FINAL

ENVIRONMENTAL IMPACT ASSESSMENT REPORT
for
THE PROPOSED
INYANGA ENERGY PROJECT 9

Prepared for:

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Submitted to:

DEPARTMENT OF ENVIRONMENTAL AFFAIRS (DEA)

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DEA Ref No: 12/12/20/2580
NEAS Ref No: DEA/EIA/0000749/2011

PROJECT SUMMARY

Proposed Site	Portions 13 and 23 of The Farm Gemsbokfontein 231 JR
21 digit SG code	T0JR00000000023100013 T0JR00000000023100023
Proposed Solar plant technology	The proposed Photovoltaic solar plant will use "Polycrystalline (fixed) photovoltaic module" technology.
Structure height	The height of the structure will be approximately 2.3 m above the ground at an angle of 30^0. The lighting mast associated with the onsite 22/ 132 kV substation will be 21m above ground level.
Structure orientation	All solar panels will be North facing.
Lay down area dimensions (construction camp)	100 m X 100 m
Permanent lay down area footprint (entire development footprint)	936 739.4 m^2
Generation Capacity	49.92 MW.
Site photograph plate	Refer to **Appendix 2.**
Copies of Title deeds	Refer to **Appendix 13**
Water Supply	Municipal (refer to section 1.1.4)
Electrical Supply	Construction Phase: Diesel Generators Operational Phase: Solar plant - self sustained

EXECUTIVE SUMMARY

1 INTRODUCTION

Strategic Environmental Focus (Pty) Ltd (SEF) has been appointed by Islandsite Investments 519 (Pty) Ltd to undertaken an environmental application process for the proposed Inyanga Energy Project 9, solar plant situated on Portions 13 and 23 of the Farm Gemsbokfontein 231 JR, approximately 2km south of Tweefontein in Mpumalanga, within the Thembisile Hani Local Municipality.

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

The Scoping Phase for the proposed project has been completed and the Final Scoping Report and Plan of Study for the EIR was submitted to the Department of Environmental Affairs (DEA) on the 19 December 2011. Approval to proceed to the EIR phase was received on 21 February 2012. The Environmental Impact Report presents the findings of specialist surveys and assesses all anticipated impacts. All comments on the Draft Environmental Impact Report was incorporated and addressed in the Final Environmental Impact Report submitted to the DEA for decision making.

2 GENERAL PROJECT DESCRIPTION

The proposed Inyanga Energy Project 9, solar farm, will generate approximately 49.92 MW of renewable electricity which will feed into the National grid via the adjacent Gemsbok 132kV substation. The site is located in an optimal landscape position to cater for such a development, within the country. There will be supporting infrastructure associated with the solar farm *viz*. power lines and transformers (22/ 132 kV substation) on site, and an internal electrical network amongst others. The technology that is proposed for the solar plant is "Fixed Polycrystalline photovoltaic (PV) module" technology.

The project life span is anticipated to be between 20 – 25 years, (if the contract to be an Independent Power Producer is not renewed), and as such the decommissioning of the solar plant is expected to have similar impacts as that of the construction phase. The site will be rehabilitated, and the original carrying capacity (in terms of livestock grazing) will be restored as far as possible.

3 KEY IMPACTS

The following key impacts were identified and will be carried forward into the EIR phase for further investigation and assessment:

Biophysical Issues -

- Limited floral destruction and faunal displacement;
- Possible surface water contamination;
- Wetland Degradation;
- Increase in soil erosion;

- Localised increase in surface water run-off during heavy rainfall events; and
- Soil contamination.

Social Issues -

- Increase in ambient dust levels;
- Increase in ambient noise levels;
- Change in visual character of the area;
- Employment opportunities;
- Impact on traffic patterns within the area;
- Locally generated electricity; and
- Reduced reliance on coal as an energy source.

Cumulative Impacts:

- Loss of open space.
- Loss of agricultural land within the greater area due to the development of several solar plants.

Based on the identified key impacts, the following specialist studies were undertaken during the EIR Phase and are reported on within this Report:

- Ecological Report (Flora and Fauna);
- Visual Impact Assessment (VIA);
- Agricultural/ Soils Impact Assessment;
- Heritage Impact Assessment (HIA);
- Transportation Study (TS);
- Wetland delineation and functional assessment; and
- Desktop Geotechnical Assessment.

4 ALTERNATIVES

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

Technology alternatives:

Two technology alternatives have been considered and investigated during the EIR phase of the project as outlined below. These technologies that have been considered have implications varying from cost to effectiveness.

Technology Alternative 1 (preferred technology): Polycrystalline Photovoltaic (PV) Solar Plant [1]

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 photovoltaic (PV) cell) or storing part of the energy in a chemical reaction (as in the conversion of water to hydrogen and oxygen).

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

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 49.92 MW of electricity that will feed into the National Grid. The solar plant 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. Each row of the solar panels will be approximately 4.9 m apart from each other due to the shadow effect (Appendix 3).

Technology Alternative 2: Micromorph Thin – Film PV module technology

The alternative technology investigated was fixed "Micromorph thin – film PV module" technology to generate electricity. 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 plant will produce less electricity than that generated when using the preferred Polycrystalline photovoltaic technology. The solar panels will all be North facing and will be approximately 1.8m in height and at an angle of 30^0. 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. Each row of the solar panels will be approximately 2.7 m apart from each other due to the shadow effect. The solar panels supporting structure will be made up of steel.

Alternative 3: No development

This option assumes that a conservative approach would ensure that the environment is not impacted upon any more than is currently the case. It is important to state that this assessment is informed by the current condition of the area. Should the DEA decline the application, the 'No-development' option will be followed and the status quo of the site will remain.

Site/ Location alternatives:

The current and only site was selected due to the area's relative flatness and connectivity to the existing electrical infrastructure (132kV line and the adjacent Gemsbok substation) to feed into the National Grid. As such alternative sites will not be discussed any further.

Layout/ Design alternatives:

Two alternative layout/ design plans have evolved from the findings of specialist studies that will be undertaken to inform this report.

Layout Alternative 1: Development of the whole site (195.61 ha)

This layout alternative proposed to develop the entire site, and does not make provision for the wetland identified on site.

Layout Alternative 2 (preferred layout): Development of 93.67 ha (excluding the wetland on site)

This layout alternative makes provision for the exclusion of the wetland and still maintains the feasibility of the solar plant. The wetland and a 50m buffer will be excluded from the development footprint.

5 CONCLUSIONS AND RECOMMENDATIONS

Having assessed all the potential environmental impacts associated with the development and taking all the above mentioned specialist studies into consideration, Layout Alternative 2 with Technology Alternative 1 (Polycrystalline PV modules) is the most suitable and preferred alternative. The environmental impacts related to this layout (and the development as a whole), with the correct mitigation measures (Appendix 12 – EMP) can be effectively minimised, to allow the development to proceed.

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Strategic Environmental Focus (Pty) Ltd is undertaking the Environmental Impact Assessment (EIA) process for the Inyanga Energy Project 9, solar plant located on Portions 13 and 23 of the Farm Gemsbokfontein 231 JR, Mpumalanga Province.

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, offering sustainable environmental solutions to private and public sector clients. With our integrated services approach in the management of natural, built and social environments; and with over a decade of experience, we bring a wealth of knowledge and expertise to each project. Recognizing the need for organizations to manage diverse environmental systems in a sustainable manner, SEF is dedicated to providing tailored solutions to client's unique challenges.

SEF services are offered in the following fields:

- Built environment;
- Social;
- Resource Management;
- Mining;
- Waste;
- Industry; and
- Energy.

SEF is consistently forging sound client relations, based on our objective approach and commitment to our corporate value system and customer service standards and strives to be the consultancy of choice, both locally and internationally. SEF is a Qualifying Small Enterprise and a Level 3 contributor in terms of the Broad Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003) and has a procurement recognition level of 110%.

SEF staff are members of various professional associations, including the International Association for Impact Assessment (IAIA), South African Association of Botanists, Professional Landscape Architect with the South African Council for the Landscape Architectural Profession (SACLAP), South African Institute for Ecologists and Environmental Scientists (SAIEES), GISSA Gauteng, Environmental Assessment Practitioners of South Africa (EAPSA), International Register of Certificated Auditors; QMS 2000 Internal Auditor (IRCA), The Association of Southern African Professional Archaeologist (ASAPA), South African Council for Natural Scientific Professions (SACNASP) and SAQA GISc SGB (Standards Generating Body for Geo-Information Science).

The following project team members are involved in this Scoping and EIR application process:

Project Team Members	Name	Organization
Project Director	Dave Rudolph	Strategic Environmental Focus (Pty) Ltd.
Project Manager	Vici Napier	
Environmental Manager	Tashriq Naicker	
Environmental Manager	Nelia Maritz	
Public Participation	Natasha Lalie	
Fauna and Floral Assessment	Karin van der Walt	
Agricultural Assessment	Riaan van der Merwe	
Phase 1 Cultural Heritage Impact Assessment	Mamoluoane Seliane	
Visual Impact Assessment	Eamonn 'O Rourke	
Wetland Delineation and Functional Assessment	Antoinette Bootsma	Limosella Consulting
Preliminary Geotechnical Study	Rene Roux	Aurecon South Africa (Pty) Ltd
Transportation Study	J Conradie	

Mr Dave Rudolph

Dave Rudolph has 20 years of experience in the field of environmental management and resource planning. The experience relates to large scale spatial planning and assessment initiatives at a National, Provincial and Local level. He has managed numerous large scale Environmental Assessments both Nationally and Internationally.

Ms Vici Napier

Vici has been an Environmental Assessment Practitioner (EAP) for more than 5 years. She has been responsible for numerous environmental applications ranging from Basic Assessments (BAs) and Scoping and EIAs in terms of NEMA, as well as various mining applications in terms of the mining legislation. Vici is the Technical Advisor to SEF's Business Management Group (as it relates to SEF's core services and environmental processes) and is also a Project Manager for SEF, focusing on Strategic Environmental Assessments (SEAs), management frameworks and large scale (time constrained) EIAs. She also provides technical supervision of projects, project leadership on large scale environmental assessments, management of multi-disciplinary teams and quality control on EIAs, BAs and strategic projects. She is registered with the South African Council for Natural Scientific Professions.

Mr Tashriq Naicker

Tashriq has obtained Honours in Environmental Geology from the University of the Witwatersrand. Tashriq is currently working as an Environmental Manager for SEF for three years and as such provides project coordination, compilation of Environmental Scoping and Environmental Impact Assessment Reports, co-ordination of the public participation process, conducting Feasibility Studies and Status Quo Assessments and compiling Environmental Management Programme Reports. Amongst other environmental duties and responsibilities, Tashriq conducts strategic geotechnical risk assessments as well as dust and water quality sampling, and has assisted with aquatic sampling. He is registered as a candidate natural scientist with the South African Council for Natural Scientific Professions.

Ms Nelia Maritz

Nelia has attained a M. Phil in Environmental Management, University of Stellenbosch (2007 - 2009), H BSc in African Vertebrate Biodiversity Studies, Rhodes University (2003) and B Sc in Genetics, University of Stellenbosch (1997 - 2000). Nelia has been an EAP for nearly 5 ½ years during which she has managed projects ranging in size and scope from small BAs to large-scale EIAs in various provinces and on provincial and National level. Nelia is an Environmental Manager for SEF and as such provides project coordination, compilation of Environmental Scoping and Environmental Impact Assessment Reports, co-ordination of the public participation process, conducting Feasibility Studies and Status Quo Assessments and compiling Environmental Management Programme Reports. She is registered with the South African Council for Natural Scientific Professions.

Ms Natasha Lalie

Natasha has an MSc. Environment and Society and has been an Environmental Assessment Practitioner (EAP) for almost eight years. She has undertaken numerous Scoping Reports, Environmental Management Programmes (EMP's) and Exemption Applications, as required by the Environment Conservation Act, 1989 (Act No. 73 of 1989); Environmental Screening and Feasibility Studies; and Scoping and EIAs as well as Basic Assessments, as required by the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended and the EIA Regulations of 2006. She has been involved in a wide range of projects, which include waste management, industrial, township establishments, mixed-use development, road upgrades, infrastructure developments, change of land use, lodge developments, proposed bulk water pipelines, proposed transmission power lines, proposed filling stations, shopping centre developments and so on.

Contact Details of Environmental Assessment Practitioner

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

CARA	Conservation of Agricultural Resources Act, 1993 (Act No. 43 of 1983)
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs, the then DEAT
DEAT	Department of Environmental Affairs and Tourism
DME	Department of Minerals and Energy
DoE	Department of Energy
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act, 1989 (Act No. 73 of 1989)
ECO	Environmental Control Officer
EIR	Environmental Impact Report
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Programme
GIS	Geographical Information Systems
GN	Government Notice
GNR	Government Notice Regulation
GPS	Global Positioning System
GWh	Giga Watt per hour
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IEM	Integrated Environmental Management
IPP	Independent Power Producers
IRP	Integrated Resource Plan
kV	Kilovolt
ℓ / s	Litres per second
mamsl	Metres Above Mean Sea Level
ME	Mitigation Efficiency
Mtoe	Million tons of oil equivalent
MW	Mega Watt
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended
NERSA	National Energy Regulator of South Africa
NWA	National Water Act, 1998 (Act No. 36 of 1998)

PoS	Plan of Study
PV	Photovoltaic
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
S&EIR	Scoping and Environmental Impact Reporting
SEF	Strategic Environmental Focus (Pty) Ltd
SFM	Significance Following Mitigation
TS	Transportation Study
VIA	Visual Impact Assessment
WM	With Mitigation
WOM	Without Mitigation

1. INTRODUCTION

Strategic Environmental Focus (Pty) Ltd (SEF) has been appointed by Islandsite Investments 519 (Pty) Ltd to undertaken an environmental application process for the proposed Inyanga Energy Project 9, solar plant situated on Portions 13 and 23 of the Farm Gemsbokfontein 231 JR, approximately 2km south of Tweefontein in Mpumalanga, within the Thembisile Hani Local Municipality (Figure 1).

The Scoping Phase for the proposed project has been completed and the Final Scoping Report and Plan of Study for the EIR was submitted to the Department of Environmental Affairs (DEA) on the 19 December 2011. Approval to proceed to the EIR phase was received on 21 February 2012. The Environmental Impact Report presents the findings of specialist surveys and assesses all anticipated impacts.

1.1. PROJECT DESCRIPTION

The proposed Inyanga Energy Project 9, solar farm, will generate approximately 49.92 MW of renewable electricity which will feed into the National grid via the adjacent Gemsbok 132kV substation. The site is located in an optimal landscape position to cater for such a development, within the country. There will be supporting infrastructure associated with the solar farm *viz*. powerlines, transformers and a 22/ 132 kV substation on site, with an internal electrical network amongst others. The GPS co-ordinates for the centre of the site is approximately 25^0 26.348' S; 28^0 49.118' E.

All existing servitudes on site will be adhered to, where applicable. The technology that is proposed for the solar plant is "Fixed Polycrystalline photovoltaic (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 2.5m 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 (Appendix 3). The solar panels supporting structure will be made up of steel, and the supporting legs will either be inserted into the ground or have precast commercially sourced concrete feet (allowing it to stand on the ground). The PV system will be composed of the following components *inter alia*:

- PV modules;
- Inverters;
- MV/LV transformers;
- 22/ 132kV substation;
- Electrical wiring;
- Protection system; and
- Electrical Switchgear.

The 22/ 132kV 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 break down/ 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 recognize 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" (Appendix 3). 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

The project life span is anticipated to be between 20 – 25 years, (if the contract to be an Independent Power Producer is not renewed), the decommissioning of the solar plant is expected to have similar impacts as that of the construction phase. The site will be rehabilitated, and the original carrying capacity (in terms of livestock grazing) will be restored as far as possible.

1.1.1. Grid Connection

When deciding where to locate a solar park development one of the main considerations is the connection to the electrical grid. The larger the generation capacity of the solar park, the higher the connecting network voltage needs to be. For a 49.92 MW solar park, one needs to at least connect to a 132kV network, as this capacity is close to the thermal limit of most of Eskom's 132kV lines. The additional benefits of connecting to a heavily loaded 132kV network is reducing the load on the network, reducing energy losses and deferring any Eskom network expansion plans. As the land parcels located next to Eskom facilities are not always readily available for development, a compromise needs to be found between the availability of land plots, and the availability of a grid connection, as the grid connection cost could make a generation project un-feasible. On the other hand the land plot should also satisfy all the other criteria to make solar development feasible.

When considering the Inyanga Energy Project 9 location the grid connections in the area where identified and considered. A description of the electrical network in the area, follows:

Eskom: Ekangala system:

- Gemsbok substation is supplied form Ekangala substation over a 45km long 132kV line. Ekangala is supplied via two 132kV lines from Vulcan MTS substation, approximately also 45km in length.
- Eskom will in future integrate the Simplon Vulcan 132kV networks (two MTS substations) and generation at Gemsbok will support this, and reduce losses.
- Grid studies will determine the various upgrade requirements at Gemsbok substation.

The proposed solar park site is located next to the existing Eskom Gemsbok 132kV substation, which forms part of the Ekangala system. The generation at this site will help to

reduce the loading on the network as well as the electrical losses. For the 49.92 MW solar park, a new 22/132 kV substation will be built, and linked to Gemsbok substation.

1.1.2. Internal Access Roads

A secondary road connects the site to the R573 to the north. An existing farm road runs parallel to Portion 13 of Farm Gemsbokfontein along its northern boundary. A short access road is proposed off this farm road. The secondary road (existing farm road) will undergo minimal compaction and ground levelling to ensure the safe transportation of the fragile components of the solar plant (refer to Appendix A and Appendix C).

1.1.3. Supporting Infrastructure

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

- A generator transformer and substation (22/132 kV) to facilitate the connection to the National Grid (via the adjacent 132 kV powerline, which ultimately connects to the adjacent Gemsbok 132 kV substation);
- Invertors to convert the electricity from direct current to alternating current;
- Cabling to connect the various components of the project (where practical 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).

1.1.4. Water Supply

During the construction phase the proposed solar plant will be supplied with approximately 1500 m^3 of municipal water for all the construction related activities, which is envisaged to take place over 6 – 9 months. During the operational phase of the solar plant, approximately 60 m^3 of water will be obtained from the local municipality and trucked to the site for the necessary cleaning activities of the solar panels. The cleaning activities are envisaged to occur once a year. The local municipality has verbally confirmed the availability of water for the proposed solar farm, a formal letter has been requested and will be submitted to the DEA once it has been issued.

1.2. DETAILS OF THE APPLICANT

The details of the project applicant are indicated as follows:

Name of Applicant	Contact Details	
Islandsite Investments 519 (Pty) Ltd. Contact Person: Mr. Kirill Ilin	Office 301, 3rd floor, The Square 30 Melrose Boulevard Melrose Arch 2076	Tel: 011 241 0550 Fax: 011 241 0550

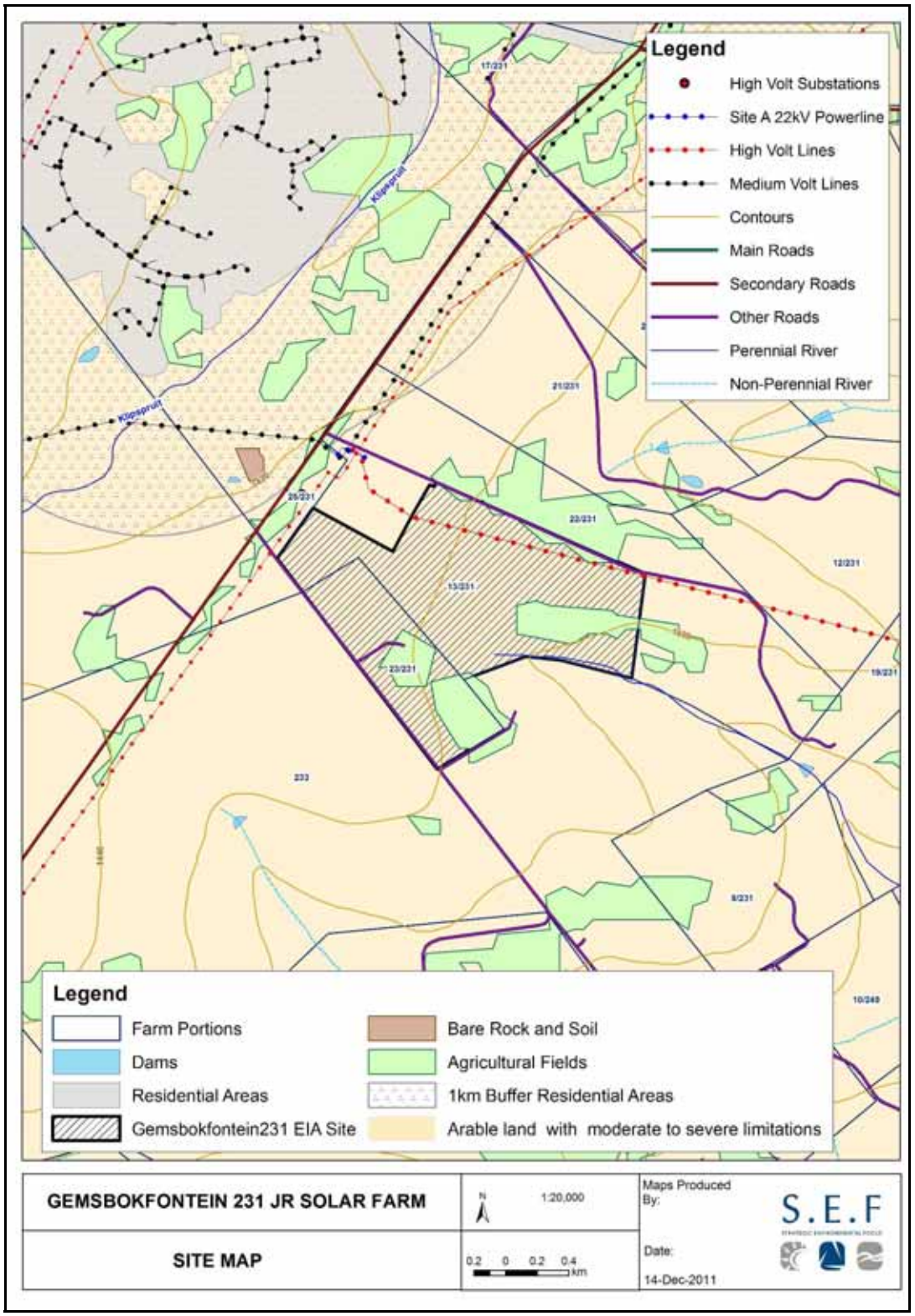

Figure 1: Locality Map

1.3. LEGAL REQUIREMENTS

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 Inyanga Energy Project 9. SEF registered the project with the DEA and the project has been assigned the reference number: 12/12/20/2580. The legislation, guidelines and policies applicable to this project are as follows:

1.3.1. NEMA and the Environmental Impact Assessment Regulations

The EIA Regulations, promulgated under NEMA, focuses 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. 544 and 546 (requiring a Basic Assessment process) and GN No. 545 (requiring a S&EIR process), the following listed activities are deemed by the EAP to be applicable to the proposed solar farm based on the information provided by the project proponent and their consulting engineers. These listed activities are those activities, which may have potentially detrimental impacts on the environment and therefore require environmental authorisation from the relevant authorising body, which in this case is the Department of Environmental Affairs (DEA).

GN No. 544 of 18 June 2010

Activity listing No. 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..

Activity Listing No. 11:
The construction of:

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.

Activity listing No. 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 of more than 5 cubic metres from:

i. a watercourse;

GN No. 546 of 18 June 2010

Activity listing No. 14:
The clearance of area of 5 hectares or more of vegetation where 75% or more the vegetative

cover constitutes indigenous vegetation**. In the Mpumalanga Province:** All areas outside urban areas

GN No. 545 of 18 June 2010

Activity listing No. 1:
The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.

Activity listing No. 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.

It must be noted that activities requiring a Basic Assessment process, as well as activities requiring a S&EIR process are triggered by the proposed Inyanga Energy Project 9. Therefore, according to the above listed activities, a situation arises, whereby; the legal requirements of the activity listed in terms of GN No. 545 of 2010 supersede those of the activities listed in terms of GN No. 544 and 546 of 2010, and as such this application shall undergo a S&EIR process. .

The DEA has acknowledged receipt of the application for an environmental authorisation of the Inyanga Energy Project 9 on 02 November 2011 and 21 November 2011. The reference numbers: DEA Ref.: 12/12/20/2580 & NEAS Ref.: DEA/EIA/0000749/2011 was assigned to the project. The Department approved the Scoping Report and Plan of study for the EIR on 21 February 2012 and as such SEF has been granted permission to proceed with the EIR process (see Appendix 1).

1.3.2. Other Legal Requirements

The following list of legislation applies to the proposed development.

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

The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) has significant implications for environmental management. The main effects are the protection of environmental and property rights, the drastic 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 NEMA. Section 24 in the Bill of Rights of the Constitution specifically states:

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.

National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
The purpose of the Act 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.

National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
The purpose of this Act is to provide for the protection, conservation and management of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes.

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. The Act aims to regulate the use of water and activities, which may impact on water resources through the categorisation of 'listed water uses' encompassing water extraction, flow attenuation within catchments as well as the potential contamination of water resources, where the Department of Water Affairs (DWA) is the administering body in this regard.

Due to the wetland on site a water use license will be required from the DWA. A water use license application has been submitted to the DWA (Appendix 14 – proof of submission).

National Heritage Resources Act, 1999 (Act No. 25 of 1999)
This Act legislates the necessity for cultural and heritage impact assessment in areas earmarked for development, which exceed 0.5 hectares and where linear developments (including pipelines) 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 South African Heritage Resources Agency (SAHRA).

Promotion of Access to Information Act, 2000 (Act No. 2 of 2000)
The Promotion of Access to Information Act, 2000 (Act No. 2 of 2000) 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.

Promotion of Administrative Justice Act, 2000 (Act No. 3 of 2000)
This Act gives effect to the right to administrative action that is lawful, reasonable and procedurally fair. Its main purpose is to:

- Promote efficient administration and good governance; and

- Create a culture of accountability, openness and transparency in the public administration or in the exercise of a public power or the performance of a public function, by giving effect to the right to just administrative action.

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.

Integrated Resource Plan (IRP), 2010 -2030

The Minister of Energy is required to publish a Integrated Resource Plan for energy by the Energy Act of 2008. The Department of Energy (DoE) in cooperation with the National Energy Regulator of South Africa (NERSA) thus compiled the Integrated Resource Plan (IRP) for 2010 to 2030. The primary objective of the IRP is to determine the long term electricity demand and discuss how this demand can be met in terms of generating capacity, type, timing and cost.

The need to reduce carbon emissions has forced the IRP to favour the development of renewable energy sources even though they may entail a higher cost in the short term.

The plan aims to make provisions of renewable energy:

- 1450 MW of power generated by converting solar radiation into direct current electricity (photovoltaic);
- 1,850 MW of wind energy generated onshore;
- 200 MW of energy generated by concentrating large areas of sunlight onto small areas with the help of lenses or mirrors (Concentrated Solar Power (CSP));
- 100 MW energy from plants fuelled by bio-gas; and
- 75 MW of hydroelectric energy.

National Climate Change Response Strategy for South Africa, 2004

To address the growing concern surrounding the implications of global climate change, the DEAT has developed a national climate change response strategy. The objective of this strategy is to support the policies and principles laid out in the Government White Paper on Integrated Pollution and Waste Management, as well as other national policies including those relating to energy, agriculture and water. The strategy highlights the following as key issues and problems:

- Supporting national and sustainable development;
- Adapting to Climate Change;
- Developing a sustainable energy programme;
- Meeting international obligations;
- The integration of climate change response in government;
- Domestic legal obligations;
- Climate change related education and training;
- Research development and demonstration;
- Inventories of greenhouse gases and air pollutants; and
- Accessing and managing financial resources for climate change.

The Strategy supports the objectives of the Government's White Paper on Renewable Energy (2003) and the Energy Efficiency Strategy.

Electricity Regulation Act, 2006 (Act No. 40 of 2004)

In terms of the National Regulatory Act, 2004 (Act No. 40 of 2004), the Electricity Regulation

Act, 2006 (Act No. 4 of 2006) as amended the NERSA is mandated to determine the price structure and the conditions under which electricity can be supplied by Independent Power Producers (IPP). As such NERSA is in the process of updating and developing its process by which electricity generation licenses are awarded.

1.3.3. Policies and Guidelines

Protected species – Provincial Ordinances

Provincial ordinances were developed to protect particular plant species within predetermined provinces. The protection of these species is enforced through permitting requirements associated with provincial lists of protected species. Permits are administered by the provincial departments responsible for environmental affairs. There are six species of provincially protected plants on site. Permits for the picking and cropping of these protected plants will be applied for from Mpumalanga Tourism and Parks Agency at a later date, as it was confirmed by the agency that a permit can only be issued once an Environmental Authorisation for the proposed development has been issued.

Integrated Environmental Management (IEM)

IEM is a procedure 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 (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.

NEMA 2010 EIA Regulation Guidelines

The following Guidelines in terms of NEMA EIA Regulations where also adhered to during the compilation of this report:

- Companion to the NEMA EIA Regulations 2010 (Final Guideline; DEA, 2010); and
- Public Participation in the EIA Process (DEA, 2010).

2. PROJECT MOTIVATION, ALTERNATIVE IDENTIFICATION AND ASSESSMENT

2.1 PROJECT MOTIVATION AND DESIRABILITY

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 impacts 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 to no air quality impacts and impacts on water resources (if any) 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 Integrated Resource Plan (IRP) for South Africa, has been initiated by the Department of Energy (DoE), it 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 a response to the Department of Energy's bid invitations for renewable energy. Should the proposed project be successful in the bid, the project will contribute approximately 49.92 MW of electricity to the national grid network. This 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.

A Community Trust, holding a share in the solar plant will be established. Under the leadership of the Community Trust various socio- economic development initiatives will be encouraged. Education, health and infrastructure requirements remain important needs in the community. Under the Community Trust various small enterprises will be created that will be involved in the operation and maintenance activities of the solar plant, and as such will contribute directly to the local economy. As part of the bid submission to the DoE a full socio-economic plan will be submitted. There are no tourism/ eco-tourism activities/ facilities are located close to the proposed development, thus an impact on regional tourism is not envisaged.

2.2 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 the EIR phase of the project, the identified alternatives will be assessed, in terms of environmental acceptability as well as socio-economic feasibility. To define the term alternatives as per Government Notice 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:

Technology alternatives:
Two technology alternatives have been considered and investigated during the EIR phase of the project as outlined below. These technologies that have been considered have implications varying from cost to effectiveness.

Technology Alternative 1 (preferred technology): Polycrystalline Photovoltaic (PV) Solar Plant [2]

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 photovoltaic (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 49.92 MW of electricity that will feed into the National Grid. The solar plant 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. 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 (Appendix 3). The solar panels supporting structure will be made up of steel. Solar panel rows will be approximately 4.9 m apart to compensate for the shadow effect and to allow equipment and persons to access the panels during the operational phase for cleaning and maintenance (Appendix 3). The PV system will be composed of the following components *inter alia*:

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

- PV modules;
- Inverters;
- MV/LV transformers;
- 22/ 132 kV substation;
- Electrical wiring;
- Protection system; and
- Electrical Switchgear.

Technology Alternative 2: Micromorph Thin – Film PV module technology

The alternative technology investigated was fixed "Micromorph thin – film PV module" technology to generate electricity. 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 plant will produce less electricity than that generated when using the preferred Polycrystalline photovoltaic technology. The solar panels will all be North facing and will be approximately 1.81m in height and at an angle of 30^0. 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.

Site/ Location alternatives:

The current and only site was selected due to the area's relative flatness and connectivity to the existing electrical infrastructure (132kV line and Gemsbok 132 kV substation) to feed into the National Grid. As such alternative sites will not be discussed any further.

Layout/ Design alternatives:

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

Layout Alternative 1: Development of the whole site (195.61 ha)

This layout alternative proposed to develop the entire site, and does not make provision for the wetland identified on site.

Layout Alternative 2 (preferred layout): Development excluding the wetland on site (93.67 ha)

This layout alternative makes provision for the exclusion of the wetland and still maintains the feasibility of the solar plant. The wetland and a 50m buffer will be excluded from the development footprint.

No development

This option assumes that a conservative approach would ensure that the environment is not impacted upon any more than is currently the case. It is important to state that this assessment is informed by the current condition of the area. Should the DEA decline the application, the 'No-development' option will be followed and the status quo of the site will remain.

3. DESCRIPTION OF THE BASELINE ENVIRONMENT

It should be noted that the adjacent site (Olam Energy Project 11) was initially submitted to the DEA as a separate basic assessment environmental application (DEA reference no: 14/12/16/3/3/1/419). The application has been subsequently withdrawn as a stand alone application and the site has been incorporated into this S&EIR application in order to increase the output capacity of this proposed larger solar plant. As such the specialist studies conducted for the basic assessment have been included within the relevant appendices and sections below to ensure that the entire development footprint is covered with specialist assessments.

3.1 Biophysical Environment

3.1.1 Climate

Mpumalanga is a province divided into two halves, the Highveld escarpment and the Lowveld plains. The west side of Mpumalanga, on the Highveld, is the extreme temperatures, hotter, drier and colder than the rest of the province. The Highveld is comparatively much cooler, due to its altitude of 2300m to 1700m above sea level. The Highveld often experiences severe frost. Winter rainfall is rare, except for some drizzle on the escarpment[3].

- Johannesburg averages: January maximum: 35 ℃ (min : 6 ℃), July maximum: 16 ℃ (min: 4 ℃), annual precipitation: 728 mm [4]

3.1.2 Geology

The site is mainly dominated by grey to pink coarse-grained granite (Nebo granite), some porphyritic grey biotite granite (Makhutso granite) and Rashoop granophyre [5]. A preliminary Geotechnical investigation was carried out by Aurecon South Africa (Pty) Ltd during December 2011 (Appendix 4). The desktop investigation found that the proposed site did not have any fatal geotechnical flaws. Due to the occurrence of granite and granophyre outcrops, limited blasting may be required for construction purposes. It was noted that spring conditions usually occur with this type of outcrops, and the design of the solar plant should take this into account. The investigation states that seismic activity is limited within the area; however the design of the solar plant should consider such activity. The investigation concluded that the area does not have any fatal geotechnical flaws to prevent the construction of the solar plant, however during the construction phase, footprint specific founding conditions must be investigated.

3.1.3 Agricultural Potential

SEF conducted an agricultural assessment during December 2011 and January 2012 (refer to Appendix 5). The dominant soils found were Hutton, Avalon Dresden, Glencoe, Westleigh, Fernwood, Katspruit, Bainsvlei and Wasbank soils. Other secluded soil forms were Longlands, Mispah, Kroonstad, Clovelly and Glenrosa soils (Figure 2). The Katspruit, Kroonstad, Longlands, Westleigh, Fernwood, Glencoe and Dresden soils are regarded as wetland soils. There are only 2 soils which can be used for cultivation purposes, these are the Clovelly and Hutton soils. Selected areas of Avalon and Bainsvlei soils can also be used for cultivation, but must be managed well to avoid water logging and losses in production.

[3] http://en.wikipedia.org/wiki/Mpumalanga
[4] http://clients.customweather.com/cgi-bin/1STWX/old/climate.cgi
[5] Department of Environmental Affairs and Tourism, 2001, ENPAT. Pretoria: DEAT.

The clay content on site varied between 5 – 35 %. The livestock grazing capacity for the area is rated at approximately 8 – 13ha per livestock unit, although this cannot be directly applied due to the current state of the site. The site can support approximately 13 - 21 livestock units. The report concluded that the approximately 60 ha of the proposed site has high agricultural potential (Figure 3) which was determined on the basis of depth and susceptibility of the soil to water logging. It is recommended that a wetland specialist be consulted to delineate the wetland area. The site is suitable to support commercial livestock farming and/ or dry land agriculture. However the socio-economic benefit from the operation of the proposed solar plant (vs) commercial livestock farming and/ or dry agriculture should be investigated.

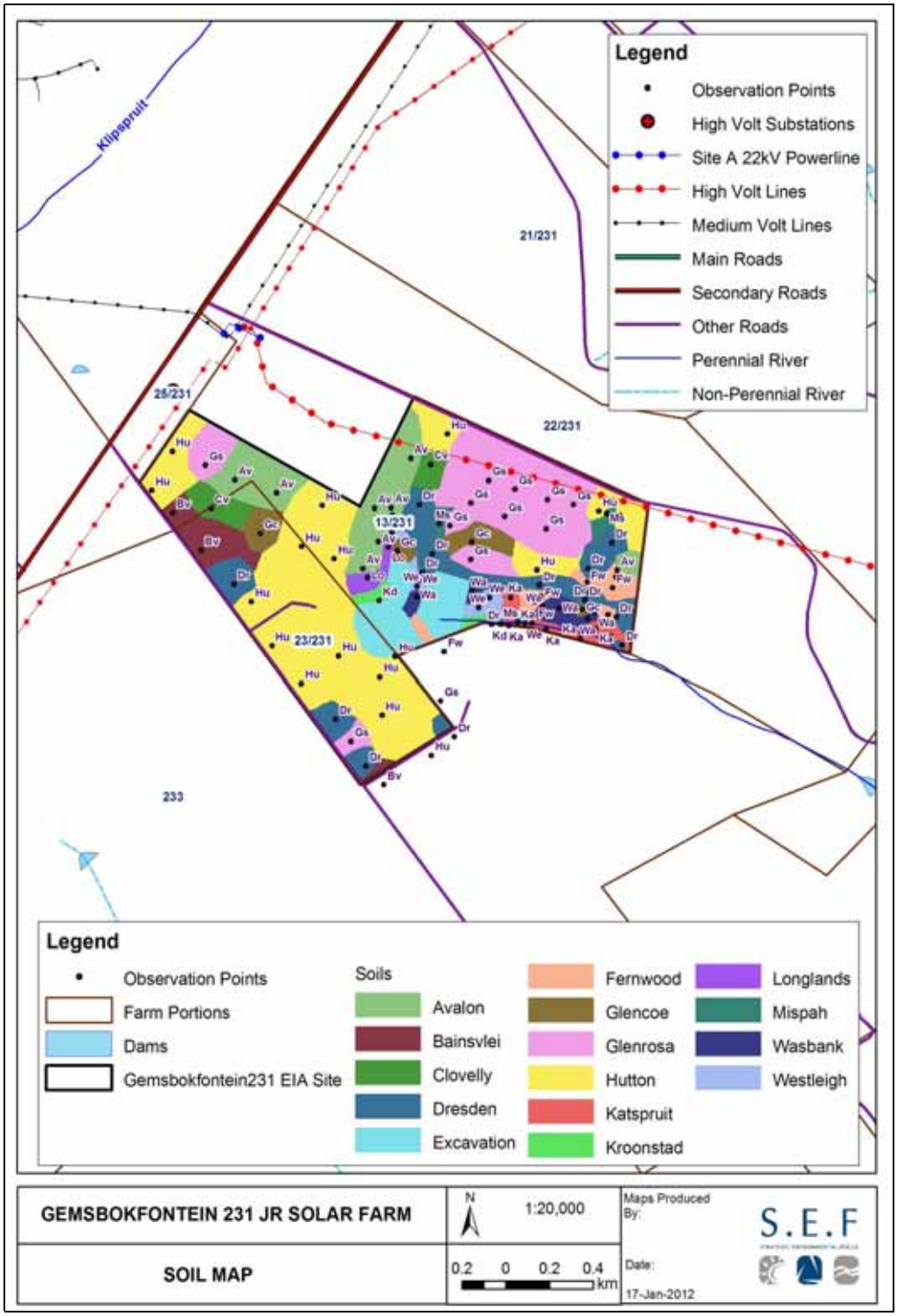

Figure 2: Soil map of the proposed site

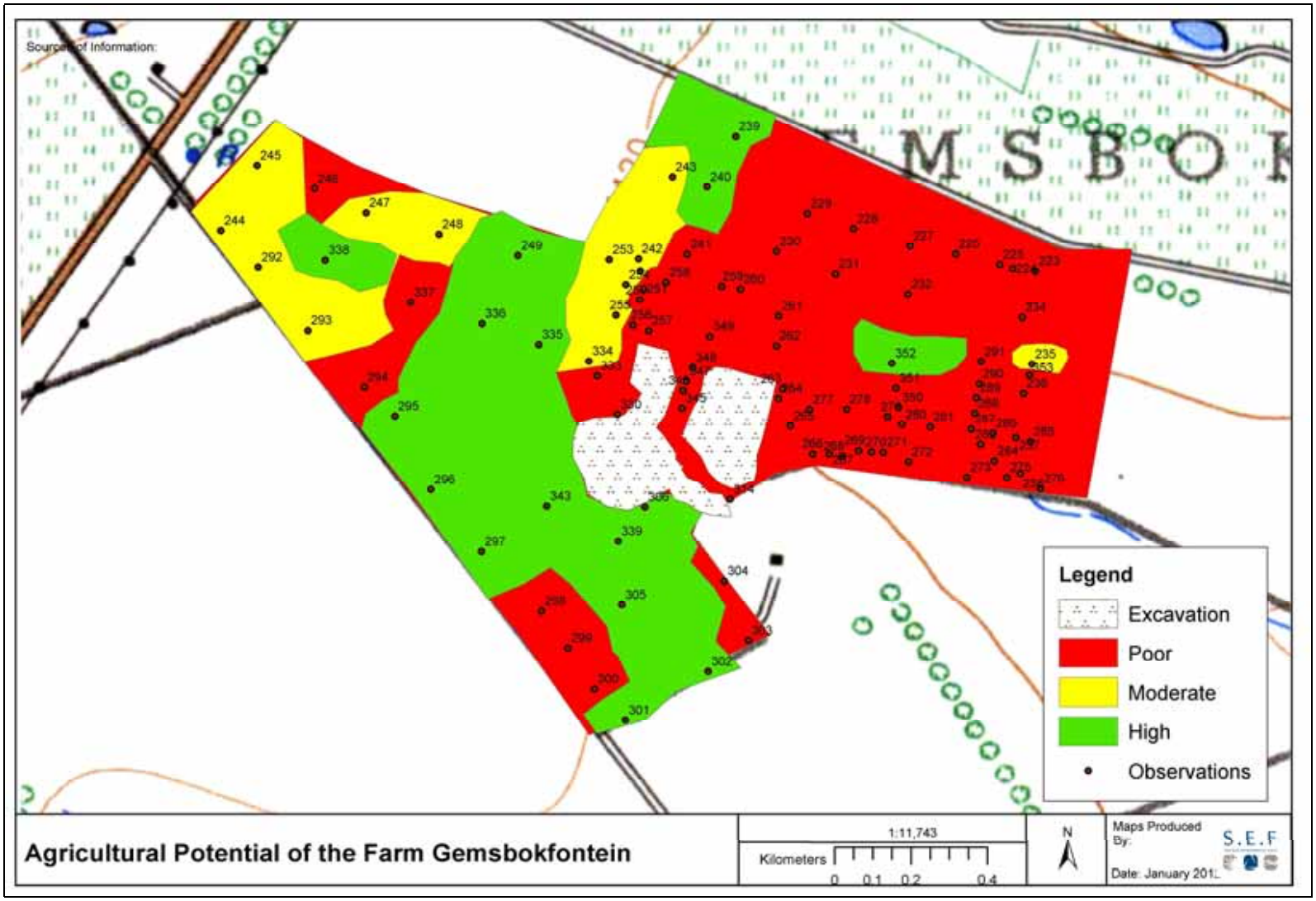

Figure 3: Agricultural potential map of the propose site

3.1.4 Hydrology

A wetland delineation and functional assessment was undertaken by Limosella Consulting during January 2012 and February 2012 (Appendix 6). The findings of the report are discussed below.

Fifty-eight (58) sites were investigated during the course of the field investigation to determine compliance with the definition of wetland conditions. Two wetland zones were found to be present on site, namely a Permanent and Seasonal zone. In addition, a temporary seepage wetland area was noted, linked to the seasonal and permanent zones (Figure 4). Within the permanent wetland zone, an abundance of sedges were observed while rushes were limited to a few areas. The seasonal zone was dominated by hydrophytic sedge and grass species.

The soil conditions within the temporary wetland zone were not consistently conclusive of a temporary wetland, however the underlying granitic lithology is known to form seepage conditions which may be cryptic, especially where historic soil disturbance such as ploughing has occurred. As such a conservative approach was adopted and the area considered as being a temporary wetland.

The overall present ecological state of the site was recorded as a category D, which means that the wetlands are largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred. As such a 50 m buffer is recommended for the wetlands on site.

3.1.5 Vegetation

An Ecological study for the site was conducted by SEF in December 2011 (Appendix 7). The findings of the report are discussed below.

Regional Vegetation

The study site occurs in the Savanna Biome and falls in the Central Sandy Bushveld vegetation type (Mucina & Rutherford, 2006). This vegetation type is characterized by low undulating terrain where catenas support tall stands of *Terminalia sericea* and *Burkea africana* woodland. Lower slopes of the catena consist of rocky and shallow soils supporting broadleaved *Combretum* shrubs. Two biogeographically important taxa are found in this vegetation type; *Mosdenia leptostachys* and *Oxygonum dregeanum* subsp. *canescens*. Central Sandy Bushveld is classified as Vulnerable with more than 24% transformed and less than 3% conserved (Mucina & Rutherford, 2006).

Vegetation Composition of the Site

Four vegetation communities were recorded in the study area; moist grassland, dry grassland, *Burkea - Parinari* woodland and historically cultivated areas. The Wetland / Moist grassland is located on the south eastern portion of the farm. The source is within the boundaries of the proposed solar farm from where it flows in an easterly direction. The vegetation in this community included typical wetland and moist grassland indicators such as *Xyris capensis, Eulophia welwitchii,, Drosera madagascariensis* and various *Cyperaceae* species. Surface water was visible through most of the wetland which extended beyond the boundaries of the study area.

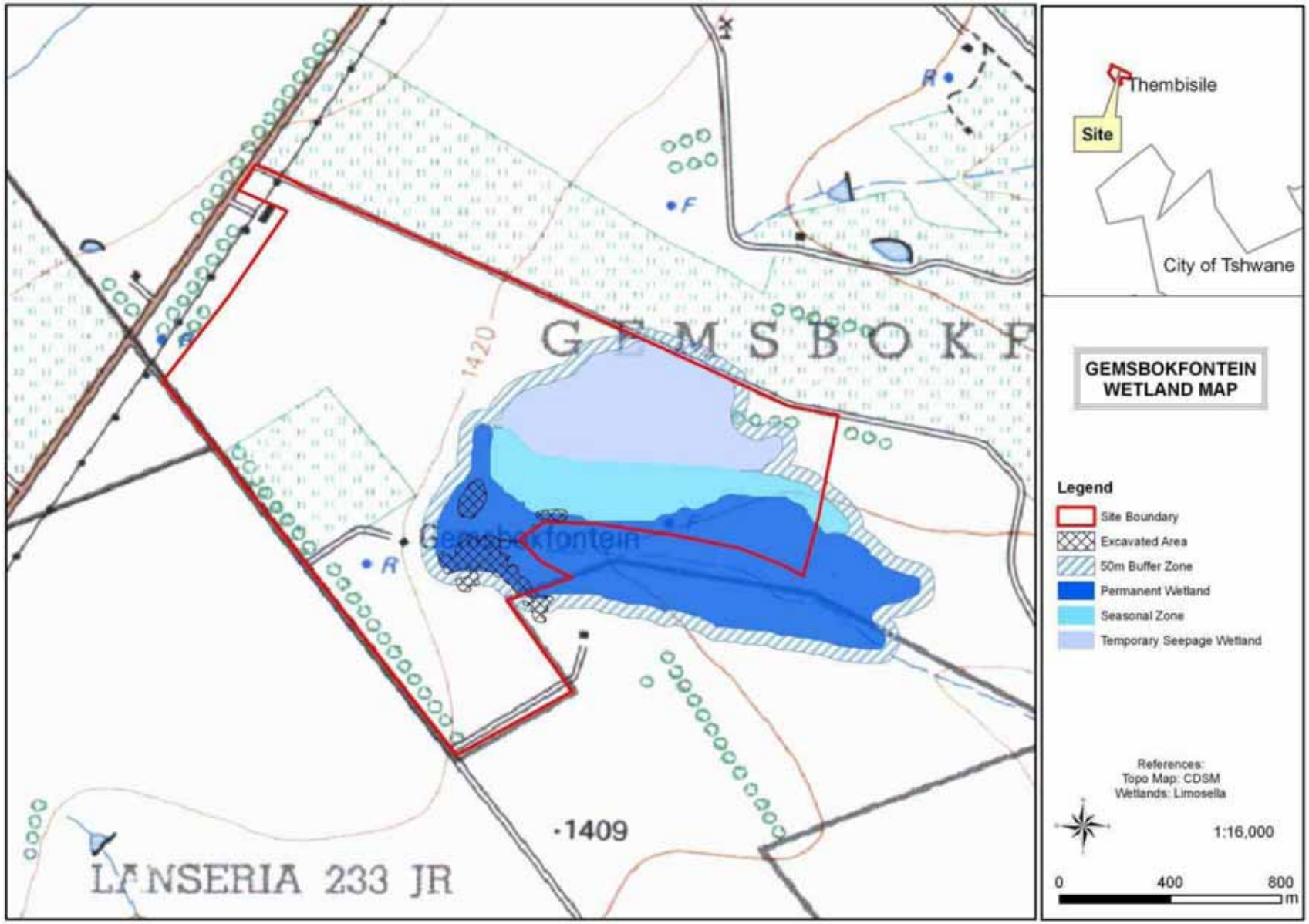

Figure 4: Wetlands identified on site

The dry grassland is interspersed with termite mounds with one small rocky outcrop in the north western portion of the study area. Although the vegetation was overgrazed and exposed to frequent fires, it still supported a relatively high species diversity which included provincially protected plants such as *Watsonia* and *Boophane disticha*.

Burkea – Parinari woodland vegetation community occupied a small portion in the northern section of the study area. The vegetation was burned frequently and is overgrazed but species such as *Boophane disticha, Crossandra greenstockii, Hypoxis iridifolia* and *Protea welwitschii* were recorded.

Portions of the study area have been previously cultivated and were characterized by tall, homogenous stands of Hyparrhenia grass, alien plant species and low floral diversity. According to the Mpumalanga Nature Conservation Act, 1998 (Act No.10 of 1998), a permit is required from the Mpumalanga Tourism and Parks Agency to pick or remove any listed protected plant. The following protected plants were recorded in the study area; *Aloe greatheadii var davyana*, *Boophane disticha, Habenaria* species, *Protea welwitschii, Scilla nervosa,* and *Watsonia* species.

Six medicinal plants were identified within the study area, along with six species of alien invaders. The alien invader species are declared Category 1 and 2 species with one special effect invader. In terms of the Conservation of Agricultural Resources Act, 1993 (Act No. 43 of 1983) (CARA), the spread of declared Category 1& 2 species must be prevented and controlled.

The dry grassland, *Burkea - Parinari* woodland were rated as having a medium sensitivity as they supported intermediate levels of Floral diversity with provincially protected plants with the historically cultivated areas having a low sensitivity. The wetland/ moist grassland was rated as sensitive environments until a wetland specialist delineated and classified the wetland (Figure 5).

3.1.6 Fauna

An Ecological study for the site was conducted by SEF in December 2011 (Appendix 7). The findings of the report are discussed below.

The wetland which is located on the south eastern portion of the farm has a dense plantation of *Eucalyptus grandis* and *Acacia dealbata*. This habitat supported a high avifaunal diversity which included various Weavers and Red Bishops. The dry grassland, interspersed with termite mounds and rocky outcrops was found throughout the study site. Although the vegetation was overgrazed and exposed to frequent fires, it still supported a relatively high faunal diversity. Sparse *Burkea africana* woodland habitat was recorded in the northern section of the study area which usually supports high avifaunal diversity, although this section has been burned frequently and most of the *Burkea africana* trees have been harvested for fire wood. Portions of the study area have been previously cultivated and were characterized by tall, homogenous stands of *Hyparrhenia* grass and alien tree species such as *Acacia dealbata*. Although this area has been transformed it was used for foraging by the White-Bellied Korhaan (*Eupodotis senegalensis)* currently listed as Vulnerable.

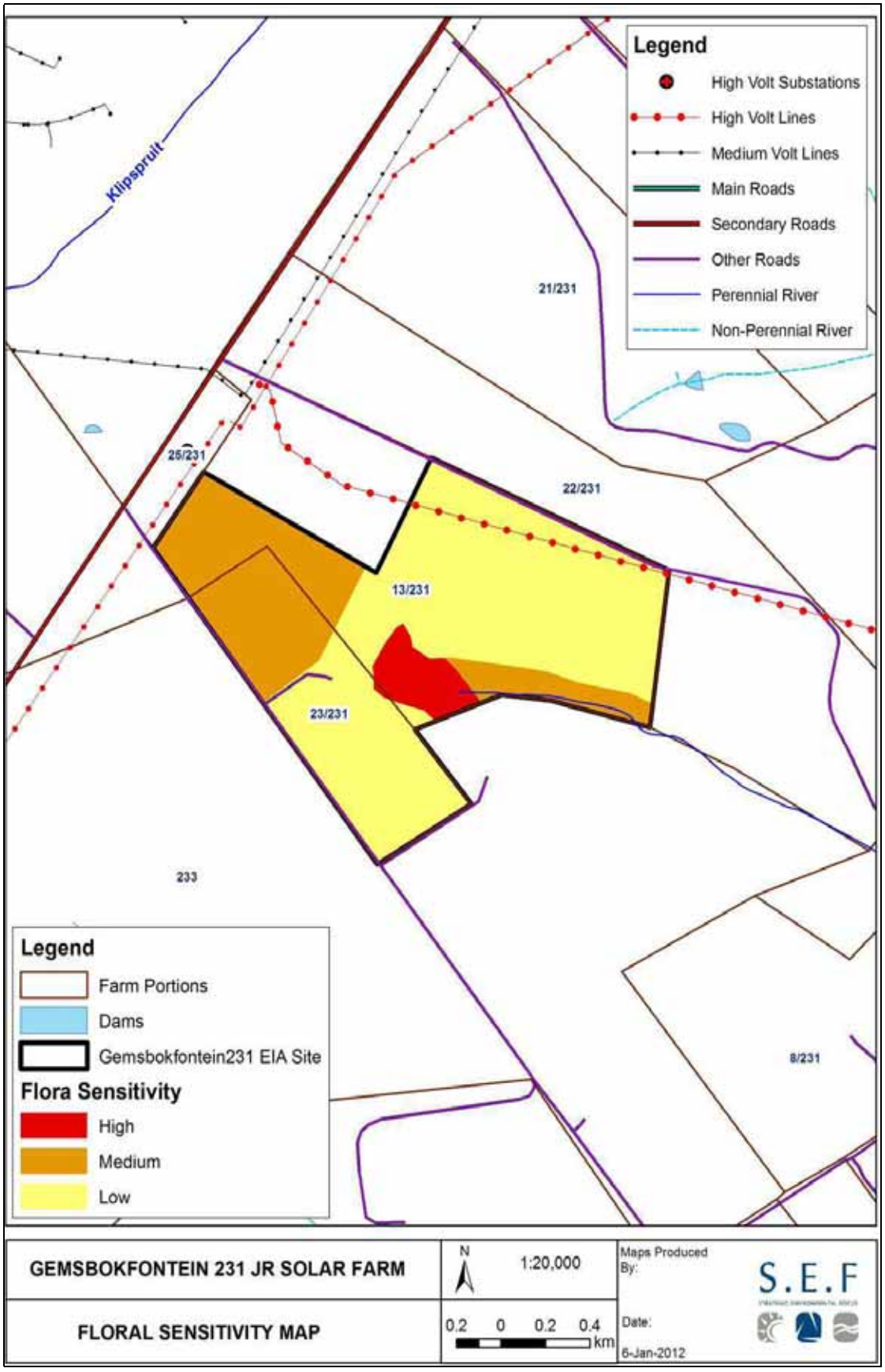

Figure 5: Floral Sensitivity map of the larger site, the sensitivity for the Olam Energy Project 11 site is included within Appendix 7

The Endangered White-tailed mouse (*Mystromys albicaudatus)* has been recorded from the QDS. Their distribution closely follows the Grassland biome and they are known to use

dense grass areas and sandy soils where they live in burrows or in cracks in the soil. The presence or absence of this species could not be confirmed due to its nocturnal and secretive behaviour, but it is predicted that the proposed solar farm will not have a negative effect on the White-tailed mouse.

33 avifaunal species where recorded on site during the survey, of which the one specie (White-Bellied Korhaan) is rated as vulnerable and the greater painted – snipe rated as near threatened in terms of the IUCN Red list. The White-backed vulture utilises the site for foraging. The Secretary bird and Denham's Bustard are listed as near threatened and vulnerable species respectively and is highly likely to occur on site. No reptile or amphibian species where identified on site, although the Giant Bull Frog is highly likely to occur on site as the wetland/ moist grassland supports the habitat requirements of this specie. The giant bull frog is listed as least concern but declining.

Based on the above, the wetland/ moist grassland is rated as sensitive followed by the dry grassland as medium sensitivity with the historically cultivated lands as medium – low sensitivity (Figure 6).

It is recommended that a wetland delineation specialist be consulted to assess and classify the wetland. It is recommended that the wetland and buffer zone (as stipulated by the wetland specialist) be excluded from the development footprint. Construction of the solar plant must be done between February – April and completed before the onset of winter to minimise the impact of construction activities on the faunal of the area. Due to the presence of the White – bellied Korhaan, it is recommended that a monitoring programme be established to observe the positive/ negative impacts of the solar plant on the specie.

An overall sensitivity map was compiled based on the abovementioned sensitivity classifications (Figure 7).

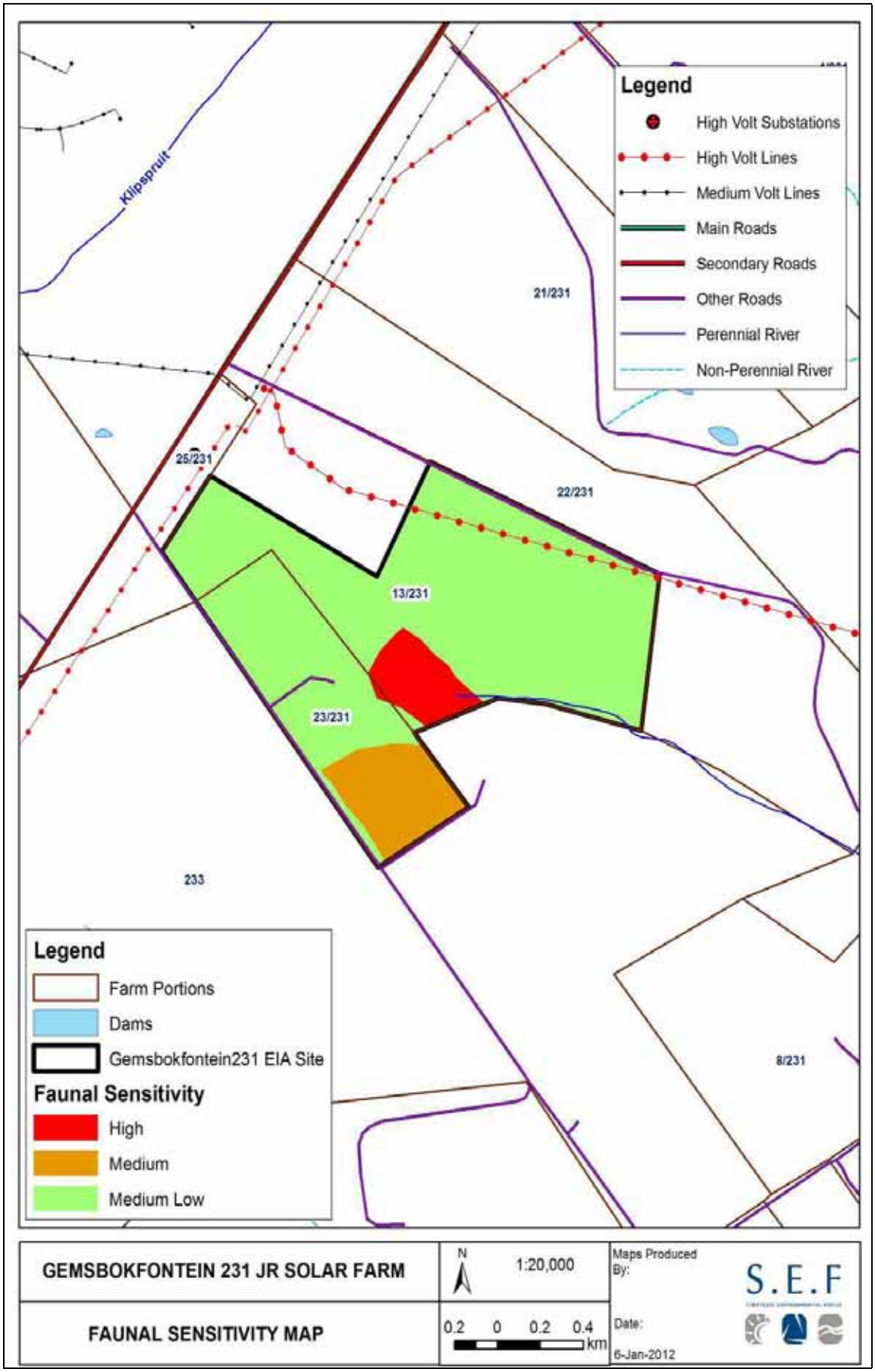

Figure 6: Faunal Sensitivity of the site, the sensitivity for the Olam Energy Project 11 site is included within Appendix 7

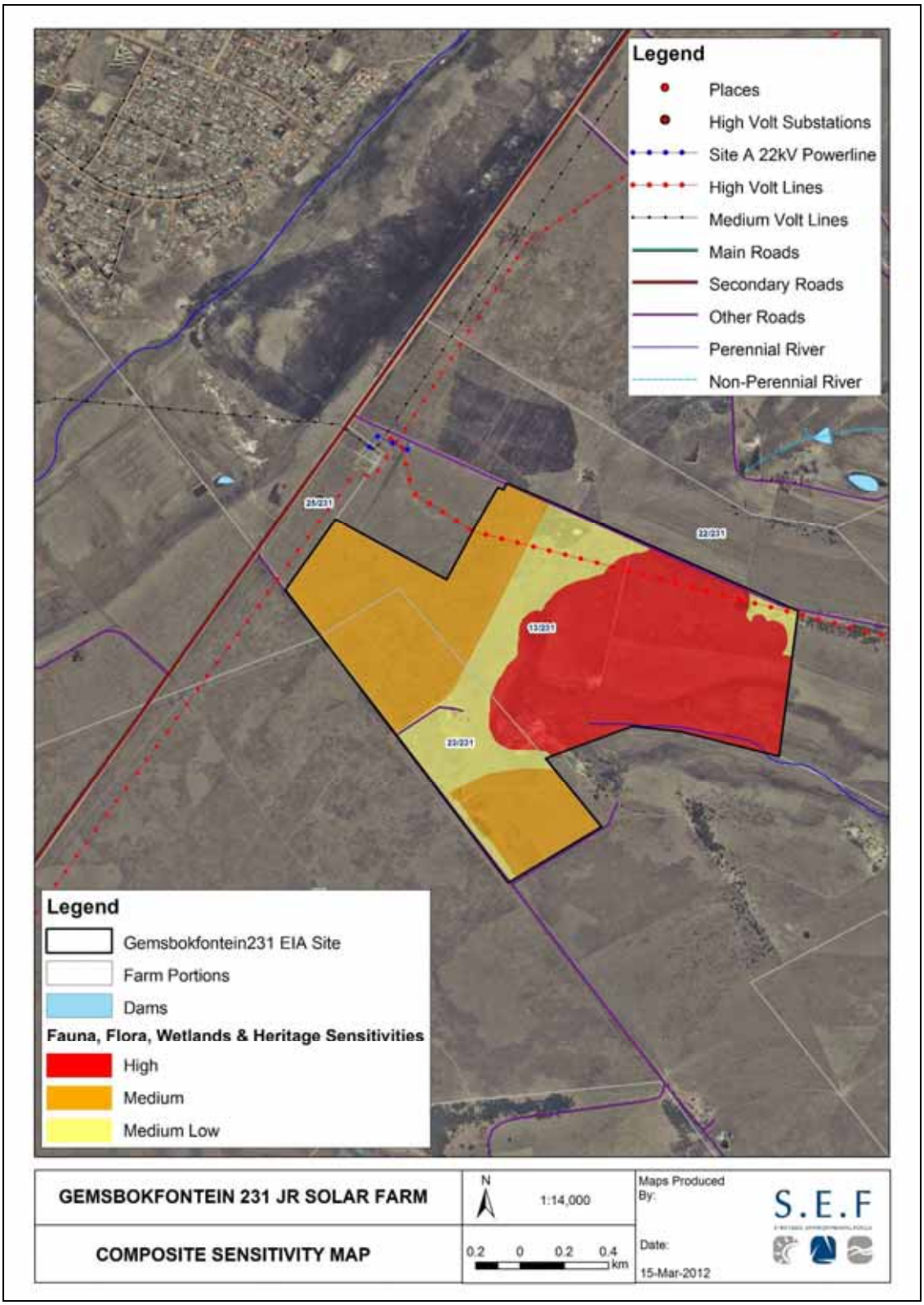

Figure 7: Overall Sensitivity map for the proposed development

3.2 SOCIAL ENVIRONMENT

The 2007 census results show that there were about 278 517 people residing in the Thembisile Hani Local Municipality. This means that the population grew by 16 333 persons from 2001 to 2007 (1. 3% per annum). The census results have that the number of females is greater than the number of males in Thembisile Hani Local Municipality. In terms of percentage, females comprise 53.7% and males 46.3%.

The majority of people in Thembisile Hani Local Municipality are still very young. According to the population data, the majority of people residing in Thembisile Hani Local Municipality are of age between 0 and 24 years (63%). This is high compared to 58.9% in Mpumalanga Province and 43% in Gauteng Province. The percentage of pensioners in Thembisile Hani Local Municipality is 4.8% as compared to 4.4% of Mpumalanga Province and 4% in Gauteng Province.

23.6% of people did not attend an educational institution or do not posses any formal education, compared to 27% in Mpumalanga Province. 27% of the population in Thembisile Hani Local Municipality is economically active, 48.8% of those people are employed. This implies that 51.2% of the people are unemployed – a number which is very high.

3.2.1 Phase 1 Cultural and Heritage Impact Assessment

SEF conducted a Phase 1 Cultural Heritage Impact Assessment during December 2011 (Appendix 8). There where 2 grave sites indentified in and around the site, and a farmhouse ruin within the site (Figure 8). Due to the fact that very little of the farmhouse is remaining, its physical and / or other heritage significance is low and as such an exemption from demolition permit will be applied for from SAHRA. The grave site that was found within the site did not have any inscriptions, thus the age of the grave site could not be determined at the time of the survey. It is recommended that the grave site be relocated and the necessary permits from SAHRA's Burial Grounds and Graves Unit be obtained. Provisions of the Human Tissue Act, 1983 (Act No. 65 of 1983) as amended will be applicable if further studies reveal that the graves are > 60 years old. The grave site is deemed to have a low cultural heritage significance, once mitigation is applied.

3.2.2 Transportation Study

A Transportation Study (TS) was conducted by Aurecon South Africa (Pty) Ltd in December 2011 (Appendix 9) for the proposed development. The study outlined the proposed route to be followed from the port for the importation of the solar plant components to the site itself. The route that will be followed will be from the Durban port via the N3, N1, R513/R573, an un-numbered gravel road and finally entering the proposed site via the internal farm road.

The un-numbered gravel road, may have to be re-gravelled depending on the amount and time of traffic. Should any material be required, this will be commercially sourced. An abnormal load permit will be required from the South African National Roads Agency Limited (SANRAL) for the transportation of the 80 MVA transformer on the National roads. The route through KwaMhlanga will require special attention to pedestrian and taxi safety. Refer to Appendix 9 for further information.

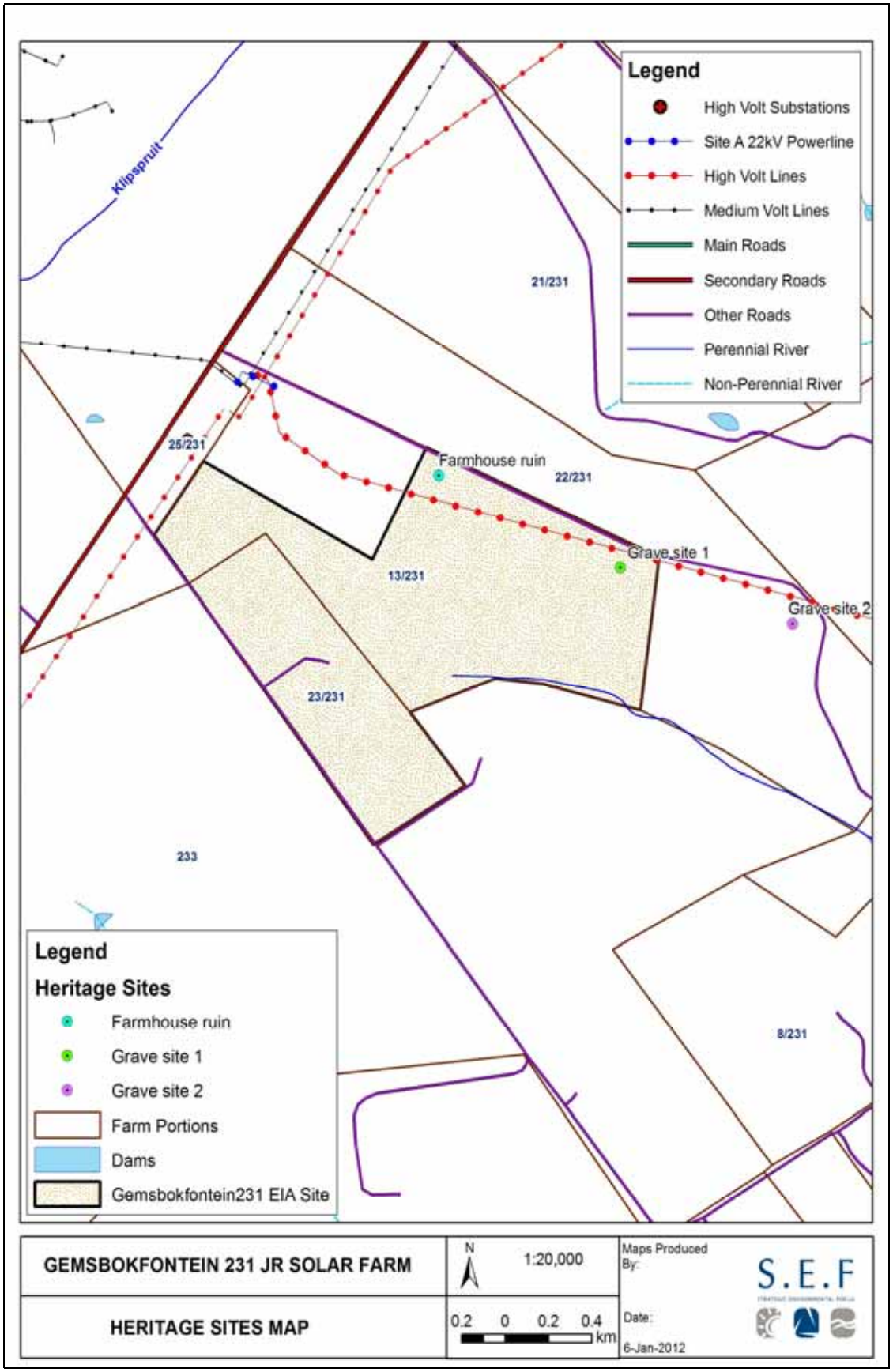

Figure 8: Heritage sites identified (no heritage sites were identified on the original Olam Energy Project 11 site)

3.2.3 Visual Impact Assessment

A Visual Impact Assessment was completed by SEF in January 2012 (Appendix 10) and the report shows that during the construction and operational phases, the project components are expected to impact on the landscape character types they traverse. The magnitude or severity of these impacts is measured against the scale of the project, the permanence of the intrusion and the loss in visual quality and the Overall Landscape Character Profile.

The site topography is gently undulating (Figure 9), consisting of grassland of the Central Sandy Bushveld vegetation type. Striations are visible on aerial images indicating that the agricultural fields have been ploughed There was no indication at the time of the site visit that the fields within the site or immediately surrounding it are currently being cultivated. The surrounding landscape is comprised of the same grassland that extends for kilometres to the east and south.

The following landscapes character types were identified in the study area:

- **Fallow fields** of the Central Sandy Bushveld vegetation type (having a low visual absorption capacity); .and
- **Wetland area** including sand mining operation (with a moderate visual absorption capacity).

The visual receptors included in this study are:

- Residents;
- Landowners and farm workers; and
- Motorists.

Adjacent Residents: Residents of the affected environment are classified as visual receptors of high sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment. The following residents were identified as potentially affected by the proposed development,

- Residents of Somaroboro J and H, west and north of the proposed project area.

Landowners & farm workers: Landowners and farm workers living within and immediately adjacent to the site are considered to be visual receptors of high sensitivity similar to residents. The following properties where landowners or farm workers may reside were observed during the site visits:

- House complex located approximately in the centre of the site adjacent to the wetland and sand mining;
- Houses located immediately to north of the site boundary;
- Houses located to the east of the site up to approximately six kilometres before views are interrupted by the next rise.

Motorists: Motorists are regarded as visual receptors of low sensitivity. Their attention is focused primarily on the road conditions and they typically enjoy only glimpses of the landscape they travel through. Motorists passing by the study area via the adjacent unnamed gravel road were identified as potentially affected by the proposed development.

Construction activity will fluctuate in intensity during the construction phase. Parcels of exposed soil will be a typical characteristic of the construction phase. The construction site may appear disorganised and dispersed with construction equipment, material stockpiles and supporting facilities. Construction equipment will be used for the planting of poles, excavation of footings and mixing of concrete. Earthwork machinery will be necessary for excavation and dust clouds may be generated by these activities.

After the construction phase, the completed development will introduce new elements that will alter the existing land cover and the character of the study area. The PV panels and associated structures will replace the shrubby grassland. While the completed development will be an improvement from the exposed soils of the construction phase the transformation of the land cover from fallow fields to rows of PV panels will be long term, possibly permanent, should the lifetime of the facility be extended.

Surface disturbances created during construction may remain for extended periods during the operational phase. These are seen as residual affects carried forward from the construction phase and can be completely or substantially mitigated, if treated appropriately during the construction phase.

Recommended mitigation measures from the specialist studies have been included within the impact assessment section of this report (Chapter 7) under the relevant impacts and within the EMP.

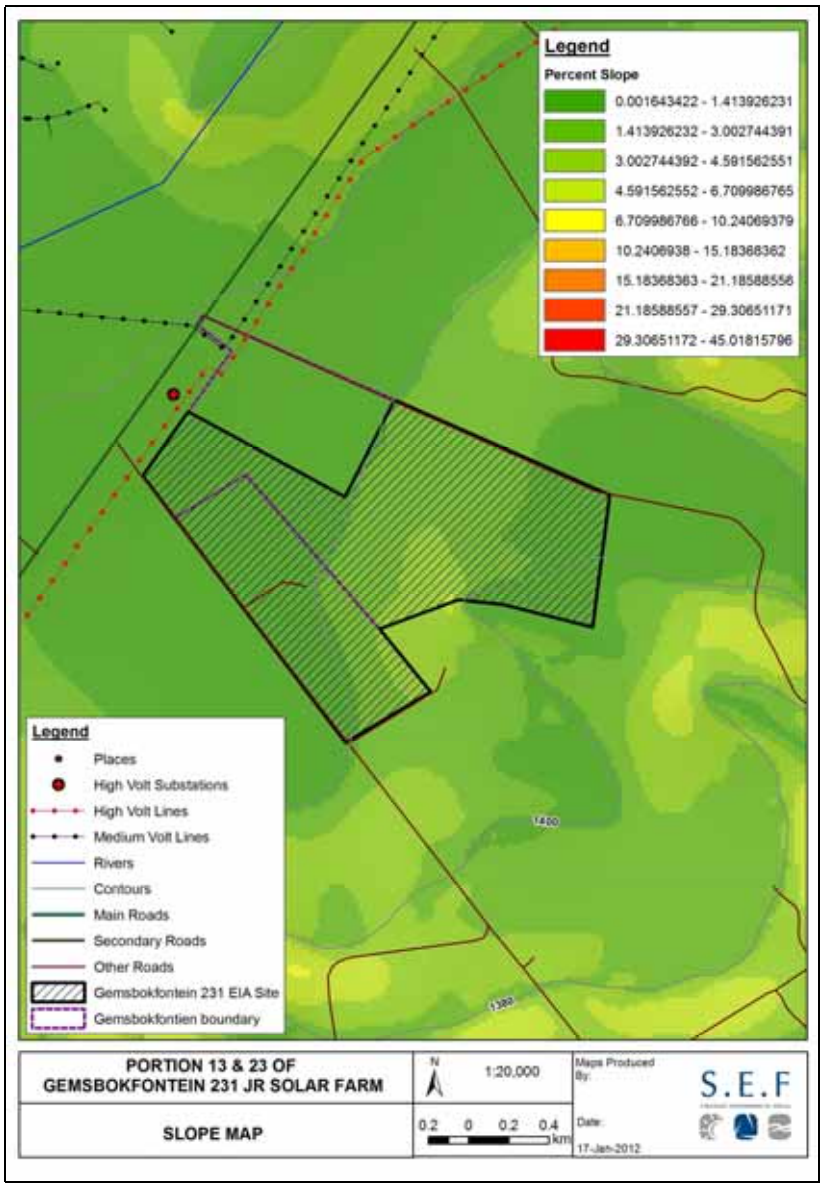

Figure 9: Slope map

4. APPROACH TO THE PROJECT

4.1 APPROACH TO THE PROJECT

A S&EIR process (Figure 10) is a good 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.

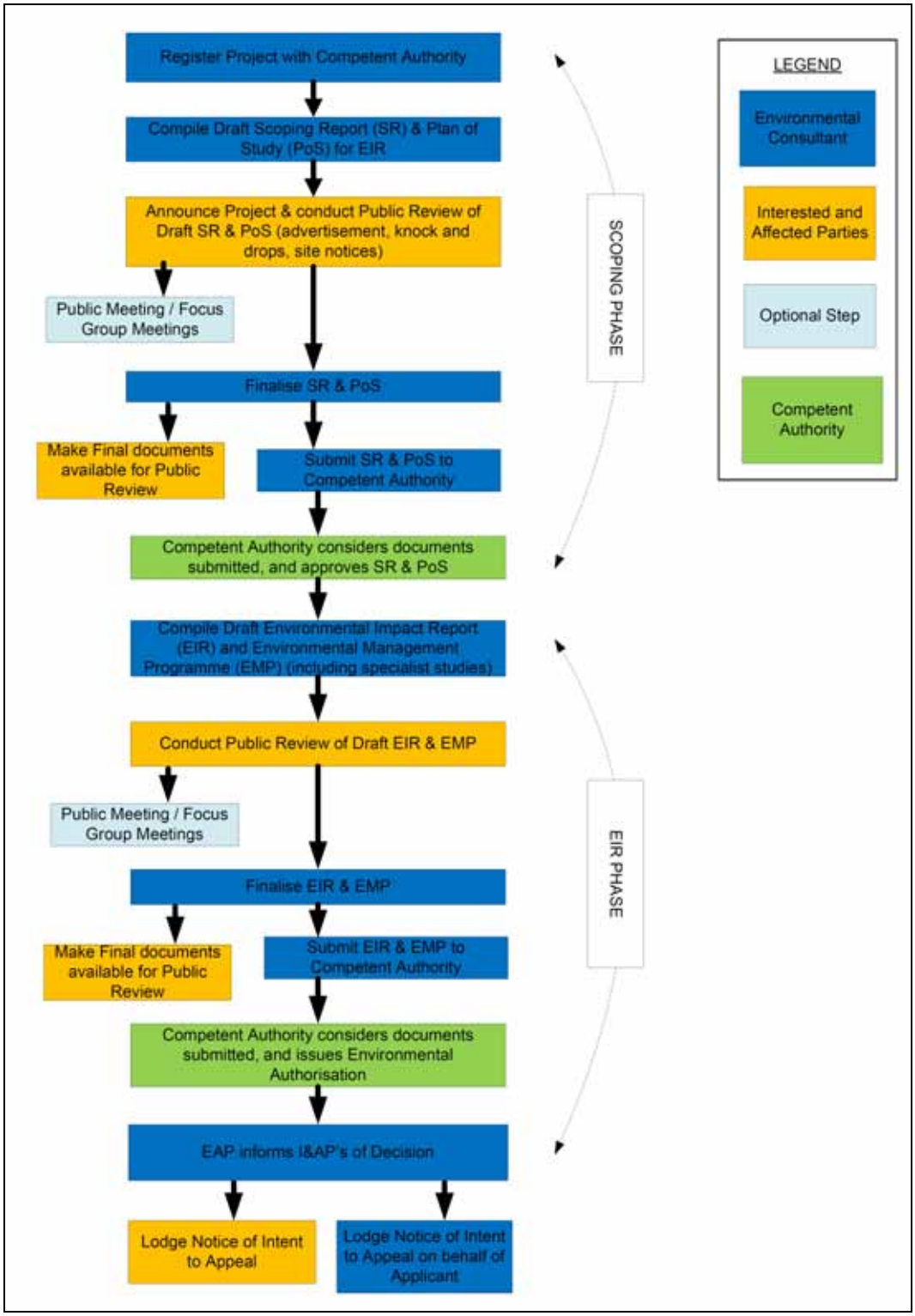

Figure 10: Flow diagram indicating the Scoping and EIR process

4.2 GUIDING PRINCIPLES FOR A S&EIR PROCESS

Principles of the S&EIR process state that:

- An open and participatory approach will be adopted throughout the process;
- This means that there will be no hidden agendas, no restrictions on the information collected during the process and an open-door policy by the proponent;
- Technical information will be communicated to stakeholders in a way that is understood by them and that enables them to meaningfully comment on the project;
- There will be ongoing consultation with Interested and Affected Parties (I&APs) representing all walks of life;
- Sufficient time for comment will be allowed;
- The opportunity for comment will be announced on an on-going basis;
- There will be opportunities for input by specialists and members of the public; and
- Their contributions and issues should be considered when technical specialist studies are conducted and when decisions are made.

4.2.1 Authority Consultation

Authority consultation plays an integral role in any S&EIR process. The authorities guide the process through highlighting the necessary legislative requirements and key areas of concerns.

4.2.2 Application for Environmental Authorisation

The application form for environmental authorisation in terms of the Scoping and EIR process was submitted to the DEA on 01 November 2011. Permission to undertake the scoping process required in terms of the EIA Regulations of 2010 was granted on 25 November 2011 (refer to Appendix 1). Subsequent to the application form, a Scoping Report and a Plan of Study (PoS) for EIR was submitted to the DEA on 03 November 2011 and approved on 21 February 2012.

4.2.3 Scoping Phase

The Scoping Report identified the key issues or concerns as highlighted by the relevant authorities, I&APs and professional judgment by the EAP. In addition, the Scoping component of the S&EIR process allowed for the identification of the anticipated impacts, particularly those, which required specialist investigations.

4.2.4 EIR Phase

The Environmental Impact Report expands on the key issues and concerns identified during the Scoping Phase and incorporates the authorities' comments on the Scoping Report. Specialist investigations were conducted and integrated in the Environmental Impact Report. The specialist studies assisted with the assessment of anticipated impacts as identified in the Scoping Phase and highlighted the key areas of concern as well as necessary mitigation measures. Assessment of impacts as well as mitigation measures were identified and discussed during this phase. Recommendations from the specialist studies and the EAP were also taken into consideration.

4.3 PUBLIC PARTICIPATION PROCESS

The principles of NEMA, govern many aspects of EIAs, including consultation with I&APs: These principles include the provision of sufficient and transparent information to I&APs on an ongoing basis, to allow them to comment, and ensuring the participation of historically

disadvantaged individuals, including women, the disabled and the youth. The following process was undertaken by SEF to facilitate the stakeholder engagement for the proposed project, which commenced on Wednesday, 02 November 2011 (Refer to Appendix 11).

4.3.1 Identification of I&APs

I&APs representing the following sectors of society have been identified (refer to Appendix 11 for a complete I&AP distribution list):

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

4.3.2 Public announcement of the project

The project was announced on Wednesday, 02 November 2011 as follows:

- Publication of a media advertisement in the regional newspaper, the Lowvelder, on Tuesday, 01 November 2011 (Appendix 11);
- On-site notices advertising the S&EIR process were erected on site and at visible and accessible locations close to the site (Appendix 11 for the site notice text and proof of site notices):
- Distribution of notification letters and Registration and Comment Sheets by fax/post/email to I&APs from Wednesday, 02 November 2011 (Appendix 11); and hand-deliveries directly affected I&APs and/ or landowners who could not be otherwise reached, on Wednesday, 02 November 201.

4.3.3 Focus Group/ Public Meetings

No focus group/ public meetings were held. No requests from the public for such meetings were received.

4.3.4 Draft Scoping Report

I&APs and relevant State Departments have had the opportunity to raise issues either in writing, by telephone or email on the Draft Scoping Report for a period of 40 days (from 02 November 2011 until 12 December 2011). The availability of the Draft Scoping Report has been announced by means of personal letters to all the registered I&APs on the distribution list, and by adverts placed in the abovementioned newspaper.

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

- Public venues (Belfast Public Library);
- 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 was captured in a Comment and Response Report (CRR). I&APs that have commented received letters acknowledging their contributions (Appendix 11).

4.3.5 Final Scoping Report

I&APs had the opportunity to comment on the Final Scoping Report which was posted on the SEF website from 15 December 2011 to 23 January 2012. Refer to Appendix 10 for the

detailed CRR.

4.3.6 Public Review of draft Environmental Impact Report

The availability of the draft Environmental Impact Report was announced by a personal progress update letter of invitation to participate in the process, addressed to registered I&APs on the database via post, fax or e-mail (Appendix 11). Registered stakeholders had an opportunity to comment on the draft Environmental Impact Report. A period of 40 days was allowed for public comment on the report (from Wednesday, 11 April 2012 to Wednesday, 23 May 2012). Copies of the draft reports were made available at the following venues:

- Thembisile Hani Public Library; and
- Posted on SEF's website at http://www.sefsa.co.za.

4.3.7 Final Environmental Impact Report

I&APs will have an opportunity to comment on the Final Environmental Impact Report which will be posted on the SEF website from Monday, 28 May 2012 to Thursday, 28 June 2012 (Appendix 11). This review period will run concurrently with the DEA review of the Final EIR towards consideration for Environmental Authorisation. All notification letters highlight that comments are to be submitted directly to the DEA and copied to SEF.

4.3.8 Comment and Response Report (CRR)

All Comments/concerns raised by I&APs during the public participation process was captured in a Comment and Response Report. The final Comment and Response Report will include and address all issues and comments raised during the EIR phase and will constitute an important component of the Final Environmental Impact Report. It will be an ongoing record of stakeholder concerns raised throughout the S&EIR process.

4.3.9 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.

4.4 CONCLUSION

The Public Participation process followed during the scoping phase for the proposed development was inline 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, were incorporated and addressed in this Final Environmental Impact Report. The comments and concerns that were raised during Public Participation process thus far have been captured and considered.

5 IMPACT IDENTIFICATION AND ASSESSMENT METHODS

5.1 ASSESSMENT OF BIOPHYSICAL, SOCIAL AND CUMULATIVE IMPACTS

The criteria for the description and assessment of environmental impacts were drawn from the EIA Regulations. Activities within the framework of the proposed development and their respective construction and operational phases, give rise to certain impacts. For the purpose of assessing these impacts, the project has been divided into two phases from which impacting activities can be identified, namely:

a) Construction phase
All the construction related activities on site, until the contractor leaves the site.

b) Operational phase
All activities, including the operation and maintenance of the proposed development.

c) Decommissioning phase
All decommissioning activities on site, until the contractor leaves the site.

The activities arising from each of these phases have been included in the tables. This is to identify activities that require certain environmental management actions to mitigate the impacts arising from them. The criteria against which the activities were assessed are given in the next section.

5.1.1 Assessment Criteria

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

Extent
The physical and spatial scale of the impact is classified as:
a) Footprint: The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
b) Site: The impact could affect the whole, or a significant portion of the site.
c) Regional: The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
d) National: The impact could have an effect that expands throughout the country (South Africa).
e) 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.
a) 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.
b) Short to Medium term: The impact will be relevant through to the end of a construction phase.

c) Medium term: The impact will last up to the end of the development phases, where after it will be entirely negated.
d) 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.
e) 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

The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as:

a) Low: The impact alters the affected environment in such a way that the natural processes or functions are not affected.
b) Medium: The affected environment is altered, but functions and processes continue, albeit in a modified way.
c) High: Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

Probability

This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:

a) 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%).
b) 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%.
c) 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%.
d) 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%.
e) 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 is rated on the following scale:

a) No significance: The impact is not substantial and does not require any mitigation action.
b) Low: The impact is of little importance, but may require limited mitigation.
c) 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.
d) 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 is rated on the following scale:

a) No significance: The impact will be mitigated to the point where it is regarded as insubstantial.
b) Low: The impact will be mitigated to the point where it is of limited importance.
c) 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.
d) 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.
e) 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.
f) 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 was necessary to weigh and rank all the criteria.

Ranking, Weighting and Scaling

For each impact under scrutiny, a scaled weighting factor is attached to each respective impact (Figure 11). The purpose of assigning such weights 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.

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 11: Description of biophysical 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 was 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 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 is therefore seen in its entirety with all considerations taken into account.

6 IDENTIFICATION OF KEY ISSUES AND IMPACTS

6.1 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.

6.1.1 Key Issues Identified during the Scoping & EIR process

The key issues have been divided into biophysical and social issues and include the following *inter alia*:

Biophysical Issues -

- Limited floral destruction and faunal displacement;
- Possible surface water contamination;
- Wetland Degradation;
- Increase in soil erosion;
- Localised increase in surface water run-off during heavy rainfall events; and
- Soil contamination.

Social Issues -

- Increase in ambient dust levels;
- Increase in ambient noise levels;
- Change in visual character of the area;
- Employment opportunities;
- Impact on traffic patterns within the area;
- Locally generated electricity; and
- Reduced reliance on coal as an energy source.

6.1.2 Affect of Key Issues on the Environment

The manner in which these issues *inter alia,* can affect the environment is briefly outlined as follows:

Negative Impacts:

- Limited floral destruction and faunal displacement due to limited clearing and cropping of "tall" vegetation. The associated construction activities will distueb fauna within the site.
- Possible surface water and soil contamination due to hydrocarbon and other liquid spillages.
- Possible wetland degradation due to hydrocarbon and other liquid spillages, and construction activities within the wetland.
- Increase in ambient dust levels due to construction activities and more specifically transportation of construction materials/ rubble on gravel roads will result in elevated ambient dust levels within the area.
- Increase in ambient noise levels due to construction activities and the movement of construction vehicles will increase the ambient noise levels within the area during the construction phase.
- Change in visual character of the area as a result of the construction activities and operational phase of the development.
- Impact on traffic patterns as a result of construction activities.
- Soil erosion due to construction activities and movement of vehicles on site.

Positive Impacts:

- Employment opportunities during the construction phase of the project with regard to construction related activities and during the operational phase in terms of security on site and maintenance activities.
- Locally generated electricity will be essentially absorbed into the local distribution network, which will result in an increase in efficiency as there will be limited electricity losses due to transmission over long distances.
- Reduced reliance on coal as an energy source which will in the long term indirectly decrease the negative impacts associated with coal fired power stations.

6.2 IDENTIFICATION OF 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.

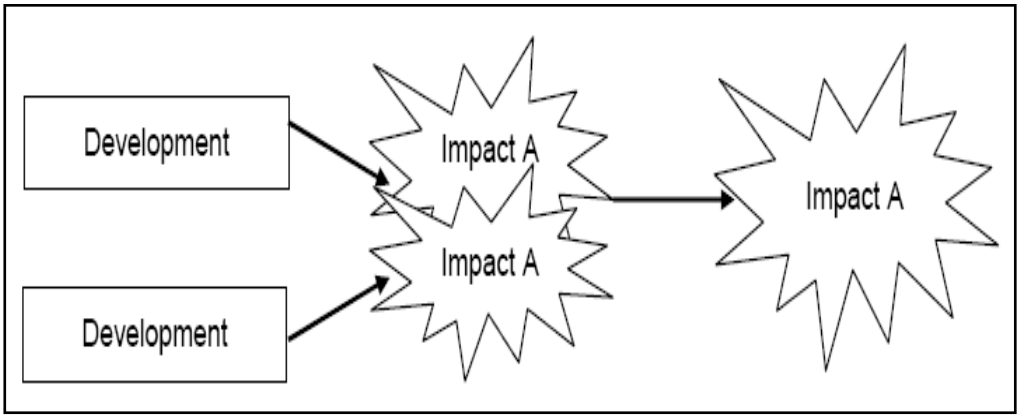

Figure 12: The Identification of Cumulative Impacts

The following cumulative impacts have been identified in terms of the proposed development:

- Loss of open space and transformation of the landscape due to the cumulative impact of having several developments such as the one in question, within the regional area (due to the regional site selection done by the Department of Energy - DoE) is that there will be a loss of open space within the region as a whole.
- Loss of agricultural land within the greater area due to the development of several solar plants.

6.3 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:

- Floral and Faunal Assessment;
- Phase 1 Cultural and Heritage Impact Assessment;
- Visual Impact Assessment;
- Agricultural Assessment;
- Wetland Delineation and Functional Assessment;
- Transportation Study; and
- Desktop Geotechnical Assessment.

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 Environmental Management Programme (EMP) (Appendix 12). The activities as described in the project description have been assessed on both an individual as well as a cumulative level for the project.

7. 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 Environmental Impact Report, 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.

7.1 DETAILED ENVIRONMENTAL IMPACT ASSESSMENT

The environmental impacts for the proposed technology alternatives have insignificant differences, and therefore the impacts assessed below are representative of the environmental impacts associated with the development of the solar farm regardless of the technology alternative.

CONSTRUCTION PHASE

LAYOUT ALTERNATIVE 1

7.1.1 Limited flora destruction and faunal displacement

Source and description of the impact:

Limited vegetation clearing is required on site during the construction phase. This is largely associated with the collection and distribution cabins and buildings on site. The greater area where the panels are to be erected will not be cleared, however vegetation may be cropped/ cut to avoid shading and for ease of construction. Activities associated with the construction phase may displace certain faunal species (however, this will be temporary – approximately 6 - 9 months).

Table 1: Disturbance of indigenous vegetation

Activity	**Limited clearing of vegetation for construction activities**			
Nature of the impact	**Floral species may be lost and fauna may be displaced due to the removal of vegetation.**		Status	-
Receiving environment	**Flora and fauna of the area**			
Magnitude	*Extent*	Site		
	Intensity	Medium		
	Duration	Short - Medium term		
	Probability	Definite		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(2 + 3 + 2 + 5) x 3 = 36* *Low - Medium*		
	With mitigation (WM)	*WOM x ME = WM* *36 x 0.4 = 14.4* *Low*		
Significance With Mitigation (WM)	**LOW**			

Mitigation Measures:

- Vegetation should be removed only where required, other areas are to be left in tact to allow these areas to act as source areas for the re-establishment of species to disturbed areas, over time.
- Sequential construction should occur in order to allow faunal species to move away from the area of disturbance.
- Construction activities should be restricted to daylight hours when the majority of faunal species are inactive.
- Sufficient care must be taken during the construction phase to ensure that areas outside of the development footprint are not disturbed through trampling.
- Plan construction activities to limit unnecessarily prolonged exposure of stripped areas. Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction/ earthworks in that area.
- Make use of existing roads and tracks where feasible, rather than creating new routes through vegetated areas.
- Clear up any gravel or cement spillages immediately.
- Construction workers may not tamper or remove the adjoining natural vegetation and neither may anyone collect seed from the plants without permission from the local authority.
- All labourers to remain inside the construction footprint.
- No animals may be snared, captured or wilfully damaged or killed.

Significance of the impact:

The extent of the impact is rated as site specific as limited floral destruction and faunal displacement will only occur on the proposed site. The impact could affect the whole, or a significant portion of the site. The intensity is rated as medium as the affected environment is altered, but ecological functions and processes continue, albeit in a modified way. The duration of the impact is rated as short – medium term as the impact will only occur over 6 – 9 months. The probability of the impact occurring is rated as definite as there will be limited vegetation clearing during the construction phase. Therefore the significance of the impact prior to any mitigation measures is rated as low – medium. The mitigation efficiency is rated as medium - high resulting in the impact significance after mitigation being Low.

7.1.2 Faunal displacement

Source and description of the impact:
Construction activities will disturb fauna within the area. These species will move away into the surrounding lands to avoid the construction activities however, this will be temporary – approximately 6 – 9 months. These species/ individuals may return to the area during the operational phase as limited activities/ disturbances will take place.

Table 2: Faunal displacement

Activity	**Construction of the solar plant**			
Nature of the impact	**Fauna will be displaced**		Status	-
Receiving environment	**Fauna**			
Magnitude	*Extent*	Site		
	Intensity	Medium		
	Duration	Short – Medium term		
	Probability	Definite		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(2 + 3 + 2 + 5) x 4 = 48* *Medium*		
	With mitigation (WM)	*WOM x ME = WM* *48 x 0.4 = 19.2* *Low-Medium*		
Significance With Mitigation (WM)	**LOW-MEDIUM**			

Mitigation Measures:

- Construction activities should be restricted to daylight hours when the majority of faunal species are inactive.
- The development footprint area should be demarcated; however it is preferable to fence the area once construction is complete. This will provide fauna with the opportunity to move away form the area as activities increase on site.
- No animals may be snared, captured or wilfully damaged or killed.

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 to a low-medium.

7.1.3 Surface water contamination

Source and description of the impact:
It is unlikely that hydrocarbons and other chemicals/ liquids will be required during the construction phase; however spills and/or leakages could occur from construction vehicles and/ or equipment (*viz.* diesel generators).

Table 3: Surface water contamination

Activity	**Hydrocarbon and other liquid spillages**			
Nature of the impact	**Contamination of surface water during heavy rainfall events**		Status	-
Receiving environment	**Surface water**			
Magnitude	*Extent*	Site		
	Intensity	Medium		
	Duration	Short term		
	Probability	Possible		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(2 + 3 + 1 + 2) x 3 = 24* *Low - Medium*		
	With mitigation (WM)	*WOM x ME = WM* *24 x 0.6 = 14.4* *Low*		
Significance With Mitigation (WM)	**LOW**			

Mitigation Measures:

- Construction should preferably take place during the dry season.
- All construction vehicles should be kept in good working condition.
- 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.
- The diesel tanks that will store the necessary diesel for the generators must be housed on an impermeable material (plastic sheeting) on an elevated surface (wooden pallets) to prevent any surface water contamination.
- If a hydrocarbon spillage occurs these should be cleaned using SUNSORB (or similar product) and the contaminated soils removed from site and dispose off at an appropriate registered landfill site.

Significance of the impact:

Due to the nature of the impact (as described above), the significance of this impact is regarded as low – medium without mitigation. By applying the above mitigation measures the significance of the impact can be reduce to that of a low significance.

7.1.4 Soil contamination

Source and description of the impact:

Spills and/or leakages could occur from construction vehicles and/or equipment or the diesel generators that will be utilised during the construction phase and contaminate the soil.

Table 4: Soil contamination

Activity	**Hydrocarbon and other liquid spillages**			
Nature of the impact	**Contamination of soils**		Status	-
Receiving environment	**The proposed site**			
Magnitude	*Extent*	Site		
	Intensity	Medium		
	Duration	Short to Medium		
	Probability	Possible		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(2 + 3 + 2 + 2) x 2 = 18* *Low*		
	With mitigation (WM)	*WOM x ME = WM* *18 x 0.4 = 7.20* *Low*		
Significance With Mitigation (WM)	**LOW**			

Mitigation measures:

- All construction vehicles should be kept in good working condition.
- 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.
- The diesel tanks that will store the necessary diesel for the generators must be housed on an impermeable material (plastic sheeting) to prevent any soil contamination.
- If a hydrocarbon spillage occurs these should be cleaned using SUNSORB (or similar product) and the contaminated soils removed from site and dispose off at an appropriate registered landfill site

Significance of the impact:

The extent of the impact is rated as site specific and the impact could affect the whole, or a significant portion of the site. The intensity is rated as medium as the affected environment is altered, but ecological functions and processes continue, albeit in a modified way. The duration of the impact is rated as short – medium term as the impact will only occur over 6 – 9 months. The probability of the impact occurring is rated as possible as there will be construction vehicles, machinery and generators used during the construction phase. Therefore the significance of the impact prior to any mitigation measures is rated as low. The mitigation efficiency is rated as medium - high resulting in the impact significance after mitigation being low.

7.1.5. Increase in ambient dust levels

Source and description of the impact:

Construction activities and more specifically transportation of construction materials/ rubble on gravel roads 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 5: Increase in ambient dust levels

Activity	**Construction activities and transportation of equipment and materials**			
Nature of the impact	**Increased ambient dust levels**		Status	**-**
Receiving environment	**Surrounding farms and persons working and/ or residing near by**			
Magnitude	*Extent*	Regional		
	Intensity	Medium		
	Duration	Short term		
	Probability	Highly likely		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(3 + 2 + 1 + 4) x 2 = 20* *Low-Medium*		
	With mitigation (WM)	*WOM x ME = WM* *20 x 0.6 = 12* *Low*		
Significance With Mitigation (WM)	**LOW**			

Mitigation measures:

- Appropriate dust suppression methods must be applied (if necessary).
- 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 low-medium. Implementation of the mitigation measures will decrease the significance of the impact to low.

7.1.6 Increase in ambient noise levels

Source and description of the impact:

Construction activities, diesel generators and the movement of construction vehicles will increase the ambient noise levels within the area during the construction phase.

Table 6: Increase in ambient noise levels

Activity	**Construction activities and the movement of construction vehicles**			
Nature of the impact	**Increased ambient noise levels**		Status	**-**
Receiving environment	**Surrounding land owners**			
Magnitude	*Extent*	Regional		
	Intensity	Medium		
	Duration	Short term		
	Probability	Highly Likely		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(3 + 3 + 1 + 4) x 2 = 22* *Low-Medium*		
	With mitigation (WM)	*WOM x ME = WM* *22 x 0.6 = 13.2* *Low*		
Significance With Mitigation (WM)	**LOW**			

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

7.1.7 Soil erosion

Source and description of the impact:

Soil erosion may occur from construction activities; especially in areas were vegetation is disturbed. Soil erosion during the dry months is largely associated with wind erosion, while water erosion may be caused as a result of heavy rainfall events. However, as the total clearing of vegetation on the site is not proposed, limited soil erosion is expected due to the activities on site.

Table 7: Soil erosion

Activity	**Soil erosion due to construction activities and movement of vehicles on site**			
Nature of the impact	**Soil becomes exposed, thus susceptible to wind and water erosion**		Status	-
Receiving environment	**The proposed site**			
	Extent	Site		
	Intensity	Medium		
	Duration	Short – Medium term		
	Probability	Highly likely		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(2 + 3 + 2 + 4) x 2 = 22* *Low-Medium*		
	With mitigation (WM)	*WOM x ME = WM* *22 x 0.8 = 17.6* *Low*		
Significance With Mitigation (WM)	**LOW**			

Mitigation measures:

- 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).

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 low-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.

7.1.8 Change in visual character of the area

Source and description of the impact:
The construction activities and camps will alter the current visual character of the area, from one of open grazing lands to a construction site associated with people, vehicles and equipment.

Table 8: Change in visual character of the area

Activity	**Construction activities and the placement of construction equipment**			
Nature of the impact	**Visual character of the area will be altered with construction activities and equipment**		Status	-
Receiving environment	**Surrounding land owners**			
Magnitude	*Extent*	Regional		
	Intensity	Medium		
	Duration	Short - Medium term		
	Probability	Likely		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(3 + 3 + 2 + 3) x 2 = 22* *Low-Medium*		
	With mitigation (WM)	*WOM x ME = WM* *22 x 0.8 = 17.6* *Low*		
Significance With Mitigation (WM)	**LOW**			

Mitigation measures:

- The construction area must at all times be neat and tidy.
- All litter must be collected and removed (daily) and disposed of appropriately.
- Equipment and/ or vehicles must be stored or parked in designated areas.
- The construction camp must be screened with shade cloth (where practical).

Significance of the impact:
Due to the limited number of visual receptors (i.e. people) within the immediate vicinity the impact associated within construction activities 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.

7.1.9 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**.

7.1.10 Impact on Traffic patterns within the area

Source and description of the impact:
Due to construction activities and associated machinery movement, the traffic patterns of the surrounding area will be affected.

Table 9: Change in traffic patterns of the area

Activity	**Construction activities and vehicle movement**			
Nature of the impact	**The traffic patterns of the surrounding area will be affected**		Status	-
Receiving environment	**Surrounding land owners**			
Magnitude	*Extent*	Regional		
	Intensity	Low		
	Duration	Short - Medium term		
	Probability	Possible		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(3 + 1 + 2 + 2) x 2 = 16* *Low*		
	With mitigation (WM)	*WOM x ME = WM* *16 x 0.8 = 12.8* *Low*		
Significance With Mitigation (WM)	**LOW**			

Mitigation measures:

- Avoid movement of construction vehicles and machinery on main access roads during peak times.
- It is envisaged that construction vehicle movement during peak hour traffic will be limited (refer to Appendix 8 – Transportation Study).

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 within construction activities during the construction phase is predicted to be of a low significance with and without mitigation measures.

7.1.11 Degradation and loss of functionality of the wetlands on site

Source and description of the impact:

Construction activities such as the erection of the solar panels and supporting infrastructure within the wetlands on site will result in the degradation of the wetlands.

Table 10: Degradation and loss of functionality of the wetlands on site

Activity	**Construction activities and the placement of the solar panels and supporting infrastructure**			
Nature of the impact	**The wetlands on site will be negatively affected**		Status	-
Receiving environment	**Wetlands on site**			
Magnitude	*Extent*	Foot print		
	Intensity	Medium		
	Duration	Long term		
	Probability	Definite		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(1 + 3 + 4 + 5) x 4 = 52* *Medium*		
	With mitigation (WM)	*WOM x ME = WM* *52 x 1 = 52* *Medium*		
Significance With Mitigation (WM)	**MEDIUM**			

Mitigation measures:

- There are neither practical nor feasible mitigation measures to protect the wetlands while developing them.

Significance of the impact:
Due to the nature of the construction activities and the erection of the supporting infrastructure (steel frames or gathering cabins etc), it is neither feasible nor practical to mitigate the impact. The development of the wetlands will result in a loss of functionality and as such the impact is rated as having a medium significance.

LAYOUT ALTERNATIVE 2

The impacts associated with Layout Alternative 2 are the same as that of Layout alternative 1, with the exception of impact "7.1.11 Degradation of the wetlands on site". Layout alternative 2 will exclude the wetlands and a 50m buffer from the development footprint of the site and by doing so; the wetlands will be protected and conserved.

OPERATIONAL PHASE

LAYOUT ALTERNATIVE 1 & 2

7.1.12 Permanent change in visual character of the area

Source and description of the impact:
The newly erected solar plant and supporting infrastructure will permanently change the visual character of the site and immediate surrounding area. The surrounding land use is mainly agriculture and as such the proposed solar plant is contrary to the current land use.

Table 11: Permanent change in visual character of the area

Activity	**Solar Farm**			
Nature of the impact	**Change in visual character of the area from grazing land to solar farm**		Status	-
Receiving environment	**Surrounding area and land owners**			
Magnitude	*Extent*	Regional		
	Intensity	Medium		
	Duration	Long term		
	Probability	Definite		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(3 + 3 + 4 + 5) x 3 = 45* *Medium*		
	With mitigation (WM)	*WOM x ME = WM* *45 x 0.6 = 27* *Low - Medium*		
Significance With Mitigation (WM)	**LOW - MEDIUM**			

Mitigation measures:

- Supporting structures should be painted with a matt paint with a tone similar to that of the prevailing landscape.
- The plant must at all times be kept neat and tidy; all litter must be regularly removed (where applicable).
- All lighting to be installed must be down light luminaire.

Significance of the impact:
The significance of the impact is regarded to be medium due to the change in land-use, however the proposed development is "low to the ground" with a maximum height of 1.82 m, with the exception of the 22/ 132kV substation which will be located in the south western corner of the site. Mitigation measures applied to the structures will marginally reduce the significance of the impact.

7.1.13 Soil contamination

Source and description of the impact:
It is unlikely that hydrocarbons and other chemicals/ liquids will be required during the operational phase; however spills and/or leakages could occur from maintenance vehicles and/or equipment and contaminate the soil. The possibility also exists that the oil within the substation transformers could leak or spill during a malfunction.

Table 12: Soil contamination

Activity	**Hydrocarbon and other liquid spillages**			
Nature of the impact	**Contamination of soils**		Status	-
Receiving environment	**The proposed site**			
Magnitude	*Extent*	Site		
	Intensity	Medium		
	Duration	Short to Medium		
	Probability	Possible		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(2 + 3 + 2 + 2) x 2 = 18* *Low*		
	With mitigation (WM)	*WOM x ME = WM* *18 x 0.4 = 7.20* *Low*		
Significance With Mitigation (WM)	**LOW**			

Mitigation measures:

- All maintenance vehicles should be kept in good working condition.
- If a hydrocarbon spillage occurs these should be cleaned using SUNSORB (or similar product) and the contaminated soils removed from site and dispose off at an appropriate registered landfill site

Significance of the impact:
The significance of this impact is regard as low with or without mitigation. Spillages are effectively mitigated, thus not resulting in significant contamination of the environment.

7.1.14 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 community and local economy due to possible skills development and income generation. This impact is predicted to have a **high positive significance**. Under the Community Trust, various small enterprise companies will be created for operational and maintenance activities for the solar plant.

7.1.15 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 (typically on the Highveld and further east in the Mpumalanga Province). 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**.

7.1.16 Localised increase in surface water run – off during heavy rainfall events

Source and description of the impact:
Currently, rainfall naturally soaks into the ground and surface water flows are only associated with heavy rainfall events. However, with the construction and orientation of the solar panels, rain water will wash over these surfaces, thus increasing the volume of water "landing" on the ground between the panel rows. This concentrated volume of water may result in surface flows, which could cause localised erosion.

Table 13: Localised increase in surface water run-off during heavy rainfall events

Activity	**Increase in surface water run-off during heavy rainfall events**			
Nature of the impact	**Less infiltration and more surface water runoff**		Status	**-**
Receiving environment	**The proposed site and surrounding land**			
Magnitude	*Extent*	Site		
	Intensity	Medium		
	Duration	Long term		
	Probability	Likely		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(2 + 3 + 4 + 3) x 2 = 24* *Low - Medium*		
	With mitigation (WM)	*WOM x ME = WM* *24 x 0.8 = 19.2* *Low*		
Significance With Mitigation (WM)	**LOW**			

Mitigation measures:

- Maintain vegetation cover between the rows of solar panels. Vegetation will decrease surface flow velocities, thus facilitating infiltration.
- Should significant erosion occur on site, an erosion management plan must be drafted by a suitably qualified professional.

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 low-medium. Implementation of the mitigation measures will decrease the significance of the impact.

7.1.17 Reflection/ glare off the solar panels

Source and description of the impact:
Due to the material that the solar panels are composed off, reflection of the sun's rays may occur (depending on the angle of the sun and time of day). This reflection may cause a visual disturbance to surrounding receptors.

Table 14: Reflection/ glare off the solar panels

Activity	**Operational activities of the solar plant**			
Nature of the impact	**Visual disturbance to adjacent farms**		Status	-
Receiving environment	**Surrounding area**			
Magnitude	*Extent*	Regional		
	Intensity	Medium		
	Duration	Long term		
	Probability	Possible		
Significance	*Without mitigation (WOM)*	*(Extent + Intensity + Duration + Probability) x Weighting Factor* *(3 + 3 + 4 + 2) x 2 = 24* *Low - Medium*		
	With mitigation (WM)	*WOM x ME = WM* *24 x 0.8 = 19.2* *Low*		
Significance With Mitigation (WM)	**LOW**			

Mitigation measures:

- The type of technology that will be utilised will limit the amount of reflection and increase the amount of absorption of the sun's rays.
- Due to the orientation and maximum height of the solar panels, not all surrounding neighbours will be affected.

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-medium. Implementation of the mitigation measures will decrease the significance of the impact to low.

7.1.18 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.

DECOMMISSIONING PHASE

Should the contract to be an IPP is not be renewed, the solar plant 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 in terms of livestock (as far as possible). 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 off at a registered landfill site (refer to Appendix 12 – EMP).

7.2 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.

7.2.1 Loss of Open Space associated within the greater area

The regional area can typically be described as that of vast open plains and sparse vegetation. The cumulative impact of having several developments such as the one in question, within the regional area (due to the regional site selection done by the DoE) is that there will be a loss of open space within the region. However, due to the sparse population within the immediate area, the climate and water supply concerns and the significant positive socio – economic benefit solar plants can have for the country as a whole, the impact of the loss of open space is considered to be of a **low significance.**

7.2.2 Loss of agricultural land

Based on the Agricultural Assessment conducted for the site, approximately 60 ha of the proposed site has high agricultural potential, which was determined on the basis of depth and susceptibility of the soil to water logging. The majority of the high potential land coincides with that of the wetland area. Layout alternative 2 excludes the wetland and a 50m buffer from development. Therefore this impact is considered to have a **low – medium significance** rating as the impact of solar farms on the areas of high agricultural potential will not be that significant.

7.2.3 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.

Due to the regional site selection process conducted by the DoE, it is envisaged that there will be several new solar plants within the area. This translates into a greater local generation of renewable energy, which is perceived to have a **high positive significant impact**.

7.2.4 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 plant developments within the greater area. As such the local community will greatly benefit from job opportunities created. The proposed project will create a Community Trust (which will have a share holding in the solar plant), and under this Community Trust various small enterprises will be formed to carry out the required maintenance and operational work. As such this impact is rated as having a **high positive significance.**

7.3 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 the wetlands and a 50m buffer) with Technology Alternative 1 (Polycrystalline PV modules) is the most suitable and preferred alternative. The environmental impacts related to this layout (and the development as a whole), with the correct mitigation measures (Appendix 12 – EMP) 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 plant is expected to have similar impacts as that of the construction phase. The site will be rehabilitated (refer to the EMP in Appendix 12 for details), and the original carrying capacity (in terms of livestock grazing) will be restored as far as possible.

Table 15: Impact Summary of the Proposed Development

	IMPACTS	*SIGNIFICANCE WITH MITIGATION*		*POSITVE/ NEGATIVE*
		CONSTRUCTION PHASE	*OPERATIONAL PHASE*	
BIOPHYSICAL ENVIRONMENT	Disturbance of Indigenous vegetation	LOW	-	-
	Faunal Displacement	LOW – MEDIUM	-	-
	Surface water contamination	LOW	-	-
	Soil contamination	LOW	LOW	-
	Soil Erosion	LOW	-	-
	Localised increase in surface water run-off during heavy rainfall events	-	LOW	-
	Degradation and loss of functionality of the wetlands on site	MEDIUM	-	-
SOCIAL ENVIRONMENT	Increase in ambient dust levels	LOW	-	-
	Increase in ambient noise levels	LOW	-	-
	Change in Visual Character of the area	LOW	LOW – MEDIUM	-
	Employment opportunities	HIGH	HIGH	+
	Local electricity generation	-	HIGH	+
	Reflection/ glare off the solar panels	-	LOW	-
	Reduced reliance on coal as a source of energy, thus decrease in associated negative environmental impacts	-	HIGH	+
	Impact on Traffic Patterns within the surrounding area	LOW	-	-
CUMULATIVE	Loss of open space	LOW		-
	Loss of agricultural land	LOW - MEDIUM		-
	Renewable supply of electricity	HIGH		+
	Increased employment and local economic development	HIGH		+

8 CONCLUSION AND RECOMMENDATIONS

8.1 RECOMMENDATIONS

SEF is of the opinion that the proposed Inyanga Energy Project 9, solar plant 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 Environmental Authorisation:

- The EMP is a legally binding document and the mitigation measures stipulated within the document must be implemented.
- An independent Environmental Control Officer (ECO) must be appointed to manage the implementation of the EMP 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 plant. This will provide valuable information on the long term impacts of the solar farm on the site's vegetation and will also assist in advising on the best rehabilitation practices, once the plant is decommissioned.
- Due to the limited understanding of the impact of solar farm on biodiversity, a monitoring programme must be implemented that monitors fauna (specifically avifauna with particular reference to the White – Bellied Korhaan) throughout the lifespan of the solar plant. This will provide valuable information on the long term impacts and/or relationship of the solar farm on avifauna.
- The wetland area with a 50m buffer must be excluded from the development footprint.
- A water use license must be obtained prior to construction.
- A permit to "pick and remove" the provincially protected plants on site must be obtained prior to construction.

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10. APPENDICES

Appendix 1: Correspondence with Authorities

Appendix 2: Photograph Plate

Appendix 3: Layout Plans & Facility illustrations

Appendix 4: Desktop Geotechnical Study

Appendix 5: Agricultural Assessment

Appendix 6: Wetland Delineation and Functional Assessment

Appendix 7: Ecological (Flora and Fauna) Assessment

Appendix 8: Phase 1 Cultural Heritage Impact Assessment

Appendix 9: Transportation Study

Appendix 10: Visual Impact Assessment

Appendix 11: Public Participation

Appendix 12: Environmental Management Programme

Appendix 13: Title Deeds

Appendix 14: Other Information