feasible.

PV modules will be assembled on zinced steel or aluminium frames, to form PV arrays. The metal frames that sustain PV arrays are set to the ground by fixed support poles.

A) In the case of PV modules mounted on fixed mounting systems:

Each mounting frame will host several PV modules along two or more parallel rows consisting of PV modules placed side by side, with the position of the PV arrays northwards and at an optimized tilt. The rows are mounted one on top of the other, with an overall mounting structure height **up to 3.1 meters above ground level.**

Figure 4: Lateral views of PV arrays mounted on fixed mounting systems

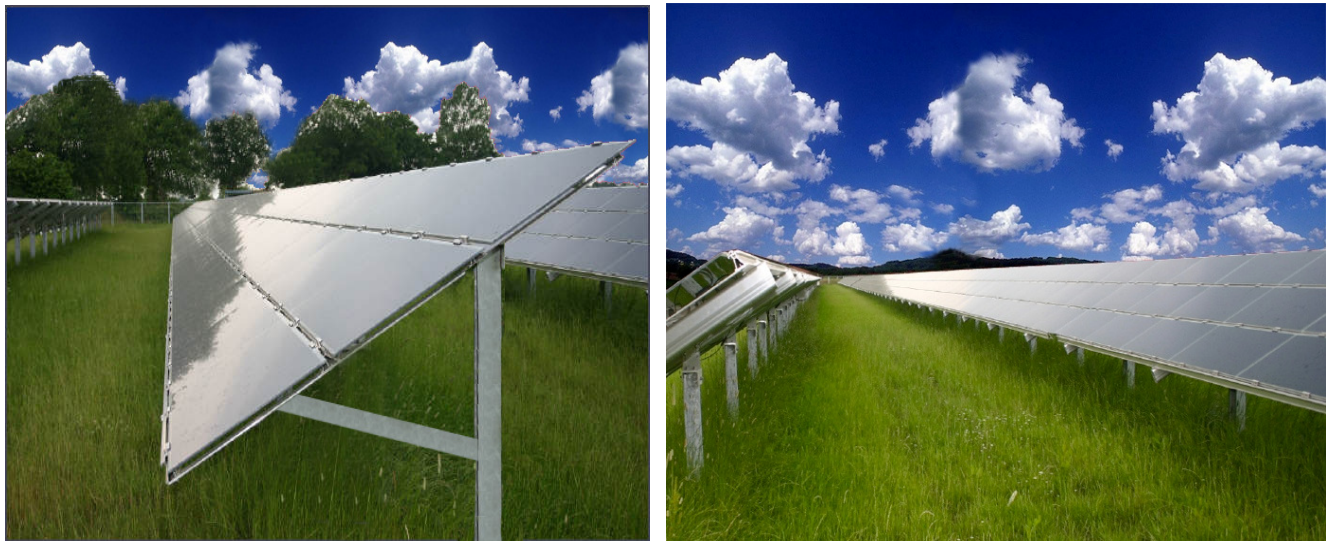


Figure 5: Frontal view of PV arrays mounted on fixed mounting systems



For further details, Please refer to Figures 4 and 5 above and to the drawing of the Annexure A:

- EASP_03_r0 Mounting System – Alternative option 1: fixed mounting systems

B) In the case of PV modules mounted on trackers:

Each PV array is composed of several PV modules disposed along one or more parallel rows consisting of PV modules placed side by side.

Each tracker is composed by several PV arrays North-South oriented and linked by a horizontal axis, driven by a motor. The horizontal axis allows the rotation of the PV arrays toward the West and East direction, in order to follow the daily sun path.

The maximum mounting structure height will be **up to 3.1 meters above ground level**.

Figure 6: Simulation views of the PV arrays mounted on 1-axis horizontal tracker

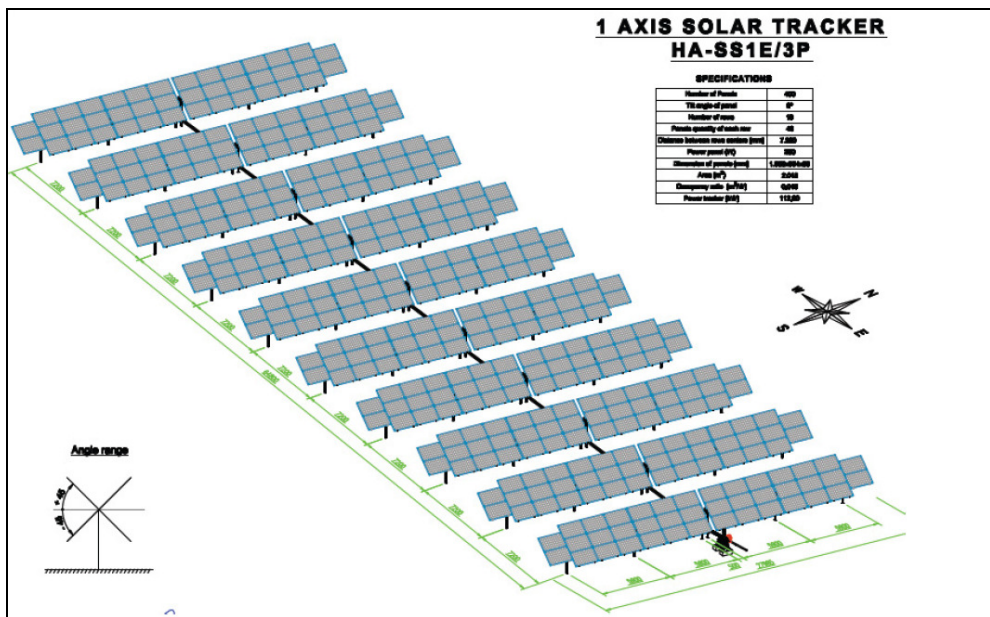


Figure 7: Frontal views of the PV arrays mounted on 1-axis horizontal tracker



For further details, see also the drawing of the Annexure A:

- EASP_04_r0 Mounting System – Alternative option 2: horizontal single-axis trackers

C) In both cases:

PV modules are series-connected outlining PV strings made of several modules, so that the PV string voltage fits into the voltage range of the inverters. PV strings are set up in order to be connected to DC-connection boxes. Each String Box allows the parallel connection of several PV strings (also called “PV sub-field”).

String Boxes monitor the currents in photovoltaic modules and can promptly diagnose faults. String boxes are also designed with a circuit breaker in order to disconnect the photovoltaic sub-fields from the inverters.

The PV sub-fields are thought to be linked to central inverters, located in **120 medium voltage stations**. Each station comprises two adjacent prefabricate buildings designed to host two **DC/AC inverters**, with a total nominal output AC power of 1,000 kW (16 parallel sub-fields), and a **medium voltage power transformer** of 1000 kVA. The DC/AC inverters are deemed to convert direct current (DC) into alternate current (AC) at low voltage (270 V); subsequently the AC will pass through a medium-voltage transformer in order to increase the voltage up to 22 kV (or 11 kV).

The medium-voltage stations are detailed in the drawing of the Annexure A:

- EASP_05_r0 *Medium-voltage stations*

The energy delivered from the 120 medium voltage stations will be collected into one (or more) **medium voltage receiving station(s)**, parallel connecting all the 120 PV fields of PV generator.

From the medium voltage receiving station, the energy will be delivered to two high-voltage power transformers (40 MVA each, plus one as spare), which will step up the electric energy from the medium voltage level (11 kV or 22 kV) to the Eskom required connecting voltage (*i.e.* 132 kV). The power transformers will be connected to an on-site 132 kV busbar (the so called “**switching station**”), to be equipped with protection and metering devices, according to Eskom requirements.

The new on-site HV substation will need to be equipped with circuit breakers upstream and downstream, in order to disconnect the PV power plant and/or the power line in case of failure or grid problems.

Two **metering devices and related kiosks** are included in the layout: one for Eskom, close to the 132 kV busbar, and one for Palus Energy, close to the power transformers. The kiosks (2.4 x 4.8 x 3.2 m) will contain the peripheral protection and control cabinets and the metering devices. The on-site HV sub-station, composed of the power transformers, the control building, the 132 kV busbar with protection and metering devices and the kiosks, will have a **footprint covering approximately 4,000 m²**.

The new power line and the busbar (*switching station*) of the on-site HV substation will be owned and operated by Eskom Distribution. The layout of the on-site high-voltage substation as well as of the control building and the subdivision between Eskom’s side and Palus Energy’s side are detailed in the drawings included in Annexure A:

- EASP_06_r0 *Control building and medium-voltage receiving station*
- EASP_07_r0 *On-site high-voltage substation*

The power generation capacity at the delivery point will be up to 120 MW.

The East Solar Park may be connected either:

- a) To the Eskom Hotazel substation, 5.5 km south of the project site, via a new 132 kV power line approximately 6.5 km long and running parallel to the existing Eskom "Hotazel - Heuningvlei" 132 kV power line (alternative connection 1) within a corridor of $\pm 1,4$ km long up to the already approved power line corridor (DEA Ref. No. 14/12/16/3/3/1/1426) of the East Power Line related to the approved East Solar Park (DEA Ref. No. 14/12/16/3/3/2/664); or
- b) To the new Eskom Umtu substation, ± 8.5 km south-west of the project site, via a new 132 kV power line approximately 11,5 km long and running parallel to the existing Eskom "Hotazel - Heuningvlei" 132 kV power line (for 5.3 km) and to the Eskom "Hotazel - Umtu" 132 kV power line (for ± 6.2 km) (alternative connection 2). Not yet approved.

Please refer to the drawing of the Annexure A:

- EASP_00.3_r3 *Connection alternatives*

If a new 132 kV power line may be erected outside the project site, **a separate Basic Assessment will be conducted by AGES.**

4.2.2. Access road and internal roads

Access to the two development areas will be from the secondary road (coming from R31) running along the eastern boundary of Portion 2 of the Farm East 270. Two new access roads (of 4.6 km and 235 m respectively) will link the secondary road to the proposed development areas.

Internal roads will consist of gravel roads designed in accordance with engineering standards. The roads will have a maximum width of 8.0 meters allowing for slow moving heavy vehicles. Once the solar farm is in operation, the internal roads will mainly be used for maintenance and inspections.

The vertical alignment of the roads will not present significant challenges due to the flatness of the terrain. The entire development will be contained inside a fenced area and the roads are not intended for public use.

4.2.3. Lighting system

The lighting system will consist of the following equipment:

- Floodlight-towers: maximum 10 meters high, with 6x400W directional lamps, installed around the HV loop-in loop-out substation. Normal lighting: 15 lux; up to 40 lux in case of emergency.
- Street lighting along internal roads, for the stretch from the access point up to the HV substation inside the property: 1 streetlamp, maximum 5.5 meters high, every 20 meters, having a metal-haloids lamp of 400 W.
- 2x400 W spotlights (SAP type) mounted on the top of medium-voltage stations.

The lighting of the MV stations and of the on-site HV substation will be on only in case of intrusion/emergency or necessity to reach the MV stations / HV substation during the night.

During the night, the video-surveillance system will use infra-red (or micro-wave) video-cameras, which do not need a lighting system (which could reduce the functioning). Only streetlamps along internal roads, for the stretch from the main access up to the HV substation inside the property, may be switched on at night.

4.2.4. Stormwater collection system

Given the low rainfall, flat topography and low flow speed of run-off, **no formal storm water structures are required** as the proposed gravel roads will be developed at ground level so as not to disturb the natural flow of storm water. This means that run-off will not be concentrated and the existing drainage patterns will be left undisturbed.

4.2.5. Water requirements

4.2.5.1. Water requirements during the construction phase

Water required during the 15-month construction phase can be summarised as follows:

- water is required for the compaction of earthworks relating to the project. The surface area of the proposed gravel roads come to 164 400 m² and the water use is expected to be 50 l/m².
- The average number of workers expected to be employed on site during construction is 160, each of which is expected to require 50 litres of water per day over 15 months (330 working days).

It is possible that the connection agreement with Eskom may require a shorter construction period. For example, in the case where the construction works are planned to last only 6 months (132 working days), the average number of workers required on site during construction will be 400 workers. Therefore, water consumption for sanitary use will be:

- 160 people x 50 l/person x 330 working days = 2 640 m³ over 15 months, or:
- 400 people x 50 l/person x 132 working days = 2 640 m³ over 6 months.
- Water will also be required for the production of concrete. The overall volume of concrete to be cast is 24 000 m³, which will require 200l of water per m³.
- The water requirement for the cleaning of vehicles and plant is expected to be negligible.

The overall water usage during the construction period can be summarised as follows:

WATER REQUIREMENT DURING THE CONSTRUCTION PHASE		
DESCRIPTION	UNIT	TOTAL
Time frame of the construction activities	<i>months</i>	up to 15
Overall water consumption for internal roads	m^3	8 220
Overall water consumption for sanitary and other uses (over 330 working days)	m^3	2 640
Overall water consumption for concrete production	m^3	4 800
TOTAL WATER CONSUMPTION	m^3	15 660

The construction phase will last approximately **15 months**.

4.2.5.2. Water provision during construction and operation

The proposed development site falls within the **Lower Vaal Water Management Area (WMA)**, on the **Quaternary Catchment Area (QCA) D41K** where no groundwater abstraction is allowed for under the DWA General Authorization.

One borehole is located on the Remainder Portion of the farm East 270 (where the development area is located). This borehole is not equipped as it has a very low yield. No groundwater sample was collected as the borehole on site was not accessible. A water sample was however collected from a borehole from the property north of the site (Rhodes 269). The water quality of the shallow aquifer in the area is fairly consistent, therefore this analysis is representative of the water quality on East 270.

The water sample collected from the borehole on Farm Rhodes 269 has elevated chloride, nitrate, selenium and sodium levels that support the high TDS count and conductivity. According to the SANS 241 drinking water standards the raw water is not suitable for human consumption. Therefore, drinking water should be treated by osmosis prior to consumption. The high salt load will also make the water unusable for cleaning the solar panels as using the water will cause scale build-up on the PV module surfaces.

The Geo-technical and geo-hydrological Study concluded that, should water for the project be sourced by means of groundwater abstraction, a new borehole should be drilled, being the existing on-site borehole not available. It is recommended that the fracture rock aquifer located below the Kalahari sediments be targeted at depths between 80 and 120 m below surface as a source of water for the project.

A new borehole with a sustainable abstraction of 3600 l/h (0.042 l/s) will be sufficient to supply the solar project with sufficient water during the construction and operational phases. Alternatively, water can be sourced **from the Vaal Gamagara Pipeline**, which crosses the project site and is operated by **Sedibeng Water**, the local water provider.

Should the water for the project being sourced from a new on-site borehole, Palus Energy will submit a Water Use Licence application (section 21a) to the Department of Water Affairs in respect of groundwater abstraction.

After the construction phase, the water consumption will drop dramatically. Water will mainly be used for sanitary purposes by the core team on site, and for cleaning of the PV panels. It is expected that 25 persons will be on site during the daytime, and only 4 persons will be on site overnight. Assuming an average water consumption of 150 l/person/day, the 29 persons will require 4 350 l/day. The cleaning of the solar panels will be done twice a year when 1 litre of water will be required per m² of PV panel surface. Approximately 1 360 m³ of water will be used for each cleaning cycle, which will last approximately two weeks (12 working days). Therefore, the overall water consumption for cleaning activities will be of 2 640 m³/year (two cleaning cycles per annum).

The water consumption will increase from 4 350 l/day to 114 350 l/day only during the days when the solar panel cleaning is done (110 000 l/day for cleaning activity and 4 350 l/day for sanitary use). The PV modules are conceived as self-cleaning with rain, but it is possible that cleaning as set out above will be required during some years. It is proposed that 90 000l be stored on site in a reservoir for emergencies (like fire), and to tide the development over when pumps or water mains are maintained or repaired.

The water consumption during the operational phase can be summarised as follows:

WATER REQUIREMENT DURING THE OPERATIONAL PHASE		
DESCRIPTION	UNIT	TOTAL
Average daily water consumption for sanitary use	l/day	4 800

The estimated annual groundwater recharge (2.1 mm/m² per annum) from an average annual precipitation of 250mm falling on 856.53ha will result in 58,500m³ of water available. It was worked out previously that the maximum annual water requirement for the project is 2,138 m³ per year. The new requirement is approximately 2 800 m³. However, this volume is still very low in relation to the volume of water available in terms of the annual recharge.

4.2.6. Sewerage

Considering that the proposed development will not include formal residential properties there is no need to connect the municipal sewer reticulation system. Sewer reticulation will be handled by the patented and commercially available *Ballam Waterslot* (or similar) sewer treatment system.

The sewer system will therefore consist of an installation to serve the offices of the control building. It is foreseen that the system will be installed in line with the requirements of the manufacturer. Typical systems consist of a conservancy tank (built underground on site), and a patented digester. Most systems require electricity to power the pumps and fans used in aeration process, although some systems use wind power (whirlybird). The system could require chlorine tablets available commercially.

The effluent from the *Ballam Waterslot* (or similar) system will be suitable for irrigation of lawns, or re-use in the dwellings as water for the flushing of toilets, or for firefighting purposes. This could reduce the overall water requirement of the development substantially.

A Water Use License application (section 21g) will be submitted to the Department of Water Affairs by Palus Energy with regard to the water treatment system on site.

4.2.7. Refuse removal

During the construction phase, solid waste will mainly consist of vegetation material as a result of the clearing activity. Other type of solid waste will be: wood from packaging, boxboards, expanded polystyrene and household waste. Vegetation material from clearing activity can be recycled to be re-used as organic fertilizer. Other solid wastes will be recycled as much as possible. Non-recyclable waste will be delivered to the closest landfill of the Municipality.

During the operational phase (25 - 30 years), solid waste will mainly consist of household waste from the operational team. Other type of solid waste will come from the maintenance activity in case of failure of some components.

At the end of the project lifetime, the PV plant will be decommissioned. Silicon of the PV modules and cables (copper and/or aluminium conductor). will be recycled, as well as the aluminium (or zinc steel) frames and piles of the mounting systems.

Palus Energy will enter into an agreement with the Joe Morolong Local Municipality for the PV plant’s refuse at the nearby municipal refuse site. No refuse will be buried or incinerated on site.

4.3. CONSTRUCTION SITE

The construction site (approximately 10ha) will be located on the western side of the planned footprint (close to the access point), covering the area where the last 4MWp are planned. Consequently, the construction site area will be gradually reduced at the completion of the last four PV fields (4 MWp), and at the end of the works all the construction area will be converted into the last PV arrays. The optimal location of the construction site is an important element of the planning phase also in order to minimize impacts on the surrounding environment. The site's location has been dictated by the nature of the works to be undertaken, specialist studies, site restrictions, town planning intended uses and access.

The area identified for the construction site had to meet the following requirements:

- sufficient size;
- proximity to existing roads;
- availability of water and energy;
- low environmental and landscape value;
- sufficient distance from residential areas; and
- proximity to the worksite.

In addition, to ensure environmental compatibility, the following factors have been considered:

- restrictions on land use (landscape, archaeological, natural, hydrological, etc.);
- terrain morphology;
- presence of high environmental value areas (e.g. wetlands); and
- sand& stone supply.

The establishment of the construction site will be divided into four phases. Steps included here do not follow a time sequence, but considered overlapping and simultaneous events.

4.3.1. Phase I

The area will be fenced to prevent intrusion of animals and to protect against materials theft within the site. A video surveillance system will be provided.

4.3.2. Phase II

During the fencing operation as described in Phase I, the most valuable trees, if any, will be removed and placed temporarily in a safe location for future planting at the end of work. This procedure is required for environmental mitigation. The other low value tree species will be cut down and transferred to facilities for wood processing.

4.3.3. Phase III

At completion of the works defined in Phases I and II, the following step will be the site clearing and the construction of internal roads. The internal road network should ensure a two-way traffic of heavy goods vehicles in order to minimize trips. The road system is planned for a width of 8 meters. Roads will be of dry and compacted materials. The facility will require constant access control, a weigh-house for heavy trucks, removable structures for the storage of yard tools and temporary storage areas. During Phase III, the installation of MV/LV transformers connected to the Eskom grid is also planned, as well as the laying of underground electrical cables.

4.3.4. Phase IV

Temporary storage areas of materials and workshops will be constructed and used for:

- temporary storage of photovoltaic modules (covered with compacted dry material in order to avoid direct contact with the ground);
- temporary storage for frames and piles of the mounting systems of the PV arrays;
- storage and processing of building material for construction (sand, gravel, concrete batching and mixing plant, steel, etc.);
- drinking water storage for human consumption;
- worker care facilities and site management buildings,
- prefabricated housing modules for workers who may require accommodation inside the site (only key personnel should be allowed to stay overnight);
- technical cabins and management offices;
- medical care unit in a prefabricated module, in order to allow immediate first aid and minor surgical emergency;
- recreation area and canteen (prefabricated modules);
- parking lots for employees (located close to the staff housing), for visiting staff (located close to the offices area), and for trucks and work vehicles during inactivity;
- workshop and storage facilities on the site for contractors;
- electrical network for living units, offices and service structures;
- water supply for living units through polyethylene pipes connected to storage;
- *Ballam Waterslot* or similar sewer treatment system. The treated water will be used to moisten dusty areas and reduce dust gathering due to windy actions;
- temporary chemical toilets, and
- solid waste collection point.

All facilities present in the construction site will be covered with dry material in order to avoid mud formation in case of rain.

4.3.5. Earthworks

Clearing activity is required in order to remove shrubs and trees from the planned footprint / fenced area (up to 250 ha).

Due to the flatness of the development area, no earthworks are envisaged for the installation of the PV module mounting systems. The mounting systems will consist of metallic frames to be assembled on-site, supported by the driven piles or pre-bored cast-in-situ concrete piles. Concrete ballasted footing foundations are also possible.

Earthworks will be required during the construction of internal roads. The vertical alignment of the roads will not present any significant challenges due to the flatness of the terrain so that no deep cuts or fills will be required. Considering a road pavement thickness of 300 mm and an overall road surface approximately 100,000 m², the amount of cut or fill is estimated to be approximately 30,000 m³.

Given the low rainfall, flat topography and low flow speed of run-off - no formal storm water structures are required as the proposed gravel roads will be developed at ground level, so as not to disturb the natural flow of storm water. This means that run-off will not be concentrated and the existing drainage patterns will be left undisturbed.

Small earthworks will be required for the installation of the medium-voltage stations. None of these activities should require earthworks in excess of 500 mm cut or fill.

Only the foundation plate for the small high-voltage substation may require earthworks in excess of 500 mm cut or fill (the footprint will be up to 4000 m²). The topsoil stripping will result in temporary spoils heaps which must be spread over the site upon completion of the project.

Underground cables will be laid down along the internal roads.

Concrete necessary for the basements of the medium-voltage stations, the high-voltage substation, the control building and the warehouse and will be manufactured using aggregate and sand from commercial sources in the vicinity of the development (in Hotazel, Kathu or Kuruman).

Only the foundation plate for the small high-voltage substations may require earthworks in excess of 500 mm cut or fill (the footprint will be up to 4000 m² per project). Topsoil stripping will result in temporary spoils heaps which must be spread over the site upon completion of the project.

Gravel necessary for the construction of internal roads may be provided from the commercial sources in the vicinity of the development (in Hotazel, Kathu or Kuruman).

4.4. TRAFFIC IMPACT OF THE PROPOSED DEVELOPMENT

4.4.1. Traffic impact – construction phase

Approximately 100 people are expected to be employed during the construction period (15 months), although this number can increase to 150 for short spaces of time during peak periods. A small accommodation area with few prefabricated buildings inside the work site may be foreseen, if accommodation facilities in Hotazel, Kathu or Kuruman are not sufficient to accommodate all workers.

Overall traffic to and from the work site will amount to approximately **1000 medium / heavy vehicle trips** over the whole construction period. As indicated in the table below, the average number of medium and heavy trucks to and from the site will be of **3 trucks per working day**.

Table 4: Construction timeframe: average daily trips of medium and heavy vehicles

Transportation of:	months	1	2	3	4	5	6	7	8
fencing and tools	trips/month	8	8	0	0	0	0	0	0
clearance of the site (vegetation transportation)	trips/month	56	32	0	0	0	0	0	0
piles / frames for mounting systems	trips/month	0	0	20	20	20	20	20	0
sands & gravel for on-site concrete production	trips/month	0	30	48	48	48	52	52	54
PV modules	trips/month	0	0	0	0	0	0	0	0
MV stations	trips/month	0	0	0	0	0	12	12	12
HV substation components	trips/month	0	0	8	8	8	0	0	0
cables	trips/month	0	0	0	0	0	0	0	16
Average trips per month	trips/month	64	70	76	76	76	84	84	82
Average trips per working day (*)	trips/day	2.9	3.2	3.5	3.5	3.5	3.8	3.8	3.7

Transportation of:	months	9	10	11	12	13	14	15	TOTAL
fencing and tools	trips/month	0	0	0	0	0	0	0	16
clearance of the site (vegetation transportation)	trips/month	0	0	0	0	0	0	0	88
piles / frames for mounting systems	trips/month	0	0	0	0	0	0	0	100
sands & gravel for on-site concrete production	trips/month	52	48	32	0	0	0	0	464
PV modules	trips/month	0	16	32	68	66	34	0	216
MV stations	trips/month	12	12	0	0	0	0	0	60
HV substation components	trips/month	0	0	0	0	0	0	0	24
cables	trips/month	16	0	0	0	0	0	0	32
Average trips per month	trips/month	80	76	64	68	66	34	0	1000
Average trips per working day (*)	trips/day	3.6	3.5	2.9	3.1	3.0	1.5	0.0	3.03

(*) assuming 22 working days per month

Medium and heavy trucks will access / leave the site only during the working days (Monday to Friday), during daytime. The provision of a fuelling area on the work site could reduce the load of heavy vehicles on public roads. The installation of two steel fuel tanks (capacity of 30,000 litres each) is recommended.

4.4.2. Traffic impact – operation phase

The traffic impact during the operation phase will be insignificant, considering that about 35/40 people will work on the PV facility, in the following manner:

- during the daytime approximately 14 people;
- during the night-time, 6 people.

4.5. MANAGEMENT OF THE SOLAR PARK DURING OPERATION

Approximately 35/40 people will be employed during the operation phase of the PV power plant, which will have a lifetime of 25 - 30 years. East Solar Park will be in operation 7 days per week; therefore personnel will operate according to shifts. The surveillance team will be on site during day-time, night-time and weekends.

The operational team will consist of the following people:

- 1 person as plant manager
- 1 person for administration
- 4 people as technicians / plant operators
- 9/12 people for electric and generic maintenance
- 20/22 people as guards

The “**fire team**” will be composed of people for generic maintenance, who will attend a comprehensive firefighting training program. After this training programme, the fire team will be able to drive/use/manage properly the fire extinguishers and the fire fighting vehicle, that will be available on the site.

5. PROJECT ALTERNATIVES

The EIA Regulations, Section 28(1)(c) and NEMA, Section 24(4), require investigation and consideration of feasible and reasonable alternatives for any proposed development as part of the environmental impact assessment process. Therefore, a number of possible alternatives for accomplishing the same objectives must be identified and investigated.

In particular:

- the property on which, or location where, it is proposed to undertake the activity;
- the location within the current identified site;
- the type of activity to be undertaken;
- the design or layout of the activity;
- the technology to be used in the activity;
- the operational aspects of the activity (schedule, process);
- the sustainability of other alternatives, and
- the option of not implementing the activity (No Go Alternative).

5.1. SITE ALTERNATIVES

Several sites have been inspected in order to find out the best solution for the PV power plant. The following selection criteria were applied:

- Connection availability and proximity
- Land availability
- Proper land surface area (±200 ha)
- Current land use
- Low environmental impact (low biodiversity)
- Low agricultural potential
- High solar radiance
- Socio-economic issues (land cost and local community unemployment)

The macro area around Hotazel were investigated, due to the high value of solar irradiation and to the presence of two substations, namely: the Eskom Hotazel substation and new Eskom Umtu substation. Furthermore, Eskom is planning to build by 2020 a new substation adjacent to the Eskom Umtu substation, called **Eskom Hotazel transmission substation**.

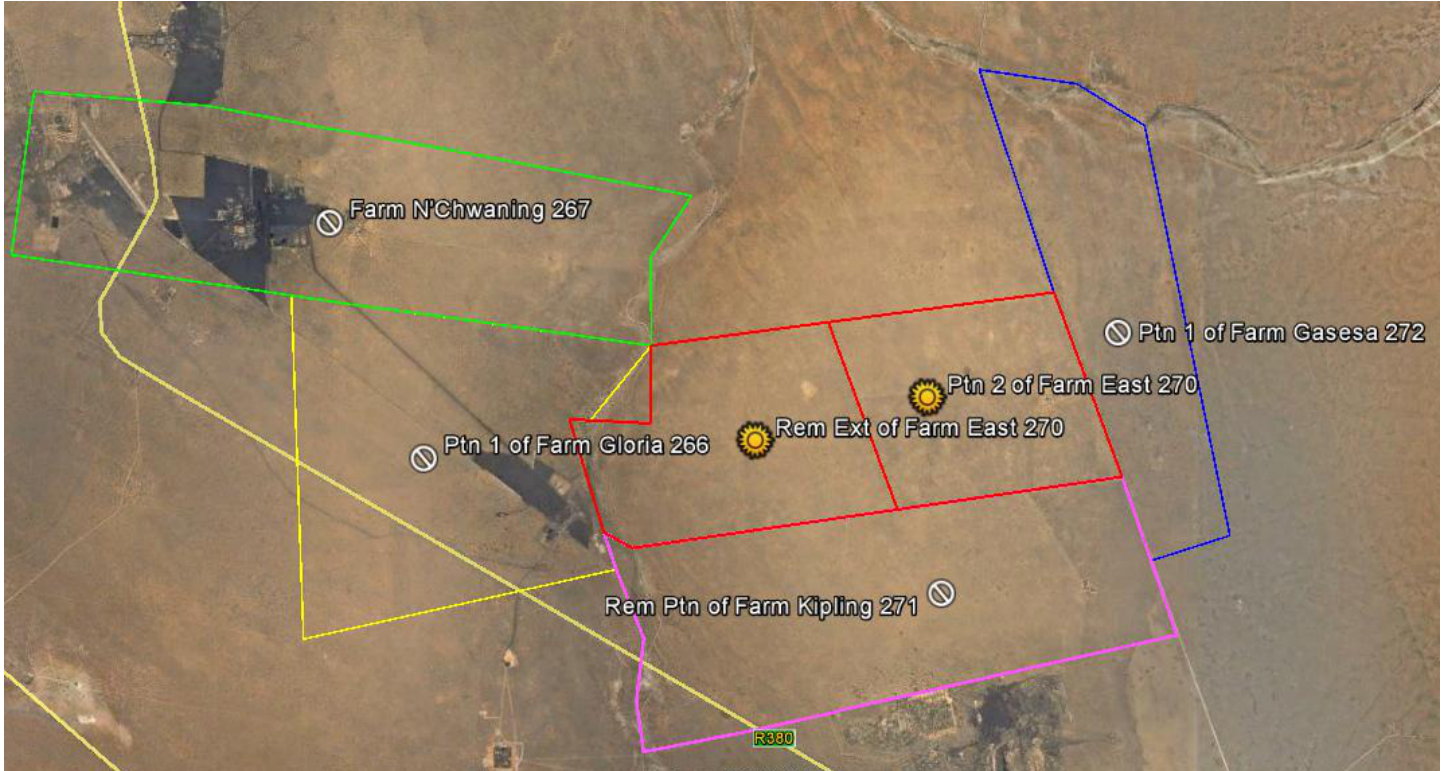
Several sites were investigated during the feasibility assessment, such as:

- a) Farm N'Chwaning 267, Kuruman RD
 - b) Portion 1 of Farm Gloria 266, , Kuruman RD
 - c) Remaining Portion of Farm Kipling 271, Kuruman RD
 - d) Portion 1 of Farm Gasesa 272, , Kuruman RD
- a) **Farm N'Chwaning 267, Kuruman RD** is 1259 ha in extent; even if almost suitable for a solar park, this farm resulted to be not ideal for the proposed development, due to mining activities on the site, and it turned out to be too far (more than 5 km) from the Eskom Umtu and Hotazel substations.
 - b) **Portion 1 of the Farm Gloria 266, Kuruman RD** is approximately 1725 ha in extent; it resulted to be almost suitable for the proposed development, but not ideal, due to the presence of active mining activities located on the site.
 - c) **Remaining Portion of Farm Kipling 271, Kuruman RD** is approximately 1905 ha in extent; even if suitable for a solar park, this farm portion resulted to be not available for the proposed development, due to the possible future mining activities on the site, owned by the mining company Assmang.
 - d) **Portion 1 of Farm Gasesa 272, Kuruman RD** is approximately 1084 ha in extent; this farm portion was found not suitable as it is currently used for communal farming activities.

Therefore, the Remainder Portion of the Farm East 270, Kuruman RD is the preferred site, being the most suitable and available alternative.

The location of the alternative sites is indicated in the Figure 9 below.

Figure 8: Location of the alternative sites



5.2. TECHNOLOGY ALTERNATIVES

5.2.1. PV Plant and Solar Thermal Power Plant

The alternative to PV for producing energy from the sun is the thermal solution. There are different forms of this technology: linear Fresnel, parabolic through or tower. These technologies can also be with or without thermal storage and they can use diathermic oils or, the more sophisticated ones can use water and/or molten salts.

The final choice is the PV option because these kinds of project result in:

- lower construction costs;
- lower operating and maintenance costs (O&M);
- it is a simpler, quicker and more experienced technology; and
- lower environmental impact, considering that, among other factors, the PV solution requires a minor quantity of water.

5.2.2. Solar Photovoltaic Technology – PV

The project envisages photovoltaic power plants with a generating capacity up to 120 MW, on a footprint up to 250 ha.

The preferred types of PV modules are:

- **monocrystalline or polycrystalline PV modules** and,
- **thin-film PV modules,**

which currently represent the best performing options in terms of reliability and costs/efficiency.

At present, mono/polycrystalline modules provide higher solar conversion efficiency (14% to 16%), if compared to the thin-film /PV modules (9% to 13%). On the other hand, thin-film modules (or amorphous silicon / Cd-Te as well) are cheaper and best performing at high temperatures, having an efficiency degradation of only 0.25 %/°C instead of 0.45 %/°C in the case of mono/polycrystalline modules.

However, it is important to consider the fact that the PV technology is in continuous evolution and it may be possible that thin-film (or amorphous silicon / Cd-Te as well) PV modules achieve a higher solar conversion efficiency in a very short time.

Furthermore, it should be kept into account the high volatility of prices of PV modules which depends on the worldwide availability of modules. Therefore, the final choice will be taken at the commissioning date, on the basis of the prices and availability of mono/polycrystalline and thin-film / amorphous silicon / Cd-Te PV modules.

The development will not exceed the current planned footprint (250ha). Therefore, the final choice of the type of PV modules, whatever it is, will not imply any additional visual or environmental impacts nor the necessity of specific or different mitigation measures.

5.2.3. Alternatives for the Mounting System of the PV Modules

The preferred technical solutions for the proposed solar park entails PV modules mounted on **fixed mounting systems** (*alternative option 1*) or on **single-axis horizontal trackers** (*alternative option 2*).

The tracking solution is the best performing in terms of efficiency, because its energy production is approximately 15% more if compared with fixed systems. This type of technology is characterized by higher technical complexity and deeper installing and maintenance costs, if compared with the fixed mounting solution.

The selected tracking system is the single-axis horizontal tracker (SAT), which doesn't differ from the fixed system, except for the presence of the tracking devices and the orientation of the rows of the PV arrays (north - south instead of west – east direction).

The technology of mounting systems is under continuous evolution. Consequently, the final decision about the mounting system technology will be taken only at the commissioning date: if addressed toward the fixed mounting system or toward horizontal single-axis trackers, the layout of the PV power plant will not imply any additional visual or environmental impacts nor the necessity of specific or different mitigation measures. The development will not exceed the currently planned footprint (250ha) and the height of the structures (PV modules and support frames) will be maximum 3.1 m above the ground level.

Both fixed and horizontal single-axis tracking solutions grant the reversibility of the development in respect of the terrain's morphology, geology and hydrogeology. This means that at the end of the PV plant's lifetime, the site can easily be returned to its status prior to the establishment of the PV plant.

5.3. LAYOUT DESIGN AND LOCATION ALTERNATIVES

The site chosen for the establishing of the proposed East 2 Solar Park is the **Remainder of the Farm East 270, Kuruman RD**. The PV power plant will have a generating capacity **up to 120 MW**, on a footprint **up to 250 ha**.

5.3.1. Layout design and Location alternatives

The layout of the proposed development is the result of a comparative study of various layout alternatives and had been defined in consideration of the results of some specialist's studies conducted / under drafting during this scoping phase.

The PV plant is designed and conceived in order to minimize visual and noise impacts, as well as to operate safely and assuring a high level of reliability, with low water consumption and the need only for easy and quick maintenance and repair for approximately 25-30 years.

As mentioned in the paragraph 4.1 - *Project layout*, the main drives of the proposed layout are:

- to maximize the energy production and the reliability of the PV plant, by choosing proven solar technologies: thin-film or mono/polycrystalline solar modules mounted on single-axis horizontal trackers (SAT) or on fixed mounting systems;
- to develop the PV power plant on the Remainder of the Farm East 270, since this farm portion is flat, has a *medium* ecological sensitivity.
- to avoid the western boundary of the property, since affected by the *Gamagara Spruit* and by sand dunes,
- to include as much as possible in the proposed footprint the low ecological sensitivity areas, in order to reduce the extension of the medium ecological sensitivity areas to be cleared and as consequence the number of protected trees to be removed;
- furthermore, the proposed footprints have been located next to PV plants already approved:
 - **East 2 Solar Park** is planned on the **Remainder of the Farm East 270**, adjacent to the northern boundary of planned East Solar Park, developed by Osalus Energy and already authorised by the DEA (DEA Ref. 14/12/16/3/3/2/664).
- furthermore, the proposed footprint has been located at a minimum distance of 100 m from the southern boundary of the property, so that the distance and the existing vegetation would be able to minimise the potential visual impact of the proposed development to the surrounding properties.

The proposed development area plan (attached as Annexure A) was drawn using PV modules mounted on trackers; in the case of PV modules mounted on fixed mounting systems, the layout plans do not change, except for the orientation of the PV arrays: East-West instead of North-South.

The required footprint - corresponding on the fenced area - will not exceed 250 ha, and the maximum height of the structures (PV modules and support frames) will be approximately 3.1 m above the ground level. Therefore the impacts and mitigation measures will remain exactly the same.

The project layout and the other plant components are detailed in the following drawings:

- EASP_01_r0 Layout plan - PV power plant up to 120 MW
- EASP_03_r0 Mounting System – Alternative option 1: fixed mounting systems
- EASP_04_r0 Mounting System – Alternative option 2: horizontal single-axis trackers
- EASP_05_r0 Medium-voltage stations
- EASP_06_r0 Control building and medium-voltage receiving station
- EASP_07_r0 On-site high-voltage substation
- EASP_08_r0 Warehouse

5.3.2. Connection alternatives

The East 2 Solar Park may be connected either:

- a) to the Eskom Hotazel distribution substation, 3.5 km south of the project site, via To the Eskom Hotazel substation, 5.5 km south of the project site, via a new 132 kV power line approximately 6.5 km long and running parallel to the existing Eskom "Hotazel - Heuningvlei" 132 kV power line (alternative connection 1) within a corridor of $\pm 1,4$ km long up to the already approved power line corridor (DEA Ref. No. 14/12/16/3/3/1/1426) of the East Power Line related to the approved East Solar Park (DEA Ref. No. 14/12/16/3/3/2/664); or
- b) To the new Eskom Umtu substation, ± 8.5 km south-west of the project site, via a new 132 kV power line approximately 11,5 km long and running parallel to the existing Eskom "Hotazel - Heuningvlei" 132 kV power line (for 5.3 km) and to the Eskom "Hotazel - Umtu" 132 kV power line (for ± 6.2 km) (alternative connection 2). Not yet approved.

Please refer to the Figure 10 below and to the drawing of the Annexure A:

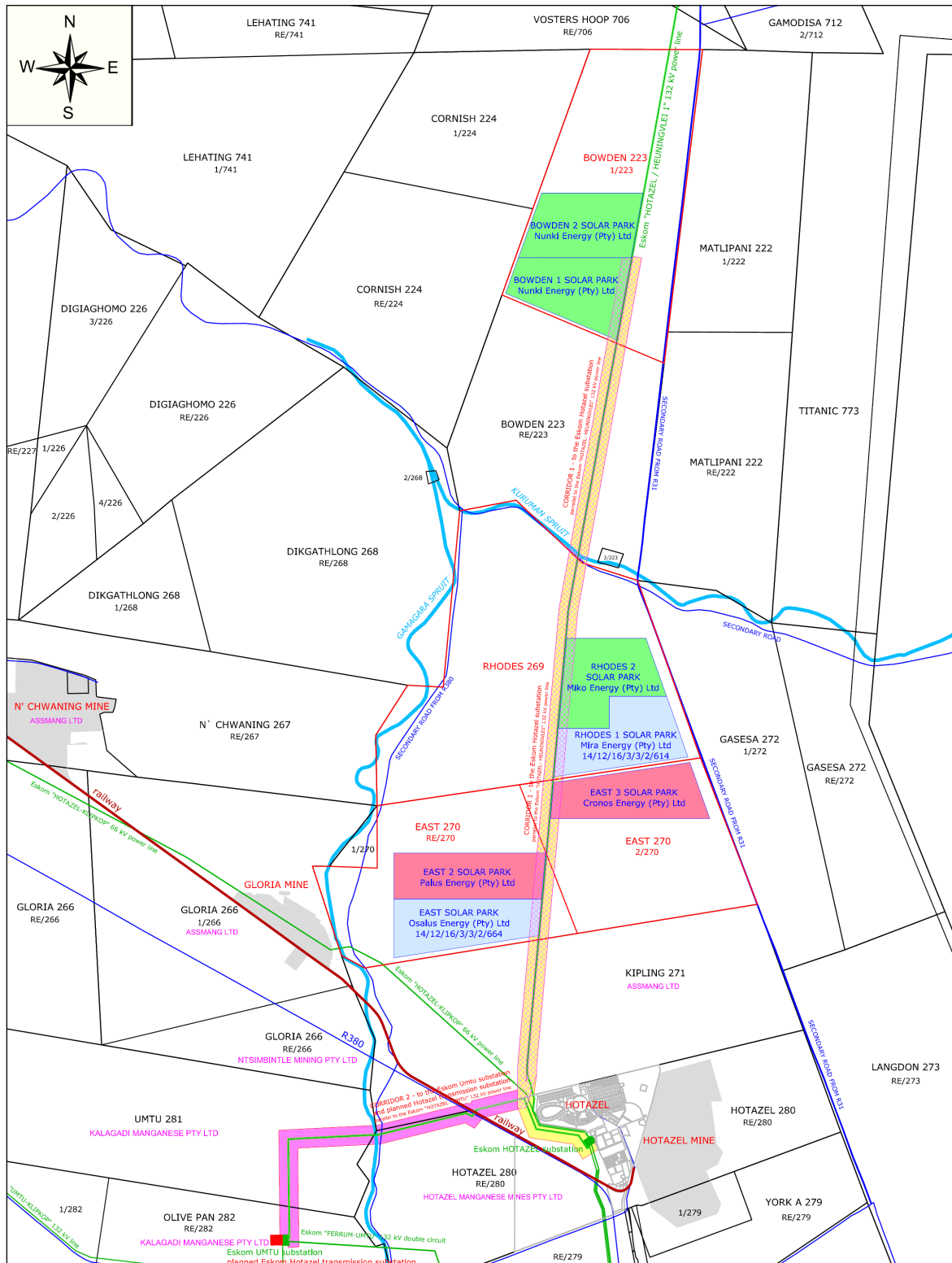
- EASP_00.3_r3 Connection alternatives

The alternative connection assessed in this EIA Report and Annexures - for which authorisation is applied for - is the *Alternative connection 1*.

It should be noted that, **in respect of the alternative connection 2**, whereby a new 132 kV power line may be erected outside the project site, **a separate Basic Assessment will be conducted by AGES Limpopo.**

Eskom is the entity which should assess the connection solutions described in this Scoping Report. Eskom also coordinates the necessary liaising between Palus Energy, Eskom Transmission, Eskom Distribution and Eskom Land & Rights Department. The preferred connection solution will be selected following the input from Eskom in the Cost Estimate Letters.

Figure 9: Connection alternatives - to be investigated in the Basic Assessment



5.4. NO-GO ALTERNATIVE

The no-go alternative is the option of not establishing a Photovoltaic Power Plant on the site, or any of its alternatives. The environment will remain in its current state (*status quo*). This will not create any new employment opportunities, and therefore the anticipated economic benefits of the project will accrue to the study area (see the paragraph 6.4 *Socio-Economic Environment*).

Should this alternative be selected the socio-economic and environmental benefits related to the use of renewable energy resources will not be realised with prejudice to the development of the area. The benefits related to the establishment of a renewable energy power plant are for example analysed in detail in the REFIT Regulatory Guideline published by NERSA (March 2009):

- **Enhanced and increased energy security**: renewable energy plays an important role in terms of power supply, improving grid strength and supply quality and contemporarily reducing transmission and distribution costs and losses.
- **Resource economy and saving**: the energy production by coal fired plants consumes a significant amount of water, this amount of water could instead be saved if a renewable energy facility like the proposed one is put in operation.(the Energy White Paper envisages that the implementation of its targets will determine water savings approximately 16.5 million kilolitres). This will be beneficial on the large scale for the water conservation measures that the country is currently undertaking.
- **Support of new technologies and new industrial sectors**: the development and establishment of renewable energy power plants contribute to the growth of new technologies and new industrial sectors with benefits for its economy.
- **Exploitation and capitalization of South Africa's renewable resources**: with the aim of increasing energy security.
- **Employment creation and career opportunities**: the construction and operation of a renewable energy power plant contributes to job creation and new career opportunities.
- **Pollution reduction**: the use of renewable energy resources decreases the demand and the dependence from coal and oil for electricity generation.
- **Contrast to Global warming and climate mitigation**: the development of renewable energy contributes to reduce global warming through the reduction of greenhouse gas (GHG) emissions.
- **Protection of natural foundations of life for future generations**: the development and establishment of renewable energy power plants offers the opportunity of consistently reducing the risks related to climate change caused by CO₂ and CO emissions, therefore preserving life for future generations.
- **Acceptability to society and community**: the use of renewable energy is largely accepted by society and community as a mean to reduce pollution concerns, improve human health and wellness, protect the environment, the ecosystem and climate;
- **Commitment to and respect of international agreements**: in particular in light of the possible commitment to the Kyoto Protocol.

6. STATUS QUO OF THE RECEIVING ENVIRONMENT

The receiving environment has been described using a combination of specialist inputs, on-site observations, a review of existing literature and utilizing Geographic Information Systems (GIS) planning tools.

6.1. PROPERTY DESCRIPTION AND CURRENT LAND USE

The proposed developments will stretch over the Remainder of the Farm East 270, Kuruman RD.

Remainder of the Farm East 270, Kuruman RD

Surveyor-general 21 digit site	C0410000000027000000
Local Municipality	Joe Morolong
District Municipality	John Taolo Gaetsewe
Province	Northern Cape
Extent	964.2695 ha
Land Owner	PRETORIUS JACOBUS NICOLAAS PRETORIUS HELETTA ROSIA
Diagram deed number	G25/1954 (Remaining Extent)
Title deed number	T791/2002 (Remaining Extent)
Registration date	20020402 (Remaining Extent)
Current land use	farming
Geo-graphical Co-ordinates East 2:	27° 09' 50" S , 22° 56' 15" E (proposed footprint)

The site is located 5 km north of Hotazel, 55 km North of Kathu. As aforementioned, the property is already affected by energetic infrastructure such as the Eskom "Hotazel-Heuningvlei" 132 kV power line crossing the project site.

Farm portions close to the project site are mainly used for farming and manganese mining purposes, as the Hotazel mine, the Kalagadi Manganese mine (under construction) and Assmang mines.

The proposed PV plant development area is located:

- 1.5 km east from the **Assmang mine** on **Portion 1 of the Farm Gloria 266**;
- 8 km south-east from the **Assmang mine** on **Farm N' Chwaning 267**;
- 4.0 km north from the **Hotazel mine**, on the **Farm Hotazel 280**;
- 6 km north-east from the **Kalagadi Manganese mine**, under construction on **Farm Umtu 281** and **Olive Pan 282**.

Please refer to the Figure 10 above and to the drawing of the Annexure A:

- EASP_00.3_r3 Connection alternatives

6.2. OTHER RENEWABLE ENERGY PROJECTS CLOSE TO THE PROPOSED DEVELOPMENT

The renewable energy project closest to the proposed East 2 Solar Park is the **proposed Rhodes 1 Solar Park** (DEA Ref. 14/12/16/3/3/2/614): a 120 MW Photovoltaic plant to be located on the **Farm Rhodes 269**; the applicant is Mira Energy (Pty) Ltd and the EAP is AGES. The Environmental Authorization has been granted.

Please refer to the Annexure A:

- EASP_00.3_r3 Connection alternatives

It should be noted that Mira Energy (the applicant of the Rhodes 1 Solar Park) and Palus Energy (the applicant of the East Solar Park) should still participate in the REIPP Procurement Programme and be selected "Preferred Bidders" in respect of the Rhodes 1 and East 2 Solar Parks before the proposed developments can take place. **Due to the high competition of this programme, it's very unlikely that both of the PV projects are selected by the DoE.** Furthermore, considering that the two projects are envisaged to be connected to the same Eskom network (Eskom "Hotazel - Heuningvlei" 132 kV power line, Hotazel substation or Umtu substation), they may be in competition also in terms of grid availability.

The renewable energy project closest to the proposed East 2 Solar Park and already selected by the DoE under the REIPP Procurement Programme is the **Adams PV project** (DEA Ref. 12/12/20/2567): a 120 MW Photovoltaic plant to be located on the Remainder Portion of the Farm Adams 328. This project has been selected by the DoE under the Window 3 of the REIPP Procurement Programme; the construction will start once the Financial Close is reached (July 2014). The Adams PV development area is located **24 km South** of the East 2 Solar Park.

Due to the distance (minimum 24 km) from the proposed East 2 Solar Park of the other renewable energy projects already built or under construction, as well as mitigation measures implemented for the proposed East Solar Park, **the cumulative impacts are not applicable / very low.**

As said, as far as the proposed Rhodes 1 Solar Park is concerned, It's very unlikely that two projects close to each other will be selected by the DoE, as they would be in competition also in terms of "grid availability".

6.3. ENVIRONMENTAL FEATURES

6.3.1. Climate

Hotazel (the closest town with climatic record, 8 km south of the site) is a summer rainfall area and has an average rainfall of about 223mm per year. Minimum rainfall of 0mm is in June and the maximum rainfall of 50mm is in February. The average daily maximum temperature is 33.2°C during summer and 19.1°C in winter. The coldest temperature occurs during July with an average night temperature of 1°C. The Weinert climatic N-number for the area is 9. This indicates that the climate is semi-arid and that physical mineral grain disintegration is the predominant mode of weathering.

6.3.2. Topography and drainage

Two land facets are present on the site. Dunes occur as high-gradient hills in the western and northern section of the site, while the remainder of the site represents slightly undulating plains. The topography across the site is slightly undulating with the average elevation of 1050 m amsl. The site is located within two quaternary catchments namely D41K (Eastern section of site) and D41L (western section of site) and is situated in the Lower Vaal Water Management Area. Drainage occurs as sheet-wash towards the major rivers namely the Gamagara Spruit, West of the site, and the Kuruman Spruit, North of the site.

The permeability of the sand is high and all but the heaviest rainfall penetrates the soil immediately. Sheet wash do occur along preferred pathways but the water sink into the ground after some distance. Sub surface drainage are expected to occur towards the Gamagara Spruit, which runs adjacent to western side of the project site.

6.3.3. Soils, geology and geo-technical features

A Geo-technical and Geo-Hydrological Report is attached as Annexure I. The site visit was conducted on 27 February 2014, when 6 trial pits were excavated across the property.

The site is underlain by unconsolidated recent aeolian sand of the Kalahari Formation (Qs). The unconsolidated recent deposits vary in thickness of as little as 3 m to over 17 m thick overlying calcrete and clay. Competent bedrock occurs at depths of 21m to 37m.

The proposed solar park development area is underlain by a single soil profile. The aeolian sand profile is consistent across the site. The soil profile underlain by dry to slightly moist, loose, uniform pale orange brown, intact, fine sand of transported (aeolian) origin. The sidewalls of the trial pits collapsed due to the loose consistent of the soil.

No perched water table was encountered. The TLB excavated the soil with ease to reach limit. The aeolian soil is non plastic and consist of a 55% fine sand and 45% silt mixture. The soil has a moderate to high collapse potential.

For the structures supporting the PV modules it is recommended that rammed piles be used as the depth of the loose sand allows sufficient shear resistance to be developed. The type and shape of the material used to manufacture the piles will determine the length of the piles as the material across the site fairly homogeneous.

For the other conventional structures on site (MV stations, warehouses, control building) normal strip foot foundations with compacted trenches is recommended. The trenches should be wetted during the compaction process.

Using the COLTO Standard, the excavatability below surface is classified as **soft** to at least 2.5m below surface. Sidewall collapse occurred in all the trial pits excavated. The potential for collapse of side walls of deep excavations is high. It is recommended that the sidewalls of any excavation deeper than 0.8m be battered back to a 1:1.5 grade slope or shored.

Two LAND USE AREAS across the property have been assessed:

The **LAND USE AREA A** (where the development area is planned) is defined as **DEVELOPABLE with PRECAUTIONS**. The status of the area is based on the low density and collapsible nature of the silty sand. Detailed testing will be required to define the collapse potential and shear strength of the soils.

The **LAND USE AREA B** (on the western and northern side of the property, close to the Gamagara River) is defined as **DEVELOPABLE with PRECAUTIONS**.

The status of the area is based on the low density and collapsible nature of the silty sand and the undulating topography of the vegetated sand dunes. The undulating topography is not well suited for the solar park development which requires gentle slopes. Therefore, it is recommended that the solar park development is restricted to Land Use Area A.

No shallow groundwater conditions were encountered in any of the trial pits on site.

No mining activities (past or present) occurred in the property. Nearby mining activities (e.g. at the Gloria Manganese Mine) is unlikely to impact on the geotechnical aspects of the project.

The soil present on site is not suitable for use as aggregate for road construction. Discard material from the nearby manganese mines can be used for roads. Other aggregates should be sourced from commercial suppliers in the area.

The Geo-technical and Geo-Hydrological Study concluded that - from a geo-technical perspective - the project site is suitable for the proposed development.

6.3.4. Geo-hydrology

As indicated in the Geo-technical and Geo-Hydrological Report (Annexure I):

The proposed development site falls within the **Lower Vaal Water Management Area (WMA)**, on the **Quaternary Catchment Area (QCA) D41K** where no groundwater abstraction is allowed for under the DWA General Authorization.

The D41K QCA has a recorded mean annual precipitation of 344 mm per annum, with an annual run-off of 1 mm. The groundwater recharge is 6.83 mm per year. The groundwater level of the area is 30 m below surface. The Eco status is category B.

The estimated annual groundwater recharge (2.1 mm/m² per annum) from an average annual precipitation of 250mm falling on 856.53ha will result in 58,500m³ of water available. The maximum annual water requirement for the project was previously calculated to be 2,138 m³ per year. This included the washing of the solar panels as well as daily sanitary use on site. This volume will increase to approximately 2 800 m³. However, this is a very low volume of water needed as there is 85 500m³ available on the property.

The maximum annual water requirement for the project is approximately 2 800 m³/a and Palus Energy will have to develop its own borehole to supply water to the solar project.

6.3.4.1. Boreholes, groundwater availability and quality on the project site

One borehole is located on the Remainder Portion of the farm East 270 (where the development area is located). This borehole is not equipped as it has a very low yield.

No groundwater sample was collected as the borehole on site was not accessible. A water sample was collected from a borehole from the property north of the site (Rhodes 269). The water quality of the shallow aquifer in the area is fairly consistent, therefore this analysis is representative of the water quality on East 270.

The water sample collected from the borehole on Farm Rhodes 269 has elevated chloride, nitrate, selenium and sodium levels that support the high TDS count and conductivity. According to the SANS 241 drinking water standards the raw water is not suitable for human consumption. Therefore, the drinking water should be treated by osmosis prior to consumption. The high salt load will also make the water unusable for cleaning the solar panels as using the water will cause scale build-up on the PV module surfaces.

The Geo-technical and geo-hydrological Study concluded that, should water for the project be sourced by means of groundwater abstraction, a new borehole should be drilled, being the existing on-site borehole not available. It is recommended that the fracture rock aquifer located below the Kalahari sediments be targeted at depths between 80 and 120 m below surface as a source of water for the project.

Alternatively, water can be sourced **from the Vaal Gamagara Pipeline**, which crosses the project site.

6.3.5. Ecology (fauna & flora)

An Ecological Impact Assessment (Annexure D) was conducted by AGES in order to describe the ecology (fauna and flora) present in the site, to assess its ecological sensitivity and to indicate the most suitable areas for the proposed development. For this purpose, detailed ecological (fauna habitat & flora) surveys were conducted during March 2014 and July 2015 to verify the ecological sensitivity and ecological components of the site at ground level.

6.3.5.1. Vegetation types

The development site lies within the Savanna biome which is the largest biome in Southern Africa. It is characterized by a grassy ground layer and a distinct upper layer of woody plants (trees and shrubs). The environmental factors delimiting the biome are complex and include altitude, rainfall, geology and soil types, with rainfall being the major delimiting factor. Fire and grazing also keep the grassy layer dominant. The most recent classification of the area by Mucina & Rutherford (2006) shows that the site forms part of the **Kathu-Bushveld and Gordonia Duneveld** vegetation types.

The proposed development is planned on a landscape that varies from slightly undulating plains to moderately undulating terrain associated with dunes. The property is currently managed as a livestock farm. The vegetation units on the site vary according to soil characteristics, topography and land-use. Most of the site is characterized by microphyllous woodland that varies in density and species composition. No major drainage features occur on site, although the Gamagara Spruit occurs to the West of the site.

The following vegetation units were identified during the survey:

- *Open Acacia haematoxylon woodland on deep Aeolian sand;*
- *Acacia mellifera thickets;*
- *Mixed Acacia haematoxylon – Grewia flava – Acacia mellifera low dune-veld;*
- *Depression (pan) wetland type.*

Acacia haematoxylon and Acacia erioloba are two protected tree species that occur on site for which permits need to be obtained in order to remove the trees.

No red data plant species were observed during the ecological surveys.

6.3.5.2. Fauna

A survey was conducted during March 2014 and July 2015 to identify specific fauna habitats, and to compare these habitats with habitat preferences of the different fauna groups (birds, mammals, reptiles, amphibians) occurring in the QDS. The area represents microphyllous woodland with some broadleaf elements in isolated areas. Detailed fauna species list for the area is included in the Ecology Impact Assessment attached as Annexure D. During the site visits mammals, birds, reptiles, and amphibians were identified by visual sightings through random transect walks.

In addition, mammals were also recognized as present by means of spoor, droppings, burrows or roosting sites. The 500 meters of adjoining properties were scanned for important fauna habitats.

The recommendations and mitigating measures highlighted in the Ecological Impact Assessment (Annexure D) should be implemented to ensure the survival of these species other fauna habitats and feeding grounds.

6.3.5.3. Summary and results of the Ecological Impact Assessment

Detailed ecological (fauna habitat & flora) surveys were conducted during March 2014 and July 2015 to verify the ecological sensitivity and ecological components of the site at ground level. An important aspect relating to the proposed development should be to protect and manage the biodiversity (structure and species composition) of the Kathu Bushveld and Gordonia Duneveld vegetation types which are represented in the project area.

Vegetation removal should be kept to a minimum during any future construction activities and only vegetation on the footprint areas should be removed. The unnecessary impact on the surrounding vegetation types and riverine ecosystems should be avoided as far as possible. Considering the footprint area to form part of a widespread vegetation entity and slightly degraded state of the proposed development sites, the impact on the vegetation of the larger area would be *medium*. Mitigation measures and monitoring should therefore be implemented should the development be approved.

In particular, the small pan (endorheic depression) found on the north-eastern side of the Remainder Portion of East 270 should be avoided and a 32 m buffer zone should be preserved around the pan boundary, as indicated in the Wetland Delineation Study (Annexure G).

The development of the solar plant would be dependent on obtaining a licence from DAFF for the removal of the following protected trees:

- *Acacia haematoxylon* (Grey camel thorn) and
- *Acacia erioloba* (Camel thorn).

The woodland variations with dense stands of protected trees have a *medium sensitivity*. Limited mitigation is needed for the preservation of some sections of this natural vegetation entity, while the eradication of invasive species should be considered a high priority. The herbaceous layer should be revived after clearance of the vegetation and actively managed through slashing during the entire lifetime of the project.

No red data plant species were found on the site due to the state of the vegetation and physical environment of the larger area mostly not being suitable for any of the red data plant species that may be found in the area.

The most suitable area for the development of the solar farm would be in the woodland areas with a Medium (*Acacia haematoxylon* dominated woodland) or Medium-low Sensitivity (*Acacia mellifera* dominated woodland). Limited mitigation is needed for the preservation of some sections of this natural vegetation entity, and the main mitigation would be to obtain a licence from DAFF for the eradication of the protected tree species.

Some potential rare fauna may also occur in the area, and specific mitigation measures need to be implemented to ensure that the impact of the development on the species' habitat will be low.

Mitigation measures are provided that would reduce these impacts from a higher to a lower significance. A monitoring plan is recommended for the construction phase of the development should the proposed application be approved.

Provided that all mitigation measures and recommendations in the Ecological Impact Assessment are strictly adhered to, and that the proposed development is consistent with the sensitivity map, the proposed development won't significantly influence the potential rare habitats for flora and fauna on the site.

6.3.6. Avifauna

An Avifauna Impact Assessment (Annexure E) was conducted by Exigo3 in order to determine whether the proposed development would have negative impact on avifauna.

About 250 hectares of natural bird habitats will be modified through the development if one considers the vegetation types (Kathu Bushveld, Gordonia Duneveld) associated with the larger area. The avifauna of the Kalahari is characteristic and essentially comprises a subset of the birds of drier woodlands generally.

The following bird habitats were identified in the study area during the field surveys that formed part of the avifauna scoping study:

- *Microphyllous woodland*
- *Duneveld*

The Development is proposed on the microphyllous woodland area which is the only habitat type for birds present on this portion of the farm. This area has a medium and medium to Low sensitivity according to the ecological report in Annexure D.

The project area still supports low densities of priority species such as secretary bird, kori bustard, vulture species and lanner falcons.

The potential impacts associated with the proposed solar farm development include the following:

- Habitat destruction, fragmentation and human disturbances, noise and fires (indirect impacts);
- Electrocutions and collisions with powerlines (direct impacts),

A series of specific mitigation measures were detailed in respect of all the aforementioned potential impacts in the Avifauna Impact Assessment in Annexure E. The Avifauna Impact Assessment concluded that, provided that the suggested mitigation measures and recommendations are adhered to, it is unlikely that the proposed development will have a long-term, significant negative impact on the local avifauna.

6.3.7. Visual

A Visual Impact Assessment (Annexure J) was conducted to determine the visual impact of the proposed solar park.

The sense of place of the study area can be described as mainly pastoral with some mining activities. The feel is quite placid and tranquil, especially in the north-eastern section. In the south-western section, the character is degraded by the presence of the mining structures and activities. These are however not dominating the scene of the study area. The topography consists of gently undulating plains with two deep cut river beds, the non-perennial Ga-Mogara (running more-or-less north-south through the study area) and the non-perennial Kuruman river (running more-or-less east-west through the study area). The Ga-Mogara river borders the project site along the western boundary.

With regards to visual contrast, lines within the study area are mostly in the horizontal plane created by the flat topography and green band of vegetation. Vegetation dominates the colour scene and provides a natural olive- to new-leaf green range. Fine textures are mostly derived from the vegetation.

Overall, the proposed development would result in a high visual contrast with the existing visual resource.

At night time, the various mining activities in the south and west as well as the lights from the town, Hotazel, would light up the otherwise dark rural skies. These lights would create a glow that would be visible further than the extent of the study area. During overcast nights this glow would be reflected against the clouds and be much more prominent. These lights are considered to be a form of light pollution. Specks of lights, from the farmsteads and workers housing would also be visible. These are however minor in comparison to the lights from the town and mines.

From the Relevance of Visual Impacts map (Figure 9 of the Visual Impact Assessment), it can be concluded that substantial and moderate visual impacts might occur for a select group of Visually Sensitive Receivers (VSRs), namely;

- residents on the farm Gloria, west of the project site (VSR R7 & VSR B1),
- travellers along sections of local roads (R380) (VSR T3).
- Rhodes Farmstead (VSR R1), other farming activities (VSR B1) Gloria Mine (VSR B2), Travellers on the R380 (VSR T2) and hunting activities on Rhodes farm (VSR B3)

It would seem that the Gloria and Rhodes farmsteads, their surrounding farming practices, and their access roads, are likely to be of the greatest concern (VSRs R1, R7, T3, B1, B3). Further out, to the west, are those who are still slightly affected and might have some reservations. They mostly include mining activities (VSR B2) but also mining residences, such as at Nchwaning (VSR R4). These are the areas where additional mitigation measures should be considered if existing vegetation does not fulfil that role.

The photo-simulations seen in Figures 10a and 10b of the Visual Impact Assessment illustrate the proposal set within the receiving landscape. The photo-simulations illustrates that for the most part, existing vegetation will adequately conceal most of the proposed project components (the vast stretch of solar panels). At night, security lights from the proposed development would only be switched on upon illegal entry onto the property and would therefore rarely contribute to the existing night light conditions.

Mitigating visual impacts arising from the implementation of projects with accentuated linear components, like power lines, are a challenge. Ideally mitigation measures should already be taken into consideration at planning phase. Existing vegetation is considered a bonus existing mitigation measure for which the developer is responsible for maintaining. Proposed mitigation measures for the following anticipated impacts must be included namely: timing of the construction phase, dust clouds, clearing of vegetation, erosion control, and the effect of lighting at night.

From **The Visual Impact Assessment** it can be concluded that the significance of the impact from the buildings would be *negative medium* for all VSRs during all phases except for Business / Occupational / Industrial VSRs during Operational phase where it would be *negative medium - high*. The significance of the impact from the PV panels would be *negative medium* for Residential VSRs during construction phase as well as for Travelling and Business VSRs during decommissioning phase. It would be *negative medium – high* for Residential VSRs during the operational phase as well as for the Travelling and Business VSRs during the construction and decommissioning phases. No Open Space users have been identified for this project. When the effect of the existing vegetation, local undulations in the topography, as well as other correct and effectively applied mitigation measures, when incorporated into this rating, changes the significance to **low for all phases**. It is thus important that the integrity of the existing vegetation be kept intact, as well as proper implementation of the other proposed mitigation measures.

6.4. SOCIO-ECONOMIC ENVIRONMENT

A report on the socio-economic considerations related to the proposed project was compiled by Glen Steyn & Associates - development economists (Annexure I).

The following aspects were highlighted in the report:

- The national and local economies will benefit from civil contractor work, labour and building materials that will be required on site. On the whole, a share approximately **40% of total CAPEX (investment costs)** will be sourced locally. This share is likely to increase once there will be a specific and competitive industry in the Republic of South Africa able to supply PV modules and other technological components.
- After approval, the project will take approximately **15 months** to be built and will have a lifetime of 25-30 years. Approximately **100 people** are expected to be employed during the construction period, although this number can increase to 150 for short spaces of time during peak periods.
- During operational phase, the power plant will require a permanent staff approximately **35-40 people**. That impact will be positive, also in consideration of the slowing down of the recruitment rate due to mining stabilization activities.
- Approximately **50% of the operation costs** will have a local economic return (mostly for maintenance works by local sub-contractors), then the impact will also be positive during the operational phase (25-30 years).
- The project will comply with the Economic Development Requirements, as requested by the IPP Procurement Programme, issued on 3rd August by the DoE. This economic development programme identifies needs of the surrounding communities in order to have a positive socio-economic impact. In particular, Palus Energy is required to identify a **Local Community** for the purpose of entering into a partnership for the solar project.

6.5. AGRICULTURAL POTENTIAL

An Environmental Report on the Soils, Land Use, Agricultural Potential and Land Capability is attached as Annexure F; the site survey was conducted during March 2014 and July 2015.

The current land-use of the proposed development site is grazing by livestock. Neighbouring farms are being used for livestock grazing or mining purposes.

The soils of the project site were classified into broad classes according to the dominant soil form and family as follows:

- Medium depth red Aeolian sands of the Hutton / Clovelly soil forms
- Very deep red apedal Aeolian sandy soils of the Hutton soil form;
- Calcareous soils of the Plooyburg soil form associated with pan on site.

The area is expected to receive an annual total rainfall between 120 and 260 mm, mostly between October to April. This amount is very low. The site is considered to be located in an area too dry for rained arable crop production. The high variability in rainfall distribution within the area could further render dry land farming a risky venture, even under irrigated conditions. The climatic conditions, in combination with the sandy nature of the soil are the main factors determining the soils to be unsuitable for arable agriculture.

The project site is thus dry which would contribute to moisture stress condition during crop growth and development. The potential of groundwater is relatively low to sustain a high water demanding irrigated cropping, expected at the project site.

The proposed development site is largely composed of very sandy Aeolian sands (clay content varies between 2 and 8% with depth mostly deeper than 1200mm). The soils are predominantly deep with some areas where the calcrete are exposed closer to the surface.

The sandy nature of the soils and climatic conditions of the area renders the area investigated unfavourable for effective crop production. **Economically viable crop production is therefore not considered as a viable option on this site.**

The project site has a **low to moderate potential for grazing**. The soil form is suitable for livestock grazing purposes, although it is limited due to the low nutrient content of the sandy soils and the palatability of the grass layer.

According to databases (ARC), the potential grazing capacity of the area for livestock is estimated to be **9 to 13 ha/LSU** (*low to moderate*). It can be deduced that the project site (Remainder of the Farm East 270), being **964.2695 hectares in extent**, would allow for **74 to 107 potential large stock units (LSU) on**, while the proposed development (up to 250 ha in extent) would entail a reduction of its grazing potential of only 19 to 27 potential large stock units.

There is a cumulative impact to consider and both East and East 2 Solar Parks have to be looked at in terms of grazing potential.

The development footprint for East Solar Park is 210 ha and for East 2 Solar Park 250 ha. Effectively there will 460 ha unavailable for grazing purposes. The Remainder of the farm East 270 is 964.27 ha in size and if both solar parks are established there will be 504.27 ha left for grazing purposes. This will allow for 39 – 56 potential large stock units.

The **low agricultural potential** of the soil is confirmed by the Agricultural Maps below (Figures 13 to 16):

- **Agricultural Potential Map** - indicating that the project site is classified as *Low Agricultural Potential*.
- **Land Capability Map**- indicating that the site is classified as *Non-arable – Low potential grazing land*.
- **Potential Grazing Capacity Map (1993)**- indicating that the project site has a potential grazing capacity of **9 - 13 ha / large stock units**. This grazing potential is *medium*, if compared to the maximum value indicated in the legend: less 3 ha / large stock units.
- **Potential Grazing Capacity Map (2007)**- indicating that the project site has a potential grazing capacity of **11 - 15 ha / large stock units**, which is *medium*. This map (2007) is not official yet and should be further confirmed by the Department of Agricultural, therefore in the calculation below we refer to the Map (1993).

These maps were generated from the Website: <http://www.agis.agric.za/agisweb/agis.html> [AGIS (Agricultural Geo-Referenced Information System) Comprehensive Atlas, commissioned by the Department of Agricultural to CETI Development CC (<http://www.ceit.cc/>)]

6.6. CULTURAL AND HERITAGE RESOURCES

An archaeological-cum-heritage assessment (Annexure H) was conducted by Exigo3 to ascertain whether there are any remains of significance in the area that will be affected by the proposed development.

No heritage resource sites or finds of any value or significance were identified in the indicated study area.

The Heritage Impact Assessment concluded that the proposed development of the East 2 Solar Park in the indicated area can continue from a heritage point of view if the recommendations suggested in the report are adhered to.

Figure 10: Vegetation Map of the project site

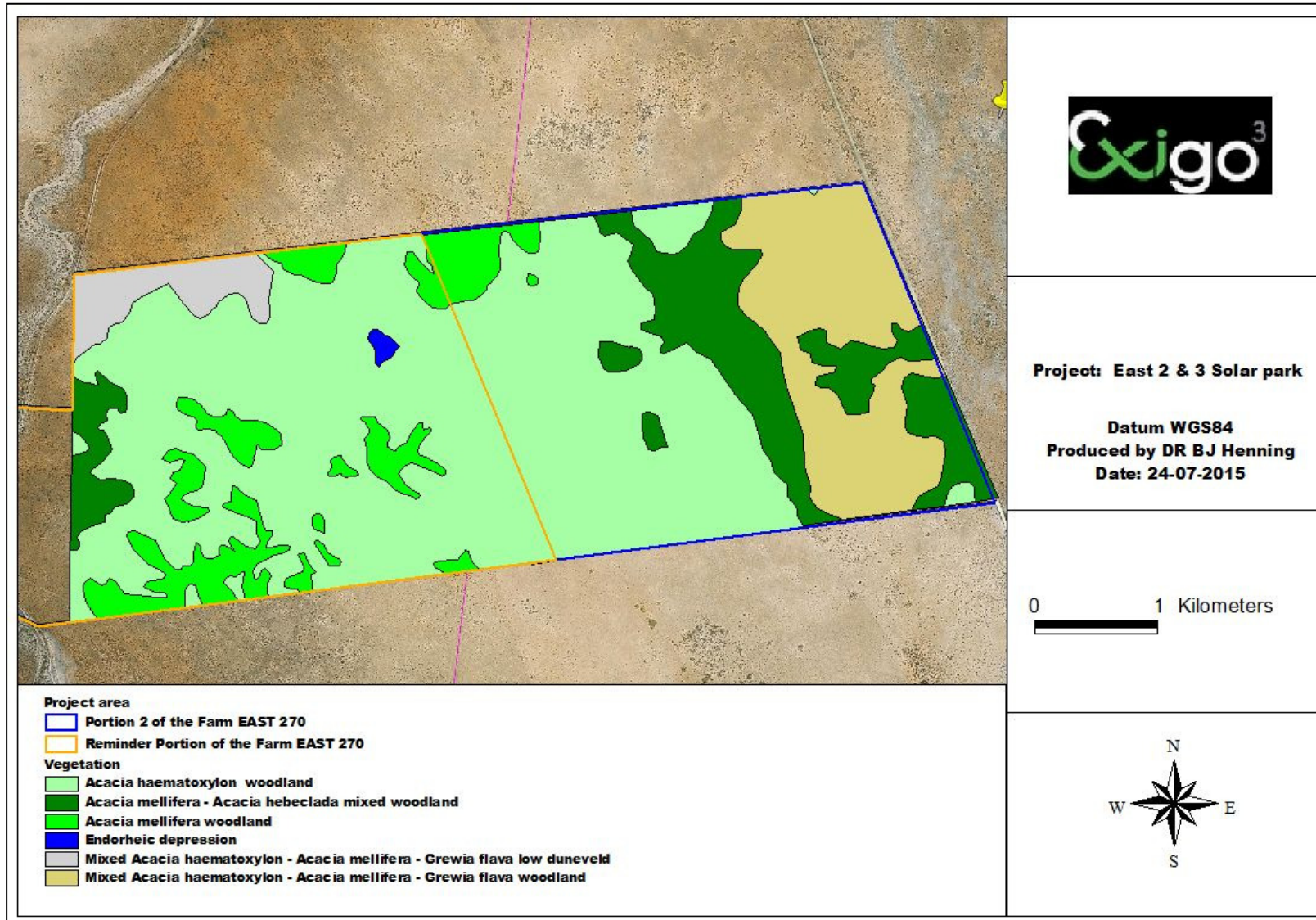


Figure 11: Sensitivity Map of the project site

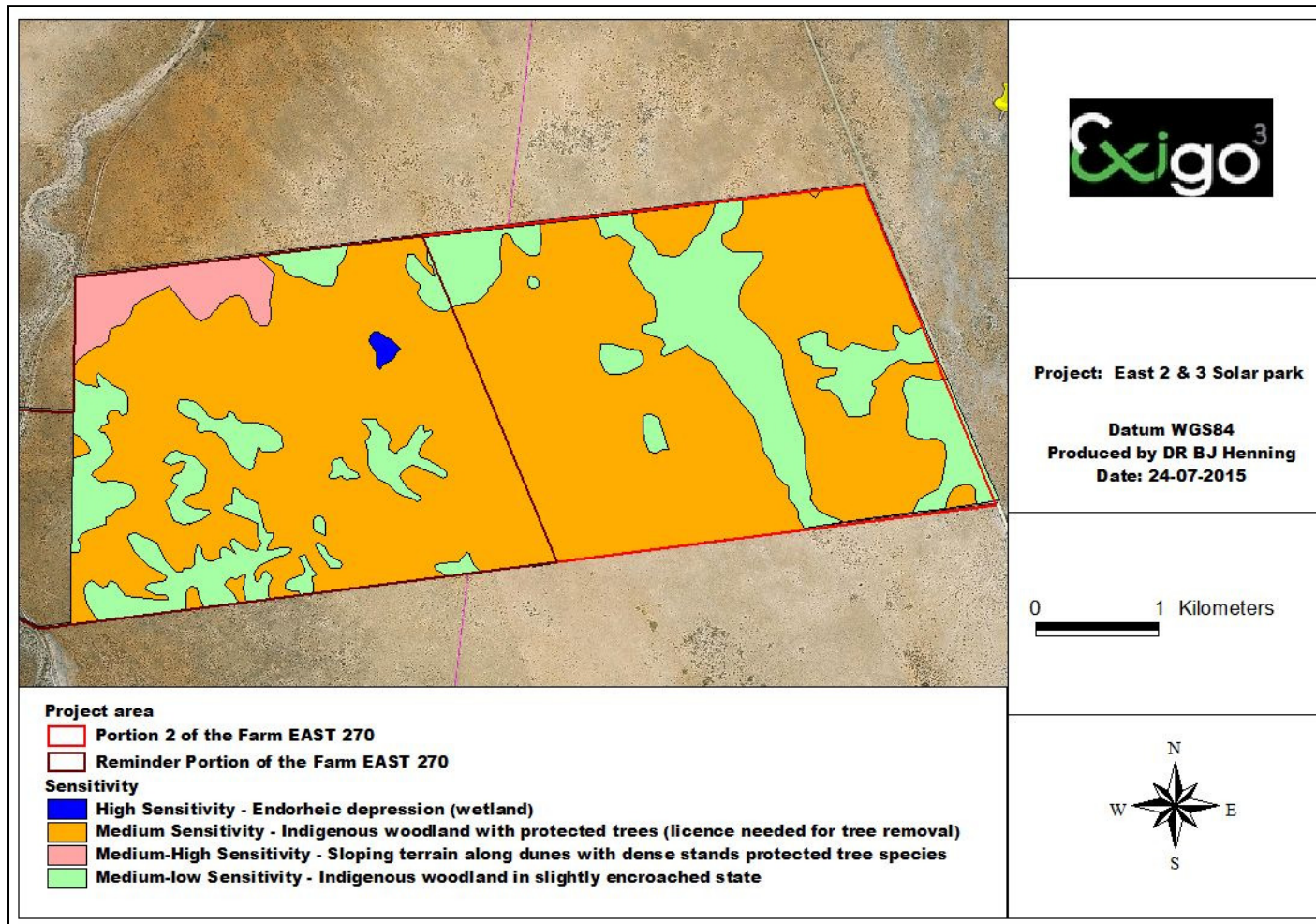


Figure 12: Agricultural Potential Map of the project site

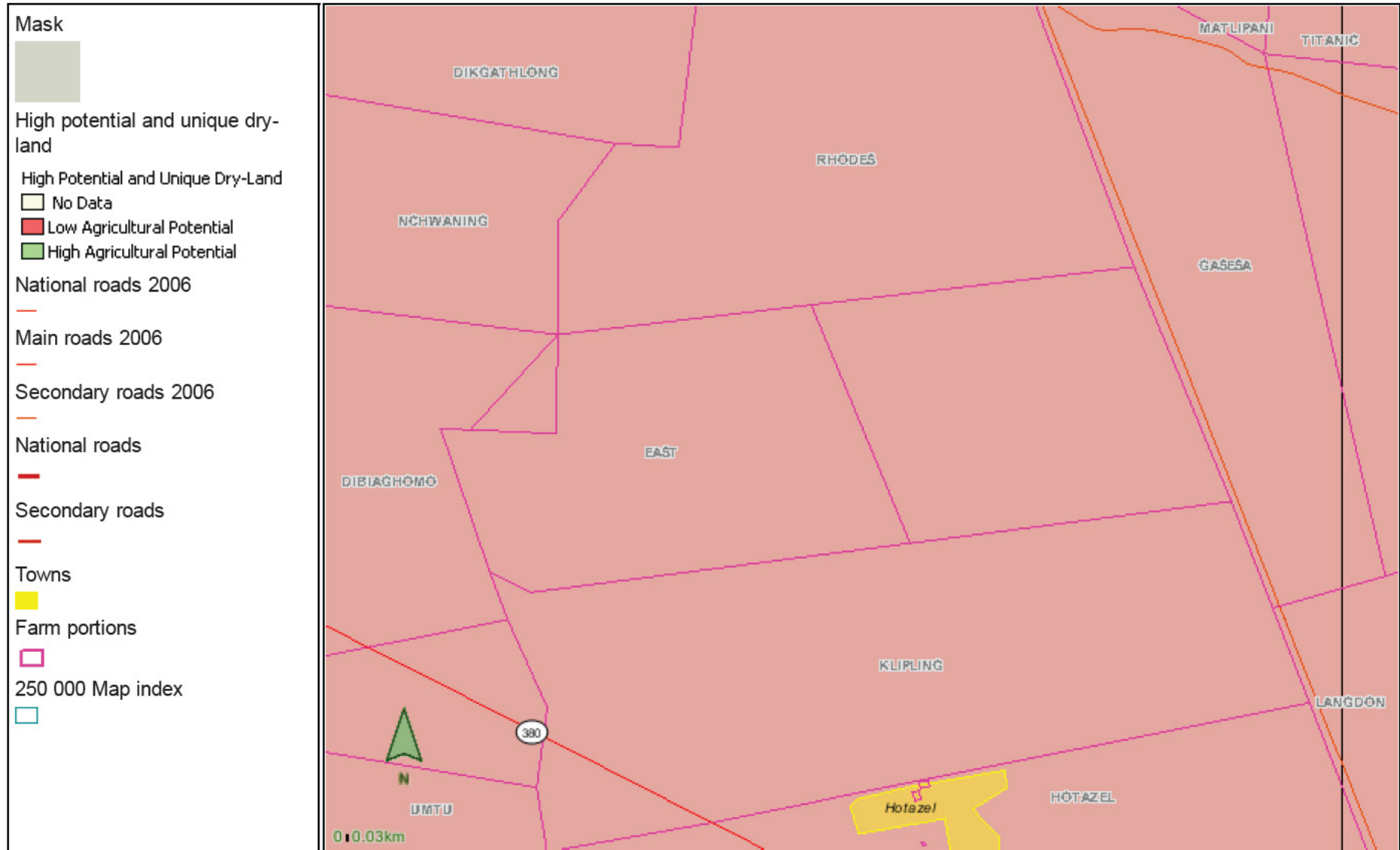


Figure 13: Land Capability Map of the project site

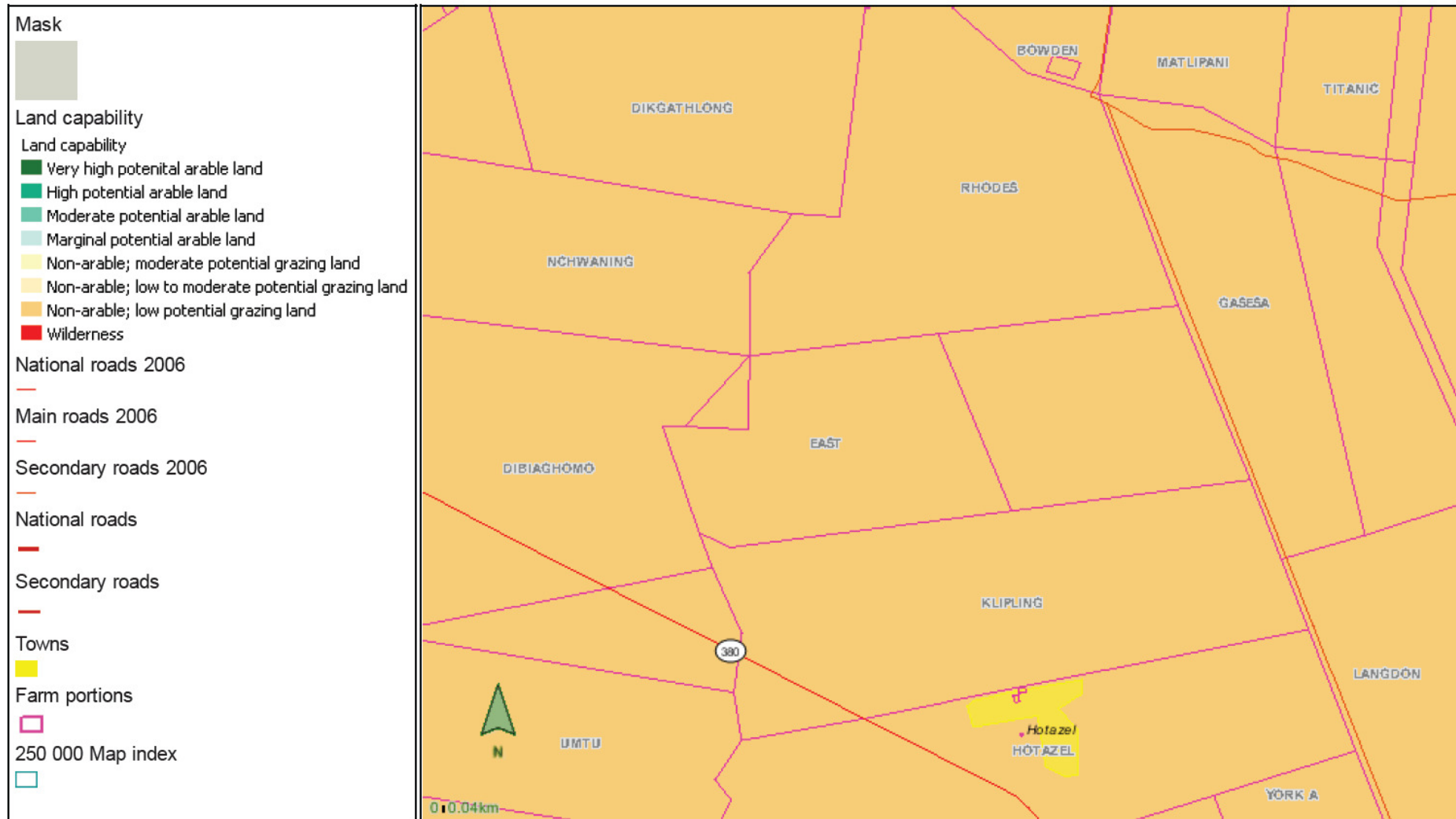
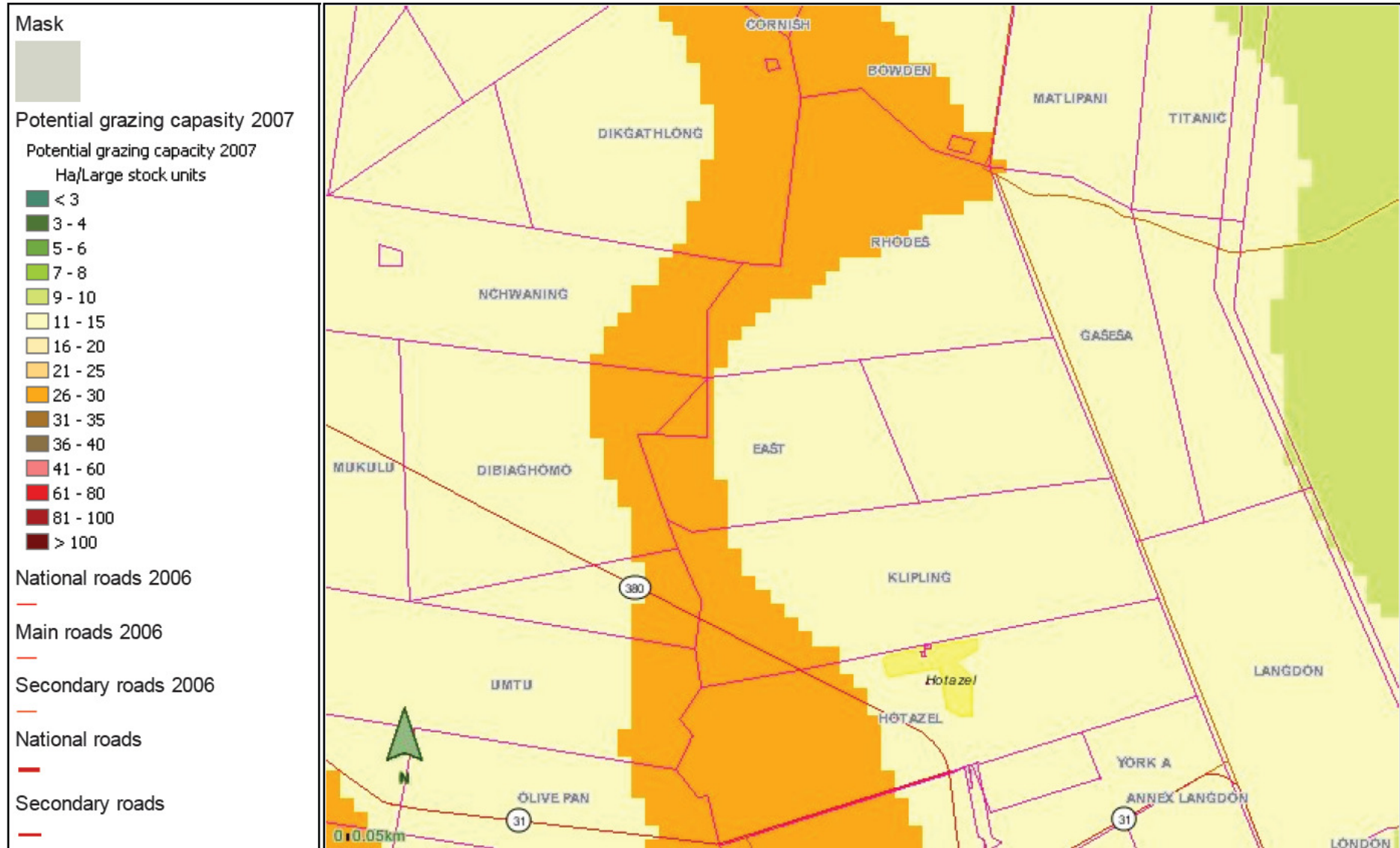


Figure 14: Potential Grazing Capacity Map (1993)



Figure 15: Potential Grazing Capacity Map (2007)



7. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROCESS AND PUBLIC PARTICIPATION PROCESS (PPP)

The environmental impact studies can be summarized in a two-phased approach:

- Phase 1: Environmental Scoping Study (ESS)
- Phase 2: Environmental Impact Assessment (EIA) and Environmental Management Program (EMP)

The scope of the EIA procedure is to provide an assessment of all impacts related to the proposed project in compliance with the EIA Regulations 2014.

7.1. SCOPING PHASE

The Scoping Phase aims to produce the following:

- a description of the proposed activity, the property and the receiving environment;
- the identification of potential significant positive and negative impacts;
- the identification of opportunities and constraints, alternatives and mitigation measures which need to be evaluated and investigated during the successive EIA phase, especially in order to prevent environmental fatal flaws and sensitive or “no-go” areas.

The Scoping Phase includes the Public Participation Process. The PPP has the aim to identify concerns and issues by the interested and affected parties (I&AP's).

Issues and concerns raised by the I&AP's and key stakeholders during the Public Participation Process have been collected, processed and addressed in the Comments and Response document which forms a part of the Final Scoping Report.

All issues and concerns identified during the Scoping Phase were documented in the Final Scoping Report which was submitted to the DEA together with a Plan of Study for EIA.

7.2. EIA PHASE

The current step of the EIA process is the development of guidelines for execution of the impact assessment and the compilation of an Environmental Impact Assessment Report.

The database of the stakeholders and I&AP's developed during the scoping process is used as a reference to ensure that stakeholders are involved and participate in this second phase of the EIA process.

All relevant issues considered during the Scoping Phase are further investigated and assessed during the EIA Phase of this project. The EIA involves various specialist studies and should provide an overall assessment of the biophysical, social and economic environment affected by the proposed project.

A detailed assessment is carried out in terms of environmental criteria and rating of significant impacts of all options identified in the scoping phase. Appropriate mitigation measures are identified and recommended for all significant impacts. These measures have been included in the Environmental Management Programme (EMPr) submitted together with the Environmental Impact Assessment Report (EIAR) to the DEA.

During the EIA phase stakeholders and I&AP's are notified in writing of the continuation of the project to the EIA Phase and are informed as to the way forward and where and when the Final Environmental Impact Assessment Report is made available for review. Comments from the stakeholders and I&AP's on the EIA and the Draft EMPr are incorporated into the Final EIAR.

The stakeholders and I&AP's will furthermore be informed of the final decision regarding the Environmental Authorization and the appeal process.

7.3. PUBLIC PARTICIPATION PROCESS (PPP)

All relevant I&AP's have been identified and involved in the public participation process from the beginning of the project as per the EIA regulations 2010.

The public participation process offers the opportunity to become actively involved through constant sharing of information. The main purposes of the public participation process are to ensure that:

- all relevant information in respect of the application is made available to I&AP's for their evaluation and review;
- reasonable opportunity is given to I&AP's to comment and to submit queries related to the proposed project;
- comments and queries by the I&AP's to the Draft Scoping and to the EIA Reports are submitted and evaluated in a reasonable timeframe and in predetermined terms.

The initial informative stage of the public participation was done from 23 July 2015 until 23 August 2015.

The public was informed of the proposed development and a database of Interested and Affected parties was compiled.

In the enclosed Annexure C there is the list of all components of the public participation process.

The public was informed of the project by means of:

- Site notices, which were put up at the proposed development site;
- Background Information Documents (BID) were sent to all adjacent land owners;
- A Notice was published in a local newspaper, which is distributed in the general area;
- Sending of BIDs to other possible interested and affected parties/stakeholders.

A data base of registered I&AP's has been established to date and will be maintained and added to as required.

Site notices were put up on site on the fence surrounding the proposed development area on 23 July 2015.

After a Deed Search was done on the surrounding properties a Background Information Document was sent to each of the adjacent landowners. Proof of this is attached in Annexure C. A number of these documents was also distributed to the relevant governmental departments including *inter alia* Department of Water and Sanitation, Agriculture Land Reform & Rural Development *etc.* Other identified interested and/or affected parties/stakeholders include Eskom, the Local municipality, the District municipality *etc.* Proof of all correspondence is included in Annexure C.

A newspaper advertisement was published in the 22 July 2015 edition of the Stellalander, which is a local newspaper, which is distributed in the nearby towns and surrounds.

One response was received during the initial public participation process. The response was received from and I& AP requesting information during the process.

The main registered I&APs involved are African Rainbow Minerals (Assmang Ltd) and Kudumane Manganese Resources (Pty) Ltd. Both these companies have an interest in the project as a result of their mining activities in the area. Comments were received both from Assmang and Kudumane.

Scoping approval was obtained from the DEA on 1 December 2015. A Draft (Consultation) EIA report was made available to registered I&APs for comment for a 30-day commenting period, from 15 February 2016 until 16 March 2016.

However, the applicant decided to increase the generating capacity of the proposed East 2 Solar Park and that implied an expansion of the proposed development footprint area from 210 ha to 250ha. This implied a significant change in the lay out of the PV solar plant and it was decided to make another draft EIA report available to I&APs in order to inform I&APs of the changes to the specifications and lay out.

7.3.1. Further steps in Public Participation Process

To ensure a transparent and complete public participation process the following steps are still to be taken during the rest of the EIA process:

- An Amended Consultation Environmental Impact Assessment Report will be made available to registered I&APs for a 30-day commenting period.
- The Final EIA Report will be made available to the DEA for review and notifications will be sent out to inform registered I&APs and governmental organizations that the Final EIA Report is again available for comments and is submitted to the DEA.
- All I&AP's and governmental organizations will be notified about the final decision of the DEA (Environmental Authorisation granted or not).

7.3.2. Results of the public participation process

A letter was received from Dr. Adrian Tiplady from SKA in which he indicated that the proposed development will have a low risk of having a detrimental impact on the SKA.

The most significant comments were received from Assmang (Pty) Ltd and a number of points were raised in a letter dated 19 October 2015.

Herewith are the comments made by Assmang and response from the EAP.

1. Kudumane Manganese Resources (Pty) Ltd (KMR) is the holder of a prospecting right over the farm Kipling 271 and has applied for a mining right. The question is whether there was consultation with Kudumane with regard to power lines and other servitudes that may be involved.
 - * There was direct consultation between the project manager for Cronos Energy (Planwise Town and Regional Planners) and KMR. Letters in this regard is included in the Public Participation Annexure C. If required / needed further talks and negotiations will take place between KMR and Cronos Energy.
2. The East 2 Solar Park is situated within the Manganese Belt.
 - * This was researched and Environmental and a Social Impact Assessment Summary for the Kalagadi Industrial Beneficiation Project was found at the following website: <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Environmental-and-Social-Assessments/ESIA%20summary%20Kalagadi.pdf>. Figure 2 in this report indicates the Kalahari Manganese Field according to the Council for GeoScience (1998) and according to this map the farm East 270 falls just outside of the Manganese field to the East. It is acknowledged that there still is the possibility that Manganese could be present on the farm East 270. However, it is not within the scope of this application to do an in-depth investigation into the viability of Manganese mining on the farm East 270.

3. There is the question of the Solar Park having an effect of sterilising a portion of the minerals on the farm Kipling.
 - * The issue of the power line crossing the farm Kipling 271 was addressed in the application for Environmental Authorization for this power line. There will be consultation with Assmang in this regard before this is finalized. However, this issue does not fall within the scope of this application.
4. The site for East 3 Solar Park was chosen on the grounds that there is a high need for electrical supply due to the presence of mines under operation and construction.
5. The point is made that there is no certainty that the mines will be provided with electricity from East 2 Solar Park and the presence of mines in the area cannot be used to justify the construction thereof.
 - * This is acknowledged, however the point is that the construction of the solar park feeding electricity into the Eskom grid will lower the pressure on the grid leading to a more reliable source of electricity, all based on supply from the Eskom grid.
6. In the scoping report the statement was made that the solar park will help to compensate the CO2 emissions arising from mining activities.
7. The statement in point 6 is seriously questioned by Assmang and justification of this statement is sought in the form of studies. An explanation of the statement is requested.
 - * This statement was made pre-maturely and is purely an assumption and is not based on any facts. This statement has been withdrawn from the report.
8. In the Scoping Report the statement is made that the use of solar radiation for power generation is considered a non-consumptive use and a renewable natural resource which does not produce greenhouse gas emissions.
9. This statement is agreed with but the CO2 and greenhouse emissions from the manufacturing, mining of raw materials and transport of parts and components is to be calculated and included in this study.
 - * This does not form part of the scoping of this application.
10. The cumulative impact of the solar parks, specifically with regard to the impacts relating to the sterilisation of mineral reserves due to reduced mining areas, buffer zones required in terms of the Mine Health and Safety Act no 29 of 1996 (MNSA), servitudes and all other related factors to be assessed.
 - * It has been found that the Kalahari Manganese Belt is situated to the West of the proposed development sites and there is currently no mining rights on the proposed development sites. Therefore, there is no baseline information in terms of either the results of any prospecting done in the area or any mining rights currently in place. The sterilisation of mineral reserves does not form part of the scope of this assessment. However, it is acknowledged that this is a concern for Assmang and will be discussed with them directly.
11. The impact of blasting at the mines to be assessed and the mines should be indemnified against any possible damage resulting from any mining activities, including blasting.
 - * There will be direct correspondence and agreements will be in place between the mines and the developing company.
12. The Department of Water and Sanitation is not included in the list of government authorities mentioned in the Scoping Report.
 - * This was an omission and an error made on our part. The Department of Water and Sanitation has been consulted with at all steps of the EIA process. See section 7.3 of this report.

13. What other authorizations will be required as Assmang should be considered and I&AP in all processes.
- * Other authorizations include *inter alia*, an application to the local municipality, an application for the Water Use License to the Department of Water and Sanitation, permit application for the removal of protected trees to the Department of Forestry as well as the Northern Cape Department of Nature Conservation. With most of these applications, Assmang will be considered as an I&AP.
14. What is the zoning on East 270? And Assmang should be considered and I&AP in the process for applying for a change in land use.
- * Assmang will definitely be considered an I&AP in the process for application for a change in land use to the local municipality.
15. Will there be a need for an application for a Water Use License in terms of the National Water Act?
- * Water use at the site is still being investigated. However, there will be an application for a water use license to the DWS and Assmang will be considered an I&AP from the start.
16. A map indicating impacts of power lines on the farm Kipling and East 270 is requested. Environmental Authorization for the power line over the farm Kipling has been granted and the impacts have been addressed during this application process.
17. What will be the water source and is a water use license required?
- * From the Geo-hydrological report, it is clear that the water quality in the area is not fit for human consumption and is also not useful for the cleaning of solar panels and the water will have to go through a process in order to get the right water quality. Also, in order to get a borehole encased and fitted will be very expensive as a result of the geology in the area. Therefore, there will be an application to Sedibeng Water in order to make use of the Vaal Gamagara water pipe line that runs in the vicinity of East 270. There has been correspondence between the applicant and Sedibeng Water already but no agreement is in place yet. However, there will be other applications for water uses to the DWS.
18. What will the purpose be of the water treatment facilities on-site?
- * This water treatment system is a small system for the treatment of household waste water emanating from activities of personnel on site.

7.4. PROJECT PHASING

For the purpose of assessing these impacts, the project has been divided into phases from which impacting activities can be identified:

- **Planning**
- **Site clearing & construction phase**
- **Operational phase**

The phases have been carefully examined in relation to the PV plant and in relation to the connection infrastructure. Indeed, as already described, in this document all impacts and mitigations are defined also for the connection infrastructure, although this part of the project may be executed, owned and operated by Eskom.

As far as the **decommissioning** phase is concerned, it is important to specify that this phase will be subject to a decommissioning plan once the project is nearing its operational life (25-30 years). Decommissioning will also be subject to an environmental authorization (Activity 34 of R983 of 4 December 2014).

This phase is important because it states the **reversibility of the development** and has to be carefully planned and executed, in order to enable the natural re-growth of indigenous vegetation and fauna re-population as well as the reuse of the area for agricultural and grazing purposes. For this reason, in the Draft Environmental Management Plan the decommissioning phase has been included and carefully analyzed, in order to anticipate activities and actions to be taken in order to minimize the relevant impacts.

The decommissioning phase, as described in Chapter 10, is similar to the commissioning phase but all possible care must be considered for the recycling of the materials and for the re-establishment of the site as it was the *status quo* – *ex ante* the development.

7.5. METODOLOGY USED FOR THE IDENTIFICATION AND ASSESSMENT OF THE IMPACTS

The potential environmental impacts identified in the study have been quantified and the significance of the impacts has been assessed according to the criteria set out below. Each impact has been assessed and rated. The assessment of the data, where possible, has been based on broadly accepted scientific principles and techniques. In defect, judgements and assessments are necessarily based on the consultant's professional expertise and experience.

7.6. ASSESSMENT CRITERIA

The terms of reference for the study include criteria for the description and assessment of environmental impacts. These criteria are drawn from the *Integrated Environmental Management Guidelines Series, Guideline 5: Assessment of Alternatives and Impacts*, published by the Department of Environmental Affairs and Tourism in terms of the Environmental Impact Assessment. These criteria include:

Table 5: Impact Assessment Criteria

Nature of impact This is an appraisal of the type of effect the proposed activity would have on the affected environmental component. The description should include what is being affected, and how.		
Extent The physical and spatial size of the impact.	Site	The impact could affect the whole, or a measurable portion of the above-mentioned properties.
	Local	The impacted area extends only as far as the activity, e.g. a footprint.
	Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
Duration The lifetime of the impact; this is measured in the context of the lifetime of the proposed base.	Short term	The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than any of the phases.
	Medium term	The impact will last up to the end of the phases, where after it will be entirely negated.
	Long term	The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter.
	Permanent	The only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.
Intensity	Low	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
	Medium	The affected environment is altered, but function and process continue, albeit in a modified way.
	High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
Probability This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time.	Improbable	The possibility of the impact occurring is very low, due either to the circumstances, design or experience.
	Probable	There is a possibility that the impact will occur to the extent that provisions must be made therefore.
	Highly probable	It is most likely that the impacts will occur at some or other stage of the development. Plans must be drawn up before the undertaking of the activity.
	Definite	The impact will take place regardless of any prevention plans, and there can only be relied on mitigation actions or contingency plans to contain the effect.

<p>Determination of significance. Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.</p>	<p>No significance</p>	<p>The impact is not substantial and does not require any mitigation action.</p>
	<p>Low</p>	<p>The impact is of little importance, but may require limited mitigation.</p>
	<p>Medium</p>	<p>The impact is of importance and therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.</p>
	<p>High</p>	<p>The impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.</p>

The general approach to this study has been guided by the principles of Integrated Environmental Management (IEM). In accordance with the IEM Guidelines issued by the DEA, an open, approach, which encourages accountable decision-making, has been adopted. The underpinning transparent principles of IEM require:

- informed decision-making;
- accountability for information on which decisions are made;
- a broad interpretation of the term “environment”;
- an open participatory approach in the planning of proposals;
- consultation with I&APs;
- due consideration of alternatives;
- an attempt to mitigate negative impacts and enhance positive impacts of proposals;
- an attempt to ensure that the social costs of development proposals are outweighed by the social benefits;
- democratic regard for individual rights and obligations;
- compliance with these principles during all stages of the planning, implementation and decommissioning of proposals; and
- the opportunity for public and specialist input in the decision-making process.

The study is also guided by the requirements of the EIA Regulations in terms of the NEMA. The NEMA EIA Regulations, which are more specific in their focus than the IEM principles, define the detailed approach to the EIA process.

8. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

8.1. POTENTIAL IMPACTS

Potential impacts associated with the construction and operational phases of the Rhodes 1 Solar Park together with its connection infrastructure are outlined and evaluated hereinafter.

As previously described, **construction activities** for the establishment of PV power plant include:

- land clearing activities necessary for preparation of the site and access routes;
- excavation and filling activities;
- transportation of various materials;
- construction of the storage structures;
- installation of the PV modules and construction of associated structures and infrastructure;
- construction of the on-site high-voltage substation;
- construction of the 132 kV power line which will deliver the energy to the Eskom grid (a separate Basic Assessment is currently undergoing by Ages in this respect).

Environmental impacts associated with the **operational phase** of a solar energy facility may include visual and other impacts.

The **decommissioning activities** of the PV plant mainly include the removal of the project infrastructure and the restoring of the site *status quo ante*.

The identification of impacts will be based on:

- legal and administrative requirements;
- the nature of the proposed activity;
- the nature of the receiving environment;
- specialist studies;
- issues raised during the public participation process.

Potential impacts may include:

- Impacts on soils & agricultural potential;
- Impacts on ground water;
- Impacts on the road system and traffic;
- Impacts on air quality and potential emissions;
- Geological, soil and erosion impacts;
- Impacts on avifauna;
- Impacts on vegetation;
- Impacts on heritage resources;
- Noise impacts;
- Impacts on tourism;
- Social impacts;
- Visual impacts.

8.2. CUMULATIVE IMPACTS

Cumulative impacts were assessed and it was found that the cumulative impacts will be low to medium. As a result of the locality of East Solar Park, that has been authorized already, there will be cumulative impacts as a result of East 2 Solar Park being located directly adjacent to East Solar Park. A number of mitigation measures are proposed which will lead to the impacts that may result from the establishment of the East 2 Solar Park to be low. The cumulative impacts of each of the possible impacts are also assessed hereunder.

8.3. SPECIALIST STUDIES

Due to the nature of the project, a number of specialist studies are required in the EIA process in order to investigate the potential environmental impacts associated with the proposed development.

Detailed studies on potentially significant impacts have been carried out to address these impacts throughout the EIA process. The public participation process provides valuable information in the identification of issues requiring further and specific investigation throughout the EIA process.

The specialist studies which have been conducted and attached to this EIA Report are the following:

- Ecological Impact Assessment (Annexure D)
- Avifauna Impact Assessment (Annexure E)
- Agricultural Potential Assessment (Annexure F)
- Wetland Delineation Study (Annexure G)
- Heritage Impact Assessment (Annexure H)
- Geo-technical and Geo-Hydrological Report (Annexure I)
- Visual Impact Assessment (Annexure J)
- Socio-economic Impact Assessment (Annexure K)
- Services Report (Annexure L)

All specialist's studies were amended to include the new generating capacity as well as the increase in the development footprint area.

8.4. IMPACTS & MITIGATION MEASURES

8.4.1. Construction & operational phases impacts and mitigation measures

All the possible impacts that can be predicted in both the construction and operational phases of the PV plant are addressed. Specific mitigation measures are proposed and the significance of these impacts is described with and without the mitigation measures.

Furthermore, considering that all or part of the construction infrastructure may be owned and/or operated by Eskom, the mitigation measures described in the following paragraphs and in particular in the attached Environmental Management Plan can be the responsibility of Eskom or of the developer.

8.4.1.1. Atmospheric pollution and noise

Construction Phase

During this phase there will be a concentration of earthmoving equipment and construction vehicles that will level the area, clear vegetation for construction purposes and in the process will create dust and exhaust smoke that will impact on air quality. There will also be more noise created by the vehicles during this phase. Burning of waste and fires at construction sites may also create smoke.

Operational phase

The increased traffic volumes and people will lead to increased levels of air pollution and noise. Smoke from burning of waste can cause air pollution.

Project Phase	Impact :Atmospheric Pollution and noise								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Earthworks and Vegetation clearance	Air pollution : Dust	Low-medium	Medium-high	Low-medium	Medium-high	Medium-high	Low-medium	Medium
	Vehicle movement	Air pollution : Smoke	Low	Medium-high	Low-medium	Medium-high	Medium-high	Low-medium	Medium
	Vehicle movement	Air pollution : Dust	Low	Medium-high	Low-medium	Medium-high	Medium-high	Low-medium	Medium
	Vehicle movement	Noise pollution	Low-medium	Medium-high	Low-medium	Medium-high	Medium-high	Low-medium	Medium
	Burning of cleared vegetation, solid waste & veld fires	Air pollution by excessive smoke	Low-medium	Medium-high	Low-medium	Medium	Medium	Low-medium	Medium
	Cooking fires of workers	Air pollution : Smoke	Low	Medium-high	Low-medium	Medium	Medium	Low	Medium
Operation	Vehicle movement	Noise pollution	Low-medium	Medium-high	Low-medium	High	Medium-high	Low-medium	Medium
	Fireplaces and veldt fires	Air pollution caused by smoke	Low-medium	Medium-high	Low-medium	High	Medium-high	Low-medium	Medium
	Burning of vegetation refuse and solid waste	Air pollution by excessive smoke	Low-medium	Medium-high	Low-medium	High	Medium-high	Low-medium	Medium
Cumulative impacts	Pollution & Noise	Increase in release of smoke and increase in noise levels	Low	Medium-high	Low-medium	Medium	Medium	Low	Medium

Mitigation measures - Construction Phase

- Vehicles must be well serviced so that it does not produce excessive smoke and noise.
- Speed of construction vehicles should be kept as low as possible to reduce dust and noise.
- Construction areas must be damped to prevent excessive dust formation.
- The clearing of the site should be done in phases as the construction progresses.
- Construction should only take place during the hours between sunrise and sunset on weekdays and Saturdays.
- Contractors must comply with Provincial noise regulations. The construction machinery must be fitted with noise mufflers and be maintained properly.
- Vegetation cleared from the site and solid waste generated by the construction teams may not be burned on site or the surrounding areas, but be regularly removed to the municipal waste disposal site.
- Fire belts must be made around the development according to the regulations of the Veld and Forest Fire Act.
- Vegetation stock-piled should be removed to a licensed waste disposal site regularly.

Mitigation Measures - Operational Phase

- Speed of vehicles on roads should be controlled e.g. speed bumps and speed restrictions.
- All roads should preferably be sealed to eliminate dust formation caused by strong winds and vehicle movement.
- Solid waste may not be burned on the project area.
- Fire belts around the development must be made according to the regulations of the Veld and Forest Fire Act.
- Vegetation refuse should be composted if possible and re-used.

8.4.1.2. Groundwater and surface water pollution

Construction Phase

- Lack of sanitation could result in ground water pollution and associated health risks.
- Construction vehicles will be refuelled at the construction camp.
- Spillage of fuel and lubricants from construction vehicles could occur. Storm water contamination by solid waste could lead to groundwater and surface water pollution.
- In this phase the soil cover as well as the vegetation is removed and storm water over the area could cause erosion as well as siltation of watercourses. Road construction will also increase the possibility of erosion and the siltation/sedimentation of surface water streams, because of increased storm water run-off.
- The small pan (endorheic depression) found on the north-eastern side of the Remainder Portion of East 270 should be avoided; a 32 m buffer zone should be preserved around the pan boundary, as indicated in the Wetland Delineation Study (Annexure G).

Operational Phase

- Pollution by sanitation leakages, solid waste and erosion may lead to water pollution. Storm water run-off over open areas can cause erosion as well as the washing of soil into the surface water streams.
- Storm water flowing over sealed and/or paved areas could lead to ground and surface water pollution. Chemicals from the vehicle wash area could negatively impact on the quality of surface and groundwater resources.
- Fertilizers, pesticides and herbicides used at the project during operation can create pollution if not handled and applied correctly.

Project Phase	Impact: Groundwater and Surface water Pollution								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Spillage of fuel and lubricants from construction vehicles	Water Pollution	Medium	Medium-high	Low-medium	Medium-high	Medium-high	Low	Medium
	Clearing of vegetation	Erosion & siltation of streams	Low-medium	Medium-high	Low-medium	Medium	Medium-high	Low-medium	Medium
	Solid waste disposal freshwater resources	Pollution of freshwater resources	Low	Medium-high	Low-medium	Medium-high	Medium-high	Low-medium	Medium

Project Phase	Impact: Groundwater and Surface water Pollution								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
	Sanitation seepage from chemical toilets and/or from the temporary sanitation system	Water Pollution	Medium	Medium-high	Low-medium	Medium	Medium	Low	Medium
Operation	Spillage of fuel and lubricants from vehicles	Water Pollution	Medium	High	Low-medium	Medium-high	Medium-high	Low-medium	Medium
	Solid waste disposal-freshwater resources	Water Pollution	Low	High	Low-medium	Medium-high	Medium-high	Low-medium	Medium
	Leakage from the permanent Sanitation system	Water Pollution	Medium-high	High	Medium	Medium	Medium-high	Low-medium	Medium-high
	Use of fertilizers, insecticides and herbicides	Pollution of streams & rivers	Low-Medium	High	Low-medium	Medium	Medium	Low-medium	Medium
	Storm water runoff	Erosion & siltation of streams	Low-medium	Medium-high	Low-medium	Medium	Medium-high	Low	Medium
Cumulative impacts	Water pollution and increased water run-off	Increased potential for water pollution and increased water run-off	Low-Medium	High	Low-medium	Medium	Medium	Low-medium	Medium

Mitigation measures - construction phase

The following precautionary measures are recommended to prevent any surface or groundwater pollution:

- Clearance of vegetation should be restricted to 250 ha footprint and access road.
- Construction activities should be restricted to the proposed 250ha footprint.
- The areas close to the western boundary of the property, affected by the *Gamaqara Spruit*, should be avoided.
- The small pan (endorheic depression) found on the north-eastern side of the Remainder Portion of East 270 should be avoided; a 32 m buffer zone should be preserved around the pan boundary, as indicated in the Wetland Delineation Study (Annexure G).
- Cleared areas should be rehabilitated by reintroducing a grass layer as soon as possible to limit the occurrence of erosion.
- Berms to limit water flow over cleared areas to limit erosion and siltation of surface water.
- Drip pans must be used during re-fuelling and servicing of vehicles. Used parts like filters should be contained and disposed of at a site licensed for dumping of these products.
- Oil traps must be installed in the vehicle wash bay to prevent pollution. Oil traps must be serviced on a regular basis by an approved service agent.
- Diesel storage must be less than 80 000l at construction camps. Diesel tanks and other harmful chemicals and oils must be within a bunded area.

- The vehicle maintenance yard and construction storage area should be placed 100m away from watercourses. This area should have bund walls and lined with impermeable material to prevent ground and surface water pollution.
- Chemical sanitation facilities and the temporary sanitation system in the construction site should be regularly serviced by appropriate companies to ensure that no spills or leaks to surface and groundwater take place. Chemical toilets and the temporary sanitation system should not be placed within 100m from any watercourse.
- Solid waste must be kept in adequate waste bins. Building rubble and various waste products should be removed on a regular basis to a licensed landfill site.
- If all possible soil pollution is restricted and prevented, there would be no cumulative impacts as a result of the establishment of the East 2 Solar Park.

Mitigation measures - operational phase

- Solid waste to be kept in waste bins and removed regularly to waste disposal site.
- Use of eco-friendly products e.g. Organic Compost, herbicides and insecticides to be promoted.
- The permanent sanitation system should be regularly inspected to ensure that no spills or leaks from sanitation system to groundwater take place.
- All possible pollution can be prevented and therefore there would be no cumulative impacts where soil pollution is concerned.
- A section 21g water use will be applied for the permanent sanitation system on site.

8.4.1.3. Water use / water quantity

Construction phase

During this phase, water consumption will be the highest because it will be utilized for gravel roads and building constructions. The water needed for the construction activities will be provided either:

- from a new on-site borehole, or
- from the Vaal Gamagara Pipeline, which crosses the project site.

Operational phase

Water use will be limited except for short periods (twice per year) when the PV modules are cleaned. The water needed for the operational phase will be provided either:

- from a new on-site borehole, or
- from the Vaal Gamagara Pipeline, which crosses the project site.

Project Phase	Impact: Water use								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Construction process	Depletion of water resources: Water consumption	Low-medium	Medium-high	Medium-high	High	High	Medium	Medium-high
Operational	Water use & cleaning of panels	Depletion of water resources: Water consumption	Low	High	Medium	High	High	Low-Medium	Medium
Cumulative impacts	Water use	Increased pressure on local water resources	Medium	Medium - High	Very Low	Low	Low-Medium	Low-Medium	Medium

Mitigation measures – Construction Phase

- Water should be used sparingly and it should be ensured that no water is wasted.
- Roads should be treated with chemicals to lower the use of water.
- Washing of construction vehicles should be limited to once or twice a month and must be done with high-pressure sprayers to reduce water consumption.
- Drinking water supply for the staff on site should be treated through an osmotic water filtration system.

Mitigation measures - Operational Phase

- Cleaning of panels should be done only when necessary, twice per year.
- Roads should be treated with chemicals to lower the use of water.
- Washing of vehicles should be limited to once a week and must be done with high-pressure sprayers to reduce water consumption.
- Care must be taken not to waste any water. In the offices, half-flush systems in the toilets as well as water aerators in all taps must be installed to reduce water consumption.
- The workers should be educated on the value of water and how to use it sparingly.
- Drinking water supply for the staff on site should be treated through an osmotic water filtration system.
- A section 21a water use should be applied for, to abstract water from a borehole for use at the facility

8.4.1.4. Land and soils

Planning phase

The *sand dunes* located on the western and northern side of the project site (close to the Gamagara River) should remain undeveloped - in compliance with the requirements highlighted in the Geo-technical and Geo-Hydrological Study (Annexure I).

Construction phase

During construction, the vehicles used have the potential to spill diesel and lubricants that can pollute the soil. The storage of solid waste before it can be disposed of has the potential to pollute the soil and becomes a nuisance.

Operational phase

Solid waste can be a nuisance and has the potential to pollute the soil if not managed correctly. The use of conventional fertilizers, herbicides and insecticides should be limited as far as possible. Wastewater from activities can pollute the soil.

Project Phase	Impact: Land and soils								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Spilling of oil/diesel by construction machines	Contamination of soil	Medium	Medium-high	Low-medium	Medium-high	Medium-high	Low	Medium
	Solid waste disposal	Soil pollution + nuisance	Low	Medium-high	Low-medium	Medium-high	Medium-high	Low-medium	Medium

Project Phase	Impact: Land and soils								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
	Storm water over roads and cleared areas	Erosion	Low-medium	Medium-high	Low-medium	Medium	Medium-high	Low-medium	Medium
	Trenches for electric cables and water and sewerage pipes	Erosion	Low-Medium	Medium-high	Low	Medium	Medium-High	Low-medium	Medium
Operation	Solid waste	Soil pollution + nuisance	Low	High	Low-Medium	Medium-High	High	Low	Medium
	Storm water from paved areas and roofs	Erosion	Low-medium	High	Low-medium	Medium	Medium-high	Low	Medium
	Use of fertilizers, insecticides and herbicides	Pollution	Low-Medium	High	Low-medium	Medium	Medium	Low-medium	Medium
Cumulative impacts	Increased potential for negative impacts on soil resource	Increased potential for erosion and soil pollution	Low-medium	High	Low-medium	Medium	Medium-high	Low	Medium

Mitigation measures - Construction Phase

- Clearance of vegetation should be restricted to 250 ha footprint and access road.
- Construction activities should be restricted to the proposed development footprint.
- Areas close to western boundary, affected by *Gamaqara Spruit*, must be avoided.
- Construction vehicles must be well maintained and serviced to minimise leaks and spills.
- Spill trays must be used during refuelling of vehicles on site.
- Diesel storage must be less than 80 000 litres at construction camp. Diesel tanks and other harmful chemicals and oils must be within a bunded area.
- Solid waste must be kept in containers and disposed of regularly at licensed dumping site.
- Building rubble must be removed to a licensed disposal site regularly during construction.
- Trenches dug must be filled up and compacted well, slightly higher than areas around it.
- The clearing of the site should be done in phases as the construction progresses.
- Slopes produced by removing soil must be kept to a minimum to limit erosion damage.

Mitigation measures - Operational Phase

- Solid waste to be kept in adequate waste bins and removed regularly to waste disposal site.
- The surface drainage system should be monitored after storms and storm water damage should be repaired. The maintenance of the roads must be kept up to standard to prevent and reduce the incident of erosion next to the roads.
- The use of eco-friendly products e.g. organic compost, herbicides and insecticides should be promoted.

8.4.1.5. Archaeological, Cultural and Social Features

Construction phase

The clearing of the site may have a negative impact on the archaeological features of the site. Care must be taken in the excavations and moving of soil to observe any archaeological feature of importance, which must be left and reported to the archaeological consultant for comments and actions.

Operational phase

The operational phase will not have any negative impact on the archaeological features of the site, if the recommendations of the Heritage Impact Assessment (Annexure H) to be undertaken will be adhered to.

Project Phase	Impact: Loss of Archaeological, Cultural and social features								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Earth moving and soil clearance	Destroy archaeological evidence and heritage and graves	Low-medium	Medium-high	Low	Low	Low-medium	Low	Low-medium
Operation	Operational activities of development	Destroy archaeological evidence and heritage and graves	Low-medium	High	Low	Low	Low-medium	Low	Low-medium
Cumulative impacts	Activities on site during construction and operational	Increase in potential to unearth archaeological evidence and graves	Low-medium	High	Low	Low	Low-medium	Low	Low-medium

Mitigation measures – Construction and operational phases

Care must be taken during the construction process that anything of archaeological value that is unearthed must be recorded. Please refer to the Heritage Impact Assessment (Annexure H). The archaeologist or SAHRA must be notified whenever anything of importance is discovered.

8.4.1.6. Impact of the development on the ecology (fauna & flora) of the area

Planning and construction phase

The removal of natural vegetation and destruction of habitat will have a negative effect on the biodiversity. The specific mitigation measures included in the Ecological and Avifauna Impact Assessment (Annexures D & E) should be adhered to.

The *sand dunes* located on the western side of the project site (close to the Gamagara River) should remain undeveloped - in compliance with the requirements highlighted in the Geo-technical and Geo-Hydrological Study (Annexure I).

The small pan (endorheic depression) found on the north-eastern side of the Remainder Portion of East 270 should be avoided; a 32 m buffer zone should be preserved around the pan boundary, as indicated in the Wetland Delineation Study (Annexure G).

Operational phase

The operation of the development can have a negative impact on the bio-diversity if it is not managed correctly. Exotic invasive plant species can have a negative impact on the indigenous vegetation.

Project Phase	Environmental Aspect: Ecology (Fauna and Flora)								Significance	
	Activity that causes impact	Specific impact	Severity	Duration	Extent	Frequency	Probability	With Mitigation	Without Mitigation	
								With Mitigation	Without Mitigation	
Construction	Earthworks and vegetation clearance at construction site	Loss of indigenous plant species & disturbance to sensitive habitat	Medium	Medium	Low-Medium	Medium	Medium-High	Low-medium	Medium	
	Vegetation clearance and the use of herbicides to control re-growth at the different development areas	The eradication and control of exotic invasive plant species Loss of indigenous plant species	Medium	Medium	Medium	Low-Medium	Medium-High	Low-Medium	Medium	
	The occurrence of veldt fires on site	Destruction of flora/habitats Loss of indigenous fauna	Medium-High	Medium	Medium	Medium-High	High	Medium	Medium-high	
	Littering (e.g. cans and plastics) along access road and at construction site	Public nuisance and loss/death of indigenous fauna	Low-Medium	Medium	Medium	Medium-High	Medium	Low	Medium	
	The control of animals on site Killing, poisoning or hunting of animals	Loss of indigenous fauna to the area	Medium-High	Medium	Medium	Medium	Low-Medium	Low-Medium	Medium	
Operation	Rehabilitation of cleared areas	The spreading of exotic invasive plant species Loss of habitat and indigenous flora	Medium	High	Medium	Low-Medium	Medium	Low-Medium	Medium	
	The occurrence of veldt fires	The loss of indigenous fauna and flora	Medium-High	Medium	Medium	Low-Medium	High	Medium	Medium-high	
	The functioning of the permanent sewage treatment systems – treated sewage outflow	Deterioration in the habitat for avifauna and aquatic life	Medium-High	High	Medium	Medium-High	Medium	Low-Medium	Medium-High	
	Disposal and storage of solid waste and littering	The death/loss of indigenous fauna e.g. raptors, mammals and reptiles	Medium-High	High	Medium-High	Medium-High	Medium	Low-Medium	Medium	
	The control of pests and vermin	Killing and poisoning of fauna feeding on the poisoned vermin or pest	Low-Medium	High	Low-Medium	Medium-High	Medium	Low	Medium	

Project Phase	Environmental Aspect: Ecology (Fauna and Flora)								
	Activity that causes impact	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
	The feeding of fauna e.g. birds & small mammals	Disturbance to bio-diversity and the natural movement of the animals through the site The death/loss of indigenous fauna	Low-Medium	High	Low-Medium	Medium-High	Low-Medium	Low	Medium
	Catching of wild animals e.g. reptiles, birds and small mammals as pets	Disturbance to bio-diversity and decline in indigenous faunal numbers	Medium-High	High	Low-Medium	Low-Medium	Low	Low	Medium
	Birds colliding with power line and panels	Electrocution of birds	Medium-High	High	Low-Medium	Low-Medium	Low	Low	Medium
	The erection of fences and the construction of roads with a kerb	The fragmentation of available habitat and the restriction of movement of small mammals, reptiles and amphibians	Low-Medium	High	Low-Medium	High	Medium	Low	Medium
Cumulative Impacts	Increased potential of negative impacts on ecology of the area	Increase in natural vegetation to be removed.	Medium-High	High	Medium-High	Medium-High	Medium	Low-Medium	Medium

Mitigation measures – Construction phase

- Clearance of vegetation should be restricted to 250 ha footprint and access road.
- Construction activities should be restricted to the proposed development footprint.
- Care must be taken that unnecessary clearance of vegetation does not take place. Where possible, natural vegetation must be retained.
- The herbaceous layer should be revived after clearance of the vegetation and actively managed through slashing during the entire lifetime of the project.
- Sand dunes located on the western side of project site (close to Gamagara Spruit) should remain undeveloped - in compliance with the requirements highlighted in the Geo-technical and Geo-Hydrological Study (Annexure I).
- The small pan (endorheic depression) on the north-eastern side of the Remainder of East 270 should be avoided; a 32 m buffer zone should be preserved around the pan.
- Protected trees and protected plant species can only be removed once permits have been obtained (DAFF and DENC).
- The protected tree species *Acacia haematoxylon* (Grey camel thorn) and *Acacia erioloba* (Camel thorn) were found across the project site. No protected trees should be removed without authorisation from DAFF.
- Project should comply with *Northern Cape Nature Conservation Act* (Act No. 9 of 2009).
- Herbicides used to control the invasive plant species should be chosen in consultation with an ecologist, as some of the agents might be detrimental to the surrounding indigenous fauna and flora e.g. Roundup is for example extremely toxic to frogs.
- Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the raptors occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.

- Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.
- Fires should only be allowed in designated places within the construction camp and extra care should be taken to prevent veldt fires of occurring.
- Firebreaks should comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to Prepare and maintain firebreaks).
- Cleared areas should be rehabilitated by reintroducing a grass layer as soon as possible to limit the occurrence of erosion.
- The cleared vegetation should not be burned on site. The cleared vegetation should be stockpiled and taken to the closest available landfill site.
- Solid waste must be kept in adequate animal proof waste bins at the construction camp and construction sites. Building rubble and various wastes should be removed on a regular basis to the closest available landfill site.
- Regular clean-up programs should be put into effect along the access road and throughout the premises to limit the impact of littering caused by construction activities.
- The stockpiled topsoil and construction material should be managed in such a way that the material is not transported by wind or rain. This can be done by restricting the height of the stockpiles, sandbagging and avoiding steep slopes.
- No animals may be killed, captured or hunted on site by construction workers. Do not feed any wild animals on site.
- Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and being trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during construction process.
- Existing game on the developed area will be relocated when the proposed solar park is developed. The relocation of the game will be executed according to the relevant legislation.
- Cumulative impacts on the ecology of the area can be significant. However, with the mitigation measures in place, the potential is very low for significant negative impacts on the ecology of the area.
- The EMPr will have to be adhered to both during the construction as well as operational phases and regular monitoring should be done to ensure that there is sound environmental practice at the East 2 Solar Park.

Mitigation measures – Operational phase

- The herbaceous layer should be revived after clearance of the vegetation and actively managed through slashing during the entire lifetime of the project.
- An ecologist should be consulted on the use of herbicides/eco-friendly products to control exotic tree and shrub species.
- Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the raptors occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.
- Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations.
- The high-risk sections of the power line should be marked with a suitable anti-collision marking device on the earth wire as per the Eskom guidelines.
- Solid waste must be kept in animal proof waste bins.
- A monitoring program should be compiled and implemented to ensure that the sewage treatment system is functioning properly and that the treated wastewater conforms to the standards set by the Department of Water Affairs.
- Staff members will not be allowed to catch or kill any wildlife or feed any wild animals.

- Firebreaks should comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to Prepare and maintain firebreaks).
- The impact on the flying invertebrates will be minimized through the use of sodium vapour (yellow) lights as outside lighting.
- The use of eco-friendly products e.g. Organic Compost and/or Effective Microorganisms (EM), which reduces the frequency of application of conventional fertilizers, herbicides and insecticides, should be promoted.
- The EMPr will have to be adhered to both during the construction as well as operational phases and regular monitoring should be done to ensure that there is sound environmental practice at East 2 Solar Park.

8.4.1.7. Visual impacts

Construction phase

The natural aesthetic character of the site will be changed. The the Eskom“ Hotazel - Heuningvlei” 132 kV power line crossing the project site, have already changed the visual characteristics of the site. The Gloria manganese mine is adjacent to the western side of the property.

Operational phase

Buildings and the solar modules have a *visual impact* and lights at night can be a *nuisance*.

Project Phase	Impact: Visual disturbance								Significance	
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	With Mitigation	Without Mitigation	
								With Mitigation	Without Mitigation	
Construction	Buildings& panels	Visual	Low	High	Low-Medium	High	High	Low-Medium	Medium	
	Lights	Visual	Low	Medium	Low-medium	Medium-high	High	Low-Medium	Medium	
Operation	Buildings and panels	Visual	Medium	High	Medium	High	High	Medium-High	Medium	
	Lights	Nuisance	Low	High	Low-medium	Medium-High	High	Low-Medium	Medium	
	Electrical lines	Visual	Low	High	Low	High	High	Low-Medium	Low-Medium	
Cumulative Impacts	Increased visibility of yet another solar park in the area	Increased visual intrusion and nuisance	Medium-High	Medium	Medium	Low-Medium	High	Low-Medium	Low-Medium	

Mitigation measures

- Plan construction activities when vegetation is dormant to minimise impacts.
- Earth works should be executed, only on the footprint and a small “construction buffer zone” around the proposed components are exposed. Indigenous vegetation should be retained as screening.
- Install light fixtures that provide precisely directed illumination to reduce light “spillage” beyond the immediate surrounds of the project site.
- Minimise the amount of light fixtures to the bare minimum and connecting these lights to motion sensors in order to limit light pollution.

- Limit high flood lights
- A video-surveillance system using infrared or microwave video cameras, which do not need a switched on lighting system, is recommended.
- Cumulative impacts will be low as it was possible to mitigate the visual impact at East 2 Solar Park successfully as a result of the natural characteristics of the area.

8.4.1.8. Safety, security and fire hazards

Construction phase

Construction activities such as excavating of foundations and trenches, movement of construction vehicles, the use of equipment and the congregation of workers and staff on site further increases the risk of injury. The activities of construction personnel on site may contribute to an increase in the level of crime in the area and may also contribute to an increase in the risk for fires.

Operational phase

Fires and criminal activities pose a significant risk during the operation of the development.

Project phase	Impact: Safety, security and fire hazards								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Construction activities – excavation of foundations, trenches etc.	Loss or injury to human life	Low-medium	Medium-high	Low	High	Medium	Low	Medium
	Security	Crime	Medium	Medium-high	Low-medium	Medium	Medium-high	Low - medium	Medium
	Fire hazards	Loss of human life and construction equipment etc.	High	Medium-high	Medium	Low	Low-Medium	Low-Medium	Medium
Operation	Security	Crime	Medium	High	Medium	Medium	Medium-high	Medium	Medium-high
	Fire hazards	Loss of human life, bio-diversity, buildings, infrastructure etc.	High	Medium	Medium-High	Low	Low	Low	Medium
Cumulative Impacts	Higher number of people in the area increases safety risks	Potential for an increase in criminal activity	High	Medium	Medium-High	Low	Low	Low	Medium

Mitigation measures

- The Contractor shall conform to the Occupational Health and Safety act (Act 85 of 1993) and regulations applicable. The Act requires the designation of a Health and Safety representative when more than 20 employees are employed.
- Open trenches or excavations must be marked with danger tape.
- The number of construction workers to stay on site should be limited to the minimum.
- Proper access control must be enforced to ensure no authorised persons enter the site.

- No solid waste or vegetation may be burnt on the premises or surrounding areas.
- Firebreaks should comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to prepare and maintain firebreaks).
- Fire extinguishers and firefighting equipment must be available.
- A fence should be constructed along the boundary of the development.
- Cumulative impacts of this impact can be successfully mitigated if managed properly.

8.4.1.9. Socio-economic impact

Construction phase

The construction and operation phases of the development will have a positive impact on the socio-economic environment of beneficiary communities through employment opportunities and training and skills development.

Operational phase

A number of permanent jobs will be created for local people during this phase. Palus Energy should identify a local Community for the purpose of entering into a partnership for the Project, as required by the rules of the REIPP Procurement programme.

Project phase	Impact: Job creation								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Operation	Job creation	Job Creation	High +	High +	Medium-high +	High +	High +	N/A	High +
Operation	Local Community development	Local Community development	High +	High +	high +	High +	High +	N/A	High +
Cumulative impacts	Increased potential for job creation.	Increased potential for local Community development	High +	High +	high +	High +	High +	N/A	High +

Mitigation measures

- During the construction and operational phases, jobs must be created for unemployed local people and skills must be transferred to them.
- Where viable, the work must be executed in a labour intensive manner to create as many jobs possible.
- The cumulative impact of this impact can just be positive. As one of the poorest provinces in South Africa, the Northern Cape is definitely in need of more job opportunities.

8.5. POTENTIALLY SIGNIFICANT IMPACTS

Impacts with a rating of Medium-high or High are impacts which are regarded as potentially significant, rated without any mitigation measures. In this impact assessment, the following impacts were regarded as potentially significant impacts:

- i. Water pollution by the inadequate functioning of the sanitation system.
- ii. Water consumption and depletion during construction phase.
- iii. The occurrence of veldt fires.
- iv. Security on site in operational phase.

These impacts (i-iv) will now briefly be discussed.

8.5.1. Cumulative impacts

- i. The effect of water pollution (surface and groundwater) by a malfunctioning of the sanitation system will have a cumulative effect only if it is not detected by a regular monitoring and if it takes place on a regular basis.
- ii. This effect is cumulative only if care is not taken to conserve water and if water usage and the water levels of boreholes are not monitored regularly.
- iii. This can have a cumulative effect if preventative measures are not followed.
- iv. This can be cumulative if not controlled effectively

8.5.2. Nature of impact

- i. This is pollution of a renewable resource.
- ii. This is a negative impact that affects water quantity available for use in the area.
- iii. Damage to property, ecology and safety of people.
- iv. Damage to and loss of property.

8.5.3. Extent and duration of impact

- i. The extent could potentially be within the farm of the proposed development and the surrounding farms.
- ii. The extent could potentially be within the area of the proposed development and the surrounding farms. The duration is only during construction.
- iii. The extent is potentially on the development area as well as surrounding properties and even regional. The duration is for the life of the development.
- iv. The extent could be on the development area as well as on surrounding properties and similar developments in the area.

8.5.4. Probability of occurrence

- i. The probability is unlikely.
- ii. The probability is possible.
- iii. The probability is infrequent or seldom.
- iv. The probability is likely

8.5.5. Degree to which impact can be reversed

- i. Impact is reversible if mitigated in time.
- ii. This impact is reversible because the higher abstraction will only be during the construction period.
- iii. If the development is not continuing there will be no guarantee that veldt fires will not occur on the property. This impact must therefore be managed accordingly.
- iv. Reversible if mitigated effectively

8.5.6. Degree to which impact can cause irreplaceable loss of resource

- i. If this impact takes place over a very long time and there is gross negligence, the water resource can be damaged to a point where it will take very long to recover and where it could almost be seen as being irreplaceable.
- ii. The recovery of the water resource is linked to rainfall and will recover accordingly. The negative impact is during the construction period.
- iii. Veldt fires can create such damage that it will take a long time for the veldt to recover but the fact is that the vegetation has been subjected to veldt fires ever since. Loss of property (buildings) can be replaced.
- iv. N/A.

8.5.7. Degree to which impact can be mitigated

- i. Successful mitigation is possible
- ii. Successful mitigation is possible
- iii. Successful mitigation is possible
- iv. Successful mitigation is possible

9. DECOMMISSIONING PHASE

Decommissioning activities of the PV plant mainly include removal of project infrastructure and restoring of the site's *status quo ante*.

The decommissioning phase will start at the end of the PV power plant lifetime (25 - 30 years) and will last approximately 6 months, involving a team of 50 workers.

Decommission will be subject to a decommissioning plan once the project is nearing its operational life (25-30 years). Decommissioning will also be subject to an environmental authorization (Activity 31 of R983 of 14 December 2014).

9.1. SITE PREPARATION

In order to ensure a correct decommissioning of the site, the first step of the process will include adequate site preparation. Integrity of access points and of laydown areas will be confirmed and eventually re-established in order to accommodate equipment and to load vehicles.

9.2. DISASSEMBLE AND REPLACEMENT OF EXISTING COMPONENTS

All components will be disassembled. Silicon of the PV modules will be recycled, as well as mounting structures (aluminium or zinc-coated steel frames and piles) and cables (copper and/or aluminium conductor).

Non-recyclable components of inverter, transformers and electrical devices will be disposed in appropriate way, in compliance with applicable laws and international standards.

9.3. RESTORATION OF THE SITE

Adequate measures will be undertaken in order to restore the site by re-planting of indigenous plant species.

9.4. ALTERNATIVE OPTION: UPGRADING THE SOLAR PARK

At the end of the PV power plant lifetime (25 ÷ 30 years), as alternative option to the decommissioning, it will be evaluated the feasibility of upgrading the solar park with the most appropriate technology/infrastructure available at that time.

10. CONCLUSIONS AND RECOMMENDATIONS

The EIA Report describes the activities undertaken for the development of the East 2 Solar Park.

The purpose of this report is to provide the relevant authorities and interested and affected parties with sufficient information regarding the potential impacts of the development to render meaningful comments. Potential impacts were identified in consultation with I&AP's and technical specialists (where applicable) and were assessed using a matrix and by applying professional knowledge.

The potentially significant negative impacts that have been identified should be mitigated through the implementation of the mitigation measures highlighted in this report. It is submitted that the proposed mitigation measures, will effectively diminish the impacts to acceptable levels. Given the socio-economic imperatives of the development, the residual impacts are not of sufficient importance to thwart the development.

The site of East 2 Solar Park has been chosen by Palus Energy on the grounds of several considerations, in particular:

- the high need for electricity supply to the Hotazel area, due to the presence of several mines under operation and under construction, including the **Hotazel Manganese, Kalagadi Manganese, Gloria and Assmang mines**;
- the availability of several connection alternatives, due to the presence of Eskom "Hotazel - Heuningvlei" 132 kV power line, which crosses the project site, and of the Eskom Hotazel and Umtu substations, 3.5 km South and 4 km South-West of the project site respectively;
- the flatness of the proposed project site;
- the medium ecological sensitivity and the low agricultural value of the proposed site.

The proposed PV plant development area is located:

- 1.5 km east from the **Assmang mine on Portion 1 of the Farm Gloria 266**;
- 8 km south-east from the **Assmang mine on Farm N' Chwaning 267**;
- 4.0 km north from the **Hotazel mine, on the Farm Hotazel 280**;
- 6 km north-east from the **Kalagadi Manganese mine, under construction on Farm Umtu 281 and Olive Pan 282**.

The project site is located in the **Joe Morolong Local Municipality**. The **Spatial Development Framework (SDF) 2012** of the Joe Morolong Local Municipality has three main nodes where relatively higher economic activity takes place, namely Vanzylsrus, Hotazel and Blackrock. The proposed solar park is situated near Hotazel and Blackrock. It is stated in the SDF that investment should be focused on these areas to expand the node into a more diverse economic centre. It is mentioned that a replacement economic activity should be found when the mineral resources are depleted for Hotazel and Blackrock. The proposed renewable energy project will contribute towards meeting this goal by introducing new economic activity and job opportunities to the area.

The SDF furthermore outlines Spatial Planning Categories. Spatial Planning Category F involves *Surface infrastructure and Buildings, i.e.* all surface infrastructure and buildings, including roads, railway lines, power lines, communication structures, etc.

The Sub-Category: F(i) includes *Renewable Energy Structures*: These include any wind turbine or solar photovoltaic apparatus, or grouping thereof, which captures and converts wind or solar radiation into energy for commercial gain irrespective of whether it feeds onto an electricity grid or not. It includes any appurtenant structure or any test facility which may lead to the generation of energy on a commercial basis.

Development Guidelines for Sub-Category: F(i) states that "*all surface infrastructure and buildings that are required for sustainable socio-economic development and resource use must be undertaken in accordance with site specific design and planning guidelines. All industry must be regulated and managed in accordance with sustainability standards (e.g. ISO 14001)*".

The East Solar Park will comply with the international standards and regulations for photovoltaic power plants.

The proposed solar park, situated nearby Hotazel and Blackrock, will aid the Municipality in the upliftment of these areas. It will a sustainable form of land development and will be developed in compliance with the Development Guidelines stipulated under Sub-Category F(i) of the SDF. The proposed Solar Park will comply with the SDF of the Joe Morolong Local Municipality.

The development of clean, green and renewable energy has been qualified as a priority by the Government of South Africa. The **Renewable Energy IPP Procurement Programme (REIPPPP)**, issued on 3rd August 2011 by the Department of Energy, envisages the commissioning of 3725 MW of renewable projects (1450 MW with solar photovoltaic technology) capable of beginning commercial operation before the end of 2020.

The development of photovoltaic power plants will represent a key feature in the fulfilment of the proposed goals and the reduction of CO₂ emissions.

The purpose of the East Solar Park is to add new capacity for the generation of renewable electric energy to the national electricity supply in compliance with the REIPP Procurement Programme and in order to meet the "sustainable growth" of the Northern Cape Province.

The following socio-economic benefits were found in the Socio-economic Impact Assessment:

- The national and local economies will benefit from civil contractor work, labour and building materials that will be required on site. On the whole, a share approximately **40% of total CAPEX (investment costs)** will be sourced locally. This share is likely to increase once there will be a specific and competitive industry in the Republic of South Africa able to supply PV modules and other technological components.
- After approval, each project will take approximately **15 months** to be built and will have a lifetime of 25-30 years. For each project, approximately **100 people** are expected to be employed during the construction period, although this number can increase to 150 for short spaces of time during peak periods.
- During operational phase, each power plant will require a permanent staff approximately **35/40 people**. That impact will be positive, also in consideration of the slowing down of the recruitment rate due to mining stabilization activities.
- Approximately **50% of the operation costs** will have a local economic return (mostly for maintenance works by local sub-contractors), then the impact will also be positive during the operational phase (25÷30 years).

- The project will comply with the Economic Development Requirements, as requested by the REIPP Procurement Programme, issued on 3rd August 2015 by the DoE. This economic development programme identifies needs of the surrounding communities in order to have a positive socio-economic impact. In particular, Palus Energy is required to identify a **Local Community** for the purpose of entering into a partnership for the project.

It is the professional opinion of AGES that the proposed development is **highly desirable** and **does not present any fatal flaws in terms of negative impacts to the environment** and therefore will not have any significant detrimental impacts to render the project unfeasible.

It is proposed that the following conditions must be included in the Record of Decision if the project is authorised:

- The mitigation measures contained in this report must be implemented.
- The management and or mitigation measures contained in the Environmental Management Plan must be implemented.
- The responsibilities to obtain any further authorisations and/or licenses will rest on the proponent of the project, PRIOR to any activities on site.