FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

THE PROPOSED MAREETSANE BATHO-BATHO SOLAR PV FACILITY

Prepared for:
Kgatelopele Private Equity and Venture Capital (Pty) Ltd
29 Tulipwood, Van Heerden
Halfway Gardens
Midrand
1686

Submitted to:

Department of Environmental Affairs
Fedsure Building
315 Pretorius Street
Pretoria

Prepared by:

Strategic Environmental Focus (Pty) Ltd
CSIR Campus
Building 4, 2nd Floor
Meiring Naude Street
Brummeria, Pretoria

Tel. No.: +27 12 349 1307
Fax. No.: +27 12 349 1229

Website: www.sefsa.co.za
E-mail: sef@sefsa.co.za

S · E · F
STRATEGIC ENVIRONMENTAL FOCUS

FEBRUARY 2014

SEF Ref: 504744
DEA Ref: 14/12/16/3/3/2/514
NEAS Ref: DEA/EIA/0001785/2013

PURPOSE OF DOCUMENT

A period of **30 calendar days** (**21 February 2014– 24 March 2014**) has been provided to **State Departments** and **registered Interested and Affected Parties (I&APs)** for the review and commenting phase of the Final Environmental Impact Report (EIR). All I&APs as well as State Departments have been notified of this review period.

The Final EIR contains the following information:

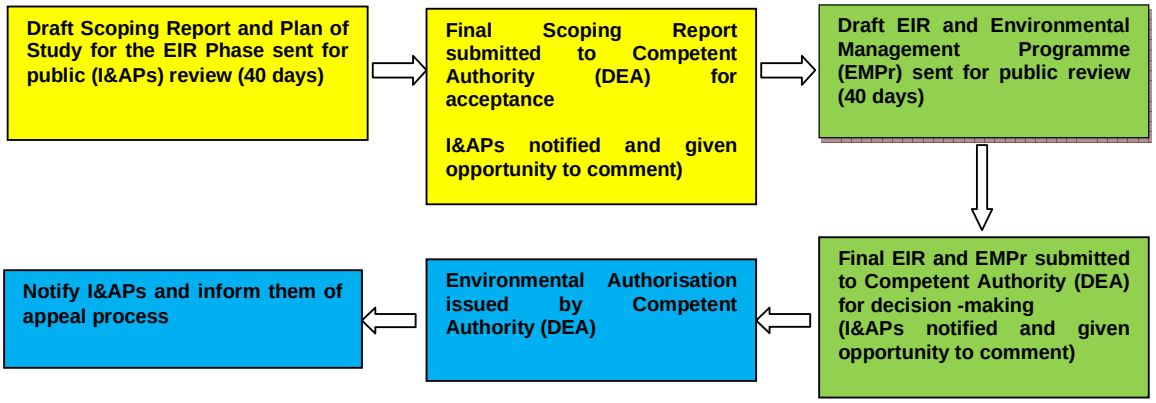
- A description of the project, including project motivation;
- A description of the environment affected by the project;
- The Public Participation Process (PPP);
- Discussion of applicable alternatives;
- Assessment of impacts for the construction and operational phases; and
- The Environmental Assessment Practitioner's (EAP's) recommendations.

The Final EIR can be viewed at the following venue:

Name of public venue	Name of Contact Person	Contact Number(s)	Viewing Times
Mareetsane Tribal Office 636 Zone 1, Batho-Batho, 2716	Chief G.G. Motshegare	072 630 6139	Mon - Fri (09h30 to 16h00) and Sat (09h30 to 14h00)

Should you wish to participate in the Scoping and Environmental Impact Reporting (S&EIR) process by contributing issues of concerns/comments, please register as an I&AP by completing the enclosed Registration and Comment Sheet or you can visit Strategic Environmental Focus (Pty) Ltd (SEF's) website at http://www.sefsa.co.za. To register as an I&AP or comment on the project, click on "Stakeholder Engagement". Click on the "register" button and complete the compulsory fields to register as an I&AP. Click on client login and use your details to login and view the Final EIR for the proposed **Mareetsane Batho-Batho Solar Photo Voltaic (PV) Facility** and associated appendices. Should you have any problems in obtaining the information from the internet, please feel free to contact SEF for assistance.

Comments on this Final EIR should be submitted directly to the Department of Environmental Affairs (DEA) having copied SEF in all communications. The DEA reference number (**DEA Ref: 14/12/16/3/3/2/514 and NEAS Ref: DEA/EIA/0001785/2013**) should be used in all communication with the DEA.



PROJECT SUMMARY	
Project Name	The Mareetsane Batho-Batho Solar Photovoltaic (PV) Facility.
Farm Name and Portion	The site has been surveyed and a draft Surveyor General (SG) diagram has been compiled (refer to Appendix 11). The SG diagram has been submitted to the SG's office for registration. The site falls within a parent portion of the Setlagoli Native Reserve and has an SG Code: BOIO000000000030400000. The farm is Tribal Land administered by Chief G.G. Motshegare.
Brief Development Overview	The proposed Mareetsane Batho-Batho Solar PV Facility will generate approximately 30 Mega Watts (MW) of power for distribution into the National Grid, specifically for the benefit of the local Mareetsane Batho-Batho Community located to the north-east of the proposed development. Three alternative powerline routes have been considered and assessed in this Final Environmental Impact Report (EIR) from which the most environmentally, socially and economically feasible powerline route alternative will connect the proposed solar facility to the National Grid – via one of the two existing Eskom substations (located to the north-east and north-west of the proposed plant). From the Specialist Studies conducted, findings show that powerline route alternative B is the most preferred, and therefore connection will be via the Mareetsane Substation on the north-eastern side of the proposed solar facility. Route B (approximately 15km in length) runs parallel to the existing Eskom powerline towards the substation situated north-east of the proposed site (Mareetsane Substation). It is recommended that the route does not turn east but continues in a northerly direction to the R375 before turning west to the substation at Mareetsane. Access to the site is proposed via the Setlagoli Native Reserve. There are no formal roads in the reserve and a service road will need to be designed and constructed to support the life span of the project. The road length will be approximately 500m and include a rail way track crossing.
Solar Technology	The proposed PV facility will use Crystalline Silicon PV technology with a fixed tilt mounting system.
Generation Capacity	30 MW.
Development Footprint	The proposed solar facility site is approximately 140ha in extent. The proposed 88kV overhead powerline predominantly falls within the existing Eskom powerline servitude.
Development / Structure Height	The proposed energy facility development will have a maximum height restriction

<table>
<tr><td></td><td>of 3m above ground level (AGL). The proposed Overhead Electric Transmission/Power Line will be restricted to a maximum of 21m AGL. An approximate distance of 4m is proposed between solar panel rows to avoid shading.

Eskom has laid down servitude widths in excess of those required by the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (OHSA). These building restrictions are constant throughout the length of power line of any particular voltage - conductor size, type of construction and route permitting. These may be reduced in accordance with the above where land values are very high. Current practice within Eskom is that each region has its own standard building restrictions, which are applicable throughout that region.

The building restriction distances given are perpendicular from the centreline of the power line to the edge of the building restriction on one side of the power line. In order to obtain the total building restriction of a single power line the figures should be multiplied by two. Separation distances between power lines that run parallel to each other are necessary in order to avoid excessive induction. The separation distance between two parallel lines is measured perpendicularly from the centre of the one line to the centre of the other line.

Table 1: Guidelines for different voltages and requirements- Applicable separation distances for different operating voltages
<table>
<tr><th>Voltage</th><th>Building restriction on each side of centre line</th><th>Separation distance between parallel lines</th></tr>
<tr><td>88kV</td><td>11 metres</td><td>12 to 15 metres</td></tr>
</table>
</td></tr>
<tr><td>Development / Structure Orientation</td><td>The solar panels will be facing north.</td></tr>
<tr><td>Lay Down Area Dimensions</td><td>The construction camp will be located 300m outside the north eastern part of the development footprint (Please refer to Appendix 3 for the construction camp layout).</td></tr>
<tr><td>Site Photographs</td><td>Refer to Appendix 2.</td></tr>
<tr><td colspan="2">Additional Authorisations Required</td></tr>
<tr><td>Water Use License</td><td><u>National Water Act, 1998 (Act No. 36 of 1998) (NWA) – Section 21</u>

Due to water resources identified on site (i.e. wetlands) and the close proximity of the Morokwa River, the proposed development triggers the following water uses listed in Section 21 of the NWA, and an application for a WUL is being submitted with this Final EIR:

c) impeding or diverting the flow of water in a watercourse; and
i) altering the bed, banks, course or characteristics of a watercourse.

The Ratlou Local Municipality (RLM) have confirmed that they would not be able to provide the project with water. The Draft EIR mentioned the fact that should water supply from the municipality not be available, a borehole will be used to</td></tr>
</table>

	supply water. This borehole would need to be licensed by the Department of Water Affairs (DWA). In addition to section 21 (c) and (i) of the NWA, section 21 (a) is being added for application of a WUL. Proof of application for a Water Use License Application (WULA) is being submitted with this Final EIR in Appendix 4.
Confirmation of Capacity to Supply Bulk Services	
Water	During construction, 25,000–40,000 m^3 of water will be required over a period of 6 - 12-month construction period. Water will be needed to control dust during grading operations and to control dust on the construction roads. During operation of the proposed facility, approximately 400 m^3 of water per year will be needed for washing of panels for maintenance. The following is therefore assumed: • Two washes per year; and • 0.001 m^3 of water necessary per square meter of panel. **For the Construction and Operational Phases**: Water will be required for construction and will also be required for module washing. Washing of modules is a site-specific decision, taking into account the availability of water and the economic benefit for the site. The RLM have confirmed that they would not be able to provide the project with water. The Draft EIR mentioned the fact that should water supply from the municipality not be available, a borehole will be used to supply water.
Stormwater Attenuation	**Operation Phase:** Stormwater generated by the Batho-Batho PV Facility will have a low runoff factor. The post-development flood risk will not increase significantly due to the fact that the existing ground surface will be left undisturbed. Solar panels will capture rain droplets but droplets will fall onto undisturbed *in situ* soil with the same characteristics as per the pre-development flood. Thus, stormwater runoff will be influenced mainly by the internal road network and mitigation measures will focus on limiting the effect that the internal road network will exert on the post-development flood risk. Permanent structures associated with the Batho-Batho PV Farm, apart from the solar panels themselves, will only include a control room building. It is proposed that a gutter system be installed to capture all stormwater falling on the structure's roof and redirecting it into a $2m^3$ stormwater attenuation tank. In order to mitigate all stormwater runoff from the Batho-Batho Facility, a berm must be constructed along the south western perimeter of the site to intercept all stormwater. No subsequent development will be allowed within the imposed flood line. The attenuation dam will be situated in the south western corner of the site. The dam will have a cross sectional area of 3 540m^2 with an average depth of approximately 1.5m. Stormwater in the attenuation dam will gradually seep into the ground as well as evaporate into the atmosphere. Storms with intensities larger than 1:100 year flood events and storms with 1:100 year storm durations

	longer than 5 minutes will be diverted into an overflow system which leads into the identified wetland area.
Sewage	**Construction and Operational Phases:** During construction, workers will not be housed/ based on site and will be transported to and from the site every day. It is expected that more than 300 workers will be employed to oversee the construction of the solar facility. It is stipulated that the amount of effluent generated is 25 litres per person per day for toilet use. 20 litres per person per day will be added for all permanent staff. This accumulates to an overall figure of 7 500 litres ($7.5m^3$) per day during the construction phase and 1 100 litres ($1.1m^3$) per day during the operational phase. Conservancy tanks will be installed to contain human effluent during the construction and operational phases of the project. The tanks will be emptied and disposed of at the nearest sewage treatment plant, in this instance located in Mahikeng. The level in the conservancy tank will be monitored by permanent staff to prevent overloading. As per SANS 10252-2, waste generated during the construction and operational phases will accumulate to $7.5m^3$ and $1.1m^3$ respectively per day. 8 X 6 m^3 (48 m^3 in total) tanks will be installed during construction and 2 X 6 m^3 (12 m^3 in total) tanks will be installed during operational phase. A vacuum tanker will convey the effluent on a weekly basis.
Electricity	**Construction Phase:** Diesel Generators will be used. **Operational Phase:** The electrical reticulation and connection to the grid has taken the 30 MW PV array into account and will be sufficient to export the power back into the grid. The overhead line will supply power to the site from the grid when there is insufficient power available from the solar farm, and conversely feed power back into the grid when there is excess renewable energy available from the solar farm. Various alternatives have been explored for connection to the national grid (see details below in Section E).
Solid Waste	**Construction Phase:** Construction waste generated is expected to include solar panel packaging, cable drums and contaminated soil. Packaging includes plastic wrapping, cardboard boxes and wooden pallets. It is estimated that at least 5000 boxes and wooden pallets will be generated by the proposed Batho- Batho PV Facility project. This will equal to 50 tonnes of boxes and 150 tonnes of wooden pallets. Soil contamination due to diesel spillage is also a factor that must be considered. In order to contain any contamination of soil, it is proposed that a diesel tank bund area will be constructed for the housing of the diesel tank. The Contractor will be responsible for the management and removal of all solid waste (refer to the Environmental Management Programme (EMPr) in Appendix 9).

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Strategic Environmental Focus (Pty) Ltd (SEF) is a privately owned company and was formed in 1997 with the objective of providing **expert solutions to pressing environmental issues. SEF is one of Africa's largest multi-disciplinary consultancies** assisting the private sector and government in managing the sustainability of our natural resources. SEF has been proactively providing these sustainable solutions for over 15 years, with offices located across the major centres of South Africa, as well as offering global expertise through years of experience providing these sustainable solutions on many international projects.

As a proudly South African company, SEF has been responding and resolving issues of environmental sustainability in the development sector, for over a decade and a half, and we have been privileged and honoured to have been part of the development of some of our country's most prized national landmarks, in both the private and public domain.

As a business steeped in entrepreneurship, we pride ourselves on being innovative and future focussed, driven through our unique offering of having all types of environmental consultant specialists under one roof. SEF's core environmental experts have extensive experience in dealing with Environmental Impact Assessments (EIAs), Public Participation Processes (PPP), Architectural and Landscape Architecture, Mining and Environmental Management. SEF also has a team of specialist practitioners such as specialists in Heritage Impact Assessments (HIA), Wetland Delineation and Functional Assessments; Wetland/ Riparian Rehabilitation, Aquatic Assessments; Ecological (Fauna, Avifauna and Flora) Assessment, Visual Impact Assessments (VIAs), Soils and Agricultural Potential Assessments, Socio-Economic Assessments, etc.

SEF's Vision

SEF is a national sustainability consultancy which provides integrated and innovative Social, Biophysical & Economic solutions while fostering strategic stakeholder relationships, underpinned by SEF's core values.

SEF's Mission

SEF offers holistic and innovative sustainable solutions in response to global challenges.

SEF is a Qualifying Small Enterprise (QSE) and a **Level 2 contributor in terms of the Broad Based Black Economic Empowerment** Act, 2003 (Act No. 53 of 2003) and has a procurement recognition level of 135%.

SEF commits itself to comply with the requirements and the implementation of a Quality Management System (QMS). The QMS will be reviewed and implemented to continually improve efficiency and effectiveness of the organisation.

SEF uses a "green" approach to anything we embark on. We believe in using technology to our and the environment's best advantage. We encourage the use of green alternatives such as telephone and video conferencing instead of travelling for workshops and meetings and Compact Discs (CDs) instead of printed material, where possible.

The following project team members are involved in this S&EIR application process.

Table 2: Project Team Members

Name	Organization	Project Role
Mr Craig Allen	SEF	Executive Director: Mining & Environment & Project Manager
Ms Mpho Manyabe	SEF	Environmental Manager
Mr Mandla Zuma	SEF	Environmental Assistant and facilitator for the PPP

Mr Craig Allen

Craig Allen has been an EAP for 7 years during which he has managed projects ranging in size and scope from small BAs to large-scale mining related EIAs throughout Southern Africa. Craig has excellent working knowledge of the NEMA and Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) Regulations and is an Executive Director for the Mining & Environment Division within SEF. As such he provides technical supervision for projects, project leadership on large-scale environmental assessments and quality assurance on EIAs, Environmental Management Plans (EMPs), Environmental Management Programmes (EMPRs) and Basic Assessments (BAs).

Ms Mpho Manyabe

Mpho has obtained her National Diploma in Environmental Sciences from the Tshwane University of Technology (TUT). Mpho has 6 years of work experience in the field of environmental management from various consulting companies. Mpho has previously worked as an assistant environmental consultant conducting EIAs for the mining industries and service stations, and also other small industries. She has also been involved in numerous Public Participation Processes (PPPs) throughout the Gauteng Region. She previously had been employed as an environmental scientist where she was involved in environmental assessment projects, for Parastatals, National Departments and Municipalities from 2008 to 2011. She has also been involved in Safety, Health and Environmental (SHE) management for private and public entities where she had been the overall project manager for such projects.

Mr Mandla Zuma

Mandla obtained a BSc in Environmental Management from the University of Zululand in 2009. He worked with the Department of Environmental Affairs (DEA) (Oceans and Coasts) as an Intern in the Coastal Conservation Strategies section for four months; where the main responsibilities included looking after coastal information. He then worked with SEF as an Intern for seven months and was later appointed as an Environmental Assistant. Mandla has been assisting in compiling BAs and EIAs and related tasks. He has been involved in tasks requiring good legislation interpretation and also assists with public and authority consultation.

Table 3: Contact Details of Environmental Assessment Practitioner

Name	Contact Details
Mr Craig Allen	Strategic Environmental Focus (Pty) Ltd Postal Address: PO Box 74785, Lynnwood Ridge, PRETORIA, 0040 Tel: +27 12 349 1307 Fax: +27 12 349 1229 Email: craig@sefsa.co.za

EXECUTIVE SUMMARY

1 INTRODUCTION

Strategic Environmental Focus (Pty) Ltd (SEF) has been appointed by Kgatelopele Private Equity and Venture Capital (Pty) Ltd (KPEVC) to undertake an environmental application process for the proposed Mareetsane Batho-Batho Solar Photovoltaic (PV) Facility and associated infrastructure (i.e. powerline).

A Scoping and Environmental Impact Reporting (S&EIR) process is being conducted for this project based on triggered listed activities within the Environmental Impact Assessment (EIA) Regulations of 2010 [Government Notice Regulation (GNR) No's 543; 544; 545 and 546] promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).

The Scoping Phase for the NEMA Environmental Authorisation (EA) Application for the proposed project has been completed and the Plan of Study (PoS) for the Environmental Impact Report (EIR) was approved by the Department of Environmental Affairs (DEA) on 28 June 2013.

The purpose of this Final EIR is to comprehensively assess the impacts associated with the proposed development and to provide all interested and affected parties (I&APs), and relevant State Departments, with an opportunity to comment and provide input into the process going forward. All comments received during the review and commenting phases have been incorporated into this Final EIR for consideration by the approving authority, in this instance the DEA.

2 BRIEF PROJECT DESCRIPTION

The proposed Mareetsane Batho-Batho Solar PV Facility will be located on Tribal Land approximately 10 km south-west of the Batho-Batho Village within the jurisdiction of the Ratlou Local Municipality (RLM), Ngaka Modiri Molema District Municipality (NMMDM) in the North West Province and falls within the Quarter Degree Grid Cell 2625AB (refer to the Locality Map in Appendix 1).

The proposed site for the solar facility is approximately 140 hectares (ha) in extent and is estimated to generate approximately 30 Mega Watts (MW) of electricity which will be fed into the National Grid via one of the two existing Eskom substations. The proposed overhead powerline will fall within the existing Eskom powerline servitudes, and will be associated with approximate 50 m servitude (i.e. 25 m on either side of the powerline centre line). Two high voltage Eskom substations and associated high and medium voltage powerlines are located to the north-east and north-west of the proposed site. The substations are approximately 10-12km from the proposed solar facility site. A railway line runs along the south-eastern boundary of the proposed site (please refer to the Locality Map in Appendix 1).

The technology that is proposed for the solar facility is **"fixed Polycrystalline PV module"** technology. With this technology it is estimated that approximately 1 MW of electricity can be generated for every 1.9 ha (in optimal conditions) of solar panels. Polycrystalline panels use solar cells that are cut from multifaceted silicon crystals. They are less uniform in appearance than monocrystalline cells, but are more efficient at converting direct sunlight into electricity than thin-film technology. The solar panels will all be north facing and will be approximately 3m in height and at an angle of 30^0. Each solar panel is envisaged to be made up of either 2 X 5 or 2 X 10 individual PV modules; with each PV module being 1.65 m long and 0.99 m wide. Solar panels will be mounted on steel columns and secured *in situ* into the soil. As per industry norms, all solar plant equipment will be raised 200mm above natural ground level to combat stormwater erosion.

An approximate distance of 4m is proposed between solar panel rows to avoid shading.

Eskom has laid down servitude widths in excess of those required by the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (OHSA). These building restrictions are constant throughout the length of power

line of any particular voltage - conductor size, type of construction and route permitting. These may be reduced in accordance with the above where land values are very high. Current practice within Eskom is that each region has its own standard building restrictions, which are applicable throughout that region.

The building restriction distances given are perpendicular from the centreline of the power line to the edge of the building restriction on one side of the power line. In order to obtain the total building restriction of a single power line the figures should be multiplied by two. Separation distances between power lines that run parallel to each other are necessary in order to avoid excessive induction. The separation distance between two parallel lines is measured perpendicularly from the centre of the one line to the centre of the other line.

Table 4: Guidelines for different voltages and requirements- Applicable separation distances for different operating voltages.

Voltage	Building restriction on each side of centre line	Separation distance between parallel lines
88kV	11 metres	12 to 15 metres

The PV system will be composed of the following components *inter alia*:

- PV modules;
- Inverters;
- MV/LV transformers;
- 35kV/ 88kV substation;
- Electrical wiring;
- Protection system; and
- Electrical Switchgear.

The 35kV/ 88kV substation will have lighting masts associated with it. These masts will be approximately 21m in height. The substation transformers will have transformer oil within them (between 30 – 50 m^3) which is necessary for the functioning of the substation. The Substation will be constructed in accordance with the relevant SANS standards and Eskom specific technical specifications. The substation transformers will have a bund wall around them for containing any oil leaks. There will be a concrete reinforced oil dam to hold any spillages should the transformers have a complete breakdown/ failure which results in any oil leakage/ spillage. It is necessary to be able to drain the oil away from the transformer bunding areas, and the oil dam provides for this.

It is important to recognise that such an event has a low probability of occurrence with a transformer rupture (that would result in a spill) being highly unlikely even throughout the entire lifespan of the substation. Because the transformer is exposed to the elements, the bunding around the transformers accumulates rainwater during rainfall events. At the same time there may be small spillages of oil within the bunding area which may be flushed through to the oil dam by the rainwater. As a result a water/ hydrocarbon separator or “oil trap” will be connected to the oil dam. A pump will automatically suck out the water from the “oil dam” from the bottom (as oil floats on top of water). This liquid will then flow through the “oil trap” which is lined with an oil absorbent cushion (which removes the oil (if any)) and releases “hydrocarbon free water”. Any oil that is lost from the transformer is removed, recycled where possible and if not recycled then disposed of at a suitably licensed waste disposal facility.

Water will be required for construction and will also be required for module washing. Washing of modules is a site-specific decision, taking into account the availability of water and the economic benefit for the site.

The RLM have confirmed that they would not be able to provide the project with water. The Draft EIR mentioned the fact that should water supply from the municipality not be available, a borehole will be used to supply water.

Permanent structures associated with the Batho-Batho PV Farm, apart from the solar panels themselves, will only include a control room building. It is proposed that a gutter system be installed to capture all stormwater falling on the structure's roof and redirecting it into a $2m^3$ stormwater attenuation tank.

During construction, workers will not be housed/ based on site and will be transported to and from the site every day. It is expected that more than 300 workers will be employed to oversee the construction of the solar facility. It is stipulated that the amount of effluent generated is 25 litres per person per day for toilet use. 20 litres per person per day will be added for all permanent staff. This accumulates to an overall figure of 7 500 litres ($7.5m^3$) per day during the construction phase and 1 100 litres ($1.1m^3$) per day during the operational phase.

Conservancy tanks will be installed to contain human effluent during the construction and operational phases of the project. The tanks will be emptied and disposed of at the nearest sewage treatment plant, in this instance located in Mahikeng. The level in the conservancy tank will be monitored by permanent staff to prevent overloading.

As per SANS 10252-2, waste generated during the construction and operational phases will accumulate to $7.5m^3$ and $1.1m^3$ respectively per day. 8 X 6 m^3 (48 m^3 in total) tanks will be installed during construction and 2 X 6 m^3 (12 m^3 in total) tanks will be installed during operational phase. A vacuum tanker will convey the effluent on a weekly basis. Please refer to Figure 1 below.

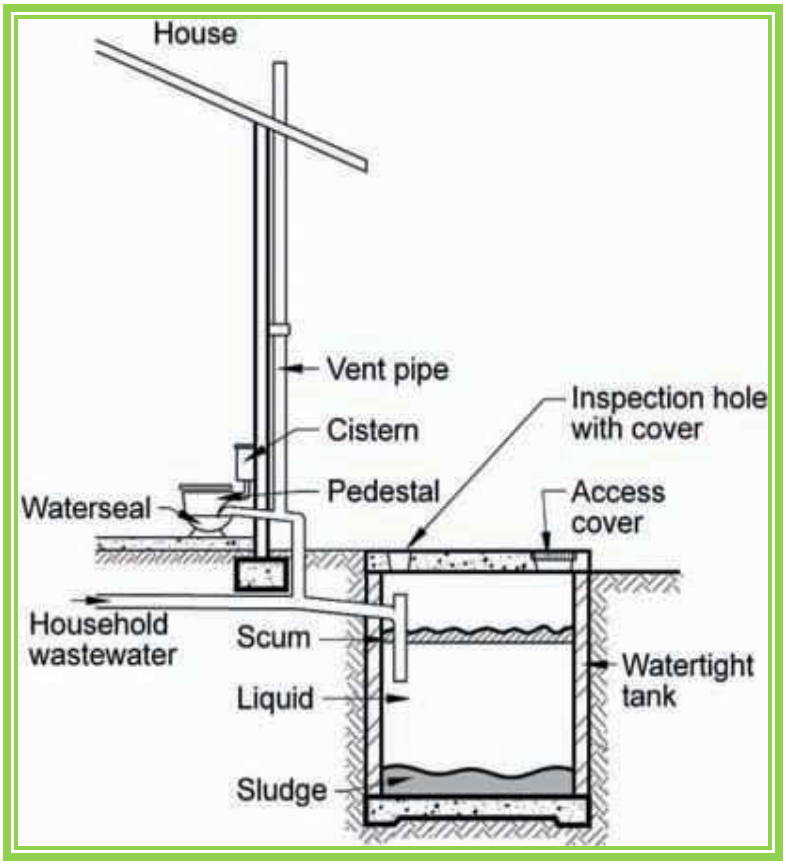


Figure 1: Schematic diagram of a typical conservancy tank

During the construction phase, diesel generators will be used. For the operational phase, the electrical reticulation and connection to the grid has taken the 30 MW PV array into account and will be sufficient to export the power back into the grid.

Access to the site is proposed via the Setlagoli Native Reserve. There are no formal roads on the reserve and a service road will need to be designed and constructed in order to support the life span of the project. The road length will be approximately 500m and include a rail way track crossing.

3 KEY IMPACTS

The following key impacts were identified during the Scoping Phase and have further been investigated and assessed within this EIR.

Biophysical Impacts:

- Potential impacts on surface water resources that occur in close proximity to the site (the non-perennial Morokwa River is situated to the west and south of the site) and wetlands scattered throughout the site (please refer to Appendix 7);
- Potential impacts of increased surface water run-off (*viz*. increased soil erosion) associated with the establishment of hard surfaces and vegetation clearing (mainly during the construction phase);
- Potential impacts on ground and surface water quality due to hydrocarbon spillages from vehicles during the construction phase of the development;
- Potential impacts on soils due to hydrocarbon spillages from vehicles during the construction and operational phase of the development;
- Destruction of flora within the proposed area, stemming from construction activities such as vegetation clearing and topsoil stripping within the site;
- Faunal displacement mainly during the construction phase of the project; and
- Adverse impacts on avifauna (the Provincially Protected *Afrotis afroides* (Northern Black Korhaan) was confirmed on site) as a result of potential habitat loss, additional overhead powerlines and the potential reflections of the solar panels (during the operation phase).

Socio-Economic Impacts:

- Increased dust and noise generation during the construction phase;
- Change in the visual character of the area;
- Potential increased access to electricity by the local community;
- Potential impacts on heritage resources (i.e. grave sites);
- Job creation during the construction and operational phases of the proposed project;
- Broader local economic development benefits for the communities within a 50 km radius as a result of the proposed Solar PV farm;
- Tourism attraction through visitation to the solar facility; and
- Develop education and training initiatives to enable the youth to develop skills especially in Science and Technology.

Cumulative Impacts:

- Possible increased loss of agricultural/ grazing land; and
- Increased visual impacts associated with additional powerlines.

4 PROJECT ALTERNATIVES

To give effect to the principles of the NEMA and Integrated Environmental Management (IEM), an EIA should assess a number of reasonable and feasible alternatives that may achieve the same end result as that of the preferred project alternative. The following alternatives have been identified as part of this EIA:

Alternative 1: Site/ Location Alternatives

A larger piece of land was considered for potential development with the intention of utilising only a portion deemed suitable for development. As a result, the proposed site (part of the Tribal Land) was the only site identified as feasible for the establishment of the solar facility, due to the following:

- Site is largely flat and suitable for the solar PV panels;
- Geotechnical soil conditions are suitable for structural foundation requirements conducive for construction of a Solar PV facility;
- High levels of solar insolation have been independently confirmed using Meteonorm software on the piece of land proposed for the solar facility. The site has been determined to have an annual average insolation of 2164 kWh/m^2;
- The proposed site is optimally located in close proximity to existing Eskom powerlines and nearby substations;
- Eskom has indicated there is capacity to absorb the MW proposed to one of the nearest substations;
- Availability of land within relatively close proximity to the local community it is intended to serve (this was the only site the land owner (Tribal Chief) has given consent for in terms of leasing it for this proposed development (Appendix 10));
- The site is easily accessible; and
- Off-take electricity agreement opportunities exist as the proposed land is within reasonable distance to mining activities in the area.

Alternative 2: Layout/ Design Alternatives

A representative conceptual design for the Mareetsane Batho-Batho project and the electrical arrangement of the project using a series of 2 MW blocks and a 35 kV collection system with four main feeders is appended to this report as Appendix 3. A 35 kV/88kV project substation would be equipped with a main power transformer to step the collection system voltage up to the grid voltage of 88 kV in order to minimise transmission losses. The electrical arrangement is representative and would vary based on contractor designs and equipment choices.

Two alternative layout/ design plans have evolved from the findings of specialist studies included as part of this report.

Layout Alternative 1: Development of the whole site (140 ha)

The proposed development initially required to develop the northern half of the site (based on the Feasibility Assessment which has been undertaken. The Specialist studies have been undertaken, and sensitivities on site have been identified. Originally, the entire site needed to be developed. The Feasibility Study (which was included in the Scoping Report) provisionally highlighted the northern section as less sensitive.

The technology that is proposed for the solar facility is **"Fixed Polycrystalline PV module technology**". Polycrystalline panels use solar cells that are cut from multifaceted silicon crystals. The proposed energy facility development will have a maximum height restriction of 3m above ground level (AGL). The proposed Overhead Electric Transmission/Power Line will be restricted to a maximum of 21m AGL. An approximate distance of 4m is proposed between solar panel rows to avoid shading. Solar panels will be mounted on steel columns and secured in situ into the soil. As per industry norms, all solar plant equipment will be raised 200mm above natural ground level to combat stormwater erosion.

Layout Alternative 2: Development excluding the sensitive areas on site (88.4 ha)

This layout alternative makes provision for the exclusion of the wetland and still maintains the feasibility of the solar facility. The wetland and a 32m buffer will be excluded from the development footprint. Layout Alternative 2 is the preferred alternative. This layout alternative makes provision for the exclusion of the sensitive areas and still maintains the feasibility of the solar facility and the associated powerline route alternatives. The sensitive areas and their buffers will be excluded from the development footprint.

Alternative 3: Route Alternatives

Three (3) powerline route alternatives for the proposed project have being considered (please refer to Section E below for more information).

Route A (approximately 18km in length) runs parallel to the existing Eskom powerline towards the substation situated to the north-west of the proposed site (Ferndale Substation). In terms of Soil and Agricultural Potential Assessment, taking both soil erosion and agricultural potential according to soil types into consideration, powerline route A would be the preferred powerline route alternative as the stream crossing along this route is rather narrow in its extent (width), while the route is also flexible. For instance, the powerline route can be shifted in a northerly direction to minimise impact on the Morokwa River towards the west of the solar facility site.

Sections of powerline route alternative A are located within both Mafikeng Bushveld and Western Highveld Sandy Grassland ecosystems. Core Biodiversity Corridors traverse powerline route alternative A located within the 1500m buffer of this Biodiversity Corridor. Several non-perennial drainage lines occur within the greater study area, with the Mareetsane and Morokwa Rivers intersecting the proposed powerline route alternative A.

Grave Site 8: 15 m east of powerline route alternative A – the grave site is located within the servitude which is a negative impact. Grave Site 9: 1 m east of Powerline route alternative A which is also a negative impact. Grave Site 10: 114 m south of powerline route A.

Powerline route alternative A is not preferred as two grave sites (Grave Site 8 and 9) are located within 20m of the proposed powerline corridor.

Several non-perennial drainage lines occur within the greater study area, with the Mareetsane and Morokwa Rivers intersecting the proposed powerline route alternative A.

Route B (approximately 15km in length) runs parallel to the existing Eskom powerline towards the substation situated north-east of the proposed site (Mareetsane Substation). Powerline alternative B is the preferred route; although it is recommended that the route does not turn east but continues in a northerly direction to the R375 before turning west to the substation at Mareetsane. The southern portion of Powerline Alternative Route B is located within the 3000m and 5000m buffer. Since there are no significant heritage resources occurring within 20m (i.e. which would be negatively impacted upon) of the outer edge of the proposed powerline route alternative B corridor. This alternative therefore is preferred from a heritage perspective. Several non-perennial drainage lines occur within the greater study area, with Mareetsane and Morokwa Rivers intersecting the proposed powerline route alternative B.

Route B is recommended as it follows existing linear developments within the study area.

Route C (approximately 46km in length) is an extension of **Route B** and continues parallel to existing Eskom powerlines towards the substation situated to the north-west (Ferndale Substation) of the proposed site. Refer to the Locality Map in Appendix 1. Sections of powerline route alternative C is located within both Mafikeng

Bushveld and Western Highveld Sandy Grassland ecosystems. Core Biodiversity Corridors traverse powerline route alternative C located within the 1500m buffer of this Biodiversity Corridor. Since there are no significant heritage resources occurring within 20m (i.e. which would be negatively impacted upon) of the outer edge of the proposed powerline route alternative C corridor. This alternative therefore is preferred from a heritage perspective. Several non-perennial drainage lines occur within the greater study area, with Mareetsane and Morokwa Rivers intersecting the proposed powerline route alternative C in a North-easterly and west directions.

Alternative 4: Technology Alternatives

Various technology alternatives have been considered and investigated/ assessed. These include the following alternatives:

- Crystalline silicon PV technology (preferred alternative);
- Thin-film PV technology;
- Concentrating PV technology; and
- Nanotechnology approaches.

Alternative 5: No Development Alternative:

The 'no-go' or 'no development' alternative would be applicable if the proposed development is not approved by the DEA. This would imply that the status quo of the site will remain. Should the proposed development not be implemented, the area will not be affected by any construction-related or operational phase impacts. Therefore, the present state of the biophysical, social and economic environment will remain, unaffected.

Under these circumstances there would be no changes to the environment along the proposed routes and site. However, the reliability of electricity supply to the Batho-Batho Community would remain a significant concern unless other sources of power generation and distribution are provided. With increasing economic activity and demand for electricity, the regional impact of electricity failures would be significant and increasingly severe. A potential for job creation, rural development and socio economic benefits that comes with the project development will not be realised.

5 CONCLUSIONS AND RECOMMENDATIONS

Having assessed all the potential environmental impacts associated with the development and taking all the specialist studies into consideration, Layout Alternative 2 (excluding the wetlands and a 32 m buffer), with Technology Alternative 1 (Polycrystalline PV modules) and Powerline Route Alternative B are the most suitable and preferred alternatives. The environmental impacts related to the preferred alternatives (and the development as a whole), with the correct implementation of mitigation measures (Appendix 9 – EMPr) can be effectively minimised, to allow the development to proceed. Refer to Section G for a detailed impact assessment.

The project life span is anticipated to be between 20 – 25 years, [if the contract to be an Independent Power Producer (IPP) is not renewed], the decommissioning of the solar facility is expected to have similar impacts as that of the construction phase. The site will be rehabilitated (refer to the EMPr in Appendix 9 for details), and the original carrying capacity will be restored as far as possible.

SEF is of the opinion that the proposed solar facility and the associated powerline be issued with a positive Environmental Authorisation from the DEA. However, to ensure that negative impacts are minimised and positive impacts enhanced, the following clauses are recommended as conditions of the EA:

- The EMPr is a legally binding document and the mitigation measures stipulated within the document must be implemented.

- An independent ECO must be appointed to manage the implementation of the EMPr during the construction phase. Environmental Audit Reports must be compiled and available for inspection.
- Due to the limited understanding of the impact of solar farm on biodiversity, a monitoring programme must be implemented that monitors flora/ vegetation composition, growth, etc. throughout the lifespan of the solar facility. This will provide valuable information on the long term impacts of the solar facility on the site's vegetation and will also assist in advising on the best rehabilitation practices, once the facility is decommissioned.
- The wetland areas with a 32 m buffer must be excluded from the development footprint.

Due to water resources identified on site (i.e. wetlands) and the close proximity of the Morokwa River, the proposed development will trigger the following water uses listed in Section 21 of the NWA, and an application for a WUL is being submitted with this Final EIR:

c) impeding or diverting the flow of water in a watercourse; and
i) altering the bed, banks, course or characteristics of a watercourse.

The Ratlou Local Municipality (RLM) have confirmed that they would not be able to provide the project with water. The Draft EIR mentioned the fact that should water supply from the municipality not be available, a borehole will be used to supply water. This borehole would need to be licensed by the Department of Water Affairs (DWA). In addition to section 21 (c) and (i) of the NWA, section 21 (a) is being added for application of a WUL.

Proof of application for a Water Use License Application (WULA) is being submitted with this Final EIR in Appendix 4.

During construction, workers will not be housed/ based on site and will be transported to and from the site every day. It is expected that more than 300 workers will be employed to oversee the construction of the solar facility. It is stipulated that the amount of effluent generated is 25 litres per person per day for toilet use. Approximately 20 litres per person per day will be added for permanent staff. This accumulates to overall 7 500 litres (7.5 m^3) per day during construction and 1 100 litres (1.1 m^3) per day during the operational phase.

Conservancy tanks will be installed to contain human effluent during the construction and operational phases of the project. The tanks will be emptied and disposed of at the nearest sewage treatment plant, in Mahikeng. The level in the conservancy tank will be monitored by permanent staff to prevent overloading.

As per SANS 10252-2, waste generated during construction and operational phases will accumulate to 7.5m^3 and 1.1m^3 respectively per day. 8 X 6m^3 (48m^3) tanks will be installed during construction and 2 X 6m^3 (12m^3) tanks will be installed during operational phase. A vacuum tanker will convey the effluent on a weekly basis.

The conservancy tanks would not be treating the waste, and therefore, there would not be a need for a Waste Management Licence (WML).

An Ecological Impact Assessment has described the relevant baseline conditions relating to the natural vegetation communities and faunal species in the area of investigation, and also recommended removal and transplanting of protected plants as well as the *in-situ* conservation of the Northern Black Korhaan.

The protected plant species referred to are as follows:

- Provincially protected: *Aloe zebrine, Ammocharis coranica, Bonatea antennifera, Crinum graminicola* and *Huernia sp*.
- Nationally protected: *Acacia erioloba*

These plant species are located on the proposed site. The provincial ordinances have been developed to protect these particular plant species within specific provinces. The protection of these species is enforced through permitting requirements associated with provincial lists of protected species. Permits are administered by the Provincial Department of Agriculture, Forestry and Fisheries (DAFF). This application will be lodged with the North West DAFF once a decision has been granted by the DEA.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

ASGISA	Accelerated Shared Growth Initiative for South Africa
BBBEE	Broad Black-Based Economic Empowerment
BA	Basic Assessment
CD	Compact Disk
DEA	Department of Environmental Affairs (previously DEAT)
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	Environmental Impact Reporting
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EPC	Engineering, Procurement and Construction Management Companies
FEPA	Freshwater Ecosystems Priority Areas
GIS	Geographic Information System
GN	Government Notice
ha	Hectares
HDI	Historically Disadvantaged Individual
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IPP	Independent Power Producer
IRP	Integrated Resource Plan
KPEVC	Kgatelopele Private Equity and Venture Capital (Pty) Ltd
ME	Mitigation Efficiency/ Effectiveness
MLM	Mafikeng Local Municipality
MPRDA	Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MW	Mega Watt
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NFEPA	National Freshwater Ecosystems Priority Areas
NGP	New Growth Path

NMMDM	Ngaka Modiri Molema District Municipality
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act, 1998 (Act No. 36 of 1998)
OEM	Original Equipment Manufacturers
PES	Present Ecological State
PoS	Plan of Study
PPP	Public Participation Process
PV	Photovoltaic
QMS	Quality Management System
QSE	Qualifying Small Enterprise
RLM	Ratlou Local Municipality
SACAA	South African Civil Aviation Authority
SAHRA	South African Heritage Resources Agency
SANBI	South African Botanical Institute
SEA	Strategic Environmental Assessment
SEF	Strategic Environmental Focus (Pty) Ltd
SFM	Significance Following Mitigation
SG	Surveyor General
SHE	Safety, Health and Environmental
S&EIR	Scoping and Environmental Impact Reporting
TOPS	Threatened or Protected Species
ToR	Terms of Reference
TUT	Tshwane University of Technology
VIA	Visual Impact Assessment
WMA	Water Management Area
WM	With Mitigation Measures
WML	Waste Management License
WOM	Without Mitigation Measures
WUL	Water Use License
WULA	Water Use Licence Application

GLOSSARY OF TERMS

Alternative	In relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to— (a) the property on which or location where it is proposed to undertake the activity; (b) the type of activity to be undertaken; (c) the design or layout of the activity; (d) the technology to be used in the activity; (e) the operational aspects of the activity; and (f) the option of not implementing the activity.
Applicant	Any person who applies for an authorisation to undertake an activity or to cause such activity to be undertaken as contemplated in sections 24(5), 24M and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).
Cumulative Impact	Cumulative impact, in relation to an activity, means the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.
Ecology	The study of the interrelationships between organisms and their environments.
Endangered Species	A species of organisms facing a very high risk of extinction.
Environment	The surroundings within which humans exist and that are made up of – (i) the land, water and atmosphere of the earth; (ii) micro-organisms, plant and animal life; (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.
Environmental Impact Assessment	Systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and S&EIR.
Environmental Management Programme	A working document on environmental and socio-economic mitigation measures, which must be implemented by several responsible parties during all the phases of the proposed project.
Indigenous Species	A species is defined as native (or indigenous) to a given region or ecosystem if its presence in that region is the result of only natural processes, with no human intervention.
Interested and Affected Party	Any person or groups of persons who may express interest in a project or be affected by the project, positively or negatively.
No-go/ Do nothing alternative	The option of not undertaking the proposed activity or any of its alternatives. The no-go alternative also provides the baseline against which the impacts of other alternatives should be compared.
Stakeholder	Any person or group of persons whose live(s) may be affected by a project.
Study Area	Refers to the entire study area encompassing all the alternatives as indicated on the study area or locality map.
State Department	Any department or administration in the national or provincial sphere of government exercising functions that involve the management of the environment.

SECTION A: INTRODUCTION

Strategic Environmental Focus (Pty) Ltd (SEF) has been appointed by Kgatelopele Private Equity and Venture Capital (Pty) Ltd (KPEVC) to undertake an environmental application process for the proposed Mareetsane Batho-Batho Solar Photovoltaic (PV) Facility and associated infrastructure (i.e. powerline).

A Scoping and Environmental Impact Reporting (S&EIR) process is being conducted for this project based on triggered listed activities within the Environmental Impact Assessment (EIA) Regulations of 2010 [Government Notice Regulation (GNR) No's 543; 544; 545 and 546] promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).

The Scoping Phase for the NEMA Environmental Authorisation (EA) Application for the proposed project has been completed and the Plan of Study (PoS) for the Environmental Impact Report (EIR) was approved by the Department of Environmental Affairs (DEA) on 28 June 2013.

The purpose of this Final EIR is to comprehensively assess the impacts associated with the proposed development and to provide all interested and affected parties (I&APs) and relevant State Departments with an opportunity to comment and provide input into the process going forward. All comments received during the review and commenting phase will be incorporated into the Final EIR for consideration by the approving authority, the DEA.

A-1 DESCRIPTION OF PROPOSED ACTIVITY

A-1.1 Locality

The proposed Mareetsane Batho-Batho Solar PV Facility will be located on Tribal Land approximately 10 km south-west of the Batho-Batho Village within the jurisdiction of the RLM, Ngaka Modiri Molema District Municipality (NMMDM) in the North West Province and falls within the Quarter Degree Grid Cell 2625AB (refer to the Locality Map in Appendix 1).

A-1.2 Surrounding Land Use

Two high voltage Eskom substations and associated high and medium voltage powerlines are located to the north-east and north-west of the proposed site. The substations are approximately 10-12km from the proposed solar plant site.

The local community of Batho-Batho (proposed to benefit from this development) is located approximately 10km to the north-east. A railway line runs along the south-eastern boundary of the proposed site. Aerial images indicate that the vegetation is largely natural but overgrazed and land use data indicates poor soil potential for intensive agriculture since these are sandy, eutrophic red soils. The predominant land use is that of grazing.

To further place the site in context, the land uses within all four major compass directions are described in the table below.

Table 5: Surrounding Land Use Table

Direction	Land Use	Distance (m)
North	Vacant Land	Adjacent to the site
East	Railway Line	Adjacent to the site.
	Vacant Land	East of the adjacent railway line
South	Vacant Land	Adjacent to the site
West	Vacant Land	Adjacent to the site

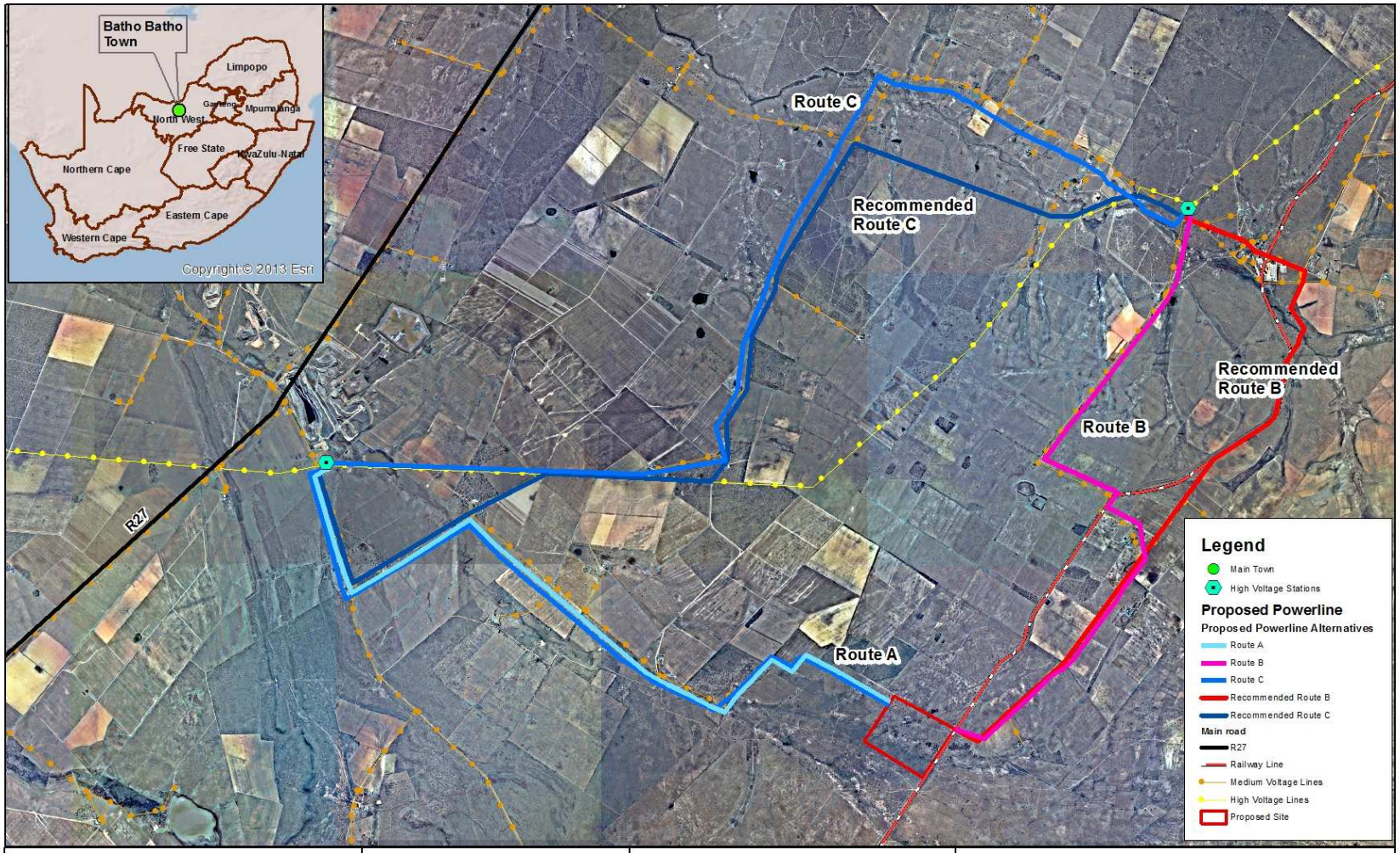


Figure 2: Locality Map of the proposed Mareetsane Batho-Batho Solar PV Facility and proposed powerline route alternatives

A-1.3 Details of the Project

The proposed site for the solar facility is approximately 140 hectares (ha) in extent and is estimated to generate approximately 30 Mega Watts (MW) of electricity which will be fed into the National Grid via one of the two existing Eskom substations. The proposed overhead powerline will fall within the existing Eskom powerline servitudes, and will be associated with approximate 50 m servitude (i.e. 25 m on either side of the powerline centre line). Two high voltage Eskom substations and associated high and medium voltage powerlines are located to the north-east and north-west of the proposed site. The substations are approximately 10-12km from the proposed solar facility site. A railway line runs along the south-eastern boundary of the proposed site (please refer to the Locality Map in Appendix 1).

The technology that is proposed for the solar facility is **"fixed Polycrystalline PV module"** technology. With this technology it is estimated that approximately 1 MW of electricity can be generated for every 1.9 ha (in optimal conditions) of solar panels. Polycrystalline panels use solar cells that are cut from multifaceted silicon crystals. They are less uniform in appearance than monocrystalline cells, but are more efficient at converting direct sunlight into electricity than thin-film technology. The solar panels will all be north facing and will be approximately 3m in height and at an angle of 30^0. Each solar panel is envisaged to be made up of either 2 X 5 or 2 X 10 individual PV modules; with each PV module being 1.65 m long and 0.99 m wide. Solar panels will be mounted on steel columns and secured *in situ* into the soil. As per industry norms, all solar plant equipment will be raised 200mm above natural ground level to combat stormwater erosion.

The PV system will be composed of the following components *inter alia*:

- PV modules;
- Inverters;
- MV/LV transformers;
- 35kV/ 88kV substation;
- Electrical wiring;
- Protection system; and
- Electrical Switchgear.

The 35kV/ 88kV substation will have lighting masts associated with it. These masts will be approximately 21m in height. The substation transformers will have transformer oil within them (between 30 – 50 m^3) which is necessary for the functioning of the substation. The Substation will be constructed in accordance with the relevant SANS standards and Eskom specific technical specifications. The substation transformers will have a bund wall around them for containing any oil leaks. There will be a concrete reinforced oil dam to hold any spillages should the transformers have a complete breakdown/ failure which results in oil leakage/ spillage. It is necessary to be able to drain the oil away from the transformer bunding areas, and the oil dam provides for this.

It is important to recognise that such an event has a low probability of occurrence with a transformer rupture (that would result in a spill) being highly unlikely even throughout the entire lifespan of the substation. Because the transformer is exposed to the elements, the bunding around the transformers accumulates rainwater when it rains. At the same time there may be small spillages of oil within the bunding area which may be flushed through to the oil dam by the rainwater. As a result a water / hydrocarbon separator or "oil trap" will be connected to the oil dam. A pump will automatically suck out the water from the "oil dam" from the bottom (as oil floats on top of water). This liquid will then flow through the "oil trap" which is lined with an oil absorbent cushion (which removes the oil (if any)) and releases "hydrocarbon free water". Any oil that is lost from the transformer is removed, recycled where possible, and if not recycled then disposed of at a suitably licensed waste disposal facility.

Water will be required for construction and will also be required for module washing. Washing of modules is a site-specific decision, taking into account the availability of water and the economic benefit for the site.

The Ratlou Local Municipality (RLM) have confirmed that they would not be able to provide the project with water. The Draft EIR mentioned the fact that should water supply from the municipality not be available, a borehole will be used to supply water.

Permanent structures on the Batho-Batho PV Farm will include a control room structure. It is proposed that a gutter system be installed to capture all stormwater on the control structure roof and directed into a $2m^3$ stormwater attenuation tanks.

During construction, workers will not be housed/ based on site and will be transported to and from the site every day. It is expected that more than 300 workers will be employed to oversee the construction of the solar facility. It is stipulated that the amount of effluent generated per person per day is 25 litre per person per day for toilet waste. 20 litres per person per day will be added for permanent staff. This accumulates to overall 7 500 litres (7.5 m^3) per day during the construction phase and 1 100 litres (1.1 m^3) per day during the operational phase.

Conservancy tanks will be installed to contain human effluent during the construction and operational phases of the project. The tanks will be emptied and disposed of at the nearest sewage treatment plant, in Mahikeng. The level in the conservancy tank will be monitored by permanent staff to prevent overloading.

As per SANS 10252-2, waste generated during construction and operational phases will accumulate to 7.5 m^3 and 1.1 m^3 respectively per day. 8 X 6 m^3 (48 m^3) tanks will be installed during construction and 2 X 6 m^3 (12 m^3) tanks will be installed during operational phase. A vacuum tanker will convey the effluent on a weekly basis. Please refer to Figure 3 below.

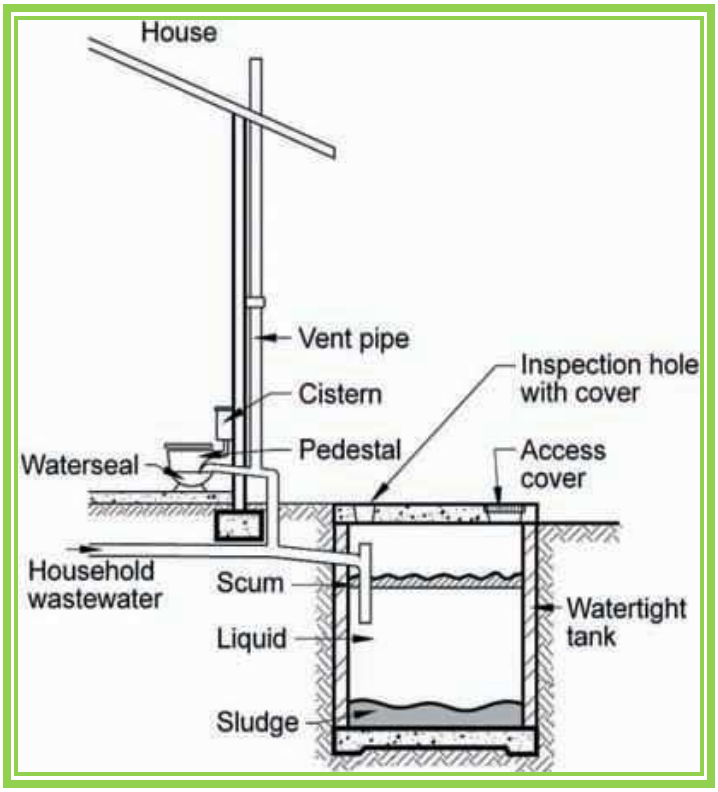


Figure 3: Schematic diagram of a typical conservancy tank

During the construction phase, diesel generators will be used. For the operational phase, the electrical reticulation and connection to the grid has taken the 30 MW PV array into account and will be sufficient to export the power back into the grid.

Access to the site is proposed via the Setlagoli Native Reserve. There are no formal roads on the reserve and a service road will need to be designed and constructed in order to support the life span of the project. The road length will be approximately 500m and include a rail way track crossing.

A-1.3.1 Supporting Infrastructure

The solar panel farm will necessitate the development of the following supporting infrastructure:

- A generator transformer and substation (35kV/88 kV) to facilitate the connection to the National Grid (via the proposed 88 kV powerline, which ultimately connects to the Eskom substation);
- Invertors to convert the electricity from direct current to alternating current;
- Cabling to connect the various components of the project (where cabling will be laid underground);
- Diesel generators for electrical power supply during construction phase only;
- A temporary laydown and storage facility during the construction phase of the development (construction camp); and
- Security fencing, lighting and CCTV cameras (during the operational phase, powered by the plant itself).

88kV Powerline:

- Construction of a contractor's camp and lay-down yard;
- Clearing of servitudes to accommodate the new powerline;
- Construction of foundations and implementation of the 21m high transmission poles; and
- Installation of overhead lines.

Mareetsane/ Kalgold Substation:

- Extend the substation yard at the 88kV busbar; and
- Install 2 x 88kV feeder bays at the substation.

A-1.3.2 Proposed Bulk Services

Electricity Supply

During the construction phase, diesel generators will be used. For the operational phase, the electrical reticulation and connection to the grid has taken the 30 MW PV array into account and will be sufficient to export the power back into the grid. The overhead line will supply power to the site from the grid when there is insufficient power available from the solar farm and feed power back into the grid when there is excess renewable energy available from the solar farm. Various alternatives have been explored for connection to the national grid (see details below in Section G).

Water

During construction, 25,000–40,000 m^3 of water will be required over a period of 6 - 12-month construction period. Water will be needed to control dust during grading operations and to control dust on the construction roads.

During operation of the proposed facility approximately 400 m^3 of water per year will be needed panel maintenance. The following is therefore assumed:

- Two (2) washes per year; and
- 0.001 m^3 of water necessary per square meter of panel.

Water will be required for construction and will also be required for module washing. Washing of modules is a site-specific decision, taking into account the availability of water and the economic benefit for the site.

The RLM have confirmed that they would not be able to provide the project with water. The Draft EIR mentioned the fact that should water supply from the municipality not be available, a borehole will be used to supply water.

Stormwater

Stormwater generated by the Batho-Batho PV Facility will have a low runoff factor. The post-development flood risk will not increase significantly due to the fact that the existing ground surface will be left undisturbed. Solar panels will capture rain droplets but droplets will fall onto undisturbed *in situ* soil with the same characteristics as per the pre-development flood. Thus, stormwater runoff will be influenced mainly by the internal road network and mitigation measures will focus on limiting the effect that the internal road network will exert on the post-development flood risk.

Permanent structures associated with the Batho-Batho PV Farm, apart from the solar panels themselves, will only include a control room building. It is proposed that a gutter system be installed to capture all stormwater falling on the structure's roof and redirecting it into a $2m^3$ stormwater attenuation tank.

In order to mitigate all stormwater runoff from the Batho-Batho Facility, a berm must be constructed along the south western perimeter of the site to intercept all stormwater. No subsequent development will be allowed within the imposed flood line.

The attenuation dam will be situated in the south western corner of the site. The dam will have a cross sectional area of 3 540m² with an average depth of approximately 1.5m. Stormwater in the attenuation dam will gradually seep into the ground as well as evaporate into the atmosphere. Storms with intensities larger than 1:100 year flood events and storms with 1:100 year storm durations longer than 5 minutes will be diverted into an overflow system which leads into the identified wetland area.

Sewage

During construction, workers will not be housed/ based on site and will be transported to and from the site every day. It is expected that more than 300 workers will be employed to oversee the construction of the solar facility. It is stipulated that the amount of effluent generated is 25 litres per person per day for toilet use. 20 litres per person per day will be added for all permanent staff. This accumulates to an overall figure of 7 500 litres ($7.5m^3$) per day during the construction phase and 1 100 litres ($1.1m^3$) per day during the operational phase.

Conservancy tanks will be installed to contain human effluent during the construction and operational phases of the project. The tanks will be emptied and disposed of at the nearest sewage treatment plant, in this instance located in Mahikeng. The level in the conservancy tank will be monitored by permanent staff to prevent overloading.

As per SANS 10252-2, waste generated during the construction and operational phases will accumulate to $7.5m^3$ and $1.1m^3$ respectively per day. 8 X 6 m^3 (48 m^3 in total) tanks will be installed during construction and

2 X 6 m^3 (12 m^3 in total) tanks will be installed during operational phase. A vacuum tanker will convey the effluent on a weekly basis.

Solid Waste

Construction waste generated is expected to include solar panel packaging, cable drums and contaminated soil. Packaging includes plastic wrapping, cardboard boxes and wooden pallets. It is estimated that at least 5000 boxes and wooden pallets will be generated by the proposed Batho- Batho PV Facility project. This will equal to 50 tonnes of boxes and 150 tonnes of wooden pallets.

Soil contamination due to diesel spillage is also a factor that must be considered. In order to contain any contamination of soil, it is proposed that a diesel tank bund area will be constructed for the housing of the diesel tank.

The Contractor will be responsible for the management and removal of all solid waste (refer to the Environmental Management Programme (EMPr) in Appendix 9).

A-1.3.3 Project Phases

The project will take place in two phases, namely the Construction and Operational Phase.

Construction Phase: All the construction related activities on site, until the contractor leaves the site. Site clearing and construction of structure for solar canopy and water storage facility will take approximately 6 - 12 months.

Operational Phase: All activities, including the operation and maintenance of the proposed development.

Construction Phase

Subject to receiving EA from DEA as well as other necessary authorisation/s, the construction of the proposed project is anticipated to commence in 2015. The construction period is estimated to be 6 -12 months from inception to completion.

The appointed Contractor will be responsible to prepare a Construction Site Development Plan prior to establishing on site. This plan will indicate the boundaries of the site that encompasses all construction related activities, vehicle and pedestrian access points, laydown area/s, offices, stockpile areas, storage areas, ablution facilities, etc. The proposed location and generic layout of the construction camp has been made available in this Final EIR, with its location. This Site Development Plan must be approved by the appointed Environmental Control Officer (ECO) as provided for within the EMPr (Appendix 9).

Diesel generators will be utilised on site and stored within the storage area as far away from the water resources/ drainage line boundary as possible (as indicated on the Construction Site Development Plan). The Contractor will be responsible for the management and removal of all solid waste from site during the construction phase, to a designated waste disposal facility. A method statement for the management of waste must be drafted and signed off by the ECO prior to commencement of construction activities, as per the attached EMPr (Appendix 9).

Operational Phase

The operational phase will be characterised by the following activities:

- The entire site will be fenced off with a 2.5 meter high security fence; and

- The fence will be visually permeable and will be screened with planting, where possible.

A-2 LEGAL REQUIREMENTS APPLICABLE TO THIS APPLICATION

The aim of this component of the report is to provide a brief overview of the pertinent policies as well as legal and administrative requirements applicable to the proposed project. The application form informing the DEA of intent to obtain an EA was submitted on 20 March 2013. The DEA accepted the application and issued the project with the following reference numbers: **DEA Ref: 14/12/16/3/3/2/514** and **NEAS Ref: DEA/EIA/0001785/2013.**

The Final Scoping Report including the PoS for EIR was submitted to the DEA on 05 June 2013 and was accepted by the DEA in a letter dated 28 June 2013 (refer to Appendix 4 for the acceptance of the Final Scoping Report and PoS for EIR).

The legislation, guidelines and policies applicable to this project are as follows:

A-2.1 The National Environmental Management Act, 1998 (Act No. 107 of 1998) and Environmental Impact Assessment Regulations of 2010

The EIA Regulations, promulgated under the NEMA, focus primarily on creating a framework for co-operative environmental governance. NEMA provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by State Departments and to provide for matters connected therewith.

In terms of the EIA Regulations of 2010 and activities listed in GN No. R544 and R 546 (requiring a Basic Assessment (BA) process) and GN No. R 545 (requiring a S&EIR process), the following listed activities are deemed by the Environmental Assessment Practitioner (EAP) to be applicable to the proposed Mareetsane Batho-Batho Solar PV Facility and associated powerline based on the information provided by the client and their consulting engineers. These listed activities are those activities, which may have potentially detrimental impacts on the environment and therefore require EA from the relevant authorising body, which in this case is the DEA.

It must be noted that activities requiring a BA process, as well as activities requiring a S&EIR process are triggered by the proposed development. Therefore, according to the below listed activities, a situation arises, whereby; the legal requirements of the activities listed in terms of GN No. R 545 of 2010 supersedes those of the activities listed in terms of GN No. 544 and 546 of 2010, and as such **this application shall undergo an S&EIR process**.

GNR No & Activity Number		Activity Description	Project Description
GN No. R 545 of 18 June 2010	1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.	The proposed solar power plant will generate approximately 30MW of electricity.
	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for: (i) linear development activities; or (ii) agriculture or afforestation where activity 16 in this Schedule will apply.	The extent of the proposed site is approximately 140 ha.

GN No. R 544 of 18 June 2010	9	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water - (i) with an internal diameter of 0,36 meters or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b. where such construction will occur within urban areas but further than 32 meters from a watercourse, measured from the edge of the watercourse.	The construction of stormwater attenuation infrastructure.
	10	The construction of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts	The proposed solar facility will require electrical distribution lines to evacuate electricity generated by the plant to the National Grid.
	11	The construction of: (i) canals; (ii) channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk storm water outlet structures; (vii) marinas; (viii) jetties exceeding 50 square metres in size; (ix) slipways exceeding 50 square metres in size; **(x) buildings exceeding 50 square metres in size; or** **(xi) infrastructure or structures covering 50 square metres or more** where such construction occurs within a watercourse or within 32 meters of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	Due to the known presence of wetlands and nearby watercourses – the proposed development will require infrastructure and/or buildings within 32m of watercourses.
	18	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock or more than 5 cubic metres from: **(i) a watercourse;** (ii) the sea; (iii) the seashore; (iv) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater- but excluding where such infilling, depositing , dredging, excavation, removal or moving; (i) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or (ii) occurs behind the development setback line.	Due to the known presence of wetlands and nearby watercourses – the proposed development will require infrastructure and/or buildings within 32m of watercourses.

	22	The construction of a road, outside urban areas, (i) with a reserve wider than 13.5 meters; or (ii) where no reserve exists where the road is wider than 8 meters,	A Traffic Impact Assessment Study has been undertaken. The best route and entry point have been identified. For the construction and operational phases of the proposed project, topsoil, grass and vegetation will be removed to provide better access for the life of the project. The last 5km's of the farm road identified needs special attention in order to be operational for the project. Grading of the road and possible realignment, including re-compaction of road layers could be necessary.
GN No. 546 of 18 June 2010	4	The construction of a road wider than 4 metres with a reserve less than 13.5 metres. **(c) In the North West:** (i) outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an International Convention; (ee) **Critical biodiversity areas (Terrestrial Type 1 and 2 and Aquatic Type 1) as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;** (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from a biosphere reserve.	The North-West Province Biodiversity Conservation Assessment Technical Report [North-West Department of Agriculture, Conservation, Environment and Rural Development (NW DACERD) 2009] outlines a provincial-level biodiversity corridor network with an aim to retain the connectivity between all geographic areas with minimal financial cost and maximum biodiversity preservation. These corridors are interconnected areas through the landscape that were identified as important for conservation through a series of systematic biodiversity assessments. Biodiversity Nodes were also identified through a systematic process to coincide with areas where important or intact biodiversity remains, however, unlike Biodiversity Corridors, these nodes are isolated from each other. These areas were often identified as the last remaining areas for the proclamation of reserves and may contribute significantly to biodiversity conservation goals. These areas have been identified as areas that are still intact and contain one of the last remaining areas of Western Highveld Sandy Grassland. Core Biodiversity Corridors traverse the southern portion of the study area with a portion of the solar facility site, powerline route alternative A and portions of powerline route alternative C located within the 1500m buffer of this Biodiversity Corridor. The remainder of the solar facility site as well as the southern portion of powerline route alternative B are located within the 3000m and 5000m corridor buffer.
	14	The clearance of area of 5 hectares or more of vegetation where 75% or more the vegetative cover constitutes indigenous vegetation **In the North West:** (i) All areas outside urban areas	Due to construction activities on the site, there may be a need to clear vegetation of 5 hectares or more that may be 75% or more indigenous.

	16	The construction of: (iii) Buildings with a footprint exceeding 10 square metres in size; or (iv) Infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 meters of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line. **(c) In North West:** (i) Outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Sites or areas identified in terms of an International Convention; (ff) **Critical biodiversity areas or ecosystems service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;** (gg) Core areas in biosphere reserves; (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from a biosphere reserve.	The North-West Province Biodiversity Conservation Assessment Technical Report (NW DACERD) 2009, outlines a provincial-level biodiversity corridor network with an aim to retain the connectivity between all geographic areas with minimal financial cost and maximum biodiversity preservation. These corridors are interconnected areas through the landscape that were identified as important for conservation through a series of systematic biodiversity assessments. Biodiversity Nodes were also identified through a systematic process to coincide with areas where important or intact biodiversity remains, however, unlike Biodiversity Corridors, these nodes are isolated from each other. These areas were often identified as the last remaining areas for the proclamation of reserves and may contribute significantly to biodiversity conservation goals. These areas have been identified as areas that are still intact and contain one of the last remaining areas of Western Highveld Sandy Grassland. Core Biodiversity Corridors traverse the southern portion of the study area with a portion of the solar facility site, powerline route alternative A and portions of powerline route alternative C located within the 1500m buffer of this Biodiversity Corridor. The remainder of the solar facility site as well as the southern portion of powerline route alternative B are located within the 3000m and 5000m corridor buffer.

The mentioned listed activities are deemed to include activities that could potentially have a detrimental impact on the social and biophysical state of an area and as such, are required to undergo a S&EIR) process. In accordance with the EIA Regulations (2010), an EIR must contain all the information that is necessary for the competent authority to consider the application and to reach a decision and must include those points included in Section 31(2) of Regulation 543 which is laid out in the table below. In order to facilitate review by the competent authority, this report is structured around these requirements.

NEMA Regulation 543, Section 31 Requirements	Relevant Section of the Report
Details of the EAP who compiled the report and the expertise of the EAP to carry out an EIA	Page vii – viii and Appendix 6
A detailed description of the proposed activity	Page ix, x, xi and xii and Section A
A description of the property on which the activity is to be undertaken and the location of the activity on the property.	Section A
A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity.	Section B
Details of the PPP conducted including: (i) Steps undertaken in accordance with the PoS; (ii) A list of persons, organisations and organs of state that were registered as I&APs; (iii) A summary of comments received from, and a summary of issues raised by registered I&APs, the date of receipt of these comments and the response of the EAP to those comments; and (iv) Copies of any representations and comments received from registered and affected parties.	Section C-4

A description of the need and desirability of the proposed activity	Section A-4
A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity.	Section E
An indication of the methodology used in determining the significance of potential environmental impacts.	Section D
A description and comparative assessment of all alternatives identified during the environmental impact process.	Section E
A summary of the findings and recommendations of any specialist report or report on a specialised process.	Section G and Appendix 7
A description of all environmental issues that were identified during the EIA process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures.	Section F
A reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	Section G and H
An environmental impact statement which contains a summary of the key findings and a comparative assessment of the positive and negative implications.	Section G and H
A draft environmental management programme	Appendix 9
Copies of any specialist reports and reports on specialist processes.	Appendix 7
Any specific information that may be required by the competent authority.	Project Summary

A-2.2 National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in responsible ways.

Of specific importance to this application is Section 19 of the NWA, which states that an owner of land, a person in control of land or a person who occupies or uses the land which thereby causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring and must therefore comply with any prescribed waste standard or management practices.

Due to water resources identified on site (i.e. wetlands) and the close proximity of the Morokwa River, the proposed development triggers the following water uses listed in Section 21 of the NWA, and an application for a WUL is being submitted with this Final EIR:

c) impeding or diverting the flow of water in a watercourse;
i) altering the bed, banks, course or characteristics of a watercourse.

The RLM have confirmed that they would not be able to provide the project with water. The Draft EIR mentioned the fact that should water supply from the municipality not be available, a borehole will be used to supply water. This borehole would need to be licensed by the Department of Water Affairs (DWA). In addition to section 21 (c) and (i) of the NWA, section 21 (a) is being added for application of a WUL.

Proof of application for a Water Use License Application (WULA) is being submitted with this Final EIR in Appendix 4.

A-2.3 National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)

The Act aims to reform the law regulating waste management in order to protect the health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and

for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licensing and control of waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

The proposed project does not trigger the need for a WML due to the following reasons:

- During construction, workers will not be housed/ based on site and will be transported to and from the site every day – thus only chemical toilets will be provided during the construction phase, thus the sewage generated on site is all disposed of off-site at a designated treatment facility. The frequency of servicing will depend on the size of the temporary tank provided by the rental company.
- During the operational phase – no persons will be permanently based on site as the plant is "self-sustaining" except for occasional maintenance visits – thus septic tanks/ French drains will be installed at the main building.
- Approximately one portable toilet would be required for every 10 workers on site.

A-2.4 National Heritage Resources Act, 1999 (Act No. 25 of 1999)

This Act legislates the necessity for Cultural and Heritage Impact Assessment (HIA) in areas earmarked for development, which exceed 0.5 hectares (ha) and where linear developments (including roads) exceed 300 metres in length. The Act makes provision for the potential destruction to existing sites, pending the archaeologist's recommendations through permitting procedures. Permits are administered by the North West Provincial Heritage Resources Authority.

The heritage survey for the proposed Mareetsane Solar PV Facility revealed 10 grave sites. Although some grave sites appear to be within the proposed site and powerline corridors, with the implementation of the mitigation measures and recommendations, the said graves can be protected against adverse impacts.

There will be a need for relocation of grave site 2 and 3. Grave site 1 is younger than 60 years whilst Grave sites 2, 3 and 4 are older than 60 years or of an undetermined age. Graves older than 60 years or of an unknown age, will need to be relocated through the SAHRA's grave relocation policy and permit application. This will constitute a Phase II HIA to be undertaken by an archaeologist.

A-2.5 Other Legal Requirements

A-2.5.1 Constitution of the Republic of South Africa Act, 1996 (Act No. 108 of 1996)

The Constitution of the Republic of South Africa Act, 1996 (Act No. 108 of 1996) (here in after referred to as the Constitution) has major implications for environmental management. The main effects are the protection of environmental and property rights, the change brought about by the sections dealing with administrative law, such as access to information, just administrative action and broadening of the *locus standi* of litigants. These aspects provide general and overarching support and are of major assistance in the effective implementation of the environmental management principles and structures of the NEMA. Section 24 in the Bill of Rights of the Constitution specifically states that:

Everyone has the right -

- To an environment that is not harmful to their health or well-being; and
- To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -
    - Prevent pollution and ecological degradation;

- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

A-2.5.2 National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)

The purpose of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed.

The NEMBA provides for listing threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected (Government Gazette, 2009). The main purpose of listing threatened ecosystems is to reduce the rate of ecosystem and species extinction and includes the prevention of further degradation and loss of structure, function and composition of threatened ecosystems.

This Act is applicable to this application for EA, in the sense that it requires the project applicant to consider the protection and management of local biodiversity.

A-2.5.3 Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970)

The purpose of the Act is to control the subdivision and, in connection therewith, the use of agricultural land.

A letter of enquiry for leasing of land for the proposed project was submitted to the DAFF on 25 March 2013. The DAFF notified the applicant of the fact that any land that fall under tribal owned land or owned by a chief is exempted from Subdivision of Agricultural Land Act 70, Act 70 of 1970. However if the land falls within Subdivision of Agricultural Land Act 70, Act 70 of 1970, an application for lease indicating the hectares to be leased and the agreement between the applicant and the landowner would need to be submitted. The title deeds, clear zoomed locality map, memorandum explaining the application etc. would have to accompany the application documentation. Please refer to Appendix 4 for all correspondences.

A lease agreement was signed by the applicant and the landowner on 08 August 2012. Please refer to Appendix 10 for the lease agreement.

A-2.5.4 Land Use Planning Ordinance 15 of 1985

Town Planning applications were submitted to the RLM for the subdivision and rezoning of the proposed site. The application was made in terms of the Land Use Planning Ordinance 15 of 1985 for the rezoning of the proposed site from Agriculture to Special. Approval was granted on 04 February 2014.

The amendment scheme shall be proclaimed upon meeting/ compliance with the following conditions:

- Provision of applicable by-laws and policies of RLM shall apply;
- The proposed site shall be used for the erection/ construction of the proposed solar facility;
- Submission of the site development plan to the municipality prior to commencement with construction;
- Record of Decision (RoD) issued by the relevant competent authority;
- Comments from the North West Department of Public Works, Roads and Transport (DPWRT), South African Roads Agency Limited (SANRAL) and the Department of Agriculture, Forestry and Fisheries (DAFF).

A-2.5.5 Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)

To provide for control over the utilisation of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.

A-2.5.6 Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)

The object of the Act is to provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith.

A-2.5.7 Civil Aviation Act, 2009 (Act No. 13 of 2009)

To repeal, consolidate and amend the aviation laws giving effect to certain International Aviation Conventions; to provide for the control and regulation of aviation within the Republic; to provide for the establishment of a South African Civil Aviation Authority (SACAA) with safety and security oversight functions, to provide for the establishment of an independent Aviation Safety Investigation Board in compliance with Annexure 13 of Chicago Convention, to give effect to certain provisions of the Convention on Offences and Certain other Acts Committed on Board Aircraft; to give effect to the Convention for the Suppression of Unlawful Acts against the Safety of Civil Aviation; to provide for the National Aviation Security Program; to provide for additional measures directed at more effective control of the safety and security of aircraft, airports and the like; and to provide for matters connected thereto.

An application was submitted to the SACAA for approval on 25 March 2013. Consent was given on 11 July 2013 for the proposed solar facility and associated infrastructure to ensure safe conduct of civil aviation. Please refer to Appendix 4 for the approval letter.

A-2.5.8 Promotion of Access to Information Act, 2000 (Act No. 2 of 2000)

The Act recognises that everyone has a constitutional right of access to any information held by the state and by another person when that information is required to exercise or protect any rights. The purpose of the Act is to foster a culture of transparency and accountability in public and private bodies and to promote a society in which people have access to information that enables them to exercise and protect their rights.

A-2.5.9 White Paper on the Energy Policy of South Africa, 1998

The White Paper was produced in the post-apartheid era of South Africa to clarify government policy regarding the supply and consumption of energy for the next decade. The policy strengthens existing energy systems, calls for the development of underdeveloped systems and demonstrates a resolve to bring about extensive change in a number of areas. It addresses international trade and co-operation, capacity building, and the collection of adequate information. The key objectives of the Energy sector policy are to:

- Increasing access to affordable energy services:
- Improving energy governance;
- Stimulating economic development;
- Managing energy-related environmental and health impacts;
- Securing supply through diversity; and
- Energy policy priorities.

As such Government policy on renewable energy is concerned with meeting the following challenges:

- Ensuring that economically feasible technologies and applications are implemented;
- Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options; and
- Addressing constraints on the development of the renewable industry.

Government policy is based on an understanding that renewables are energy sources in their own right, are not limited to small-scale and remote applications, and have significant medium and long-term commercial potential. Government has undertaken to provide focused support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications, promote the development and implementation of appropriate standards and guidelines and codes of practice for the correct use of renewable energy technologies and establish suitable information systems of renewable energy statistics.

White Paper on the Promotion of Renewable Energy and Clean Energy Development in South Africa, 2002

The Renewable Energy White Paper (Department of Minerals and Energy (DME), 2002) supplements the White Paper on Energy Policy, which recognises that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa.

The government recognises that South Africa is endowed with an abundance of renewable energy resources and wants to ensure that the renewable energy resources are used optimally. The policy highlights a range of measures to bring about integration of renewable energies into the mainstream energy economy. The Government has set as its target an additional 10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2012. This energy is to be produced mainly from biomass, wind, solar and small-scale hydro.

It is also the intention of the Government to make South Africa's due contribution to the global effort to mitigate greenhouse gas emissions. For this purpose, the Government has undertaken to develop the framework within which the renewable energy industry can operate, grow, and contribute positively to the South African economy and to the global environment.

A-2.5.10 Integrated Environmental Management (IEM)

IEM is a philosophy for ensuring that environmental considerations are fully integrated into all stages of the development process. This philosophy aims to achieve a desirable balance between conservation and development [Department of Environmental Affairs (DEAT, 1992)]. The IEM guidelines intend encouraging a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels.

The DEA Integrated Environmental Management Information Series guidelines have also been considered during the S&EIR application process.

A-2.5.11 The National Building Regulations and Building Standards Act, 1997 (Act No. 103 of 1997)

The object of the Act is to promote the promotion of uniformity in the law relating to the erection of buildings in the areas of jurisdiction of local authorities for the prescribing of building standards and for matters connected therewith.

A-2.5.12 National Spatial Biodiversity Assessment

The National Spatial Biodiversity Assessment (NSBA) classifies areas as worthy of protection based on its biophysical characteristics, which are ranked according to priority levels.

A-2.5.13 Protected species – Provincial Ordinances

Provincial ordinances were developed to protected particular plant species within specific provinces. The protection of these species is enforced through permitting requirements associated with provincial lists of protected species. Permits are administered by the Provincial DAFF. The suite is characterised by the following provincially protected plant species:

Aloe zebrine, Ammocharis coranica, Bonatea antennifera, Crinum graminicola and *Huernia sp.*

The provincial ordinances have been developed to protect these particular plant species within specific provinces. The protection of these species is enforced through permitting requirements associated with provincial lists of protected species. Permits are administered by the Provincial DAFF. This application will be lodged with the North West DAFF once a decision has been granted by the DEA.

A-2.5.14 Accelerated Shared Growth Initiative for South Africa (ASGISA)

Accelerated Shared Growth Initiative for South Africa (ASGISA) resulted from Government's commitment to halve unemployment and poverty by 2014 and was launched in February 2006. ASGISA is not a government programme but a national initiative supported by key groups in the economy viz, Business, Labour, State-owned enterprises, Government economic agencies, Entrepreneurs and all spheres of government.

In regard to improving national energy efficiency, the National Electricity Response Team, convened by government in February 2008, has giving consideration to amending housing regulations and specifications to make solar-heating systems and energy efficiency mandatory.[1]

A-2.5.15 New Growth Path (NGP)

In 2010, President Jacob Zuma, endorsed by the Cabinet, proposed a New Growth Path (NGP) for the South African economy. Later in the same year, Minister Ebrahim Patel, released the Framework of the New Economic Growth Path, which includes many elements of the ASGISA framework and outlines the Government’s revised approach to economic policy.

The NGP is an integrated macroeconomic path, designed to deal with some of the major structural fault lines of the South African economy, namely, unemployment, poverty, and low growth rates. The NGP places critical responsibilities on the State towards job creation. As such, the private sector should also play a vital role in helping achieve the Government’s objectives. The creation of five million jobs over the next decade is the central political economy goal of the NGP. Furthermore, the NGP places emphasis on the means of achieving global competitiveness via a series of integrated socioeconomic interventions that improve the country’s vital infrastructure, its human resources, and its global strategic alliances.
The NGP focuses on the following:

- Increasing employment intensity of the economy;
- Reducing the cost to improve infrastructure and address competitiveness;
- Balancing spatial development of rural areas and poorer provinces;

1 http://www.info.gov.za/asgisa/

- Reducing the carbon intensity of the economy; and
- Creating opportunities in changing regional and global environments.

The NGP identifies five other priority areas as part of the programme to create jobs, through a series of partnerships between the State and the private sector.

- **Green economy: expansions in construction and the production of technologies for solar, wind and biofuels are supported by the draft Energy on Integrated Resource Plan (IRP). Clean manufacturing and environmental services are projected to create 300 000 jobs over the next decade.**
- Agriculture: jobs will be created by addressing the high input costs and up scaling processing and export marketing. Support for small holders will include access to key inputs. Government will explore ways to improve working and living conditions for the country's 660 000 farm workers. The growth path also commits the Government to unblocking stalled land transfers, which constrain new investment.
- Mining: calls for increased mineral extraction and improving infrastructure and skills development. It focuses support for beneficiation on the final manufacture of consumer and capital goods, which can create large-scale employment. It foresees the establishment of a state mining company concentrating on beneficiation and enhanced resource exploitation in competition with a strong private mining sector.
- Manufacturing: calls for re-industrialisation in the South African economy based on improving performance through innovation, skills development and reduced input costs in the economy. The document targets a doubling of South Africa's research and development investment to 2% of gross domestic product by 2018.
- Tourism and other high-level services: hold employment potential and the framework calls for South Africa to position itself as the higher education hub of the African continent.

A-2.5.16 Ngaka Modiri Molema District Municipality: Integrated Development Plan 2011/ 2012

The NMMDM's vision is to be a District Municipality (DM) that delivers sustainable quality services with the aim to:

- Eliminate the service backlogs by 2014 by delivering on the constitutional obligation to provide basic services to all;
- Develop economic sectors and spatial localities in accordance with people's need and potential; and
- Protect and use the natural resource base in a sustainable manner.

The NMMDM Integrated Development Plan (IDP) specifies Mining and Energy as two of the important pillars for sectorial growth and economic development in the DM. The proposed development is in alignment with the IDP as it intends to produce energy which is greatly needed by the DM for its economic growth.

A-2.5.17 Ratlou Local Municipality: Integrated Development Plan 2010

The following objectives from the RLM's IDP are relevant to the proposed project:

- Ensure sustainable provision of services;
- Promote social and economic development;
- Promote safe and healthy environments; and
- Give priority to the basic needs of communities.

The proposed Mareetsane Batho-Batho Solar PV Facility is located within the rural area of the municipality, and the IDP specifically states that the empowerment programmes should be focused on the rural areas. The

proposed development will contribute to local economic development through job creation and the potential attraction of investment into the area, which are two of the IDP goals. The spin-offs would ensure the future sustainability of this area and enable the local communities to improve their quality of life.

A-3 DETAILS OF THE APPLICANT

The details of the project applicant are:

Name of Applicant	Postal Address	Relevant Numbers
Mr Keobakile Sedupane Kgatelopele Private Equity and Venture Capital (Pty) Ltd (KPEVC)	P.O. Box 32836 Kyalami 1686	Tel: (011) 057 2955 Cell: 083 254 5210 Fax: 086 276 8475 E-mail:keobakiles@kgatelopele.co.za

KPEVC is a South African 100% black youth owned company developing solar renewable energy projects in South Africa.

- KPEVC was launched in 2011, with the main objective of becoming one of South Africa's leading providers of Solar PV renewable energy;
- The company works with landowners, rural communities, technology Original Equipment Manufacturers (OEMs), Engineering, Procurement and Construction Management Companies (EPCs), competent authorities, regulators and investors to develop projects;
- In each project, KPEVC plays the role of project developer and manager, coordinating all specialist studies, site identification, project structure, selecting strategic partners and arranging financing; and
- To ensure successful development of projects, KPEVC has relationships and partnerships with local and international service providers in engineering, construction, project management and financial expertise.

A-4 NEED AND DESIRABILITY OF THE PROJECT

At present, South Africa relies heavily on fossil fuels to provide electricity for the country. This practice is not sustainable, associated with very high environmental and socio-economic impacts. As such, there is a drive to locate and identify feasible, sustainable and environmentally acceptable alternatives for electricity generation.

One such alternative is solar power; this form of electricity generation is sustainable and is associated with "lesser" environmental impacts, for example, there are limited air quality impacts and impacts on water resources are minimal and effectively mitigated. There is global pressure on countries to decrease their reliability on fossil fuels and to increase their share of renewable energy. In 2008, approximately 93% of South Africa's electricity was produced from coal, with nuclear energy making up most of the remainder. The growing energy demand and concern over the environmental impact of coal-fired power generation has led to government outlining a programme that would attempt to change this situation (Goldie-Scott, 2011).

In South Africa, The IRP for South Africa which was initiated by the Department of Energy (DoE) which is a "*co-ordinated schedule for generation expansion and demand-side intervention programmes, taking into consideration multiple criteria to meet electricity demand*". The IRP has undergone two rounds of public participation, and has been recommended to Cabinet for adoption. The Policy-Adjusted IRP for South Africa is a major step towards building local industry clusters, as well as assisting South Africa in fulfilling the commitments made at the Copenhagen Climate Change Summit, in terms of mitigating climate change (IRP2, 2011).

The current goal set for the sustainable renewable energy industry, is 17.8 GW of renewables by 2030. This

mix of renewables will come mainly from wind, solar, biomass and small-scale hydro. This will result in a total of 42 % of new power generation being sourced from renewables.

The proposed project is responding to the high demand of energy in the North West Province. The generation of additional “green” power will reduce the burden of electricity demand on the existing coal fuelled power stations, and in turn reduce the amount of fossil fuels required for electricity production, which will have positive benefits on the receiving environment as a whole. The proposed project is located in a suitable area for the utilisation of solar energy. With the facility located in the rural area of Mareetsane, more people will have access to electricity as a basic need, which is in line with municipal objectives.

Mareetsane is generally a very poor community. The unemployment rate stands at over 42.3% of the population. This project will bring hope to the community through socio-economic development spin-offs. Jobs will be created during the construction, operations and maintenance of the project. This will contribute towards uplifting the community and 60% of jobs will be for the previously disadvantaged local community. The Mareetsane community is unable to sustain itself and mostly rely on subsistence farming and small scale cattle farming. There is currently no development taking place in the area. There is an abundance of un-used land suitable for solar energy generation. The development of the project will foster rural development, skills development and enterprise development through the community trust to be established. In terms of education, the project will bring an opportunity to put practical rural education into action since some learners and teachers in the area have never seen a facility of this nature, yet it is included in the curriculum for technology related learning areas.

SECTION B: THE RECEIVING ENVIRONMENT

In order to, with any level of confidence, assess the potential impacts of the proposed Mareetsane Batho-Batho Solar PV Facility and associated powerlines on the receiving environment, one need to first assess the baseline conditions found over the site. Using this *Status Quo,* one can then, broadly speaking, determine the likely impacts that will emanate from a specific development typology on a well-defined receiving environment.

Prior to the commencement of this environmental process, the Applicant undertook a desktop Environmental Feasibility Assessment (Appendix 11) for the proposed site and a larger study area that encompassed the existing Eskom substations located to the north-east and north-west of the proposed site – in order to broadly identify any sensitive environments that may be impacted on by associated powerline infrastructure. The report concluded the following:

- The study area and proposed solar farm site coincide with areas that are known or expected to contain Threatened Ecosystems, protected watercourses (including wetlands) and Threatened (Provincially and Nationally Protected) floral and faunal species.
- Only the larger study area encompasses Critically Important / Hyperdiversity Areas, known as Freshwater Ecosystems Priority Area (FEPA) wetlands and wetland clusters as well as important heritage/ cultural resource areas.
- A Biodiversity Node and associated Biodiversity Corridors traverse the majority of the study area and the proposed site falls within these Corridor buffer zones.
- The site scan also revealed sensitive environments present on site (such as isolated wetlands and patches of threatened and protected flora). Details from the Environmental Feasibility Assessment have been included in the sections that follow.

A team of specialists also conducted their Specialist Studies to confirm the study area's status quo. The following sections confirm the current status quo.

B-1 BIOPHYSICAL ENVIRONMENT

B-1.1 Geology and Geotechnical Suitability

The site is dominated by sandy soils and Clovelly and Hutton soils[2]. According to the available geological data, the site is underlain by Kalahari sands that consist predominantly of recent Aeolian deposits. During the Geotechnical Assessment's field investigation it was found that the Aeolian sand is underlain by limestone that has progressed into Hardpan calcrete. A geotechnical Investigation had already been undertaken during the Environmental Feasibility Assessment. In the report, the geological map indicates that the Aeolian sand and limestone (Qw) are underlain by rhyolite (Ra) to the east and lavas and schist's (Zg) to the south (Envitech Solutions, 2012 – Please refer to Appendix 7 for the Geotechnical Investigation Report.

Considering that the site is underlain by Aeolian sand that consists of silty and clayey sands that are underlain by either nodular ferricrete or Calcrete, excavation of the material on site should pose no problem as the material classifies as medium to intermediate in terms of earthworks excavation. The in-situ soil is not suitable as road building material due to the non-cohesive nature of the sand. Due to the collapsible nature of the Aeolian sands, on-site pre-consolidation of the foundations should be carried out to prevent any potential subsidence, and the only major concern could be a the potential for a perched groundwater table during the rainy season in the lower lying areas. However, this can be overcome by proper design of a stormwater and groundwater control system.

[2] Department of Environmental Affairs and Tourism 2001, ENPAT. Pretoria: DEAT

B-1.2 Soils and Agricultural Potential

A detailed Soils and Agricultural Potential Specialist Study was conducted from 8 to 12 April 2013 on the solar farm site, and the alternative powerline routes from the 20 to 23 May 2013.

The following findings have been recorded:

B-1.2.1 Dominant Soil Types

The surveyed area comprised a wide variety of soils including, oxidic, duplex, plinthic, calcic, and hydromorphic soils. Oxidic soils primarily consisted of well drained apedal Clovelly (Cv) soils (Figure 2), occurring on relatively flat and gently sloping land within the solar facility site and along the proposed powerline routes. Duplex Valsrivier (Va) and Sepane (Se) soil forms we also identified on site, and constituted approximately half of the solar facility footprint. Plinthic soils including Longlands (Lo), Westleigh (We), and Katspruit (Ka) soil forms were also identified on landscape depressions and along drainage lines, within the solar facility site and also along the proposed powerline route alternative C (refer to Appendix 1).

Calcic (calcacreous) soils included Addo (Ad), Molopo (MP), and Brandvlei (Br) were identified on pans (Figure 4), with visible lime nodules and effervesces distinctly when treated with cold 10% hydrochloric acid (HCl). Calcareous forms of Ka and Se soils were also identified on site, also with visible streaks of lime nodules in the G horizons and unspecified material with signs of wetness of the Ka and Se soils, respectively. Slight effervescent was observed when these calcareous Ka and Se soils were treated with cold 10% HCl. The other variety of soils identified during the survey comprises hydromorphic soils, including Fernwood (Fw), Longlands (Lo), Kroonstad (Kd), Cactref (Cf), and Katspruit (Ka) soil forms, also associated with landscape depressions and drainage lines. The G horizon of Ka and Kd soils is saturated with water for long periods under natural conditions. Both plinthic and hydromorphic soils are characteristic of wetlands.

Figure 4: Redoximorphic signs of wetness characteristic of plinthic and hydromorphic soils (top left), yellow-brown apedal oxidic (Cv) soil (bottom left), and calcareous (Br) with free lime nodules (right).

B-1.2.2 Land Use Capability and Agricultural Potential

High potential agricultural land is defined as having "the soil and terrain quality, growing season and adequate available moisture supply to sustain crop production when treated and managed according to best possible farming practices" (Land Capability report, 2006). Agricultural potential and land capability is inferred from the influence of physical factors, e.g. soil, climate, and terrain.

The agricultural potential was inferred in consideration of the susceptibility of soils to damage from erosion and other causes, as well as various limitations to land use due to physical factors, such as climate. Common limiting factors for agricultural production in the area were identified as follows:

- Shallow effective rooting depth due to shallow bedrock and strongly developed structure, impermeable to plant roots;
- Overgrazing by livestock; and
- Low rainfall and limited water availability for dry land agriculture.

B-1.2.3 Soil Erodibility

Soil erosion within the survey area is primarily attributed to poor vegetation management with injudicious grazing; this reduces vegetation cover which increases soil and organic matter removal through water and wind erosion. Soils with an E horizon including Fw, Lo, Cf, and Kd soil forms are highly susceptible to erosion due to the loose leached nature of the E horizon and their topographic position. This is attributable to the intermittent saturation with water and subsequent lateral discharge of water through the A and E horizons during wet conditions.

Agricultural potential of the various identified soils is largely restricted by climate, soil water availability in particular. Annual rainfall below 500mm is generally considered as restrictive to crop production unless irrigation provision is accessible. However, some of the Clovelly soils are currently under maize and peanut cultivation along the proposed powerline routes. Clovelly soils within the proposed solar facility site have an equivalent agricultural potential, the reason for not cultivating these soils is probably attributed to landowner plans and/or preference. Although constituting a substantial portion of the site and with fairly good potential, these soils play an important role as recharge soils, feeding wetlands and constructed water reservoirs for livestock drinking.

B-1.3 Topography and Hydrology

The topography of the proposed site is flat. There are isolated wetlands scattered throughout the site and non-perennial rivers in close proximity of the site. The study area and proposed site are located within Quaternary Catchment D41B within the Lower Vaal Water Management Area (WMA) and Molopo sub-management area.

The main rivers of this WMA are the Molopo, Harts and Vaal. All rivers associated with the study site area classified as non-perennial. The Mareetsane River flows through the north of the greater study area, while the Morokwa River flows through the central region. To the south, several small rivers flow into the study area including; the Mosime, Tlhakajeng, Makgelejane, Mosime, Thalatau, Sepane and Sebengi Rivers. Only the Mareetsane and Morokwa Rivers are listed on the National Spatial Biodiversity Assessment (Nel *et al.*, 2004) and a summary of their ecological and conservation status is listed in the table below:

Table 6: Ecological and conservation status of the Mareetsane and Morokwa Rivers according to the NSBA (Nel et al., 2004).

River name	Signature	Ecological Status	Conservation Status
Mareetsane	Kalahari Basin	Class B: Largely natural	Not threatened
Morokwa	Kalahari Basin	Class B: Largely natural	Not threatened

A Wetland Assessment Study was conducted on the proposed study area and the report outlines the following findings.

Based on current outputs of the National Freshwater Ecosystems Priority Area (NFEPA) project, no NFEPA wetland areas or wetland clusters were identified within the study area. Further, wetlands on site fall within the Eastern Kalahari Bushveld Group 1 and Dry Highveld Grassland Group 5, NFEPA WetVeg Groups (Ollis *et al,*. 2013). Both identified NFEPA WetVeg Groups are classified as being of Least Concern.

Five hydro-geomorphic (HGM) types of wetlands were delineated within the study area and classified into thirty separate HGM units within the study area. These included valley-bottom wetlands without a channel, valley-bottom wetlands with a channel, hillslope seepage wetlands that were connected to a watercourse, hillslope seepage wetlands that were not connected to a watercourse and depression. The thirty HGM units identified during the current assessment are presented graphically in Figure 5.

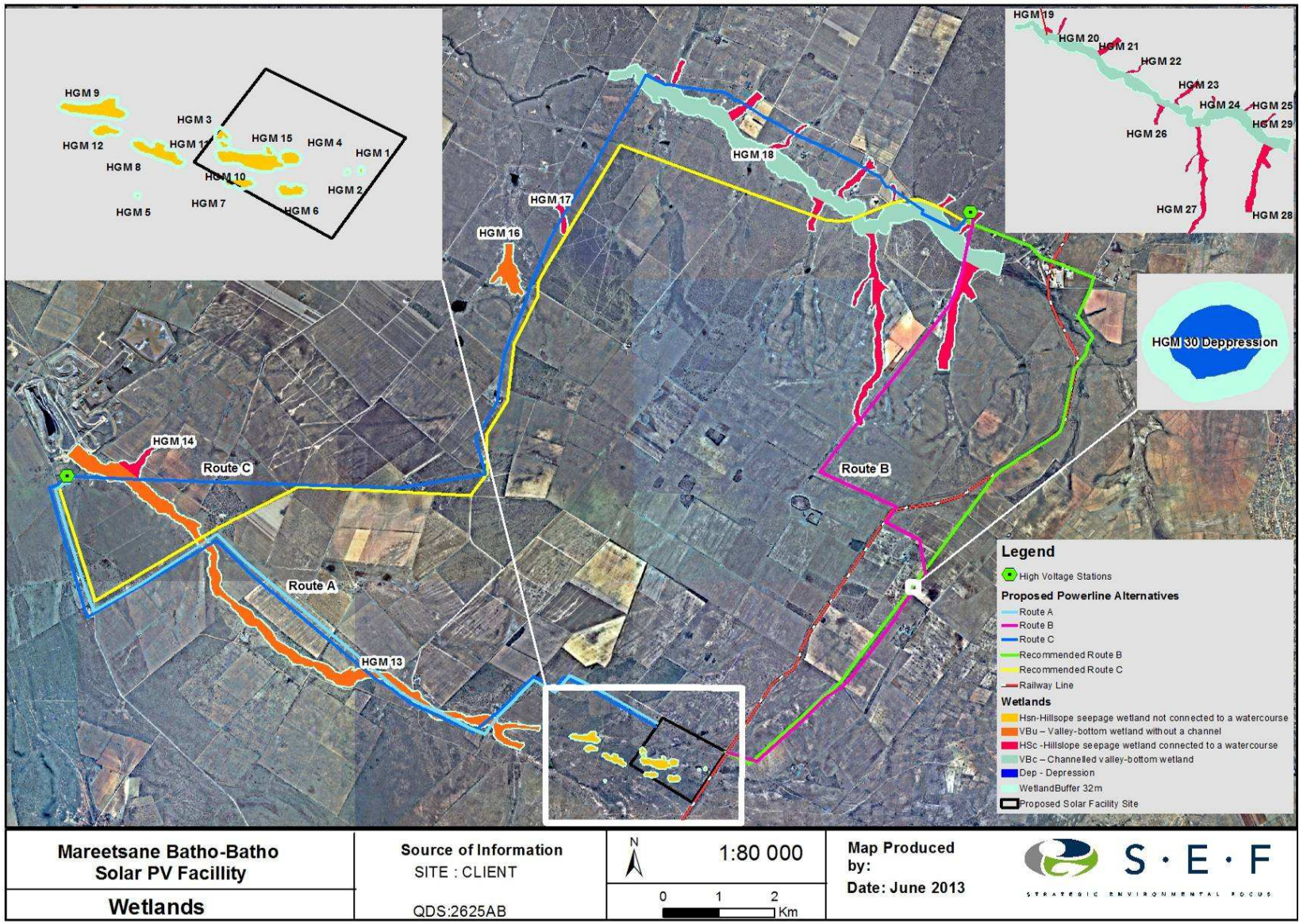


Figure 5: Delineated wetland areas within the study area

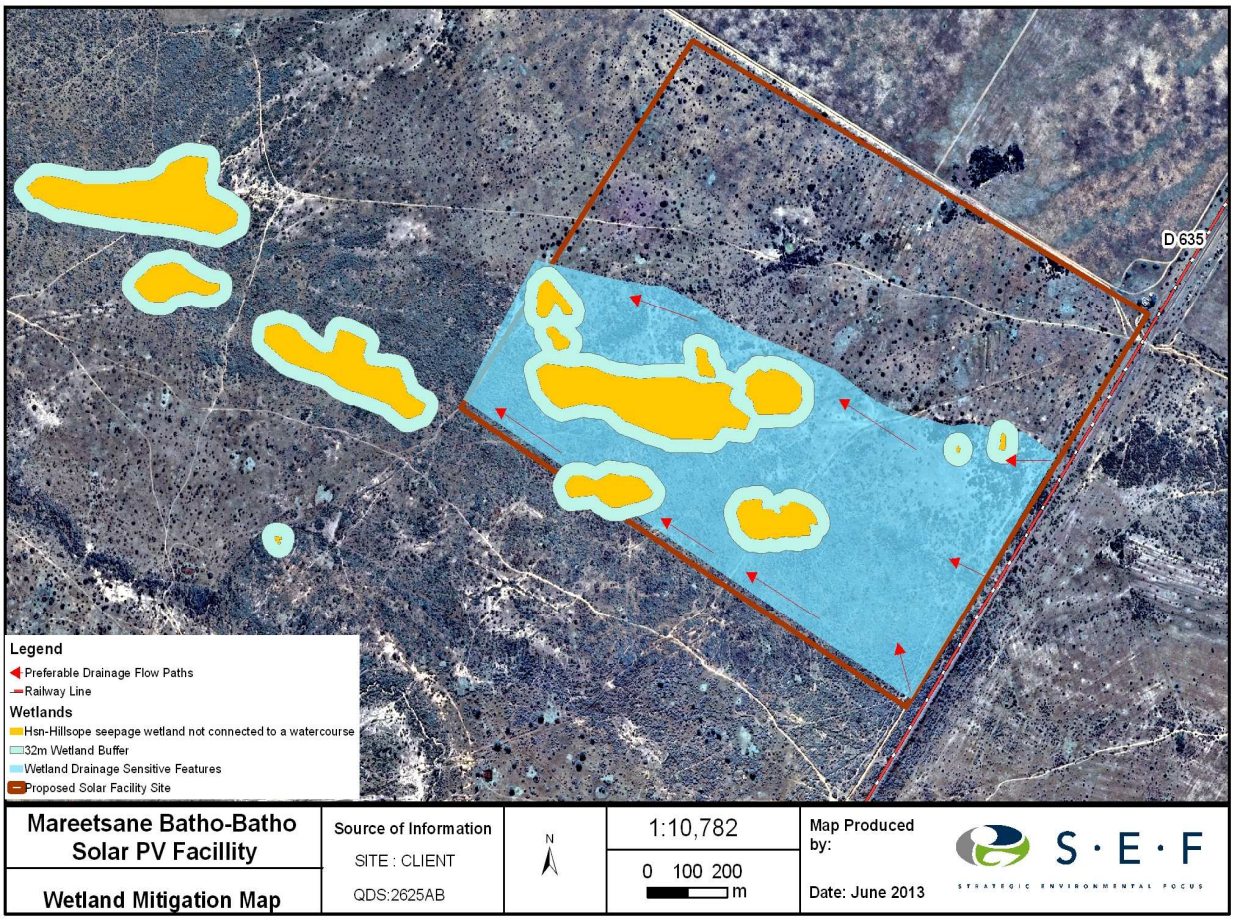


Figure 6: Wetland Mitigation Map

The layout design should therefore place infrastructure as far from wetland boundaries as possible, but as a minimum, a 32m buffer should be applied to all wetlands and serve as a no go areas as a minimum. Further, development of the site should not cause negative changes to the hydrology of the wetlands. Uprooting trees and shrubs within especially the southern section of the solar site could expose the soils to accelerated erosion processes as this area forms a preferential flow path for stormwater. The southern section should preferably not be developed unless a sensitive stormwater management could be developed that would ensure similar or improved site drainage and run-off characteristics to the receiving environment.

Linear infrastructure including access roads within the Solar PV Facility site should take cognisance of drainage patterns and incorporate sensitive stormwater management principles to avoid concentrating flow paths which could initiate erosion processes.

From a wetland perspective, recommended route A and recommended route B, should be utilised as it follows existing linear developments within the study area. Wetland areas should be crossed perpendicularly with pylons placed outside of the wetlands habitat (preferably also avoiding a 32 m wetland buffer), especially the valley-bottom wetlands. If necessitated, pylons could be placed within certain hillslope seepage wetlands where further on site studies and mitigation measures are confirmed by a wetland specialist.

In general, the study area has undergone a high level of transformation with dryland crop cultivation as the dominant land-use with grazing applied in especially the wetland habitats. Areas within valley-bottom wetlands with permanent and seasonal zonation and associated high water tables contained hydrophylic plants, such as *Typha capensis, Phragmites sp., Juncus sp., Schoenoplectus sp. and Cyperus sp*. The temporary wetland areas consisted of a mixture of facultative wetland and terrestrial species such as *Imperata cylindrical, Searsia lancea, Setaria sp., Thermeda triandra, Eragrostis plana, Eragrostis gummiflua, Aristida sp., Andropogan sp.,*

Setaria sphacelata, Hyparrenhia sp., Monopsis decipiens and *Nidorella anomala*. The vegetation associated with several hillslope seepage wetlands as well as the channelled valley-bottom wetland was impacted on through overgrazing, resulting in encroachment by the indigenous *Tarchonanthus camphorates. Melia azedarach*, an alien vegetation species, was recorded within the drainage lines and channelled valley bottom wetland.

B-1.4 Climate

The North West Province is located in the north west of South Africa, bordering Botswana. The province has warm climate with the temperatures ranging from 17 ºC to 31 ºC in the summer and from 3 ºC to 21 ºC in the winter. The annual rainfall in the province totals about 360 mm, with almost all of it falling during the summer months, between October and April (Wikipedia North West, 2013).

B-1.5 Flora and Fauna, including avifauna

Three NEMBA threatened/ protected ecosystems/ vegetation types occur within the study area and include Klerksdorp Thornveld (Grassland biome), Western Highveld Sandy Grassland (Grassland biome) as well as Mafikeng Bushveld (Savanna biome) (Figure 7).

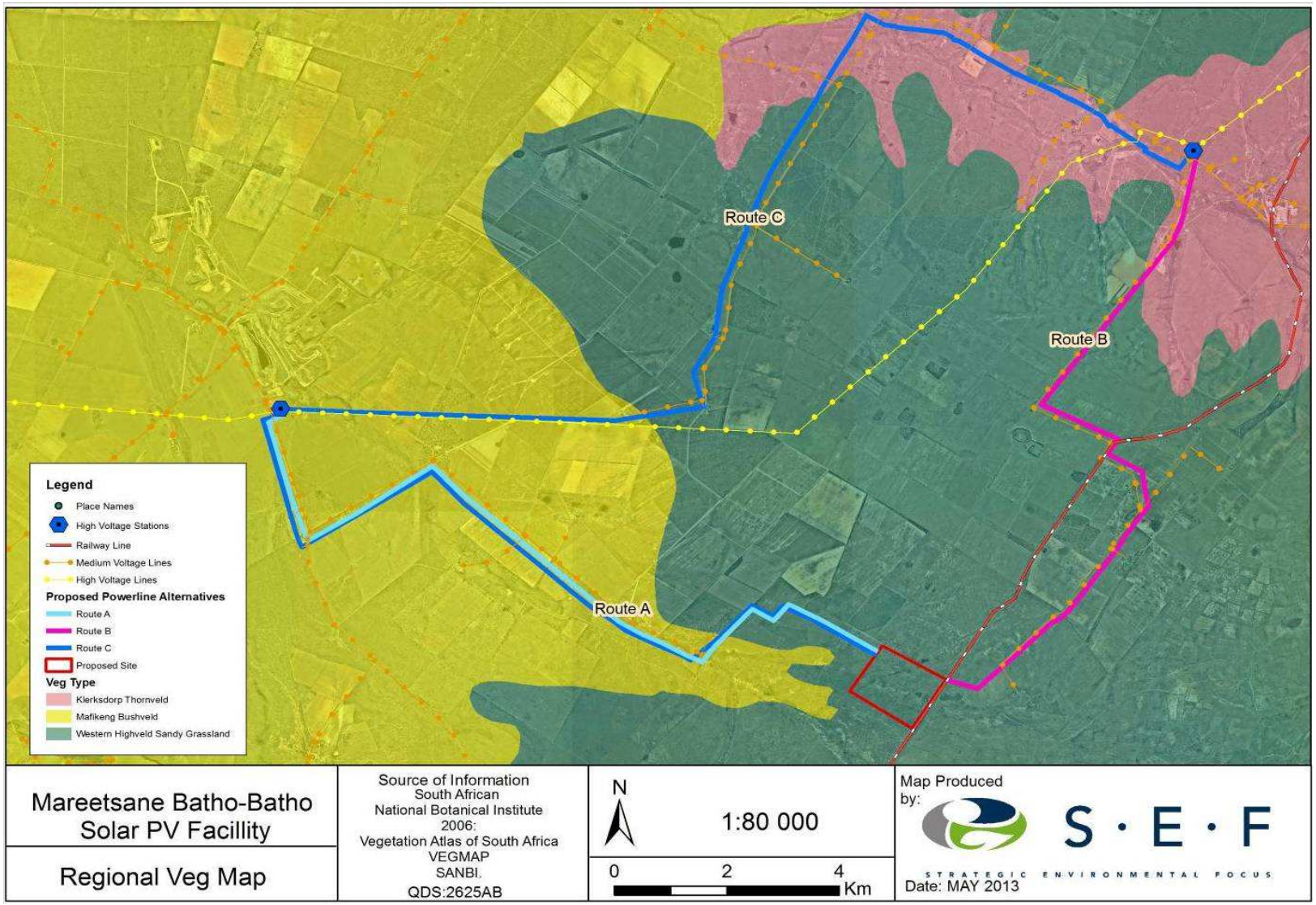


Figure 7: Regional vegetation in relation to the study area

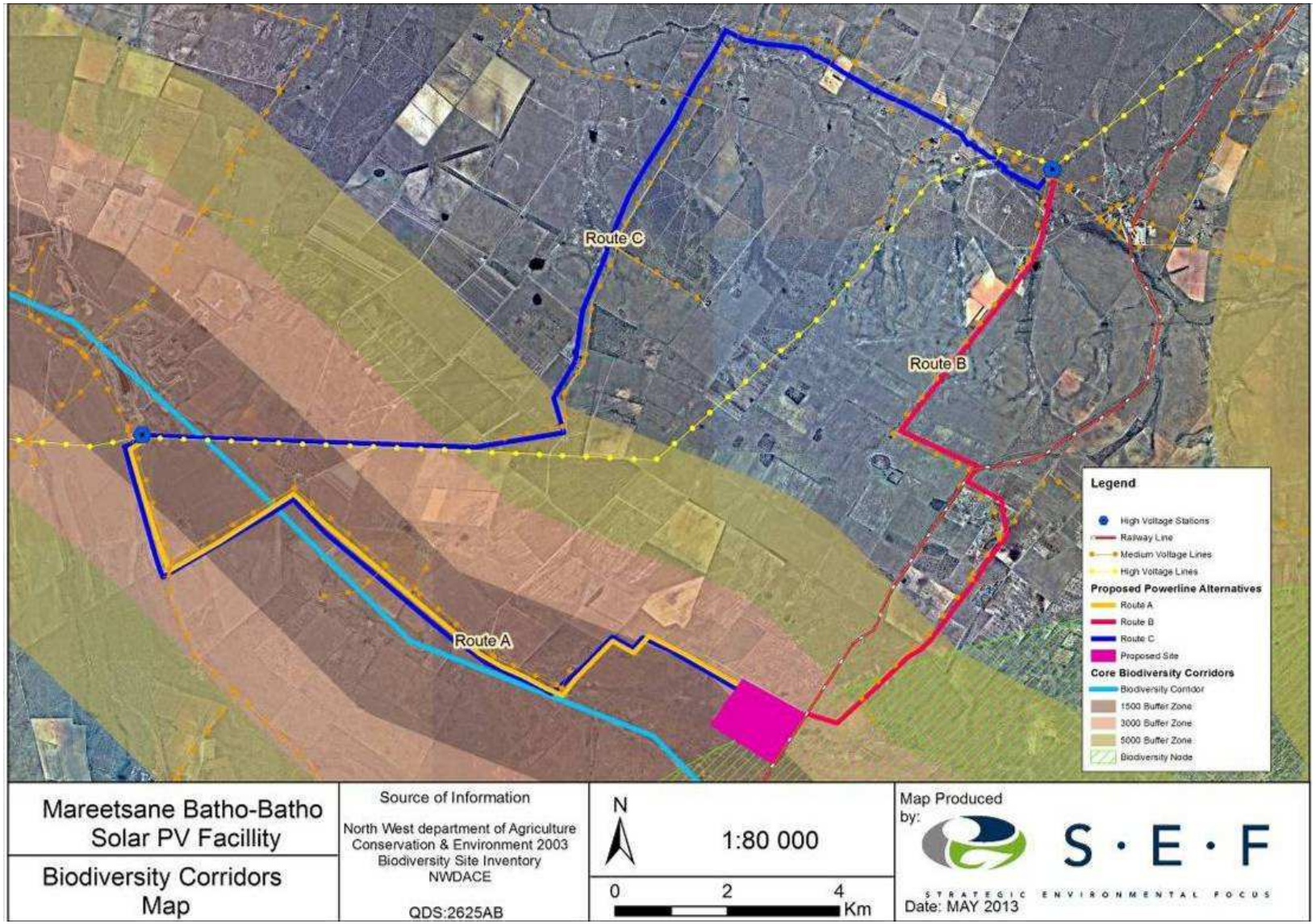


Figure 8: Biodiversity corridors within the study area

The Western Highveld Sandy Grassland ecosystem is currently listed as CE while the Mafikeng Bushveld is listed as Vulnerable in terms of Section 52 of NEMBA (Government Gazette, 2011). The site of the proposed solar facility is located within the Western Highveld Sandy Grassland and consisted of natural vegetation representative of this ecosystem while sections of powerlines route alternatives A & C are located within both Mafikeng Bushveld and Western Highveld Sandy Grassland ecosystems.

The area associated with the solar facility site was classified as medium to high ecological sensitivity due to the presence of large populations of various species of conservation concern and since the nationally protected tree species, *Acacia erioloba* is the dominant woody species within this site. Furthermore, the vegetation associated with the solar facility is representative of Western Highveld Sandy Grassland which is classified as a Critically Endangered ecosystem.

Two game camps were associated with the second portion of powerline route alternative C. The first game camp located closer to the Kalgold substation was dominated by the protected tree *Acacia erioloba* (Camel Thorn) and also included a small portion of pasture field. Since the game camp was not accessible, a detailed floral study was not conducted within the camp.

The second game camp was located further north and although it was more disturbed than the first, still contained natural indigenous vegetation with numerous *Acacia erioloba* (Camel Thorn) trees.

A small rocky outcrop and wetland was located east of the Kalgold substation and although species diversity in these areas were lower than what would be expected of rocky areas and wetlands, this could be attributed to the below average rainfall experienced in 2013 as well as overgrazing. Despite this, at least one provincially protected species, *Ammocharis coranica* (Seeroogblom), was recorded from this area.

The northern portion of powerline route alternative C traverses the Mareetsane River. The vegetation associated with the river was impacted on through overgrazing resulting in encroachment by the indigenous *Tarchonanthus camphorates* (Camphor Bush). Despite this, the area supported floral species representative of riverine or moist areas such as *Pharagmites australis* (Common Reed), *Imperata cylindrica* (Cottonwool Grass), *Searsia lancea* (Karee), *Cyperus fastigiatus* and *Schoenoplectus sp*. At least one species of conservation concern, *Crinum c.f. stuhlmannii*, was also recorded in this area.

Large portions of *Acacia erioloba Bushveld* were also recorded along the northern portion of powerline route alternative C and included areas which have been disturbed through overgrazing as well as areas which were in good condition. The nationally protected tree *Acacia erioloba* (Camel Thorn) was the dominant tree in this area while at least one species of conservation concern, *Boophone disticha* (Poison Bulb), and one provincially protected species*, Crinum graminicola*, was also frequently recorded from these areas.

A number of plants identified on the study site are not threatened, but are protected by Schedule 7 of the Bophutatswana Nature Conservation Act, 1973 (Act No. 3 of 1973). These plants may not be removed, picked, pruned or destroyed.

The National Forest Act, 1998 (Act No. 84 of 1998) enforces the protection of a number of indigenous trees. The removal, thinning or relocation of protected trees will require a permit from the DAFF. One nationally protected tree species, *Acacia erioloba* (Camel Thorn) (Photograph 6) was recorded throughout the study area and in most instances was the dominant species within the vegetation communities, thus each individual was not recorded.

Approximately 359 bird species have been confirmed to occur within QDGC 2625AB. Of this total, approximately 346 species (96.4%) are associated with a savanna / farmland mosaic (including terrestrial water systems), as is the character of the study area. A total of 62 bird species were identified in the study area during the field surveys.

A total of 18 species endemic to southern Africa were recorded in the study area during the field surveys. Although not recorded during the field survey a further seven species of conservation concern were given a high probability of occurring in the study area due to the presence of suitable breeding and/or foraging habitat. Such species included *Polemaetus bellicosus* (Martial Eagle), *Ardeotis kori* (Kori Bustard) and *Aquila rapax* (Tawny Eagle) which are currently listed nationally as Vulnerable; *Certhilauda chuana* (Short-clawed Lark) and *Falco biarmicus* (Lanner Falcon), currently listed nationally as Near Threatened; and *Coracias garrulus* (European Roller) and *Falco vespertinus* (Red-footed Falcon) which are non-breeding migrants currently listed globally as Near Threatened.

Two species of conservation concern, *Gyps africanus* (White-backed Vulture) which is currently listed as Endangered and *Sagittarius serpentarius* (Secretary bird) currently listed as Vulnerable, were confirmed at various locations throughout the study area.

Approximately 69 terrestrial mammal species are expected to occur within the geographical area associated with the study area, according to the IUCN distribution ranges. Twenty mammal species were identified in the study area during the field survey by sight or field evidence such as spoor, droppings or burrows. While none of these were of conservation concern, eight species are protected by Schedule 1 and Schedule 2 of the Bophutatswana Nature Conservation Act, 1973 (Act No. 3 of 1973) while an additional two species are nationally protected by the NEMBA.

Based on the ecological surveys, powerline route alternative B would be the preferred alternative since this powerline traversed only small patches which contained indigenous vegetation. Furthermore, *Acacia erioloba* (Camel Thorn) which is a nationally protected tree species was not as prolific along this alternative when compared to powerline route alternative A and C. However, it is strongly recommended that powerline route alternative B does not turn east at approximately S26º12’00.3”; E25º24’14.7” but continue due north following the existing road (Figure 10). The original route proposed for powerline route alternative B traverse areas which have been classified as medium to high ecological sensitivity due to the presence of breeding pairs of *Sagittarius serpentarius* (Secretary bird) and *Gyps africanus* (White-backed Vultures) which are both of conservation concern. Furthermore, due to their large body size, these species are exceptionally Vulnerable to electrification through powerlines.

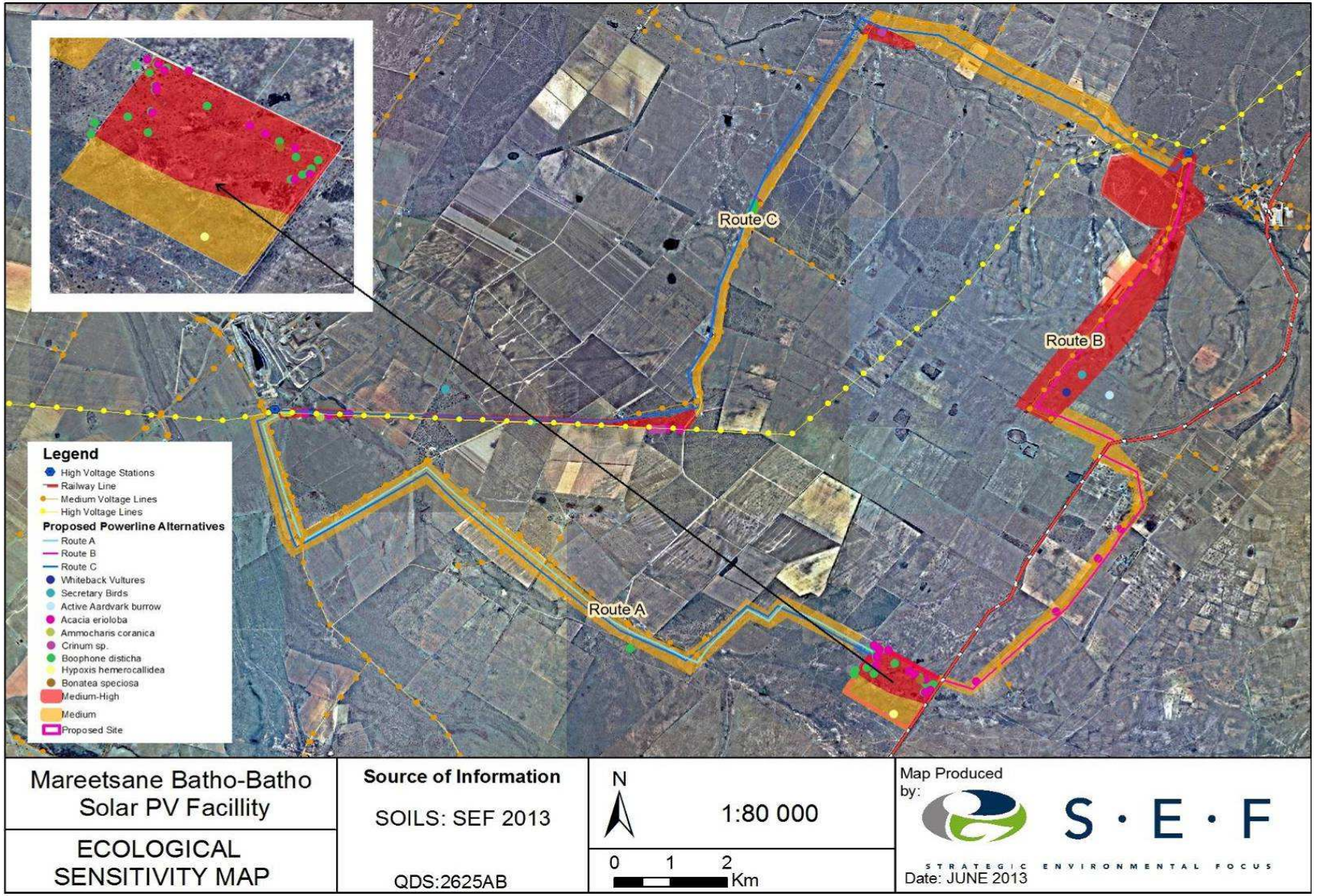


Figure 9: Ecological Sensitivity

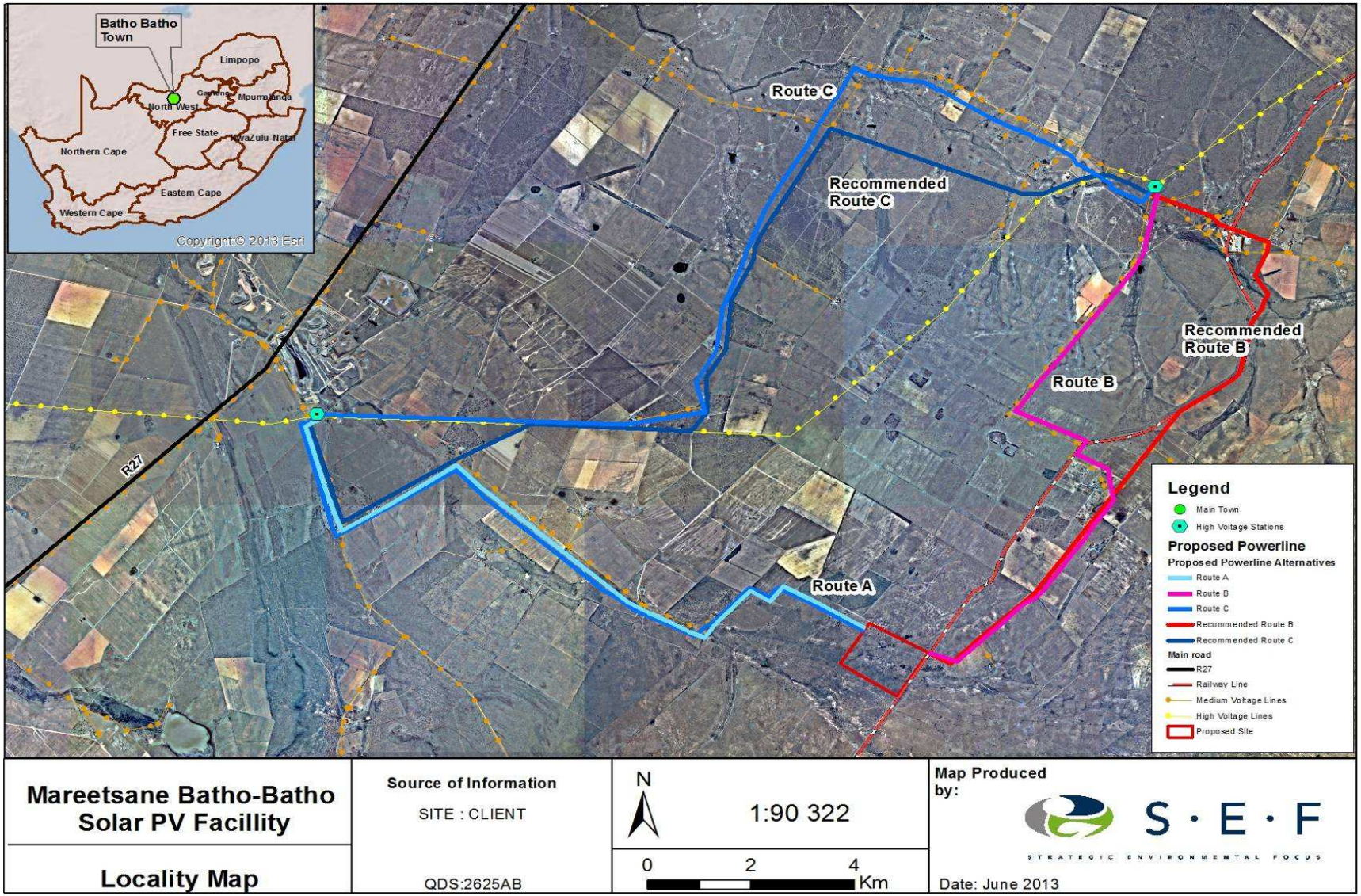


Figure 10: Recommended powerline route alternative B (preferred) and C

B-2 SOCIAL ENVIRONMENT

B-2.1 Demographic Conditions

According to the NMMDM IDP, the total area of the municipal area is approximately 2, 788, 84 hectares, which is equivalent to 26% of the total number of hectares in the North West Province.

The DM has a total population of 764,351, which is equivalent to 24% of the total population in North-West. 34% of the population is found in the Mafikeng Local Municipality (MLM), thus giving it the largest population density in the District; while 14% of the population is situated within the RLM.

The DM has a total of 554,668 people living under the minimum living income, which is equivalent to 29% of the total number of minimum living income earners in the Province; thus, making it the District with the most underprivileged people. The DM has a total household income figure of R4, 640,814,817 which makes up 17% of the total household income figure in the North-West province. The highest average household income is found in the Mafikeng Local Municipality. The lowest level of household income is found in the RLM 33% of the minimum level income earners are in the MLM. In comparison, 9% of below minimum living income earners are found in the RLM, making it the region with the least underprivileged population segment both in percentage and numbers within the District.

The DM has a total of 157,036 unemployed people, which is equivalent to 23% of the total number of unemployed people in the Province.

B-2.2 Visual

Scenic value can be described as the reaction to aesthetics of the environment as perceived by an individual or a group and therefore it is a very subjective perception. Visual impacts generally occur as a result of changes to the landscape (i.e. development). A distinction, however, should be made between impacts on the visual resource (physical landscape) and impacts on the visual receptor (viewer). Changes to the visual resource will impact on the viewing experience of its visual receptors. The intensity of these impacts will be determined by a range of visual aspects.

The solar facility site lies within a predominantly flat area with scattered thickets of shrubby vegetation. The area is completely isolated and undisturbed apart from grazing and the existence of a dilapidated perimeter fence. Although the vegetation within and around the solar site is generally in a good condition there are no remarkable views or interesting landscape features present. The dense vegetation in the southern parts of the site restricts views to and from the adjacent land to a large degree.

The areas along the proposed powerline routes are strongly influenced by a combination of farming activities, road and/or rail infrastructure as well as existing overhead telecommunication and electricity distribution lines.

The visual envelope demarcates the zone of visual influence (ZVI) and includes the area within which views to the proposed solar facility and powerline is expected to be of concern. The visual envelope for the study area is limited to a 4km radius around the location of the proposed solar facility and 2km corridors along proposed powerline routes. These distances are considered an adequate distance to assess the significance of the potential visual impact.

In order to assess the extent of visual exposure in the area, a GIS was utilised. A viewshed analysis was created by utilising a DEM with 20m contour intervals (Figure 11). Based on the graphical representation of Figure 11, visual receptors that will experience views of the proposed solar facility include Residents on the farms Woodpark, Jackalsdans and Ellenbury.

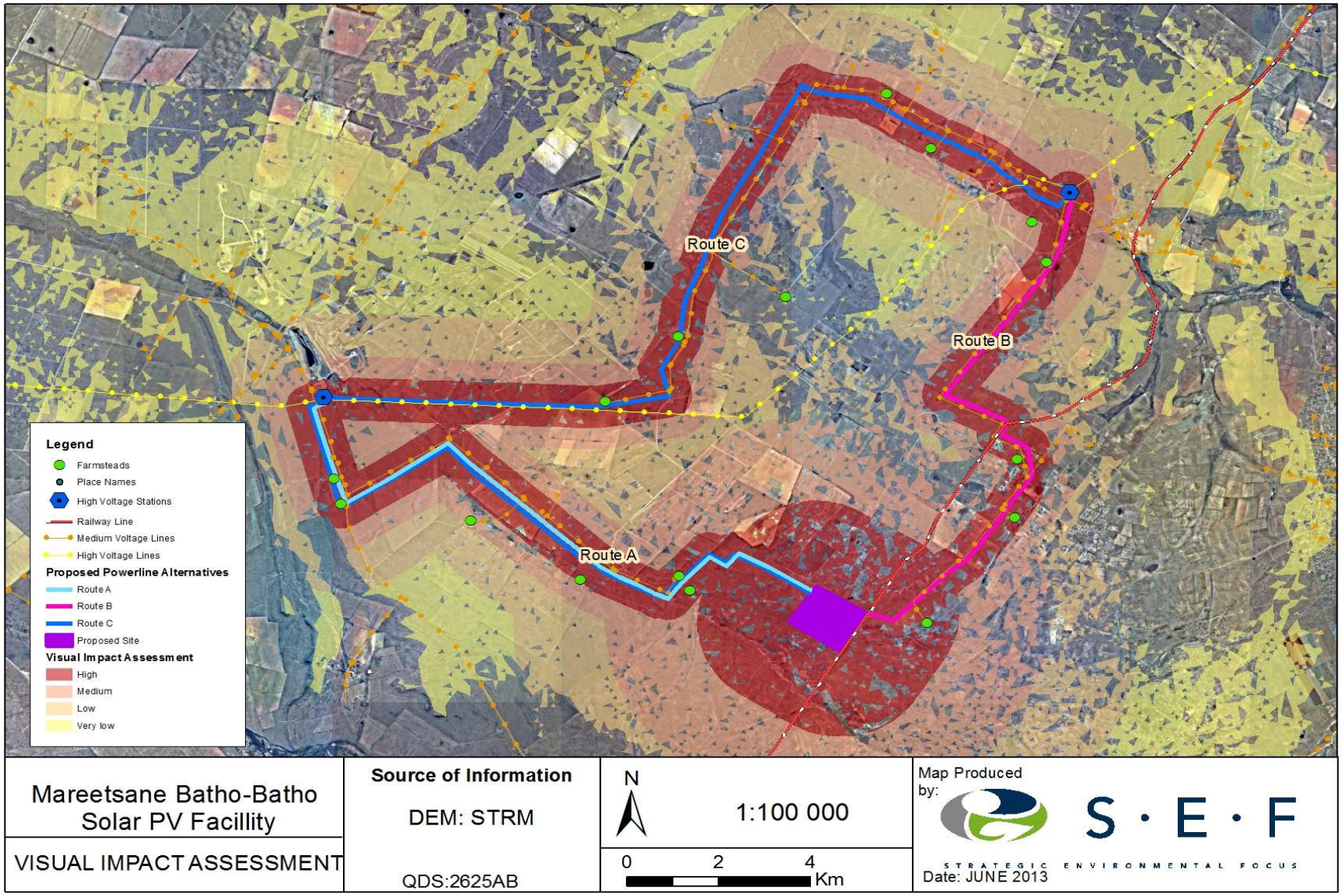


Figure 11: Visibility Map

B-2.3 Heritage

As per the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a Phase 1 HIA has been undertaken for the proposed development, due to the size of the development exceeding 0.5 ha and based on the identification of a graveyard during the Environmental Feasibility Assessment. The site visit for the proposed Mareetsane Solar PV Facility was conducted over two visits on 9 to 10 April and 21 to 22 May 2013. The survey was undertaken by means of walking and driving throughout the study area.

The aim of the cultural heritage survey (Phase I HIA, in accordance with NHRA was to locate, identify, document and assess sites of cultural heritage, architectural and archaeological significance that may occur within the proposed footprint for the establishment of the Mareetsane Solar PV Facility and associated powerline route alternatives. An assessment of the impact of the establishment of the solar farm and the installation of the powerline on such resources will be provided. Where the impact is negative, alternatives and/or mitigation plans will be considered.

The heritage investigation focused on the proposed site for the establishment of the solar facility, including the three powerline route alternatives for connecting the solar facility to the National Grid via one of two nearby Eskom substations. The study area is mainly farmlands, and as such the heritage resources revealed by the study conform to agricultural land heritage and archaeology. The heritage resources found on site constitute graves of various ages (some older and others younger than 60 years).

The heritage survey for the proposed Mareetsane Solar PV Facility revealed 10 grave sites (Figure 12). Please refer to Appendix 7 for the HIA Report.

The following categories of grave sites were identified at the proposed project site:

- Grave sites occurring within the proposed solar facility site – Grave sites 2 and 3;
- Grave sites located outside of the proposed solar facility site but occurring within 20 m of its boundary – Grave sites 1 and 4; and
- Graves sites occurring within the proposed servitude for the powerlines (Grave Sites 8 and 9).

There will be a need for relocation of grave site 2 and 3. Grave site 1 is younger than 60 years whilst Grave sites 2, 3 and 4 are older than 60 years or of an undetermined age. Graves older than 60 years or of an unknown age, will need to be relocated through the SAHRA's grave relocation policy and permit application. This will constitute a Phase II HIA to be undertaken by an archaeologist. The provisions of the Human Tissue Act, 1983 (Act No. 65 of 1983) as amended, as well as the regulations (22 May 2013) relating to the management of human remains under the National Health Act, 2003 (Act No. 61 of 2003) take precedence if affected graves are younger than 60 years.

The SAHRA recommends a 20m buffer around grave sites. Thus mitigation measures must be implemented, as outlined in the HIA Report as attached in Appendix 7, to reduce the likely impacts on these identified heritage resources.

The majority of the graves identified on the solar facility site are ancestral graves belonging to families who lived on the native reserve in the past and have relocated elsewhere in the surrounding places. Most of the graves have no inscriptions, and the age and the name of the deceased cannot be known.

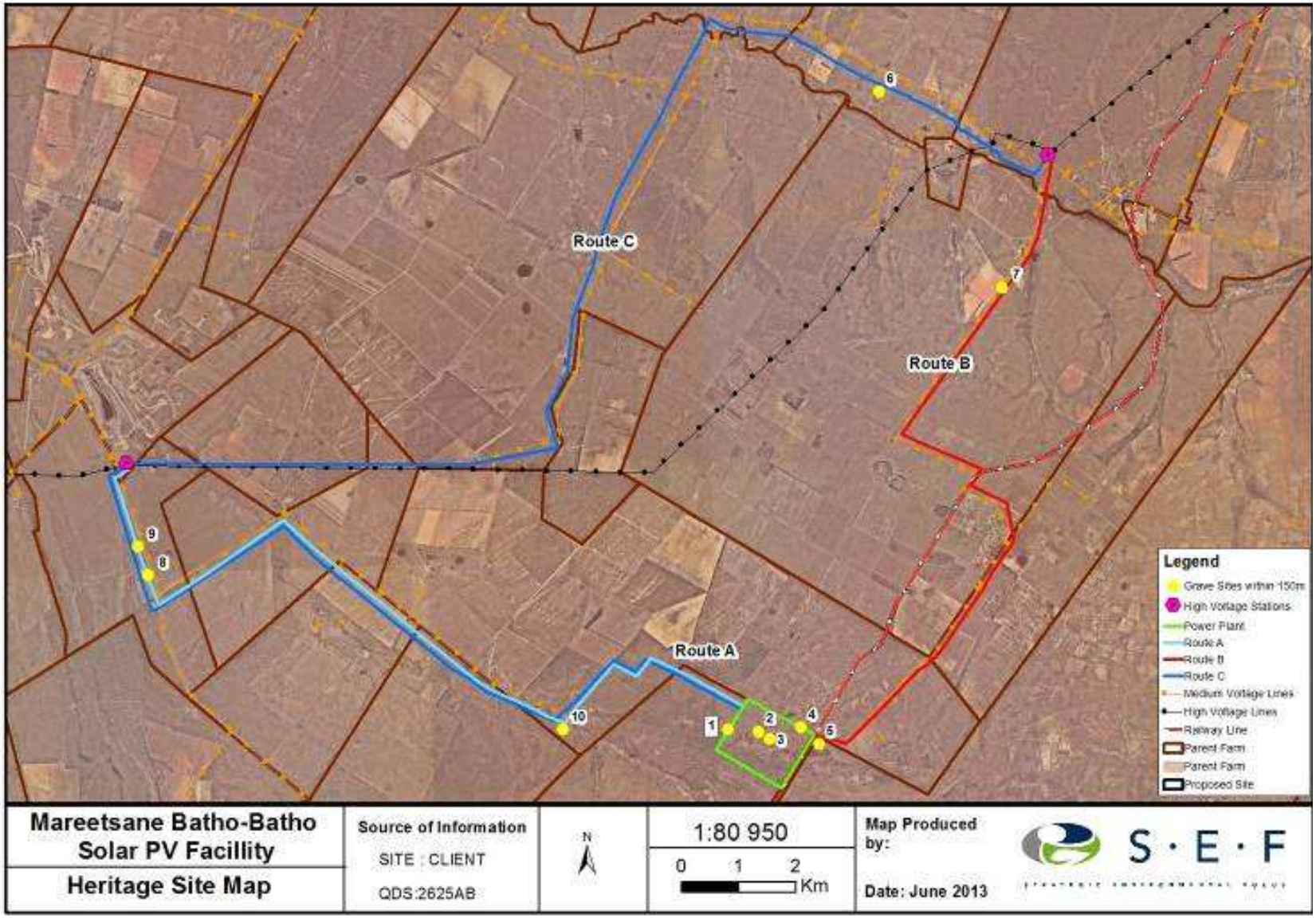


Figure 12: Heritage Site Map of the Mareetsane Solar PV Facility and proposed powerline route alternatives

B-2.4 Noise

Noise control must form part of the planning stage of any development. During the construction phase, noise may be generated as a result of construction related activities such as: the use of machinery and equipment, and the movement of construction vehicles, etc. These potential noise impacts must be mitigated, where possible.

B-2.5 Air

Vehicles travelling on exposed surfaces, earthworks as well as wind are the main generators of dust. The nuisance and aesthetic impacts associated with the dust generated during the construction phase should be minimal, if mitigating measures are implemented.

Dust generated off the earth's surface is generally regarded as a nuisance rather than a health or environmental hazard. On a large scale dust will impair atmospheric visibility; however, in the context of the proposed activity, the impact of dust production on air quality should be minimal taking into account that effective dust suppression techniques are available. The nuisance aspect of dust will be minimal as the area is sparely populated and people do not reside in close proximity to the site.

SECTION C: ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROCESS

C-1 APPROACH TO THE EIA

An EIA is an effective environmental planning tool. It identifies the environmental impacts of a proposed project and assists in ensuring that a project will be environmentally acceptable and integrated into the surrounding environment in a sustainable way.

The EIA for this project complies with the requirements of the NEMA EIA Regulations, 2010 of the DEA. The guiding principles of an EIA are listed below.

Definition of the term "environment"

The term "environment" is used in the broadest sense in an environmental impact assessment. It covers the physical, biological, social, economic, cultural, historical, institutional and political environments.

C-2 GUIDING PRINCIPLES FOR AN EIA

The EIA must take an open participatory approach throughout. This means that there should be no hidden agendas, no restrictions on the information collected during the process and an open-door policy by the proponent. Technical information must be communicated to stakeholders in a way that is understood by them and that enables them to meaningfully comment on the project.

There should be on-going consultation with I&APs representing all walks of life. Sufficient time for comment must be allowed. The opportunity for comment should be announced on an on-going basis. There should finally be opportunities for input by specialists and members of the public. Their contributions and issues should be considered when technical specialist studies are conducted and when decisions are made.

The eight guiding principles that govern the entire process of EIA are as follows (see Figure 13 below):

- **Participation:** An appropriate and timely access to the process for all I&APs.
- **Transparency:** All assessment decisions and their basis should be open and accessible.
- **Certainty:** The process and timing of the assessment should be agreed in advanced and followed by all participants.
- **Accountability:** The decision-makers are responsible to all parties for their action and decisions under the assessment process.
- **Credibility:** Assessment is undertaken with professionalism and objectivity.
- **Cost-effectiveness:** The assessment process and its outcomes will ensure environmental protection at the least cost to the society.
- **Flexibility:** The assessment process should be able to adapt to deal efficiently with any proposal and decision making situation.
- **Practicality:** The information and outputs provided by the assessment process are readily usable in decision making and planning.

An S&EIR process is considered as a project management tool for collecting and analysing information on the environmental effects of a project. As such, it is used to:

- Identify potential environmental impacts;
- Examine the significance of environmental implications;
- Assess whether impacts can be mitigated;
- Recommend preventive and corrective mitigating measures;
- Inform decision makers and concerned parties about the environmental implications; and

- Advise whether development should go ahead.

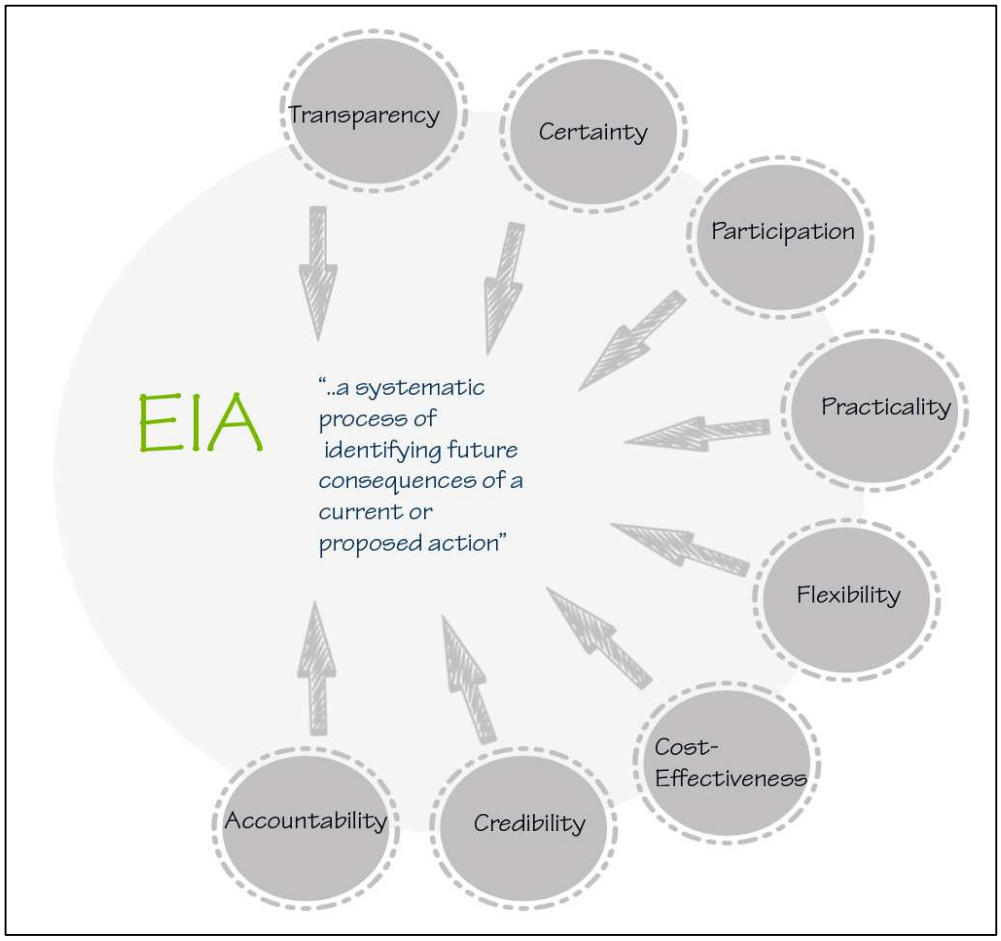


Figure 13: The eight guiding principles for the EIA process

An S&EIR process typically has four phases, as illustrated in Figure 14 below. The Public Participation Process (PPP) forms an integral part of all four phases and is discussed in greater detail in Section C – 4 of this Final EIR.

C-3 S&EIR TECHNICAL PROCESS

This section provides a summary of the technical process to be followed for this S&EIR process.

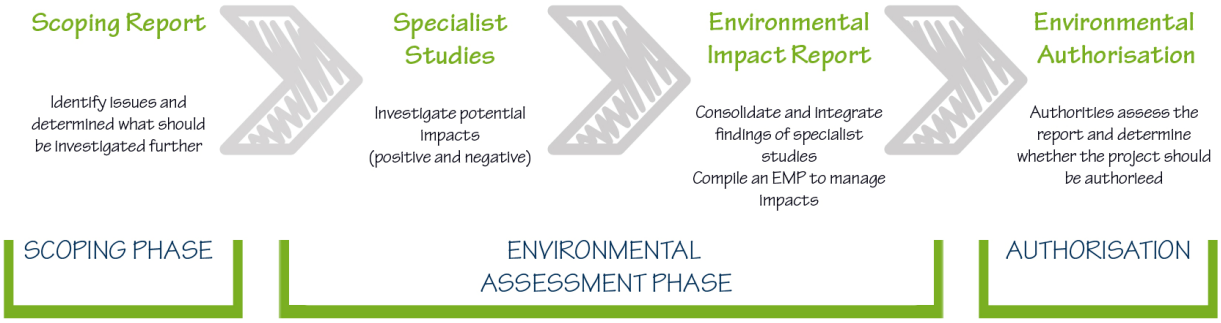


Figure 14: Flow diagram of the Scoping and EIR process

Pre-application Consultation with the DEA

No pre-consultation meeting was held between SEF and the DEA. SEF are conducting the S&EIR process for the applicant, in support of their application for an EA, and are deemed to have a good understanding of the information requirements of the DEA for the proposed Mareetsane Batho-Batho Solar PV Facility, such that the DEA's specific information requirements are deemed to have been met for the EIR phase of this project.

C-3.1 Application for Authorisation

The application form informing the DEA of intent to obtain an EA was submitted on 20 March 2013. The DEA issued the application with the following reference numbers: **DEA Ref No: 14/12/16/3/3/2/514** and **NEAS Ref No: DEA/EIA/0001785/2013**. The letter acknowledging receipt of the application form is included in Appendix 4.

C-3.2 Information Gathering

Early in the EIA process, the technical specialists identified the information that would be required for the impact assessment and the relevant data was obtained. In addition, the specialists sourced available information about the receiving environment from reliable sources, I&APs, previous documented studies in the area and previous EIA Reports.

C-3.3 Specialist Studies

The following specialist studies were identified in the Scoping Phase and have been undertaken (Please refer to Appendix 7 for Specialist Reports).

- Soils and Agricultural Potential Assessment;
- Ecological Assessment (Flora and Fauna including Avifauna) Assessment;
- Phase 1: Heritage Impact Assessment (HIA);
- Visual Impact Assessment (VIA);
- Wetland Delineation and Functional Assessment;
- Stormwater and Waste Management Plan; and
- Traffic Impact Assessment/ Statement.

C-4 PUBLIC PARTICIPATION PROCESS

The principles of NEMA govern many aspects of the S&EIR process, including consultation with I&APs. These principles include the provision of sufficient and transparent information to I&APs on an on-going basis, to allow them to comment; and ensuring the participation of Historically Disadvantaged Individuals (HDIs), including women, the disabled and the youth.

The principal objective of public participation is thus to inform and enrich decision-making. This is also the key role in the Scoping phase of the process.

C-4.1 Identification of Interested and Affected Parties

I&APs representing the following sectors of society have been identified in terms of Regulation 55 of the EIA Regulations R543 of 2010 (see Appendix 5 for a complete preliminary I&AP distribution list):

- National Authorities;
- Provincial Authorities;
- Local Authorities;

- Ward Councillors;
- Parastatal/ Service Providers;
- Non-governmental Organisations;
- Local forums/ unions; and
- Adjacent Landowners.

C-4.2 Public Announcement of the Project

The project was announced on 16 April 2013 in the following manner (see Appendix 5 for public announcement documentation):

- Publication of media advertisements (in English and Setswana) in the local newspapers, The Noordwester, on 12 April 2013 and The Mail, on 26 April 2013;
- On-site notices (10) (in English) advertising the S&EIR process were placed on and around the site, as well as at Mareetsane Tribal Office and other strategic locations within the Mareetsane area on 16 and 17 April 2013; and
- Distribution of letters by fax/ by hand/courier/ email to I&APs including Registration and Comment Sheets.

C-4.3 Draft Scoping Report

A period of **40 calendar days (16 April – 28 May 2013)** was provided to the **State Departments** and the **general public** for the review and commenting phase of the Draft Scoping Report. All I&APs as well as State Departments were notified of this review period. I&APs and relevant State Departments had the opportunity to submit comments on the Draft Scoping Report either in writing, by telephone or email.

The availability of the Draft Scoping Report was announced by means of personal letters to all stakeholders on the distribution list, site notices placed on and around the site, and by adverts placed in the abovementioned newspapers.

In addition, the Draft Scoping Report was distributed for comment as follows:

- Left in a public venue (Mareetsane Tribal Office);
- Hand-delivered/ couriered to the relevant authorities; and
- Posted on SEF's website at http://www.sefsa.co.za.

All the comments and concerns raised by I&APs during the S&EIR process were captured in a CRR. I&APs will receive correspondence acknowledging their contributions.

C-4.4 Final Scoping Report

The Final Scoping Report was updated with comments and/or concerns raised by I&APs during public review of the Draft Scoping Report. The CRR has also been attached (Appendix 5). The final Scoping Report was submitted to the DEA and registered I&APs simultaneously for review and comment for a period of **30 calendar days (05 June to 08 July 2013)**. Registered I&APs were advised to submit any additional comments on the final Scoping Report directly to the DEA prior to the lapsing of the 30 day review period.

The Final Scoping Report (including the PoS for EIR) was submitted to the DEA on 05 June 2013. In a letter dated 28 June 2013, the DEA approved the Final Scoping Report and gave the authority to proceed with the EIR (refer to Appendix 4).

C-4.5 Draft Environmental Impact Report

The findings of the Impact Assessment Phase were presented in the Draft EIR and EMPr (including the specialist studies conducted) and the report was made available for public review and comment. A period of **40 calendar days** (**02 December 2013 – 31 January 2013**) was provided to the State Departments and Registered I&APs for the review and commenting phase of the Draft EIR. The availability of the Draft EIR was announced by means of personal letters to all the registered I&APs on the distribution list.

In addition, the Draft EIR was distributed for comment as follows:

- Left in a public venue (Mareetsane Tribal Office);
- Hand-delivered/ couriered to the relevant authorities; and
- Posted on SEF's website at http://www.sefsa.co.za.

All the comments and concerns raised have been captured in the CRR. I&APs were sent letters acknowledging their contributions.

C-4.6 Final Environmental Impact Report

This Final EIR has been made available for public review and comment. A period of **30 calendar days** (**21 February 2014– 24 March 2014**) has been provided to the State Departments and Registered I&APs for the review and commenting phase of this Final EIR. The CRR has been attached to this Final EIR. This Final EIR is being submitted to the DEA and registered I&APs simultaneously for review. Registered I&APs are advised to submit any additional comments on the Final EIR directly to the DEA to the contact details detailed below, having copied SEF in all communication. The DEA's reference number (**DEA Ref: 14/12/16/3/3/2/514 and NEAS Ref: DEA/EIA/0001785/2013**) should be indicated in all communication with them.

Attention: Masina Litsoane
Tel: 012 395 1778
Fax: 012 320 7539
E-mail:

Copies to be submitted to SEF to the following contact details:

Attention: Mandla Zuma
Tel: 012 349 1307
Fax: 012 349 1229
E-mail: mandla@sefsa.co.za

C-4.7 Comment and Response Report

All comments/concerns raised by I&APs during the PPP to-date have been captured in the CRR (Appendix 5). The final CRR includes and addresses all issues and comments raised during the EIR phase and constitute an important component of tis Final EIR. It will be an on-going record of stakeholder concerns raised throughout the S&EIR process.

C-4.8 Notification letters of the department's decision

All registered I&APs will receive a letter at the end of the process notifying them of the authority's decision, thanking them for their contributions and explaining the appeal procedure. The department's decision will also be advertised, as required by the EIA regulations, 2010.

C-4.9 Conclusion

The PPP followed during the scoping phase for the proposed development was in line with the EIA regulations, 2010. In order to facilitate an open and transparent process, I&APs were identified and notified of the proposed development. All comments/ concerns received, to date, have been incorporated and addressed in this Final EIR.

SECTION D: ASSESSMENT CRITERIA

D-1 IMPACT IDENTIFICATION AND ASSESSMENT

The EAP must make a clear statement, identifying the environmental impacts of the construction, operation and management of the proposed development. As far as possible, the EAPs must quantify the suite of potential environmental impacts identified in the study and assess the significance of the impacts according to the criteria set out below. Each impact will be assessed and rated. The assessment of the data must, where possible, be based on accepted scientific techniques, failing which the specialist is to make judgements based on his/ her professional expertise and experience.

D-1.1.1 Assessment Procedure: Proposed Impact Assessment Methodology

For the purpose of assessing impacts during the EIR phase of the project, the project has been divided into two phases from which impacting activities can be identified, namely:

Construction Phase:	All the construction related activities on site, until the contractor leaves the site.
Operational Phase:	All activities, including the operation and maintenance of the proposed development.

The activities arising from each of these phases have been included in the impact assessment tables. This is to identify activities that require certain environmental management actions to mitigate the impacts arising from them.

The assessment of the impacts will be conducted according to a synthesis of criteria required by the integrated environmental management procedure.

Extent The physical and spatial scale of the impact.	Footprint	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
	Site	The impact could affect the whole, or a significant portion of the site.
	Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
	National	The impact could have an effect that expands throughout the country (South Africa).
	International	Where the impact has international ramifications that extend beyond the boundaries of South Africa.

Duration The lifetime of the impact, that is measured in relation to the lifetime of the proposed development.	Short Term	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.
	Short-Medium Term	The impact will be relevant through to the end of a construction phase.
	Medium Term	The impact will last up to the end of the development phases, where after it will be entirely negated.
	Long Term	The impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter.
	Permanent	This is 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 Is the impact destructive or benign, does it destroy the impacted environment, alters its functioning, or slightly alter the environment itself?	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 functions and processes 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 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 none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0%).
	Possible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25%.
	Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50%.
	Highly Likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75%.
	Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100%.

Mitigation **–** The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

Determination of Significance – Without Mitigation **–** Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as "positive". Significance will be rated on the following scale:

No significance: The impact is not substantial and does not require any mitigation action;
Low: The impact is of little importance, but may require limited mitigation;
Medium: The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels; and
High: The impact is of major 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.

Determination of Significance – With Mitigation – Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation will be rated on the following scale:

No significance: The impact will be mitigated to the point where it is regarded as insubstantial;
Low: The impact will be mitigated to the point where it is of limited importance;
Low to medium: The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels;
Medium: Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw;
Medium to high: The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels; and
High: The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

Assessment Weighting – Each aspect within an impact description was assigned a series of quantitative criteria. Such criteria are likely to differ during the different stages of the project's life cycle. In order to establish a defined base upon which it becomes feasible to make an informed decision, it will be necessary to weigh and rank all the identified criteria.

Ranking, Weighting and Scaling – For each impact under scrutiny, a scaled weighting factor will be attached to each respective impact. The purpose of assigning such weightings serve to highlight those aspects considered the most critical to the various stakeholders and ensure that each specialist's element of bias is taken into account. The weighting factor also provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspect criteria.

Simply, such a weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance (See Figure below: Weighting description).

Extent	Duration	Intensity	Probability	Weighting Factor (WF)	Significance Rating (SR)	Mitigation Efficiency (ME)	Significance Following Mitigation (SFM)
Footprint 1	Short term 1	Low 1	Probable 1	Low 1	Low 0-19	High 0,2	Low 0-19
Site 2	Short to medium 2		Possible 2	Low to medium 2	Low to medium 20-39	Medium to high 0,4	Low to medium 20-39
Regional 3	Medium term 3	Medium 3	Likely 3	Medium 3	Medium 40-59	Medium 0,6	Medium 40-59
National 4	Long term 4		Highly Likely 4	Medium to high 4	Medium to high 60-79	Low to medium 0,8	Medium to high 60-79
International 5	Permanent 5	High 5	Definite 5	High 5	High 80-100	Low 1,0	High 80-100

Figure 15: Description of bio-physical assessment parameters with its respective weighting

Identifying the Potential Impacts Without Mitigation Measures (WOM) – Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned weightings, resulting in a value for each impact (prior to the implementation of mitigation measures).

Equation 1: Significance Rating (WOM) = (Extent + Intensity + Duration + Probability) x Weighting Factor

Identifying the Potential Impacts With Mitigation Measures (WM) – In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it will be necessary to re-evaluate the impact.

Mitigation Efficiency (ME) – The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation effectiveness (ME) rating. The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will manage the impact.

Thus, the lower the assigned value the greater the effectiveness of the proposed mitigation measures and subsequently, the lower the impacts with mitigation.

Equation 2: Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency
Or
WM = WOM x ME

Significance Following Mitigation (SFM) – The significance of the impact after the mitigation measures are taken into consideration. The efficiency of the mitigation measure determines the significance of the impact. The level of impact will, therefore, be seen in its entirety with all considerations taken into account.

D-1.1.2 Integration of Specialist's Input

In order to maintain consistency in the impact assessment, it is suggested that all potential impacts to the environment (or component of the environment under review) should be listed in a table similar to the example shown below (more than one table will be required if impacts require assessment at more than one scale). The assessment parameters used in the table should be applied to all of the impacts and a brief descriptive review of the impacts and their significance will then be provided in the text of the specialist reports and consequently in the EIR.

Table 7: Example of an Impact Table

Impact source(s)		Status	
Nature of impact			
Reversibility of impact			
Degree of irreplaceable loss of resource			
Affected stakeholders			
Magnitude	Extent		
	Intensity		
	Duration		
	Probability		
Significance	Without mitigation		
	With mitigation		

D-1.1.3 Mitigation Measures

Mitigation measures will be recommended in order to enhance benefits and minimise negative impacts and they will address the following:

- Mitigation objectives: what level of mitigation must be aimed at: For each identified impact, the specialist must provide mitigation objectives (tolerance limits) which would result in a measurable

reduction in impact. Where limited knowledge or expertise exists on such tolerance limits, the specialist must make an "educated guess" based on his/ her professional experience;

- Recommended mitigation measures: For each impact the specialist must recommend practicable mitigation actions that can measurably affect the significance rating. The specialist must also identify management actions, which could enhance the condition of the environment. Where no mitigation is considered feasible, this must be stated and reasons provided;
- Effectiveness of mitigation measures: The specialist must provide quantifiable standards (performance criteria) for reviewing or tracking the effectiveness of the proposed mitigation actions, where possible; and
- Recommended monitoring and evaluation programme: The specialist is required to recommend an appropriate monitoring and review programme, which can track the efficacy of the mitigation objectives. Each environmental impact is to be assessed before and after mitigation measures have been implemented. The management objectives, design standards, etc., which, if achieved, can eliminate, minimise or enhance potential impacts or benefits. National standards or criteria are examples, which can be stated as mitigation objectives.

Once the above objectives have been stated, feasible management actions, which can be applied as mitigation, must be provided. A duplicate column on the impact assessment tables described above will indicate how the application of the proposed mitigation or management actions has reduced the impact. If the proposed mitigation is to be of any consequence, it should result in a measurable reduction in impacts (or, where relevant, a measurable benefit).

D-1.2 Approach to the Assessment of Cumulative Impacts

Cumulative impacts can arise from one or more activities. A cumulative impact may result in an additive impact i.e. where it adds to the impact which is caused by other similar impacts or an interactive impact i.e. where a cumulative impact is caused by different impacts that combine to form a new kind of impact. Interactive impacts may be either countervailing (the net adverse cumulative impact is less than the sum of the individual impacts) or synergistic (the net adverse cumulative impact is greater than the sum of the individual impacts).

Possible cumulative impacts of the project have been evaluated in the EIR. In addition, various other cumulative impacts e.g. other external impacts that could arise from the project will be further investigated in the EIR phase of the project.

The assessment of cumulative impacts on a study area is complex; especially if many of the impacts occur on a much wider scale than the site being assessed and evaluated. It is often difficult to determine at which point the accumulation of many small impacts reaches the point of an undesired or unintended cumulative impact that should be avoided or mitigated. There are often factors which are uncertain when potential cumulative impacts are identified.

D-1.3 Steps in Assessing Cumulative Impacts

The assessment of cumulative impacts will not be done separately from the assessment of other impacts. Cumulative impacts however, tend to have different time and space dimensions and therefore require specific steps. This may even mean that some of the actions in the assessment process, that preceded general impact identification, may have to be revisited after potential cumulative impacts have been identified. This will ensure that the scope of the EIR process is adequate to deal with the identified cumulative impacts.

Three (3) general steps, which are discussed below, will be recommended to ensure the proper assessment of cumulative impacts.

D-1.3.1 Determining the Extent of Cumulative Impacts

To initiate the process of assessing cumulative impacts, it is necessary to determine what the extent of potential cumulative impacts will be. This will be done by adopting the following approach:

- Identify potentially significant cumulative impacts associated with the proposed activity;
- Establish the geographic scope of the assessment;
- Identify other activities affecting the environmental resources of the area; and
- Define the goals of the assessment.

D-1.3.2 Describing the Affected Environment

The following approach is suggested for the compilation of a description of the environment:

- Characterise the identified external environmental resources in terms of their response to change and capacity to withstand stress;
- Characterise the stresses affecting these environmental resources and their relation to regulatory thresholds; and
- Define a baseline condition that provides a measuring point for the environmental resources that will be impacted on.

D-1.3.3 Assessment of Cumulative Impacts

The general methodology which is used for the assessment of cumulative impacts should be coherent and should comprise of the following:

- An identification of the important cause-and-impact relationships between proposed activity and the environmental resources;
- A determination of the magnitude and significance of cumulative impacts; and
- The modification, or addition, of alternatives to avoid, minimize or mitigate significant cumulative impacts.

SECTION E: ALTERNATIVES

E-1 ALTERNATIVE ANALYSIS

The EIA procedures and regulations stipulate that the environmental investigation needs to consider feasible alternatives for any proposed development. Therefore, a number of possible proposals or alternatives for accomplishing the same objectives should be identified and investigated. During this EIR phase of the project, the identified alternatives have been assessed, in terms of environmental acceptability as well as socio-economic feasibility. To define the term alternatives as per GN No. 543 of the NEMA EIA Regulations 2010 means:

"…in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

(a) The property on which or location where it is proposed to undertake the activity;
(b) The type of activity to be undertaken;
(c) The design or layout of the activity;
(d) The technology to be used in the activity;
(e) The operational aspects of the activity; and
(f) The option of not implementing the activity."

The various alternatives were assessed in terms of both environmental acceptability as well as economical feasibility and are as follows:

E-1.1 Alternative 1: Site/ Location Alternatives

A larger piece of land was considered for potential development with the intention of utilising only a portion deemed suitable for development. As a result, the proposed site (part of the Tribal Land) was the only site identified as feasible for the establishment of the solar facility, due to the following:

- Site is largely flat and suitable for the solar PV panels;
- Geotechnical soil conditions are suitable for structural foundation requirements conducive for construction of a Solar PV facility;
- High levels of solar insolation have been independently confirmed using Meteonorm software on the piece of land proposed for the solar facility. The site has been determined to have an annual average insolation of 2164 kWh/m^2;
- The proposed site is optimally located in close proximity to existing Eskom powerlines and nearby substations;
- Eskom has indicated there is capacity to absorb the MW proposed to one of the nearest substations;
- Availability of land within relatively close proximity to the local community it is intended to serve (this was the only site the land owner (Tribal Chief) has given consent for in terms of leasing it for this proposed development (Appendix 10));
- The site is easily accessible; and
- Off-take electricity agreements opportunities exist as the proposed land is within reasonable distance to mining activities in the area.

E-1.2 Alternative 2: Layout/ Design Alternatives

A representative conceptual design for the Mareetsane Batho-Batho project and the electrical arrangement of the project using a series of 2 MW blocks and a 35 kV collection system with four main feeders is appended to

this report as Appendix 3. A 35 kV/88kV project substation would be equipped with a main power transformer to step the collection system voltage up to the grid voltage of 88 kV in order to minimise transmission losses. The electrical arrangement is representative and would vary based on contractor designs and equipment choices.

Two alternative layout/ design plans have evolved from the findings of specialist studies included within this report.

E-1.2.1Layout Alternative 1: Development of the whole site 140 ha (with original cad overlay

Originally, the entire site needed to be developed. The Feasibility Study (which was included in the Scoping Report) provisionally highlighted the northern section as less sensitive (Figure 17).

The technology that is proposed for the solar facility is **"fixed Polycrystalline PV module technology"**. Polycrystalline panels use solar cells that are cut from multifaceted silicon crystals. The proposed energy facility development will have a maximum height restriction of 3m above ground level (AGL). The proposed Overhead Electric Transmission/Power Line will be restricted to a maximum of 21m AGL. An approximate distance of 4m is proposed between solar panel rows to avoid shading. Solar panels will be mounted on steel columns and secured in situ into the soil. As per industry norms, all solar plant equipment will be raised 200mm above natural ground level to combat stormwater erosion. The PV system will be composed of the various components as indicated in
Figure **16** below.

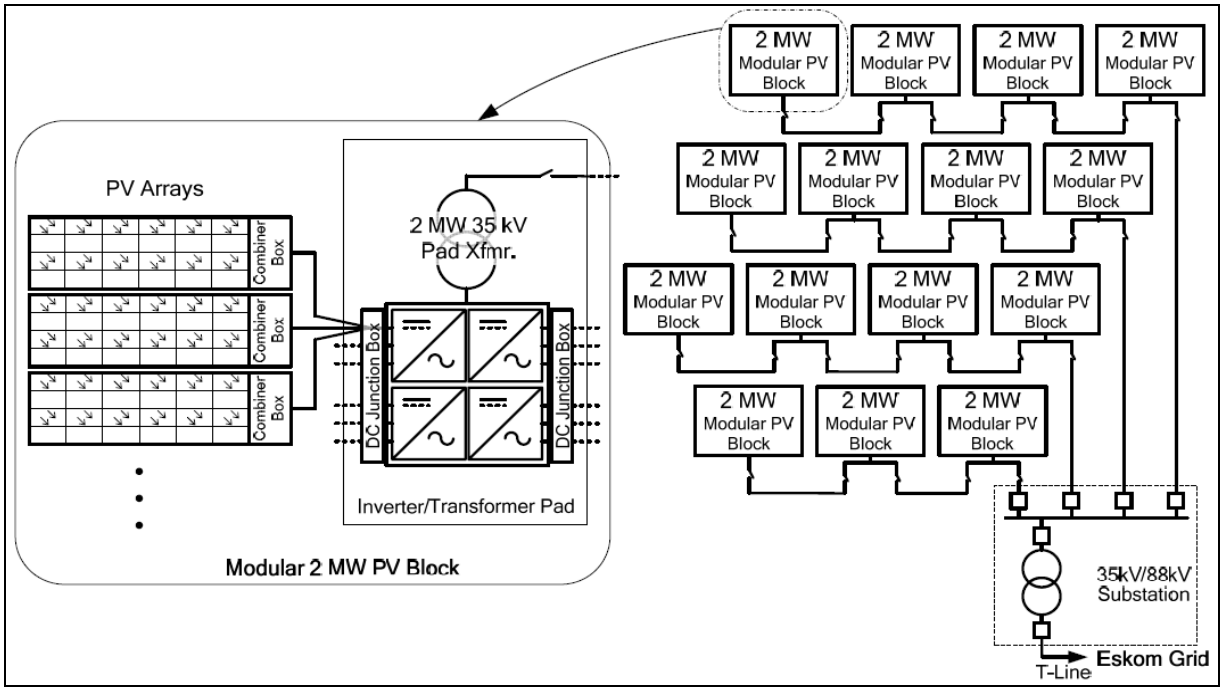


Figure 16: Electrical Conceptual Diagram

This layout alternative proposed to develop the just the northern part of the site.

Soils and Agricultural

- The proposed solar facility comprises a substantial portion of moderate potential soils, which would limit agricultural production in the affected areas for the duration of the operation.
- Majority of the PV facility site is dominated by Se and Va soils, which are both derived from

cretaceous sediments, and commonly found in dry bushveld habitats. They are both prone to compaction when the soils are wet and capping when dry, their subsoils are often highly erodible with dispersive clays.

Ecological Sensitivity

- The area has been kept as far north as possible to remain outside of the ecological sensitive area to the south. The Layout therefore assumes that the grave sites (2 and 3) will be relocated and that a 32m buffer on all wetlands will be excluded from the development footprint. The footprint size has been delineated for development after all the sensitivities have been accounted for.
- The area associated with the solar facility site is classified as medium to high ecological sensitivity due to the presence of large populations of various species of conservation concern. The nationally protected tree species, *Acacia erioloba* is the dominant woody species within the site. Furthermore, the vegetation associated with the solar plant is representative of Western Highveld Sandy Grassland which is classified as a CE ecosystem.

The protected plant species referred to are as follows:

- Provincially protected: *Aloe zebrine, Ammocharis coranica, Bonatea antennifera, Crinum graminicola* and *Huernia sp*.
- Nationally protected: *Acacia erioloba*

These plant species are located on the proposed site.

Core Biodiversity Corridors traverse the southern portion of the study area with a portion of the solar facility site

Heritage Resources

- Grave sites 1 and 4 will be impacted upon negatively by the establishment of the solar facility should the footprint of the solar facility be located less than 20 m from the outer edge of the grave site. The footprint of the solar facility will be located such that a buffer of at least 20 m exists between the footprint of the solar facility and the outer edge of the grave sites. The grave sites will be fenced off with palisade fencing.
- Grave sites 2 and 3 graves will be relocated. As per the SAHRA's grave relocation policy and permit application, a Phase II HIA to be undertaken by an archaeologist.

Visual

The proposed development will be concealed to an extent but that there will still be short and long-term visual impacts on the identified visual receptors (Residents and Motorists). The majority of the visual impacts by the solar facility on visual receptors can be mitigated successfully through the implementation of visual mitigation measures.

Wetlands

The northern section of the solar site are more readily developable compared to the southern section of the site which contains wetlands as well as diffused drainage lines which conveys stormwater from the east to the west.

Traffic

The internal road network will be constructed as to ensure serviceability during construction phase as well as the operational phase. The 22meter interlinks required to transport the construction and solar material to and from site require a minimum 12 meter turning radius. All construction camp circles must comply with this requirement.

The Rural farm road has two road profiles. From the solar facility, the first 5km's of the rural road has a single one way carriage profile and a width of approximately 4.5meters. The road is in a poor condition and will need to be upgraded to accommodate the project. The road has been eroded and is below natural ground level which will present problems in the rainy season as it will act as a stormwater channel.

The second road profile increases from a 4.5meter to 6meter gravel road. It can accommodate traffic in both directions. The shoulders are well maintained and very little work is needed on this part of the road. There is a low level pipe culvert on the road which would have to be upgraded to prevent stormwater problems during the rainy season.

E-1.2.2 Layout Alternative 2 (preferred layout): Development excluding the sensitive areas on site (88.4 ha)

This layout alternative (Figure 18) makes provision for the exclusion of the wetlands and still maintains the feasibility of the solar facility and the associated powerline route alternatives. The wetlands and a 32m buffer will be excluded from the development footprint. Layout Alternative 2 is the preferred alternative.

Soils and Agricultural

- The proposed solar facility comprises a substantial portion of moderate potential soils, which would limit agricultural production in the affected areas for the duration of the operation.
- Majority of the PV facility site is dominated by Se and Va soils, which are both derived from cretaceous sediments, and commonly found in dry bushveld habitats. They are both prone to compaction when the soils are wet and capping when dry, their subsoils are often highly erodible with dispersive clays.

Ecological Sensitivity

- The area has been kept as far north as possible to remain outside of the ecological sensitive area to the south. The Layout therefore assumes that the grave sites (2 and 3) will be relocated and that a 32m buffer on all wetlands will be excluded from the development footprint. The footprint size has been delineated for development after all the sensitivities have been accounted for.
- The area associated with the solar facility site is classified as medium to high ecological sensitivity due to the presence of large populations of various species of conservation concern. The nationally protected tree species, *Acacia erioloba* is the dominant woody species within the site. Furthermore, the vegetation associated with the solar plant is representative of Western Highveld Sandy Grassland which is classified as a CE ecosystem.

The protected plant species referred to are as follows:

- Provincially protected: *Aloe zebrine, Ammocharis coranica, Bonatea antennifera, Crinum graminicola* and *Huernia sp*.
- Nationally protected: *Acacia erioloba*

These plant species are located on the proposed site.

Heritage Resources

- Grave sites 1 and 4 will be impacted upon negatively by the establishment of the solar facility should the footprint of the solar facility be located less than 20 m from the outer edge of the grave site. The footprint of the solar facility will be located such that a buffer of at least 20 m exists between the footprint of the solar facility and the outer edge of the grave sites. The grave sites will be fenced off with palisade fencing.
- Grave sites 2 and 3 graves will be relocated. As per the SAHRA's grave relocation policy and permit application, a Phase II HIA to be undertaken by an archaeologist.

Visual

The proposed development will be concealed to an extent but that there will still be short and long-term visual impacts on the identified visual receptors (Residents and Motorists). The majority of the visual impacts by the solar facility on visual receptors can be mitigated successfully through the implementation of visual mitigation measures.

Wetlands

The southern section of the site contains wetlands as well as diffused drainage lines which convey stormwater from the east to the west.

Traffic

The internal road network will be constructed as to ensure serviceability during construction phase as well as the operational phase. The 22meter interlinks required to transport the construction and solar material to and from site require a minimum 12 meter turning radius. All construction camp circles must comply with this requirement.

The Rural farm road has two road profiles. From the solar facility, the first 5km's of the rural road has a single one way carriage profile and a width of approximately 4.5meters. The road is in a poor condition and will need to be upgraded to accommodate the project. The road has been eroded and is below natural ground level which will present problems in the rainy season as it will act as a stormwater channel.

The second road profile increases from a 4.5meter to 6meter gravel road. It can accommodate traffic in both directions. The shoulders are well maintained and very little work is needed on this part of the road. There is a low level pipe culvert on the road which would have to be upgraded to prevent stormwater problems during the rainy season.

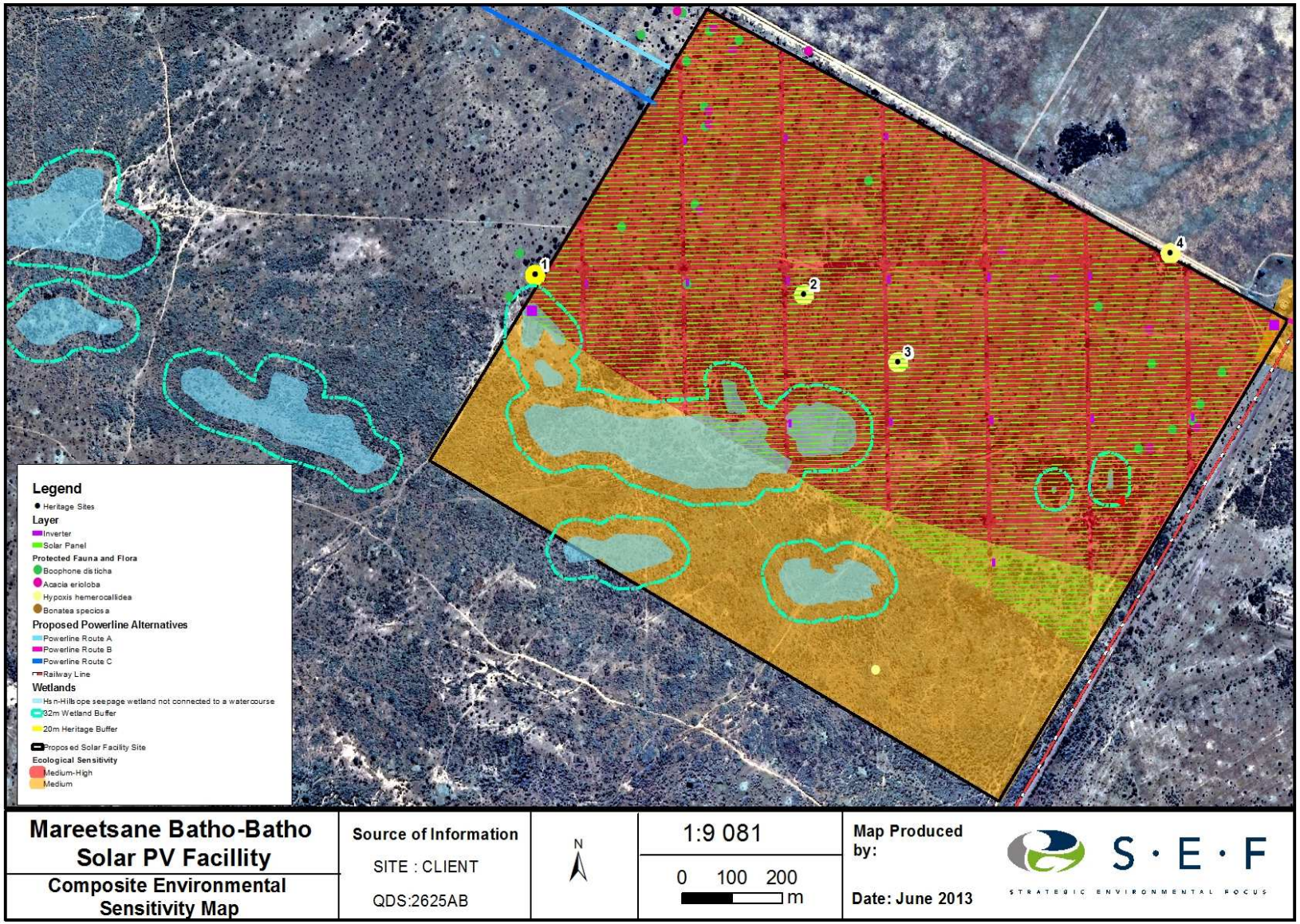


Figure 17: Composite Environmental Sensitivity Map- Option 1

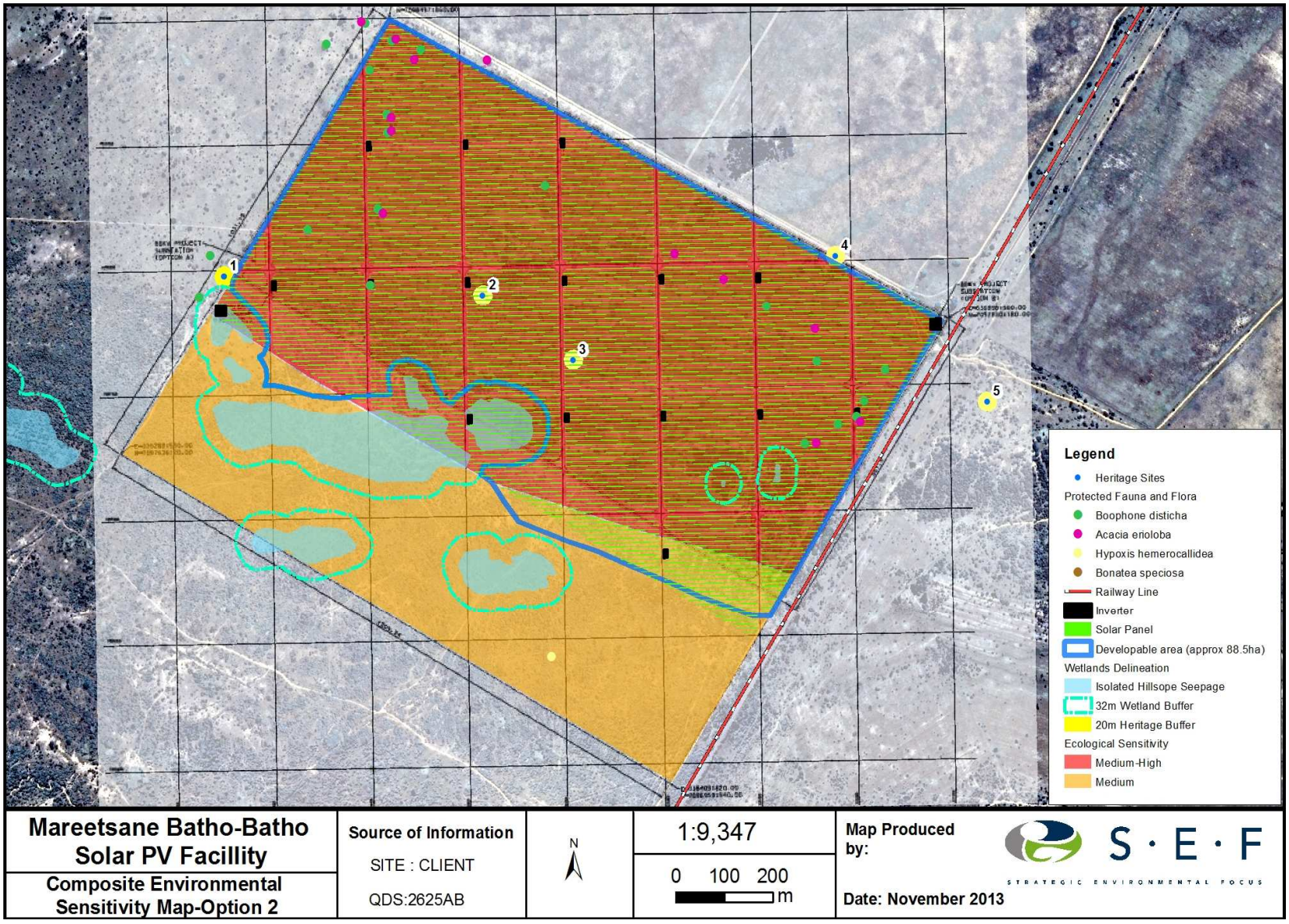


Figure 18: Composite Environmental Sensitivity Map- Option 2

E-1.3 Alternative 3: Route Alternatives

Three (3) powerline route alternatives for the proposed project have been considered (please refer to Section E below).

E-1.3.1 Route Alternative A

Route Alternative A is approximately 18km in length and runs parallel to the existing Eskom powerline towards the substation situated to the north-west of the proposed site (Ferndale Substation).

Following are the environmental characteristics of the proposed route:

Soils and Agricultural Assessment

In terms of Soils and Agricultural Potential Assessment, Taking both soil erosion and agricultural potential according to soil types into consideration, powerline route A would be the preferred powerline route alternative, as the stream crossing along this route is rather narrow in its extent (width), while the route is also flexible. For instance, the powerline route can be shifted in a northerly direction to minimise impact on the Morokwa River towards the west of the solar facility site.

Ecological Assessment (Flora and Fauna including Avifauna) Assessment

Sections of powerline route alternative A is located within both Mafikeng Bushveld and Western Highveld Sandy Grassland ecosystems. Core Biodiversity Corridors traverse powerline route alternative A located within the 1500m buffer of this Biodiversity Corridor. Several non-perennial drainage lines occur within the greater study area, with Mareetsane and Morokwa Rivers intersecting the proposed powerline route alternative A.

Heritage Impact Assessment

Grave Site 8: 15 m east of powerline route alternative A – the grave site is located within the servitude which is a negative impact. Grave Site 9: 1 m east of Powerline route alternative A which is also a negative impact. Grave Site 10: 114 m south of powerline route A. Powerline route alternative A is not preferred as two grave sites (Grave Site 8 and 9) are located within 20m of the proposed powerline corridor.

Visual Impact Assessment

it is of the VIA specialist's opinion that although the Mareetsane Batho-Batho Solar PV Facility will change the visual character and quality of the landscape in the long term, that the implementation of this project will not be unacceptable from a visual point of view. Direct views of the proposed powerline servitude would be experienced by visual receptors (Residents and Motorists) regardless of the route that is selected. Route A however will have a slightly lower visual impact on Residential receptors due to the position of farmsteads in relation to the route. Since all three proposed routes will be running parallel with existing powerline servitudes the visual impact on the landscape character will be somewhat mitigated (no crossing of greenfield areas).

Wetland Delineation and Functional Assessment

Several non-perennial drainage lines occur within the greater study area, with Mareetsane and Morokwa Rivers intersecting the proposed powerline route alternative A. Powerline route alternative A is recommended as it follows existing linear developments within the study area.

E-1.3.2 Route Alternative B (Preferred alternative)

Route Alternative B is approximately 15km in length and runs parallel to the existing Eskom powerline towards the substation situated north-east of the proposed site (Mareetsane Substation).

Ecological Assessment (Flora and Fauna including Avifauna) Assessment

Powerline alternative B is the preferred route; although it is recommended that the route does not turn east but continues in a northerly direction to the R375 before turning west to the substation at Mareetsane. The southern portion of Powerline Alternative Route B is located within the 3000m and 5000m buffer.

Heritage Impact Assessment

Since there are no significant heritage resources occurring within 20m (i.e. which would be negatively impacted upon) of the outer edge of the proposed powerline route alternative B corridor. This alternative therefore is preferred from a heritage perspective.

Visual Impact Assessment

it is of the VIA specialist's opinion that although the Mareetsane Batho-Batho Solar PV Facility will change the visual character and quality of the landscape in the long term, that the implementation of this project will not be unacceptable from a visual point of view. Direct views of the proposed powerline servitude would be experienced by visual receptors (Residents and Motorists) regardless of the route that is selected. Route A however will have a slightly lower visual impact on Residential receptors due to the position of farmsteads in relation to the route. Since all three proposed routes will be running parallel with existing powerline servitudes the visual impact on the landscape character will be somewhat mitigated (no crossing of greenfield areas).

Wetland Delineation and Functional Assessment

Several non-perennial drainage lines occur within the greater study area, with Mareetsane and Morokwa Rivers intersecting the proposed powerline route alternative B. Route B is recommended as it follows existing linear developments within the study area.

E-1.3.3 Route Alternative C

Route Alternative C is approximately 46km in length and is an extension of Route B and continues parallel to existing Eskom powerlines towards the substation situated to the north-west (Ferndale Substation) of the proposed site. Refer to the Locality Map in Appendix 1.

Ecological Assessment (Flora and Fauna including Avifauna) Assessment

Sections of powerline route alternative C is located within both Mafikeng Bushveld and Western Highveld Sandy Grassland ecosystems. Core Biodiversity Corridors traverse powerline route alternative C located within the 1500m buffer of this Biodiversity Corridor.

Heritage Impact Assessment

Since there are no significant heritage resources occurring within 20m (i.e. which would be negatively impacted upon) of the outer edge of the proposed powerline route alternative C corridor. This alternative therefore is preferred from a heritage perspective.

Visual Impact Assessment

it is of the VIA specialist's opinion that although the Mareetsane Batho-Batho Solar PV Facility will change the visual character and quality of the landscape in the long term, that the implementation of this project will not be unacceptable from a visual point of view. Direct views of the proposed powerline servitude would be experienced by visual receptors (Residents and Motorists) regardless of the route that is selected. Route A however will have a slightly lower visual impact on Residential receptors due to the position of farmsteads in relation to the route. Since all three proposed routes will be running parallel with existing powerline servitudes the visual impact on the landscape character will be somewhat mitigated (no crossing of greenfield areas).

Wetland Delineation and Functional Assessment

Several non-perennial drainage lines occur within the greater study area, with Mareetsane and Morokwa Rivers intersecting the proposed powerline route alternative C in a North-easterly and west directions.
Powerline Route Alternative B is the preferred alternative.

E-1.4 Alternative 4: Technology Alternatives

Various technology alternatives have been considered and investigated/ assessed. These include the following alternatives:

- Crystalline silicon PV technology (preferred alternative);
- Thin-film PV technology;
- Concentrating PV technology; and
- Nanotechnology approaches.

E-1.4.1 Technology Alternative 1: Crystalline silicon PV technology (preferred alternative)

Solar photovoltaic technologies convert solar energy into useful energy forms by directly absorbing solar particles of light that act as individual units of energy, and either converting part of the energy to electricity (as in a PV cell) or storing part of the energy in a chemical reaction (as in the conversion of water to hydrogen and oxygen). The preferred alternative will utilise fixed "polycrystalline photovoltaic" technology to generate electricity. The proposed system creates approximately 1 MW of electricity for every 1.98 hectares of solar panels. The proposed plant will produce approximately 30 MW of electricity that will feed into the National Grid.

The solar facility must be north facing for optimal solar radiation absorption. The polycrystalline silicon based PV module produces a higher output than the thin-film micromorph PV module.

The proposed energy facility development will have a maximum height restriction of 3m AGL. The proposed Overhead Electric Transmission/Power Line will be restricted to a maximum of 21m AGL. An approximate distance of 4m (in total 42 m for the overall 15 Modular PV Block) is proposed between rows of solar panels to avoid shading and to allow equipment and persons to access the panels during the operational phase for cleaning and maintenance. The solar panels supporting structure will be made up of steel.

The Crystalline Silicate cell and module technology is the most preferred technology because of the following reasons:

- High conversion efficiency (15 – 20%);
- High material costs;
- Production costs driven by automation;
- Affected by temperature variation;

- Proven technology; and
- Dominant market share (~80% as of 2010).

Mounting System and PV Orientation

Fixed-tilt mounting systems are currently the most common type in the industry. They achieve good power output without introducing the increased cost and risk associated with the design, installation, and maintenance of a tracking system's moving parts. A tilted mounting system allows the PV modules to be oriented towards the sun since the sun's location in the sky is dependent upon latitude. Tilt angles are typically chosen based on optimization simulations that consider site location and mutual shading between panels. Fixed-tilt modules in South Africa would be oriented in rows along an east-west axis and tilted towards the north.

A fixed tilt mounting system, with a fixed tilt of 25°–26°will be applicable.

E-1.4.2 Technology Alternative 2: Thin – Film PV module technology

The fixed "Micromorph thin – film PV module" technology was investigated for the proposed project. The proposed system creates approximately 1 MW of electricity for every 2.5 hectares (in optimal conditions) of solar panels. Thus, if this technology is applied, the proposed solar facility will produce less electricity than that generated when using the preferred Polycrystalline photovoltaic technology, and would utilise approximately 75 ha for generation of 30 MW. Each solar panel is envisaged to be made up of 2 X 4 individual PV modules; with each PV module being 1.3m long and 1.1m wide. Solar panels rows will be approximately 2.7 m apart to remove the potential shadow effect and to allow for equipment and persons to access the panels during the operational phase for cleaning and/or maintenance. The solar panels supporting structure will be made up of steel.

Thin film module technology has the following characteristics:

- Low activation energy (implying more energy production daily), low material costs, production costs limited by economies of scale, flexible lightweight base materials.
- *Amorphous-Silicate – low efficiencies (<10%), high production costs, solar degradation issues.*
- *Cadmium-Telluride (CdT) – moderate efficiencies (9 – 11%), short value chain (implying higher production capacity),*
- *CdT is hazardous to dispose of and dangerous to work with.*
- *Copper-Indium-Gallium-Selenium (CI (G) S) – moderate efficiencies (12.5 – 14.5%), short value chain (implying higher production capacity).*

E-1.4.3 Technology Alternative 3: Concentrating PV technology

Concentrated Solar Power (CSP) is used to produce electricity (sometimes called solar thermoelectricity, usually generated through steam). Concentrated-solar technology systems use mirrors or lenses with tracking systems to focus a large area of sunlight onto a small area. The concentrated light is then used as heat or as a heat source for a conventional power plant (solar thermoelectricity). The solar concentrators used in CSP systems can often also be used to provide industrial process heating or cooling, such as in solar air-conditioning.

Concentrating technologies exist in four common forms, namely parabolic trough, dish Stirlings, concentrating linear Fresnel reflector, and solar power tower. Although simple, these solar concentrators are quite far from the theoretical maximum concentration. For example, the parabolic-trough concentration gives about 1/3 of the theoretical maximum for the design acceptance angle, that is, for the same overall tolerances for the

system. Approaching the theoretical maximum may be achieved by using more elaborate concentrators based on non-imaging optics.
Different types of concentrators produce different peak temperatures and correspondingly varying thermodynamic efficiencies, due to differences in the way that they track the sun and focus light.

This is a maturing technology still at development stage, commercial applications developing.

E-1.4.4 Technology Alternative 4: Nano technology approaches

These are new technologies with future potential.

They are characterised by the following:

- Organic polymers
- Dye-sensitized (Graetzel cells)
- Quantum dots
- Niche technologies as of today (too expensive, not reliable/robust)
- Early research/ experimental stage

Alternative 5: No Development Alternative:

The 'no-go' or 'no development' alternative would be applicable if the proposed development is not approved by the DEA. This would imply that the status quo of the site will remain. Should the proposed development not be implemented, the area will not be affected by any construction-related or operational phase impacts. Therefore, the present state of the biophysical, social and economic environment will remain, unaffected.

Under these circumstances there would be no changes to the environment along the proposed routes and site. However, the reliability of electricity supply to the Batho-Batho Community would remain a significant concern unless other sources of power generation and distribution are provided. With increasing economic activity and demand for electricity, the regional impact of electricity failures would be significant and increasingly severe. A potential for job creation, rural development and socio economic benefits that comes with the project development will not be realised

E-2 COMPARATIVE ASSESSMENT

Advantages are marked with a (√) while disadvantages are marked with (**x**) under the subsequent headings.

E-2.1 Layout/ Design Alternatives

Layout Alternative- Development of the whole site (140 ha)	Layout Alternative 2- Development excluding the sensitive areas on site (88.4 ha)
Soils and Agricultural Assessment	
√ Substantial portion of moderate potential soils √ Majority of the PV facility site is dominated by Se and Va soils √ Prone to compaction when the soils are wet and capping when dry √ Subsoils are often highly erodible with dispersive clays.	
Ecological Assessment (Flora and Fauna including Avifauna) Assessment	
X Medium to high ecological sensitivity. **X** The nationally protected tree species, *Acacia erioloba* **X** CE ecosystem. **X** The protected plant species: Provincially protected: *Aloe zebrine, Ammocharis coranica, Bonatea antennifera, Crinum graminicola* and *Huernia sp.* Nationally protected: *Acacia erioloba*	

X At least two avifaunal species which are of conservation concern, namely *Gyps africanus* (White-backed Vulture) and *Sagittarius serpentarius* (Secretarybird).	
X Core Biodiversity Corridors traverse the southern portion of the study area.	
Heritage Impact Assessment	
X Grave sites 1 and 4 (should be located less than 20 m from the outer edge of the grave site). X Grave sites 2 and 3 graves will be relocated.	
Visual Impact Assessment	
√ Short and long-term visual impacts on the identified visual receptors (Residents and Motorists). √ The majority of the visual impacts can be mitigated successfully.	
Wetland Delineation and Functional Assessment	
X Several non-perennial drainage lines occur within the greater study area. X The southern section can only be developed in the presence of a sensitive stormwater management plan. X Contains wetlands as well as diffused drainage lines which conveys stormwater from the east to the west.	√ The northern section of the solar site are more readily developable.
Traffic Impact Assessment	
√ The internal road network will be constructed. √ The Rural farm road has two road profiles. X The road has been eroded and is below natural ground level. Access to the site is proposed via the Setlagoli Native Reserve. √ There are no formal roads on the reserve and a service road will have to be designed and constructed	

E-2.2 Route Alternatives

Route A (approximately 18km in length)	Route B (approximately 15km in length)	Route C (approximately 46km in length)
Soils and Agricultural Assessment		
√ the stream crossing along this route is rather narrow in its extent (width), while the route is also flexible.	X Plinthic soils including Longlands (Lo), Westleigh (We), and Katspruit (Ka) soil forms identified on landscape depressions and along drainage lines. X Mareetsane and Morokwa Rivers intersect the proposed powerline route alternative B in a North-Easterly direction.	X Mareetsane and Morokwa Rivers intersect the proposed powerline route alternative C in a North-Easterly direction and towards west of the solar PV facility site.
Ecological Assessment (Flora and Fauna including Avifauna) Assessment		
X Core Biodiversity Corridors traverse powerline route alternative A.	X The southern portion of Powerline Alternative Route B is located within the 3000m and 5000m buffer.	X Core Biodiversity Corridors traverse powerline route alternative C.
Heritage Impact Assessment		
X Grave Site 8: 15 m east of powerline route alternative A within the servitude. X Grave Site 9: 1 m east of powerline route alternative A Grave Site 10: 114 m south of powerline route A.	√ There are no significant heritage resources occurring within 20m	

Visual Impact Assessment		
√ Direct views of the proposed powerline servitude would be experienced by visual receptors (Residents and Motorists) regardless of the route that is selected. Since all three proposed routes will be running parallel with existing powerline servitudes the visual impact on the landscape character will be somewhat mitigated (no crossing of greenfield areas).		
√ Route A will have a slightly lower visual impact on Residential receptors due to the position of farmsteads in relation to the route.		
Wetland Delineation and Functional Assessment		
X Several non-perennial drainage lines occur within the greater study area, with Mareetsane and Morokwa Rivers intersecting the proposed powerline routes.		
√ Powerline route alternative A is recommended as it follows existing linear developments within the study area.	√ Route B is recommended as it follows existing linear developments within the study area.	
Traffic Impact Assessment		
X The proposed powerline will intersect the R375.	**X** The proposed powerline will intersect the R375 and the rail way line.	**X** The proposed powerline will intersect the R375 and the rail way line.

E-2.3 Technology Alternatives

Crystalline silicon PV technology (preferred alternative	Thin-film PV technology	Concentrating PV technology	Nanotechnology approaches
√ 1 MW of electricity for every 1.98 hectares of solar panels. 59.4 ha to generate 30MW. **X** High material costs.	**X** 1 MW of electricity for every 2.5 hectares (in optimal conditions) the proposed solar facility will produce less electricity than that generated when using the preferred Polycrystalline photovoltaic technology, and would utilise approximately 75 ha for generation of 30 MW. **X** The use of chemicals.	**X** Low thermal efficiency. **X** Negative visual impacts. **X** Use of water is of environmental concern.	**X** New technologies.

SECTION F: IDENTIFICATION OF KEY ISSUES AND IMPACTS

F-1 IDENTIFICATION OF KEY ISSUES

The identification of the potential impacts of a proposed development on the environment should include impacts that may occur during the commencement, operation and termination of an activity or activities. After all significant potential impacts have been identified; the nature and characteristics of the impacts can be predicted. Once the impacts have been identified and predicted, appropriate mitigation measures need to be established to reduce the identified impacts as far as possible. Lastly, after mitigation measures have been determined the impacts must be evaluated to determine how significant the impacts are likely to be. Potential impacts resulting from the proposed development were identified using input from the following sectors:

- Views of I&APs;
- Site Visits;
- Specialist studies;
- Legislation; and
- Experience of the EAP.

The following issues were identified in the PoS and were investigated as assessed for the proposed development and the preferred alternative (as discussed in Section E above):

F-1.1 Biophysical Impacts

- Potential impacts on surface water resources that occur in close proximity to the site (the non-perennial Morokwa River is situated to the west and south of the site) and wetlands scattered throughout the site (please refer to Appendix 7);
- Potential impacts of increased surface water run-off (*viz*. increased soil erosion) associated with the establishment of hard surfaces and vegetation clearing (mainly during the construction phase);
- Potential impacts on ground and surface water quality due to hydrocarbon spillages from vehicles during the construction phase of the development;
- Potential impacts on soils due to hydrocarbon spillages from vehicles during the construction and operational phase of the development;
- Destruction of flora within the proposed area, stemming from construction activities such as vegetation clearing and topsoil stripping within the site;
- Faunal displacement mainly during the construction phase of the project; and
- Adverse impacts on avifauna (the Provincially Protected *Afrotis afroides* (Northern Black Korhaan) was confirmed on site) as a result of potential habitat loss, additional overhead powerlines and the potential reflections of the solar panels (during the operation phase).

F-1.2 Socio-Economic Impacts:

- Increased dust and noise generation during the construction phase;
- Change in the visual character of the area;
- Potential increased access to electricity by the local community;
- Potential impacts on heritage resources (i.e. grave sites);
- Job creation during the construction and operational phases of the proposed project;
- Broader local economic development benefits for the communities within a 50 km radius as a result of the proposed Solar PV farm;
- Tourism attraction through visitation to the solar facility; and
- Develop education and training initiatives to enable the youth to develop skills especially in Science and Technology.

F-2 IDENTIFIED CUMULATIVE IMPACTS

Cumulative impacts, as illustrated below, occur as a result from the combined effect of incremental changes caused by other activities together with the particular project. In other words, several developments with insignificant impacts individually may, when viewed together, have a significant cumulative adverse impact on the environment (see Figure 19 below).

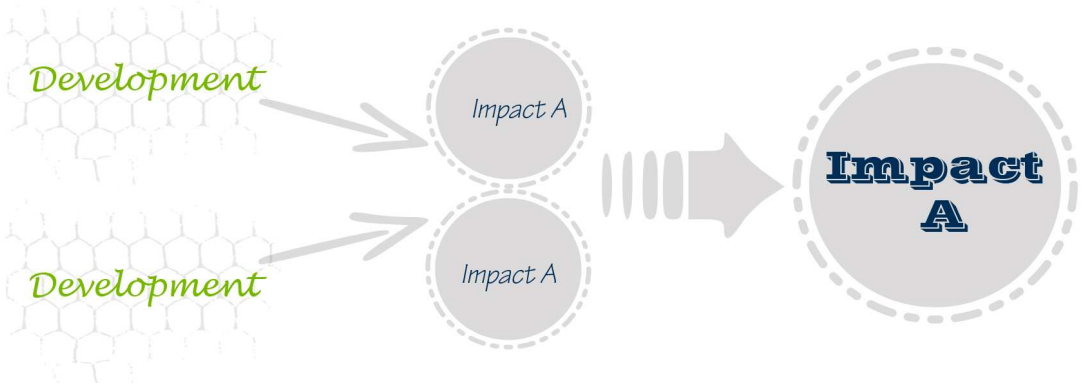


Figure 19: The identification of Cumulative Impacts

The following cumulative impacts have been identified in terms of the proposed development and warrant further investigation during the assessment phase:

- Possible increased loss of agricultural/ grazing land; and
- Increased visual impacts associated with additional powerlines.

F-3 SPECIALIST STUDIES

As a result of the key impacts identified during the Scoping phase and comments received from I&APs and other stakeholders, various specialist studies were conducted:

- Soils and Agricultural Potential Assessment;
- Ecological Assessment (Flora and Fauna including Avifauna) Assessment;
- Phase 1: Heritage Impact Assessment (HIA);
- Visual Impact Assessment (VIA);
- Wetland Delineation and Functional Assessment;
- Traffic Impact Assessment/ Statement; and
- Stormwater and Waste Management Plan.

The findings and recommendations from the specialist studies were used to inform the assessment of potential impacts on the environment as a result of the proposed development. They also served as a guideline in the compilation of mitigation measures included in the EMPr (Appendix 9). The activities as described in the project description have been assessed on both an individual as well as a cumulative level for the project.

SECTION G: DETAILED ASSESSMENT OF IMPACTS

The determination of the significance lies at the core of impact identification, prediction, evaluation and decision making (Rossouw, 2002). The process of identifying impact significance includes the following tasks:

- Impact identification;
- Impact prediction, and
- Impact evaluation.

The identification of the potential impacts of a proposed development on the environment may include impacts that occur during the construction, operation and decommissioning phases of the development. After all potential impacts have been identified the nature and characteristics of the impacts can be assed. For the purposes of the EIR, the term "assessment" refers to "the process of collecting, organising, analysing, interpreting and communicating data relevant to some decisions". The assessment of the data was, where possible, based on accepted scientific techniques, failing which the specialists were to make judgements based on their professional expertise and experience.

G-1 CONSTRUCTION PHASE

The environmental impacts associated with the development of the preferred solar technology, the preferred layout (taking into account the environmental sensitivities on site) and preferred powerline route are assessed in this section.

G-1.1 Biophysical Environment

G-1.1.1 Soil erosion and silting

Source and nature of the impact

By clearing the vegetation for preparing the site for development and introducing hard surfaces, such as the construction of the access road, internal roads, laydown areas and contractor's camps, the stormwater run-off from the site may increase in volume and velocity. This may lead to an increased amount of soil erosion resulting in increased volumes of silt entering the wetlands which could impact on functionality.

Table 8: Soil erosion and silting

Impact source(s)	Increased surface area of hard surfaces as a result of construction activities and vehicles	Status	-
Nature of impact	Increased soil erosion and silting		
Reversibility of impact	The impact is reversible.		
Degree of irreplaceable loss of resource	Low		
Affected stakeholders	N/A		
Magnitude	*Extent*	Regional 3	
	Intensity	Medium 3	
	Duration	Short - Medium term 2	
	Probability	Highly Likely 4	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF (3+3+2+4) x 4 = 48*	***M***
	With mitigation	*WOM x ME = WM 48 x 0.4 =19.2*	***L-M***

Mitigation measures:

- Appropriate mitigation measures (in consultation with the ECO) must be implemented at areas susceptible to erosion (either by wind or rain) to decrease and/or cease erosion.
- An ecologically-sound stormwater management plan must be implemented during construction and vegetation clearing should be kept to a minimum and phased and only where absolutely necessary (where possible).
- Areas susceptible to erosion (by either wind and/or rain) must be rehabilitated and appropriate mitigation measures employed to decrease and/or cease erosion (where practical).
- Existing roads and tracks must be used where feasible.
- During the construction phase, measures must be put in place to control the flow of surface water so that it does not impact on the vegetation, i.e. energy dissipaters and canal flow designs must be used to prevent scouring and erosion.
- All areas susceptible to erosion must be protected and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas.
- Areas exposed to erosion due to construction should be vegetated with species naturally occurring in the area.
- Surface water or stormwater must not be allowed to concentrate, or flow down cut or fill slopes without erosion protection measures being in place.
- Erosion berms should be installed to prevent gully formation and siltation of the drainage lines/watercourse
- Sheet run-off from paved surfaces and access roads needs to be curtailed.
- Run-off from paved surfaces should be slowed down by the strategic placement of berms.
- As much vegetation growth as possible should be promoted within the proposed development area in order to protect soils. In this regard special mention is made of the need to use indigenous vegetation species to maintain a high level of biodiversity.
- All areas of disturbed and compacted soil need to be ripped and reprofiled before rehabilitation.
- Concurrent rehabilitation must take place throughout the construction phase.

Significance of the impact:

Due to the nature of the impact (as described above), the significance of this impact, without mitigation, is regarded to be medium. Implementation of the mitigation measures will decrease the significance of the impact. As vegetation will not be cleared entirely, soil erosion is not predicted to be a significant impact.

G-1.1.2 Surface and Ground water contamination

Source and nature of the impact:

Hydrocarbons (oil, petrol and diesel) and other chemicals/ liquids will be required during the construction phase. Spills and/or leakages could occur from construction vehicles and/or equipment. These spills could contaminate the surface and ground water should they occur simultaneously with a heavy rainfall event.

Table 9: Surface and Ground water contamination

Impact source(s)	Hydrocarbon and other chemical spillages	Status	-
Nature of impact	Contamination of surface and ground water during heavy rainfall events		
Reversibility of impact	The impact is reversible by containing and clearing spills as and when they occur by means of an appropriate spill kit.		
Degree of irreplaceable loss of resource	Low		
Affected stakeholders	N/A		
Magnitude	*Extent*	Site 2	
	Intensity	Medium 3	
	Duration	Short - Medium term 2	

	Probability	Likely 3	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF (2+3+2+3) x 4 = 40*	***M***
	With mitigation	*WOM x ME = WM 40 x 0.4 =16*	***L***

Mitigation Measures:

- Construction should preferably take place during the dry season.
- All construction vehicles should be kept in good working conditions.
- All construction vehicles should be parked in demarcated areas when not in use and drip trays should be placed under vehicles to collect any spillages/leaks.
- If a hydrocarbon spillage occurs these should be cleaned using SUNSORB (or similar product) and the contaminated soils removed from site and disposed of at an appropriate registered landfill site.

Significance of the impact:

The significance of this impact is regarded as medium without mitigation; however, if spillages are effectively mitigated to reduce the likelihood of surface and/or ground water contamination, the significance will be reduced to low.

G-1.1.3 Soil contamination

Source and nature of the impact:

Hydrocarbons (oil, petrol and diesel) and other chemicals/ liquids will be required during the construction phase. Spills and/or leakages could occur from construction vehicles and/or equipment. These spills could contaminate the soil.

Table 10: Soil contamination

Impact source(s)	Hydrocarbon and other chemical spillages	Status	-
Nature of impact	Contamination of surface and ground water during heavy rainfall events		
Reversibility of impact	The impact is reversible by containing and clearing spills as and when they occur by means of an appropriate spill kit.		
Degree of irreplaceable loss of resource	Low		
Affected stakeholders	N/A		
Magnitude	*Extent*	Site 2	
	Intensity	Low 1	
	Duration	Short - Medium term 2	
	Probability	Likely 3	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF (2+1+2+3) x 4 = 32*	***L-M***
	With mitigation	*WOM x ME = WM 32 x 0.4 =12.8*	***L***

Mitigation Measures:

- All construction vehicles should be kept in good working conditions.
- All construction vehicles should be parked in demarcated areas when not in use and drip trays should be placed under vehicles to collect any spillages/leaks.
- If a hydrocarbon spillage occurs these should be cleaned using SUNSORB (or similar product) and the contaminated soils removed from site and disposed of at an appropriate registered waste disposal site.

Significance of the impact:
The significance of this impact is regarded as low to medium without mitigation, however, if spillages are effectively mitigated the significance will be reduced to low.

G-1.1.4 Flora

Solar Facility Site

Source and nature of the impact:
The proposed site for the solar facility is located within a medium to highly ecologically sensitive area due to the presence of numerous plant species of conservation concern as well as nationally and provincially protected plant species. A permit will be required to destroy, cut, relocate or remove any species which are provincially or nationally protected.

Furthermore, the proposed site is located within the Western Highveld Sandy Grassland ecosystem which is currently listed as CE and also located within the 1000m buffer of an ecological corridor.

Table 11: Flora (Destruction of natural vegetation)

Impact source(s)	Ground clearing and construction of the solar plant and roads, construction workers, construction activity and construction vehicles		Status	-
Nature of impact	Destruction of faunal habitat, Interference with fauna and faunal behavioural activities			
Reversibility of impact	The impact is not reversible.			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	N/A			
Magnitude	*Extent*	Site 2		
	Intensity	High 5		
	Duration	Permanent 5		
	Probability	Definite 5		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x Weighting Factor (2 + 5 + 5 + 5) x 5 = 85*		***H***
	With mitigation	*WOM x ME = WM 85 x 1.0 = 85*		***H***

Mitigation Measures:

- All plant species of conservation concern or species which are nationally or provincially protected which will not be directly affected by the developments should be cordoned off as no go areas during construction. These areas which are cordoned off should however not prevent movement of indigenous fauna;
- An independent Environmental Control Officer (ECO) should be appointed to oversee all construction activities;
- No open fires should be allowed in areas containing natural vegetation, especially during the dry season;
- Formalise access roads and make use of existing roads and tracks where feasible, rather than creating new routes through naturally vegetated areas; and
- A rubble clean-up plan must be implemented throughout the duration of the construction phase.

Significance of the impact:
The significance of this impact, without mitigation, is regarded to be high. Implementation of the mitigation measures will not decrease the significance of the impact.

Source and nature of the impact:

During construction, vegetation will be removed and soil disturbed. The seed of alien invasive species that occur on and in the vicinity of the construction area could spread into the disturbed and stockpiled soil and into adjacent areas. In addition, the construction vehicles and equipment were likely used on various other sites and could introduce alien invasive plant seeds or indigenous plants not belonging to this vegetation unit to the construction site.

Table 12: Flora (Potential increase in invasive vegetation)

Impact source(s)	Disturbance / destruction of indigenous vegetation making ecosystem vulnerable to invasions		Status	-
Nature of impact	Introduction and spread of invasive vegetation			
Reversibility of impact	The impact is not reversible.			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	N/A			
Magnitude	*Extent*	Site 2		
	Intensity	High 5		
	Duration	Permanent 5		
	Probability	Definite 5		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x Weighting Factor (2 + 5 + 5 + 5) x 5 = 85*		***H***
	With mitigation	*WOM x ME = WM 85 x 1.0 = 85*		***H***

Mitigation Measures:

- During construction, the construction area and immediate surroundings should be monitored regularly for emergent invasive vegetation;
- Surrounding natural vegetation should not be disturbed to minimise chances of invasion by alien vegetation;
- All alien seedlings and saplings must be removed as they become evident for the duration of construction and operational phase;
- Manual / mechanical removal is preferred to chemical control;
- All construction vehicles and equipment, as well as construction material should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the construction site.
- An alien invasive eradication and monitoring plan must be compiled and implemented whereby all emergent invasive species are removed during construction. The monitoring plan must also ensure that the re-emergence of invasive species is monitored continuously during the operational phase.

Significance of the impact:

The significance of this impact, without mitigation, is regarded to be high. Implementation of the mitigation measures will not decrease the significance of the impact.

G-1.1.5 Fauna

Solar Facility Site

Source and nature of the impact:

The construction of the solar facility will result in the destruction of natural vegetation and associated faunal

habitat leading to the possible mortality of faunal species. Bird species particularly at risk are territorial, ground-dwelling, ground-nesting, large-bodied species such as the endemic *Afrotis afraoides* (Northern Black Korhaan). Since solar plants are a new concept in South Africa, the impact of these plants on local faunal species have not yet been studied, but it is possible that some faunal species might be able to persist within these areas.

Table 13: Disturbance of fauna (Destruction of faunal habitat)

Impact source(s)	Ground clearing and construction of the solar plant and roads	Status	-
Nature of impact	Destruction of faunal habitat, Interference with fauna and faunal behavioural activities		
Reversibility of impact	The impact is not reversible.		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	N/A		
Magnitude	*Extent*	Site 2	
	Intensity	Medium 3	
	Duration	Permanent 5	
	Probability	Definite 5	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x Weighting Factor (2 + 3 + 5 + 5) x 5 = 75*	***H***
	With mitigation	*WOM x ME = WM 75 x 1.0 = 75*	***H***

Mitigation Measures:

- Indigenous vegetation should be retained as far as possible in the state / structure that occurs naturally on the site;
- Construction should commence in the winter months in order to minimise the impacts on the breeding activities of faunal species;
- Permits must be obtained from the Issuing Authority if the habitat of provincially protected species such as *Afrotis afraoides* (Northern Black Korhaan) is to be destroyed. The males of this species hold territories of 200-300m and it is highly likely that such territories exist on the site;
- The solar plant site should ideally not be fenced to enable larger faunal species to move through the area and use the plant for shelter and feeding;
- Should a fence prove to be essential, this fence should be designed to enable the movement of faunal species and should therefore not include electrified or barbed wire fences which result in faunal injury and mortality; and
- A monitoring programme should be developed to determine and document the effect of the solar plant on faunal species. This monitoring programme should include detailed baseline information indicating the species and numbers within the solar plant site as well as immediate surroundings. Monitoring should furthermore be conducted by a suitably qualified ecologist.

Significance of the impact:
The significance of this impact is regarded as high without mitigation, however, mitigation measures are effectively mitigated, and the significance will remain as high.

Source and nature of the impact:
The presence of the construction site may result in negative faunal interactions that could be associated with construction personnel including poaching, trapping and hunting of faunal species, as well as possible collisions of fauna with construction vehicles. Furthermore, construction will result in high levels of noise, vibrations and the operation of floodlights, should construction continue at night. This will disturb the fauna utilising the surrounding vegetation, especially nocturnal species, and could result in a localised decrease in

biodiversity as faunal species move away from the disturbance into the surrounding areas. Food and rubbish left by construction workers can attract wildlife to the area, increasing risk of negative interactions.

Table 14: Disturbance of fauna (Interference with fauna and faunal behavioural activities)

Impact source(s)	Construction workers, construction activity and construction vehicles	Status	-
Nature of impact	Interference with fauna and faunal behavioural activities		
Reversibility of impact	The impact is not reversible.		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	N/A		
Magnitude	*Extent*	Site 2	
	Intensity	High 5	
	Duration	Permanent 5	
	Probability	Definite 5	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x Weighting Factor (2 + 5 + 5 + 5) x 5 = 85*	***H***
	With mitigation	*WOM x ME = WM 85 x 1.0 = 85*	***H***

Mitigation Measures:

- Construction should commence in the winter months (April - August) in order to minimise the impacts on the breeding activities of faunal species;
- The provincially protected *Afrotis afraoides* (Northern Black Korhaan) breeds year round (although less commonly during the winter months (April - August). Before construction commences the site must be checked for the breeding activity and any nests of this species. This must be done by a suitably qualified ecologist;
- Permits must be obtained from the Issuing Authority if any provincially protected faunal species are to be removed or relocated;
- As far as possible, construction should be limited to the daylight hours in order to minimise the need for lights;
- An education programme should be compiled for all contractors, subcontractors and workers to ensure compliance to all aspects of the Environmental Management Programme (EMPr) as well as educating personnel in the safe and proper conduct within areas of natural habitat;
- No wild animal may under any circumstance be handled, removed or be interfered with by construction workers;
- No wild animal may be fed on site;
- No wild animal may under any circumstance be hunted, snared, captured, injured or killed. This includes animals perceived to be vermin. Checks of the surrounding natural vegetation must be regularly undertaken to ensure no traps have been set. Any snares or traps found on or adjacent to the site must be removed and disposed of;
- No domesticated animals must be allowed on site;
- To prevent possible collisions with animals, drivers of construction vehicles must remain vigilant to the possibility of animals crossing their paths and a strict speed limit of 30 km/h should be adhered to; and
- All food should be securely stored away to prevent attraction of faunal species and all rubbish should be disposed of away from the site. Bins located around the infrastructure should have tightly fitting lids to prevent faunal species raiding the bins and thereby becoming habituated to humans.

Significance of the impact:

The significance of this impact is regarded as high without mitigation, however, mitigation measures are

effectively mitigated, and the significance will remain as high.

Powerlines

Electrical infrastructure comprises a significant interface between wildlife and man due to the nature and distribution of electrical structures within the landscape. The development of new electrical infrastructure poses three primary threats to avifauna and volant (flying) mammals (bats): (1) electrocution of individuals perching or roosting on or near conductors; (2) collisions with overhead wires; and (3) habitat loss through the destruction or degradation of vegetation during construction. Electrocution and collision associated with electrical infrastructure are common causes of unnatural mortality to many bird and bat species and may significantly impact on population structure (Sergio et al., 2004; Cryan & Barclay, 2009). Conversely, power supply may be interrupted which has negative economic impacts resulting from damaged equipment, loss of service to the power grid, human safety issues and veld fires.

Source and nature of the impact:

Birds are more susceptible to electrocutions than bats generally due to their larger body size or long feathers. The impact of electrocution in bats is poorly documented however it is believed bats are less affected due to their small size and navigational ability through echolocation. Larger bat species such as the fruit bats are however at a higher risk due to their larger body size and lack of echolocation as these species rely on eyesight to locate their fruit diet. Bird species that are prone to electrocution are larger perching species such as birds of prey (including vultures, medium and large bodied raptors, and smaller raptors such as falcons), storks and herons. A number of these species were confirmed to occur in the study area including the globally Endangered *Gyps africanus* (White-backed Vulture) as well as the Vulnerable *Sagittarius serpentarius* (Secretarybird). Both species have also confirmed to be breeding in the study area.

Electrocutions may happen in two ways, (1) phase-to-phase electrocution by bridging the air gap between two live conductors, and (2) phase-to-earth electrocution by contact between a live conductor and earth device (pylon or pole), and occurs especially when the feathers / wings are wet (Bevanger, 1998). A number of factors determine the likelihood of electrocutions including landscape features such vegetation and topography, weather conditions, size of the individual, behaviour of the bird, and structure and dimensions of the pylon (Smallie et al., 2009). Most bird electrocutions occur on lower voltage electricity pylons, where the gaps between conductors are small, and which are attractive perching and nesting alternatives to trees in otherwise open, flat areas. More electrocutions in birds occur in rainy and/or misty weather conditions.

Table 15: Disturbance of fauna (Faunal electrocution)

Impact source(s)	Live conductors		Status	-
Nature of impact	Electrocution of birds and large bat species			
Reversibility of impact	The impact is not reversible.			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	N/A			
Magnitude	*Extent*	Regional 3		
	Intensity	Medium 3		
	Duration	Long Term 4		
	Probability	Likely 3		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x Weighting Factor (3 + 3 + 4 + 3) x 5 = 65*		***M-H***
	With mitigation	*WOM x ME = WM 65 x 1.0 = 65*		***M-H***

Mitigation Measures:

- All jumpers at transformers, T-offs and strain structures should be insulated;
- Only pole structures that are approved as "bird friendly" by Eskom's ENVIROTECH Forum should be used;
- Powerlines should be routed alongside existing infrastructure such as existing powerlines, roads, buildings, and railway lines where possible; and
- Lines traversing open areas must be marked with anti-collision devices. Bird Flight Diverters on the earth wires must be installed as per specifications devised by the Endangered Wild Trust (EWT).

Significance of the impact:
The significance of this impact is regarded as medium to high without mitigation, however, mitigation measures are effectively mitigated, and the significance will remain as medium to high.

Source and nature of the impact:
Collisions are the leading threat to birds caused by electrical infrastructure both globally and in southern Africa (Bevanger, 1994; van Rooyen, 2004). The likelihood of collisions with powerlines is determined by factors such as bird flight path/height, bird ocular structure and acuity, bird morphology, acquired knowledge of existing structures, bird behaviours, landscape topography, vegetation and weather conditions (APLIC, 1994; Bevanger, 1994; Hunting 2002; Jenkins et al., 2010).

Generally, bird species that are at risk include: large flocking species that commute at low altitudes; large, heavy bodied, less manoeuvrable species with low ocular acuity; individuals that have no acquired knowledge of existing infrastructure such as juveniles of migratory species, and individuals engaging in behaviours such as aerial displays, hunting chases, and flight at night, dusk or dawn. Such species which occur in the study area include korhaans, raptors and doves.

Generally, collisions are most prevalent in open, flat areas dominated by grassland and wetlands, and more collisions occur in rainy and/or misty weather conditions as well as strong winds. However in any landscape, a basic factor for survival requires birds to make regular and direct flights between resource points. For example, waterbirds flying between waterbodies are at risk of collision with powerlines as they are generally large bodied, flocking species with low manoeuvrability, low ocular acuity and tend to fly at powerline height (APLIC, 1994). In the case of the study area, the nearest large body of water is at Barberspan and Leeupan which is an Important Bird Area (IBA ZA019; Barnes, 1998) situated approximately 35 km south east of the study area. It is unlikely that the proposed development will have an impact on the birds utilising this area due to the existing powerline infrastructure in the area.

Impacts of collisions of bats with powerlines is also not as well documented and does not have as high an impact as barotrauma (internal organ collapse, especially lungs, caused by rapid air pressure reduction around the rotating wind turbine blades) caused by wind energy turbines. Collisions of bats and powerlines do however occur and may have an impact on migratory bat species populations.

Table 16: Disturbance of fauna (Collisions of fauna with structures)

Impact source(s)	Powerlines	Status	-
Nature of impact	Collisions by birds and bats with structures		
Reversibility of impact	The impact is not reversible.		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	N/A		
Magnitude	*Extent*	Regional 3	
	Intensity	Medium 3	
	Duration	Long Term 4	

	Probability	Likely 3	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x Weighting Factor (3 + 3 + 4 + 3) x 5 = 65*	***M-H***
	With mitigation	*WOM x ME = WM 65 x 1.0 = 65*	***M-H***

Mitigation Measures:

- Lines traversing open areas must be marked with anti-collision devices. Bird Flight Diverters on the earth wires must be installed as per specifications devised by the EWT;
- Only pole structures that are approved as "bird friendly" by Eskom's ENVIROTECH Forum should be used; and
- Most importantly, powerlines should be routed alongside existing infrastructure such as existing powerlines, roads, buildings, and railway lines.

Significance of the impact:
The significance of this impact is regarded as medium to high without mitigation, however, mitigation measures are effectively mitigated, and the significance will remain as medium to high.

Source and nature of the impact:
Albeit a small footprint, removal of natural vegetation (including species of conservation concern or provincially protected species) for pylons and servitudes will have a negative impact on the faunal communities through destruction and degradation of habitat. Generally, permanent habitat destruction may lead the surrounding natural areas becoming degraded with the inevitable establishment of alien invasive plant species. This creates a domino effect and would ultimately lead to a break-down in community structure within the ecosystem and an eventual loss of biodiversity. Bird species with specific habitat requirements and restricted ranges are the most at risk with respect to habitat destruction.

In the context of the study site, areas that may be impacted on include patches of *Acacia erioloba* Bushveld and riparian habitat associated with rivers such as the Mareetsane River in the north of the study area.

Table 17: Disturbance of fauna (Degradation and fragmentation of natural habitat by powerlines)

Impact source(s)	Power pylons	Status	-
Nature of impact	Destruction and fragmentation of natural habitat		
Reversibility of impact	The impact is not reversible.		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	N/A		
Magnitude	*Extent*	Site 2	
	Intensity	Medium 3	
	Duration	Long Term 4	
	Probability	Likely 3	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x Weighting Factor (2 + 3 + 4 + 3) x 5 = 60*	***M-H***
	With mitigation	*WOM x ME = WM 60 x 1.0 = 60*	***M-H***

Mitigation Measures:

- Powerlines should be constructed as close to the road and existing powerlines as possible;

- A qualified botanist should be present at the time when powerlines are constructed to identify any plant species which are of conservation concern, nationally or provincially protected and where possible pylons should be moved to prevent the destruction of these species; and
- Where possible, powerline servitudes should not be cleared of vegetation to ensure that indigenous species still occurring within these areas are maintained

Significance of the impact:

The significance of this impact is regarded as medium to high without mitigation, however, mitigation measures are effectively mitigated, and the significance will remain as medium to high.

G-1.1.6 Wetlands

Source and nature of the impact:

The clearing of natural vegetation and the stripping of topsoil and sub-soils for placing pylons, solar panels and substations will potentially result in increased runoff of sediment from the site into water resources associated with the study area. Several soil types associated with wetlands are particularly susceptible to soil erosion due to the presence of an E-horizon. The high soil erodibility within parts of the study area motivates for good catchment principles to be applied in order to mitigate any potential impacts that could result due to the proposed development.

Table 18: Wetlands (Sedimentation of wetlands)

Impact source(s)	Runoff from construction activities and clearing of natural and secondary vegetation		Status	-
Nature of impact	Sedimentation of wetlands			
Reversibility of impact	The impact is not reversible.			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	N/A			
Magnitude	*Extent*	Regional 3		
	Intensity	Medium 3		
	Duration	Short Term 1		
	Probability	Likely 3		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x Weighting Factor (3 + 3 + 1 + 3) x 5 = 50*		***M***
	With mitigation	*WOM x ME = WM 50 x 0.2 = 10*		***L***

Mitigation Measures:

- The layout and placement of solar panels, substations and other associated infrastructure should take cognisance of the delineated wetland boundaries. The northern section of the solar site are more readily developable compared to the southern section of the site which contains wetlands as well as diffused drainage lines which conveys stormwater from the east to the west towards HGM 13, Figure 5. The layout design should therefore place infrastructure as far from wetland boundaries as possible, but as a minimum, a 32m buffer should be applied to all wetlands and serve as a no go areas as a minimum. Further, development of the site should not cause negative changes to the hydrology of the wetlands. Uprooting trees and shrubs within especially the southern section of the solar site could expose the soils to accelerated erosion processes as this area forms a preferential flow path for stormwater. The southern section should preferably not be developed unless a sensitive stormwater management could be developed that would ensure similar or improved site drainage and run-off characteristics to the receiving environment. As a minimum stormwater design

will have to include:

- Increased surface roughness across the entire site through increased basal cover;
- Attenuation facilities e.g. attenuation swales; and
- Diffuse water release infrastructure.

- Linear infrastructure including access roads within the Solar PV Facility site should take cognisance of drainage patterns and incorporate sensitive stormwater management principles to avoid concentrating flow paths which could initiate erosion processes
- Good catchment management principles including appropriate stormwater planning need to be applied within the proposed Solar PV Facility site. Vegetation basal cover should be increased through removing grazing pressure and introducing an indigenous and appropriate seeding program. A reduced grazing regime and successful re-establishment of a good basal cover are essential and are likely to result in a positive effect on wetlands through increased surface roughness within the wetlands themselves as well as their associated catchments.
- Wetland areas should be crossed perpendicularly with pylons placed outside of the wetlands habitat (preferably also avoiding a 32m wetland buffer), especially the valley-bottom wetlands. If necessitated, pylons could be placed within certain hillslope seepage wetlands where further on site studies and mitigation measures are confirmed by a wetland specialist.
- Develop soil management measures for the route and substation construction sites which will prevent runoff of sediment into the associated watercourses, e.g. scheduling the construction phase during low rainfall periods, installing soil curtains and use of swales to capture run-off water and settle suspended materials etc.
- Usually substations and associated infrastructure are bedded with gravel which is a good medium to curtail excessive precipitation run-off. However, if the proposed development is to include several hardened surfaces which could increase peak flows received by wetlands, attenuation facilities should be designed which diffusely releases water. Further, wetland rehabilitation in the vicinity of such infrastructure is then also highly recommended.
- A wetland monitoring program must be in place to pro-actively detect threats to wetlands before it can cause damage through an adaptive management approach, e.g. the initiation of new concentrated drainage pathways and erosion processes as a result of new access roads etc. It is recommended that a wetland specialist (preferential) or ecologist have at least one visit during the construction process and three visit after construction is completed. The wetland specialist needs to ensure that no negative impacts on wetlands have occurred or that processes have been initiated that could harm wetlands in the future, e.g. preferential flow paths or erosion.

Significance of the impact:

The significance of this impact is regarded as medium without mitigation, however, mitigation measures are effectively mitigated, and the significance will be reduced to low.

Source and nature of the impact:

The footprint of new infrastructure and construction activities could infringe or destroy wetland habitat and associated biota through removal of hydrophytic vegetation and or hydric soils. Activities are also likely to negatively affect supporting hydrological sources of wetlands.

Table 19: Wetlands (Destruction of wetland habitat and associated loss of wetland functionality)

Impact source(s)	Destruction of wetland habitat and associated loss of wetland functionality	Status	-
Nature of impact	Destruction of hydric soils and hydrophytic vegetation		
Reversibility of impact	The impact is not reversible.		
Degree of irreplaceable loss of resource	High		

Affected stakeholders	N/A		
Magnitude	*Extent*	Regional 3	
	Intensity	Medium 3	
	Duration	Short Term 1	
	Probability	Likely 3	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x Weighting Factor (3 + 3 + 1 + 3) x 5 = 50*	***M***
	With mitigation	*WOM x ME = WM 50 x 0.2 = 10*	***L***

Mitigation Measures:

- Avoid construction activities in wetlands as far as possible through proper planning, demarcation and appropriate environmental awareness training. Appropriate wetland buffer zones (minimum of 32m from the outer edge of wetlands) and no-go areas must be assigned in particular to valley-bottom wetlands.
- All construction staff must be informed of the need to be vigilant against any practice that will have a harmful effect on wetlands e.g. Do not take short-cuts through valley bottoms (wetlands) but use existing road infrastructure.
- Any proclaimed weed or alien species that germinate during the construction period shall be cleared as per the recommendation of the vegetation assessment (SEF, 2013).
- Caution must be taken to ensure building materials are not dumped or stored within the delineated wetland zones
- Emergency plans must be in place in case of spillages into wetland systems.
- Littering and contamination of water sources during construction must be mitigated by effective construction camp management.
- All construction materials including fuels and oil should be stored in a demarcated area that is contained within a bunded impermeable surface to avoid spread of any contamination (outside of wetlands or wetland buffer zones).
- Cement and plaster should only be mixed within mixing trays. Washing and cleaning of equipment should also be done within a bermed area, in order to trap any cement or plaster and avoid excessive soil erosion. These sites must be rehabilitated prior to commencing the operational phase. .

Significance of the impact:

The significance of this impact is regarded as medium without mitigation, however, mitigation measures are effectively mitigated, and the significance will be reduced to low.

Source and nature of the impact:

Linear construction activities, excavations, removal and disturbances to vegetation could create preferential flow paths and/or cut off existing flow paths on the surface as well as sub-surface. Hydrology is an important driver of wetlands and changes thereto could have various negative impacts on wetlands and their associated functionality.

Table 20: Wetlands (Changes to surface and sub-surface flow regimes of wetlands)

Impact source(s)	Destruction of wetland habitat and associated loss of wetland functionality	Status	-
Nature of impact	Destruction of hydric soils and hydrophytic vegetation		
Reversibility of impact	The impact is not reversible.		
Degree of irreplaceable loss of resource	High		

Affected stakeholders	N/A		
Magnitude	*Extent*	Regional 3	
	Intensity	Medium 3	
	Duration	Short Term 1	
	Probability	Likely 3	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x Weighting Factor (3 + 3 + 1 + 3) x 5 = 50*	***M***
	With mitigation	*WOM x ME = WM 50 x 0.2 = 10*	***L***

Mitigation Measures:

- Avoid construction activities in wetlands or preferential hydrological pathways supporting wetlands through proper planning, appropriate design and minimising the construction footprint as per previous impacts discussed.
- Soils should be replaced in the same order as removed.
- Where it is absolutely necessary for the use of machinery, limit the footprint of impact to a minimum through appropriate planning, e.g. keeping turning circles outside of the wetland. Where vehicle tracks have formed rehabilitate immediately by levelling (where possible by hand)
- Re-vegetation of the affected areas should be done as priority.

Significance of the impact:
The significance of this impact is regarded as medium without mitigation, however, mitigation measures are effectively mitigated, and the significance will be reduced to low.

G-1.1.7 Heritage Resources

Solar Facility Site

Source and nature of the impact:

The investigation revealed 10 grave sites. These grave sites are discussed below in detail. The majority of the graves identified on the solar facility site are ancestral graves belonging to families who lived on the native reserve in the past and have relocated elsewhere in the surrounding places.

Grave Site 1
The site contains four (4) graves. Some of the graves do have head stones and are inscribed. All graves are younger than 60 years. This site is located about 13m west of the western boundary of the solar facility site. This site will be impacted upon by the proposed installation of the solar facility as it occurs less than 20m away from the edge of the proposed developmental boundary.

Grave Site 4
There are over five (5) graves of undetermined age at this site. The informant Mr Mogodu believes that the graves belong to the Modise Family. None of them have inscriptions so their age is unknown. The grave site is located 6m south-west of the northern boundary of the solar facility site. This site will be impacted upon negatively by the establishment of the solar facility if the footprint of the solar facility is located less than 20 m from the outer edge of the grave site.

Mitigation measures for grave sites 1 and 4:

- The footprint of the solar facility should be located such that a buffer of at least 20 m exists between the footprint of the solar facility and the outer edge of the grave site.

- Fence off the grave site with palisade fencing.
- If the solar facility cannot be shifted due to other sensitivity elements, the graves older than 60 years or of an unknown age, will need to be relocated through SAHRA's grave relocation policy and permit application. This will constitute a Phase II HIA to be undertaken by an archaeologist.
- The provisions of the Human Tissue Act, 1983 (Act No. 65 of 1983) as amended, as well as the regulations (22 May 2013) relating to the management of human remains under the National Health Act, 2003 (Act No. 61 of 2003) take precedence if affected graves are younger than 60 years.

Grave Site 2

There are about five (5) graves at this site. All of the graves do not have inscriptions and therefore their ages are unknown. An informant, by the name of Oneleng Mogodu, indicated that these graves belonged to ancestors of the Mogodu Family. The grave site occurs within the proposed solar site. This site will be impacted upon negatively by the proposed establishment of the solar facility.

Grave Site 3

There is only one (1) grave at this site belonging to the Mogodu Family. The remains are buried in a sitting position according to the informant Oneleng Mogodu. This site occurs within the proposed solar facility site. This site will be impacted upon negatively by the proposed establishment of the solar facility.

Mitigation measures for grave sites 2 and 3:

- If the grave is older than 60 years or of an undetermined age, relocate the graves through SAHRA's grave relocation policy and permit application. This will constitute a Phase II HIA to be undertaken by an archaeologist. If the graves are younger than 60 years, relocate that graves following the provisions of the Human Tissue Act, 1983 (Act No. 65 of 1983) as amended and the regulations (22 May 2013) relating to the management of human remains under the National Health Act, 2003 (Act No. 61 of 2003).

Table 21: Heritage Resources

Impact source(s)	Construction activities		Status	-
Nature of impact	The heritage resources will be negatively affected			
Reversibility of impact	The impact is irreversible			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	Families of ancestral graves			
Magnitude	*Extent*	Site 2		
	Intensity	Medium 3		
	Duration	Long Term 4		
	Probability	Highly likely 4		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF (2+3+4+4) x 3 = 39*		***M***
	With mitigation	*WOM x ME = WM 39 x 0.4 =15.6*		***L***

Significance of the impact:

The impact associated with construction of the proposed site on the destruction of heritage resources during the construction phase is predicted to be of a medium significance without mitigation measures, however, this impact can be reduced to a low significance if appropriate measures are adopted.

Powerlines

There are no significant heritage resources occurring within 20m (i.e. which would be negatively impacted

upon) of the outer edge of the proposed powerline routes alternative B and C corridors. Powerline route alternative A is not preferred as two grave sites (**Grave Site 8 and 9**) are located within 20m of the proposed powerline corridor.

Mitigation Measures
These will be the same as prescribed above.

G-1.2 Socio- Economic Environment

G-1.2.1 Increase in ambient dust levels

Source and nature of the impact:
Construction activities, such as transportation vehicles travelling on exposed surfaces, earthworks as well as wind, will result in elevated ambient dust levels within the area. Increased dust levels may adversely affect persons working and/or residing in the nearby area.

Table 22: Increase in ambient dust levels

Impact source(s)	Transportation vehicles travelling over exposed surfaces, earthworks and the wind		Status	-
Nature of impact	Increased levels of ambient dust			
Reversibility of impact	The impact is irreversible but can be mitigated to a large extent			
Degree of irreplaceable loss of resource	Low			
Affected stakeholders	Surrounding land owners			
Magnitude	*Extent*	Regional 3		
	Intensity	Medium 3		
	Duration	Medium term 3		
	Probability	Highly Likely 4		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF (3+3+3+4) x 4 = 52*		***M***
	With mitigation	*WOM x ME = WM 52 x 0.6 =31.2*		***L-M***

Mitigation measures:

- Appropriate dust suppression methods must be applied (if necessary).
- Exposed soil stockpiles shall be covered, kept damp or protected using organic binding agents or alternative techniques that are not water intensive.
- The clearing of vegetation must be kept to a minimum and only where required.
- Avoid unnecessary movement of construction vehicles on site.
- Vehicles travelling on gravel roads/ tracks must travel at a speed that creates minimal dust entrainment

Significance of the impact:
Due to the nature of the impact (as described above), the significant of this impact, without mitigation, is regarded to be medium. Implementation of the mitigation measures will decrease the significance of the impact to low to medium.

G-1.2.2 Increase in ambient noise levels

Source and description of the impact:
Construction activities and movement of construction vehicles will increase the ambient noise levels within the area during the construction phase. This may impact on adjacent landowners as well as sensitive faunal

species within the study area.

Table 23: Increase in ambient noise levels

Impact source(s)	Construction activities	Status	-
Nature of impact	Increased level of ambient noise		
Reversibility of impact	The impact is irreversible but can be mitigated to a large extent		
Degree of irreplaceable loss of resource	Low		
Affected stakeholders	Surrounding land owners		
Magnitude	*Extent*	Regional 3	
	Intensity	Low 1	
	Duration	Medium term 3	
	Probability	Highly Likely 4	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF (3+1+3+4) x 3 = 33*	***L-M***
	With mitigation	*WOM x ME = WM 33 x 0.6 =19.8*	***L***

Mitigation Measures:

- Construction times must be restricted to working hours (06:00-18:00).
- All construction equipment or machinery should be switched off when not in use.
- Construction equipment must be kept in good working condition

Significance of the impact:

Due to the limited number of noise receptors within the immediate vicinity (i.e. people) the impact associated within increased ambient noise levels during the construction phase is predicted to be of a low to medium significance; however the implementation of mitigation measures will reduce the significance of the impact to low.

G-1.2.3 Visual

Source and nature of the impact:

This impact involves temporary direct views of construction camps, material lay-down yards, stockpiles, cranes, scaffolding, delivery vehicles, perimeter fencing, powerline construction and dust that may cause a negative visual impact on Residents and Motorist in the study area. The moderate VAC of the landscape will however conceal these negative visual impacts to an extent. The intensity of the impact, based on the visual aspects is overall considered to be medium.

Table 24: Visual impact of construction activities on visual receptors (Residents and Motorists)

Impact source(s)	Construction activities including construction camps, material lay-down yards, stockpiles, cranes, scaffolding, delivery vehicles, fencing, powerline construction and dust.	Status	-
Nature of impact	Direct views of the above mentioned construction activities which are out of character with the surrounding landscape and which will progressively increase in intensity as the development and the ancillary components increase.		
Reversibility of impact	The impact is partially reversible through the implementation of adequate visual mitigation measure during the construction phase.		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	Residents on the surrounding farms as well as Motorists traveling along the N18 and R375 surfaced roads as well as along relevant gravel farm roads.		
Magnitude	*Extent*	Regional - 3	
	Intensity	Medium - 3	
	Duration	Short – Medium Term - 2	
	Probability	Highly Likely - 4	
Significance	*Without mitigation*	*(Extent + Intensity +*	

		Duration + Probability) x WF (3+3+2+4) x 4 = 48 Medium	M
	With mitigation	*WOM x ME = WM* 48 x 0.4 =19.2 Low	L

Mitigation measures:

- Utilise the existing screening capacity of the site and improve it by enclosing the construction site and stockyards with a dark green or khaki brown shade cloth of at least 20% density and at least 3 metres high, as an additional screen.
- Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance.
- Remove rubble and other construction rubbish off site as soon as possible or place it in containers in order to keep the construction site free from additional unsightly elements.
- Dust suppression techniques should be implemented especially on windy days, preferably using biodegradable binding agents.

Significance of the impact:

The construction activities (as discussed above) will have high VC with the existing landscape character in the study area. The moderate VAC of the landscape and especially the number of existing human interventions (agriculture and overhead transmission lines), will however reduce the significance of the impact by construction activities to medium. The implementation of the mitigation measures (as discussed above) will further decrease the significance of the impact to low.

Source and nature of the impact:

Visual character and quality can be affected by changing the landscape character (i.e. development). It was established, however, that the proposed site and associated powerline, situated in a predominantly flat area, together with the medium high growing, shrubby vegetation of the North Western Highveld will be able to absorb a moderate amount of the visual changes to the landscape character. The intensity of the impact that the unattractive construction activities will have on the geographic sense of place of the area is therefore considered to be medium.

Table 25: Temporarily affecting the visual character and quality of the study area (Visual Resource)

Impact source(s)	Construction activities including construction camps, material lay-down yards, stockpiles, cranes, scaffolding, delivery vehicles, fencing, powerline construction and dust.	Status	-
Nature of impact	A change in the sense of place will occur by temporarily lowering the visual quality of the landscape.		
Reversibility of impact	The impact is partially reversible through the implementation of adequate visual mitigation measure during the construction phase.		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	All observers		
Magnitude	*Extent*	National - 4	
	Intensity	Medium - 3	
	Duration	Short – Medium Term - 2	
	Probability	Highly Likely - 4	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (4+4+2+4) x 4 = 56 Medium	M
	With mitigation	*WOM x ME = WM* 56 x 0.6 =33.6 Low to Medium	L-M

Mitigation measures:

- Although mitigation measures are generally less effective for impacts on the landscape character than they are for impacts on visual receptors, they can still make a difference. See mitigation measures above.

Significance of the impact

Due to the high visual quality associated with the landscape character of the North Western Highveld and as well as the rural sense of place of the study area, the significance of the temporary impact of construction activities on the landscape, without mitigation, is regarded to be medium. Implementation of the proposed mitigation measures will slightly decrease the significance of the impact to low - medium.

G-1.2.4 Temporary job creation

Temporary employment opportunities will be created during the construction phase, via construction related activities. This will positively impact on the surrounding community and local economy due to possible skills development and income generation. This impact is predicted to have a high positive significance.

G-1.2.5 Traffic patterns within the area

Source and nature of the impact:

The construction phase of the project will have the biggest impact on the local road network. Expected construction activities will include, construction of the internal roads and access roads; rehabilitation of the unclassified farm road; construction of the solar panels and supporting steel work; construction of operations building; trenching for cables; and construction of perimeter fence.

Internal roads will be constructed using available material on site but if necessary external material will be imported to site using the previously determined route. The solar panels will most likely be anchored to the *in situ* soil using friction steel columns. An alternative approach could include the more conventional method of casting reinforced concrete foundations. Concrete will be mixed on site as there are no batch facilities in the area. Components for the solar facility will be transported to site from either Durban harbour or Richards Bay harbour.

It is assumed that construction will take place 5 days per week, with a total of 52 weeks per year. The total vehicles generated for the construction phase of the project will amount to 4353 vehicles; 273 Trucks, 1300 busses and 2600 cars. This means that on average the site will receive one truck per day or two trips. Based on previous projects it is estimated that 300 construction workers could be employed during the construction phase of this project. Assuming 75% of the workforce will use the contractor's bus service to be transported to and from site, 10% will walk from nearby settlements and 5% will use private vehicles. This will add an extra 15 vehicles per day or 30 trips generated per day. Total trips generated during construction phase will amount to 64 trips per day.

Table 26: Change in traffic patterns of the area

Impact source(s)	Construction activities and vehicle movement		Status	-
Nature of impact	Traffic patterns of the surrounding area will be affected			
Reversibility of impact	The impact is irreversible but will be less intrusive if mitigation measures are adopted			
Degree of irreplaceable loss of resource	Low			
Affected stakeholders	Surrounding land owners and road users			
Magnitude	*Extent*	Regional 3		
	Intensity	Low 1		
	Duration	Short term 1		
	Probability	Definite 5		

Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF (3+1+1+5) x 2 = 20*	***L-M***
	With mitigation	*WOM x ME = WM 20 x 0.8 =16*	***L***

Mitigation measures:

- Avoid movement of construction vehicles and machinery on main access roads during peak times.

Significance of the impact:

Due to the location of the site, limited amount of existing traffic and limited movement of construction vehicles during peak hours, the impact associated with construction activities during the construction phase is predicted to be of a low significance with and without mitigation measures.

G-2 OPERATIONAL PHASE

G-2.1 Biophysical Environment

G-2.1.1 Soil erosion and silting

Source and nature of the impact:

By the presence of hard surfaces, such as the access and internal roads, the stormwater run-off from the site may increase in volume and velocity. This may lead to an increased amount of soil erosion resulting in increased volumes of silt entering the wetlands which could impact on functionality.

The impact is as assessed in Section G-1.1.1 above.

Mitigation measures:

Same as prescribed in Section G-1.1.1 above.

Significance of the impact:

The significance of the impact is the same as in Section G-1.1.1 above.

G-2.1.2 Wetlands

Source and nature of the impact:

Maintenance activities are likely to have a lower impact than construction activities, except for worst case scenarios where sections of the powerline might have to be reconstructed. Wetland habitat could be impacted on or be destroyed through maintenance operations e.g. through removal of hydrophytic vegetation and or hydric soils.

Table 27: Wetlands (Destruction of wetland habitat and associated loss of wetland functionality)

Impact source(s)	Destruction of wetland habitat and associated loss of wetland functionality	Status	-
Nature of impact	Operation		
Reversibility of impact	The impact is not reversible.		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	N/A		
Magnitude	*Extent*	Regional 3	
	Intensity	Medium 3	
	Duration	Short Term 1	
	Probability	Probable 1	

Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x Weighting Factor (3 + 3 + 1 + 1) x 3 = 24*	***L-M***
	With mitigation	*WOM x ME = WM 24 x 0.4 = 9.6*	***L***

Mitigation Measures:

- Mitigation measures for worst case scenarios would be the same as for the construction phase.

Significance of the impact:
Due to the nature of the impact (as described above), the significant of this impact, without mitigation, is regarded to be low to medium. Implementation of the mitigation measures will decrease the significance of the impact to low.

G-2.2 Socio- Economic Environment

G-2.2.1 Visual

Source and nature of the impact:
This impact involves permanent views of the proposed solar facility and associated powerline servitude experienced by Residents and Motorists in the study area. The moderate VAC of the landscape will however conceal these negative visual impacts to an extent. The intensity of the impact based, on the visual aspects is overall considered to be medium.

Table 28: Long-term visual impact of operational activities on visual receptors (Residents and Motorists)

Impact source(s)	The proposed solar facility and associated powerline servitude	Status	-
Nature of impact	Long-term views of the above mentioned activities which are out of character with the surrounding landscape.		
Reversibility of impact	The impact is permanent		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	Residents on the surrounding farms as well as Motorists traveling along the N18 and R375 surfaced roads as well as along relevant gravel farm roads.		
Magnitude	*Extent*	Regional - 3	
	Intensity	Medium - 3	
	Duration	Permanent - 5	
	Probability	Highly Likely - 4	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (3+3+5+4) x 4 = 60 Medium - High	M - H
	With mitigation	*WOM x ME = WM* 60 x 0.4 = 24 Low to Medium	L - M

Mitigation measures:

- The orientation of the solar collector panels are facing due north for maximum energy production and faces away from the majority of the receptors.
- Treat sub-frames for the solar panels with a matt paint to limit reflection.
- Be sensitive towards the use of glass or materials with a high reflectivity to avoid glare from the shiny surfaces and to avoid visual discomfort for viewers during the day.
- Apply appropriate screening techniques, such as dense tree planting on the northern perimeter of

the solar facility site in order to eliminate any direct views from current and future Residents.
- Repair damage and do not allow the facility to fall into disrepair.
- Maintain powerline servitudes and remove any litter and/or dead vegetation.

Significance of the impact:
The permanent operational activities (as discussed above) will have high VC with the existing landscape character in the study area. The moderate VAC of the landscape and especially the number of existing human interventions (agriculture and overhead transmission lines), will however reduce the significance of the impact by operational activities to medium - high. The implementation of the mitigation measures (as discussed above) will further decrease the significance of the impact to low – medium.

Source and nature of the impact:
It was established that the proposed permanent operational activities of the proposed solar facility and associated powerline servitude will strongly contrast the existing landscape character of the study area. The topography (predominately flat) as well as at the medium high growing, shrubby vegetation of the North Western Highveld will be able to absorb a moderate amount of unattractive visual impacts associated with the operational phase. The intensity of the impact that the operational phase activities will have on the geographic sense of place of the area is therefore considered to be medium.

Table 29: Permanently affecting the visual character and quality of the study area (Visual Resource)

Impact source(s)	The proposed solar facility and associated powerline servitude	Status	-
Nature of impact	A change in the sense of place will occur by permanently lowering the visual quality of the landscape.		
Reversibility of impact	The impact is partially reversible through the implementation of adequate visual mitigation measure during the operational phase.		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	All observers		
Magnitude	*Extent*	National - 4	
	Intensity	Medium- 3	
	Duration	Permanent - 5	
	Probability	Highly Likely - 4	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (4+3+5+4) x 4 = 64 Medium to High	M - H
	With mitigation	*WOM x ME = WM* 72 x 0.6 =38.4 Low to Medium	L - M

Mitigation measures:
- Although mitigation measures are generally less effective for impacts on the landscape character than they are for impacts on visual receptors, they can still make a difference. See mitigation measures in the construction phase.

Significance of the impact
Due to the high visual quality associated with the landscape character of the North Western Highveld and as well as the rural sense of place of the study area, the significance of the permanent impact of the proposed solar facility and associated powerline on the landscape, without mitigation, is regarded to be medium to high. Implementation of the proposed mitigation measures will decrease the significance of the impact to low - medium.

G-2.2.2 Traffic patterns within the area

Source and nature of the impact:

During the operational phase of the proposed development it is expected that 20 permanent workers will be employed at the solar facility on a permanent basis. Assuming all of the workers will travel to and from the solar facility each day. This will increase the number of trips generated. Trips generated during operational phase will thus amount to 40 trips per day

Table 30: Change in traffic patterns of the area

Impact source(s)	Transport to site		Status	-
Nature of impact	Traffic patterns of the surrounding area will be affected			
Reversibility of impact	The impact is irreversible but will be less intrusive if mitigation measures are adopted			
Degree of irreplaceable loss of resource	Low			
Affected stakeholders	Surrounding land owners and road users			
Magnitude	*Extent*	Regional 3		
	Intensity	Low 1		
	Duration	Medium term 3		
	Probability	Definite 5		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF (3+1+3+5) x 2 = 24*		***L-M***
	With mitigation	*WOM x ME = WM 24 x 0.2 =4.8*		***L***

Mitigation measures:

- Avoid movement of construction vehicles and machinery on main access roads during peak times.

Significance of the impact:

The impact associated with operational activities during the operation phase is predicted to be of a low to medium significance without mitigation measures, and will be reduced to low with mitigation measures.

G-2.2.3 Permanent employment opportunities

Permanent jobs will be created during the operational phase of this development (with regard to security on site and cleaning and maintenance of the solar panels). This will positively impact on the surrounding communities and local economy due to possible skills development and income generation. This impact is predicted to have a high positive significance. 20 permanent staff will be employed during the operational phase.

G-2.2.4 Local electricity generation

This additional renewable electricity generation will thus be locally produced and essentially absorbed into the local distribution network. Thus, decreasing the reliance on electricity generated at great distances. Locally produce electricity is also more efficient as electricity is "lost" due to transmission over long distances (electrical losses). This impact is predicted to have a high positive significance.

G-2.2.5 Reduced reliance on coal as an energy source, and thus a reduction in the associated negative environmental impacts

A positive indirect benefit from the generation of renewable energy is the decreased reliance on coal based energy. In the long-term, renewable energy will contribute a significant portion of the energy used to produce electricity, thus indirectly decreasing the negative environmental impacts associated with coal fired power stations.

G-3 DECOMMISSIONING PHASE

Should the contract to be an Independent Power Producer (IPP) not be renewed, the solar facility will be decommissioned. The impacts anticipated to occur during the decommissioning phase will be largely similar to that of the construction phase. All disturbed areas will be rehabilitated back to its previous carrying capacity. Natural indigenous vegetation will be utilised for the rehabilitation. All recyclable materials will be recycled at an appropriate registered facility and all non – recyclable material will be disposed of at a registered waste disposal facility site (refer to Appendix 9 – EMPr).

G-4 CUMULATIVE IMPACTS

Cumulative impacts are those impacts that are created as a result of the combination of the impacts of the proposed project, with impacts of other projects or operations, to cause related impacts. These impacts occur when the incremental impact of the project, combined with the effects of other past, present and reasonably foreseeable future projects, are cumulatively considerable. The assessment of cumulative impacts on a site-specific basis is however complex – especially if many of the impacts occur on a much wider scale than the site being assessed and evaluated.

G-4.1 Socio- Economic Environment

G-4.1.1 Visual

Source and description of the impact:
The main element that provides the study area (visual resource) with a unique landscape character and strong sense of place is the rural feeling of remoteness. The proposed development will change this landscape character through the high VC that the solar facility and powerline will have with the surrounding landscape, as well as through introducing higher volumes of traffic and people into the area. This is generally associated with any form of development and is already evident in the activities around the Kalgold Harmony Gold Mine, the NWK grain silos as well as the existing two Eskom power stations and their associated powerlines. The intensity of the cumulative impact that development has on the natural open space and rural landscape character of the North Western Highveld is therefore considered to be high.

Table 31: Loss of visual resources (natural open space and rural sense of place)

Impact source(s)	The proposed solar facility and associated powerline servitude	Status	-
Nature of impact	A cumulative impact by development on the natural open space and rural landscape character of the North Western Highveld.		
Reversibility of impact	The impact is partially reversible through the implementation of adequate mitigation measures.		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	All observers		
Magnitude	*Extent*	National - 5	
	Intensity	High- 5	
	Duration	Permanent - 5	
	Probability	Highly Likely - 4	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (5+5+5+4) x 4 = 76 Medium to High	M - H
	With mitigation	*WOM x ME = WM* 76 x 0.6 =45.6 Medium	M

Mitigation measures:

- See mitigation measures under sections G-1.2.3

Significance of the impact:

Due to the high visual quality associated with rural landscapes as well as the ever-increasing number of developments a cumulative visual impact on visual resources was identified throughout this region (North Western Highveld). Therefore, the significance of the cumulative impact that the proposed development will have in conjunction with other developments in the region, without any mitigation, is regarded to be medium to high. Implementation of appropriate mitigation measures will decrease the significance of the impact to medium.

Source and nature of the impact:

Direct views of the proposed powerline servitude would be experienced by visual receptors (Residents and Motorists) regardless of the route that is selected. Route A however will have a slightly lower visual impact on Residential receptors due to the position of farmsteads in relation to the route. Since all three proposed routes will be running parallel with existing powerline servitudes the visual impact on the landscape character will be somewhat mitigated (no crossing of greenfield areas). The intensity of the cumulative impact that increased overhead transmission lines will have on visual receptors in the area, however, is considered to be medium.
Table 10: Increased amount of overhead transmission lines.

Table 32: Increased amount of overhead distribution powerlines

Impact source(s)	The selected powerline servitude		Status	-
Nature of impact	Cumulative impact of increased overhead transmission lines on visual receptors (Residents and Motorists)			
Reversibility of impact	The impact cannot be reversed			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	Residents on the surrounding farms as well as Motorists traveling along the N18 and R375 surfaced roads as well as along relevant gravel farm roads.			
Magnitude	*Extent*	Regional - 3		
	Intensity	Medium- 3		
	Duration	Permanent - 5		
	Probability	Highly Likely - 4		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (3+3+5+4) x 4 = 60 Medium to High		M - H
	With mitigation	*WOM x ME = WM* 60 x 0.8 =48 Medium		M

Mitigation measures:

- Follow existing powerline servitudes as closely as possible (no deviations from the existing routes).
- Maintain the powerline servitude and keep clear of litter and dead vegetation.

Significance of the impact

Due to the existing number of overhead transmission lines in the area the additional powerline will not have such a high impact on the landscape character. The significance of the cumulative effect of the overhead transmission lines on visual receptors in the area, however, is considered to be medium to high. Due to the limited number of visual mitigation measures that exist for powerlines the significance of this cumulative impact, with mitigation, can only be reduced to medium.

G-4.2 Renewable supply of electricity

At present South Africa relies heavily on fossil fuels to generate electricity for the country. Fossil fuels (such as

coal) are not sustainable and are associated with high negative environmental impacts. The alternatives for electricity generation lie within renewable energy, such as solar, wind and wave power. The proposed project is a response to the Department of Energy's (DoE) bid invitations for renewable energy projects to generate electricity to feed into the National Grid, which is in line with the Integrated Resource Plan for Electricity, revision 2 (IRP). The IRP makes provision for the integration of renewable energy, more specifically the integration of PV generated electricity into the National Grid to meet the country's rising demand. The IRP also allocates a portion of the country's electricity to be generated to PV plants, illustrating Government's commitment to clean renewable energy, specifically those that are best suited to the local environment.

G-4.3 Increased employment and local economic development

One of the requirements of the DoE's bid, is that there is a strong component of local development and skills utilisation, and due to the regional site selection, it is envisaged that there will be several other solar facility developments within the greater area. As such the local community will greatly benefit from job opportunities created. The impact is therefore rated as having a high positive significance.

G-5 CONCLUSION & IMPACT STATEMENT

Having assessed all the potential environmental impacts associated with the development and taking all the above mentioned specialist studies into consideration, Layout Alternative 2 (excluding a larger number of wetlands and a 32m buffer), with Technology Alternative 1 (Polycrystalline PV modules) and Powerline Route Alternative B are the most suitable and preferred alternatives. The environmental impacts related to all these alternatives (and the development as a whole), with the correct mitigation measures (Appendix 9 – EMPr) can be effectively minimised, to allow the development to proceed.

The project life span is anticipated to be between 20 – 25 years, (if the contract to be an IPP is not renewed), the decommissioning of the solar facility is expected to have similar impacts as that of the construction phase. The site will be rehabilitated (refer to the EMPr in Appendix 9 for details), and the original carrying capacity will be restored as far as possible.

Table 33: Impact Summary of the Proposed Development

Impact	Significance	
	WOM	WM
Construction Phase	**Layout Alternative 2**	
Soil erosion and silting	Medium	Low- Medium
Surface and ground water contamination	Medium	Low
Soil contamination	Low to Medium	Low
Destruction of natural vegetation	High	High
Potential increase in invasive vegetation	High	High
Destruction of faunal habitat	High	High
Interference with fauna and faunal behavioural activities	High	High
Faunal electrocution	Medium- High	Medium- High
Collisions of fauna with structures	Medium- High	Medium- High
Degradation and fragmentation of natural habitat by powerlines	Medium- High	Medium- High
Sedimentation of wetlands	Medium	Low
Destruction of wetland habitat and associated loss of wetland functionality	Medium	Low
Changes to surface and sub-surface flow regimes of wetlands	Medium	Low
Heritage Resources	Medium	Low
Increase in ambient dust levels	Medium	Low- Medium
Increase in ambient noise levels	Low- Medium	Low
Visual impact of construction activities on visual receptors (Residents and Motorists)	Medium	Low

Temporarily affecting the visual character and quality of the study area (Visual Resource)	Medium	Low- Medium
Temporary Job Creation	High	High
Traffic		
Traffic Patterns within the area	Low- Medium	Low
Operational Phase		
Soil erosion and silting	Medium	Low- Medium
Destruction of wetland habitat and associated loss of wetland functionality)	Low- Medium	Low
Long-term visual impact of operational activities on visual receptors (Residents and Motorists)	Medium- High	Low- Medium
Permanently affecting the visual character and quality of the study area (Visual Resource)	Medium- High	Low- Medium
Traffic Patterns within the area	Low- Medium	Low
Permanent Employment Opportunities	High	High
Local electricity generation	High	High
Reduced reliance on coal as an energy source, and thus a reduction in the associated negative environmental impacts	High	High
Cumulative Phase		
Loss of visual resources (natural open space and rural sense of place)	Medium- High	Medium
Increased amount of overhead distribution powerlines	Medium- High	Medium
Renewable supply of electricity	High	High
Increased employment and local economic development	High	High

SECTION H: CONCLUSION AND RECOMMENDATIONS

H-1.1 RECOMMENDATIONS

Having assessed all the potential environmental impacts associated with the development and taking all the specialist studies into consideration, Layout Alternative 2 (excluding the wetlands and a 32 m buffer), with Technology Alternative 1 (Polycrystalline PV modules) and Powerline Route Alternative B are the most suitable and preferred alternatives. The environmental impacts related to the preferred alternatives (and the development as a whole), with the correct implementation of mitigation measures (Appendix 9 – EMPr) can be effectively minimised, to allow the development to proceed. Refer to Section G for a detailed impact assessment.

The project life span is anticipated to be between 20 – 25 years, (if the contract to be an IPP is not renewed), the decommissioning of the solar facility is expected to have similar impacts as that of the construction phase. The site will be rehabilitated (refer to the EMPr in Appendix 9 for details), and the original carrying capacity will be restored as far as possible.

SEF is of the opinion that the proposed solar facility and the associated powerline be issued with a positive Environmental Authorisation from the DEA. However, to ensure that negative impacts are minimised and positive impacts enhanced, the following clauses are recommended as conditions of the EA:

- The EMPr is a legally binding document and the mitigation measures stipulated within the document must be implemented.
- An independent ECO must be appointed to manage the implementation of the EMPr during the construction phase. Environmental Audit Reports must be compiled and available for inspection.
- Due to the limited understanding of the impact of solar farm on biodiversity, a monitoring programme must be implemented that monitors flora/ vegetation composition, growth, etc. throughout the lifespan of the solar facility. This will provide valuable information on the long term impacts of the solar facility on the site's vegetation and will also assist in advising on the best rehabilitation practices, once the facility is decommissioned.
- The wetland areas with a 32 m buffer must be excluded from the development footprint.

Due to water resources identified on site (i.e. wetlands) and the close proximity of the Morokwa River, the proposed development triggers the following water uses listed in Section 21 of the NWA, and an application for a WUL is being submitted with this Final EIR:

c) impeding or diverting the flow of water in a watercourse;
i) altering the bed, banks, course or characteristics of a watercourse.

The RLM have confirmed that they would not be able to provide the project with water. The Draft EIR mentioned the fact that should water supply from the municipality not be available, a borehole will be used to supply water. This borehole would need to be licensed by the Department of Water Affairs (DWA). In addition to section 21 (c) and (i) of the NWA, section 21 (a) is being added for application of a WUL

Proof of application for a Water Use License Application (WULA) is being submitted with this Final EIR in Appendix 4.

During construction, workers will not be housed/ based on site and will be transported to and from the site every day. It is expected that more than 300 workers will be employed to oversee the construction of the solar facility. It is stipulated that the amount of effluent generated is 25 litres per person per day for toilet use. 20 litres per person per day will be added for all permanent staff. This accumulates to an overall figure of 7 500

litres (7.5m^3) per day during the construction phase and 1 100 litres (1.1m^3) per day during the operational phase.

Conservancy tanks will be installed to contain human effluent during the construction and operational phases of the project. The tanks will be emptied and disposed of at the nearest sewage treatment plant, in this instance located in Mahikeng. The level in the conservancy tank will be monitored by permanent staff to prevent overloading.

As per SANS 10252-2, waste generated during the construction and operational phases will accumulate to 7.5m^3 and 1.1m^3 respectively per day. 8 X 6 m^3 (48 m^3 in total) tanks will be installed during construction and 2 X 6 m^3 (12 m^3 in total) tanks will be installed during operational phase. A vacuum tanker will convey the effluent on a weekly basis.

The conservancy tanks would not be treating the waste, and therefore, there would not be a need for a WML.

An Ecological Impact Assessment has described the relevant baseline conditions relating to the natural vegetation communities and faunal species in the area of investigation, and also recommended removal and transplanting of protected plants as well as the *in-situ* conservation of the Northern Black Korhaan.

The protected plant species referred to are as follows:

- Provincially protected: *Aloe zebrine, Ammocharis coranica, Bonatea antennifera, Crinum graminicola* and *Huernia sp*.
- Nationally protected: *Acacia erioloba*

These plant species are located on the proposed site. The provincial ordinances have been developed to protect these particular plant species within specific provinces. The protection of these species is enforced through permitting requirements associated with provincial lists of protected species. Permits are administered by the Provincial DAFF. This application will be lodged with the North West DAFF once a decision has been granted by the DEA.

SECTION I: REFERENCES

Acocks, J.P.H. 1988. Veld Types of South Africa. Mem. Botanical Survey South Africa. No. 57. DEAT: Pretoria.

ASGISA annual report, 2007. Accelerated and Shared Growth Initiative for South Africa

Department of Environmental Affairs and Tourism (DEAT). 2001. ENPAT. Pretoria.

Department of Rural Development and Land Reform. Chief Directorate: Surveys and Mapping 2009: Hydrology. Cape Town: CDSM

Goldie-Scot, G (2011) South Africa decides to give wind and PV a tender embrace. Bloomberg New Energy Finance. Research Note – Clean Energy.

Handbook for Solar Photovoltaic (PV) systems, Energy Market Authority

http://clients.customweather.com/cgi-bin/1STWX/old/climate.cgi. Date Accessed: 27 January 2012

http://en.wikipedia.org/wiki/Mpumalanga :(Date Accessed: 29 November 2011)

http://en.wikipedia.org/wiki/North West
(Accessed: 25 March 2013)

http://www.infor.gov.za/asgisa
(Date Accessed: 24 August 2012)

Integrated Resource Plan (March 2011) Revision 2 – Final Report.

Low, A.D., Rebelo, G. (Editors) 1996. Vegetation of South Africa, Lesotho and Swaziland. A companion to the Vegetation Map of South Africa, Lesotho and Swaziland. Pretoria.

National Department of Agriculture. 2002. Development and Application of a Land Capability Classification System for South Africa. Report GW/A/2000/57. Pretoria

Ngaka Modiri Molema District Municipality. Integrated Development Plan, 2011 - 2012.

Ratlou Local Municipality. Integrated Development Plan. 2009/2010.

Simberloff, D., Farr. J. A., Cox. J. Mehlman. D. W. 1992. Movement Corridors: Conservation Bargains or Poor Investments? Conservation Biology 6 (4), 493–504.

South African National Botanical Institute (SANBI). 2004. Unpublished version of VEGMAP. Cape Town: SANBI.

Statistics SA. 2001. Census 2001 Data.

Strategic Environmental Focus, Mareetsane Batho-Batho Solar PV Facility Environmental Feasibility Assessment Report (2013)

South African National Botanical Institute (SANBI). 2006. Vegmap. Cape Town.

SECTION J: APPENDICES

Appendix 1: Locality Map

Appendix 2: Photograph plate

Appendix 3: Layout Plans and Designs

Appendix 4: Authority Correspondence

Appendix 5: Public Participation

Appendix 6: EAP Details

Appendix 7: Specialist Study Reports

Appendix 8: Confirmation from service providers

Appendix 9: Environmental Management Programme

Appendix 10: Copy of Title Deeds

Appendix 11: Background Information