

LEBONE SOLAR FARM

THE PROPOSED DEVELOPMENT OF A 75MW PHOTOVOLTAIC SOLAR FARM, A 132KV POWER LINE AND ASSOCIATED INFRASTRUCTURE ON THE REMAINING EXTENT OF THE FARM ONVERWAG NO. 728 AND PORTION 2 OF THE FARM VAALKRANZ NO. 220, VENTERSBURG RD, WELKOM, MATJHABENG LOCAL MUNICIPALITY, FREE STATE PROVINCE

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DEA REF NO: 14/12/16/3/3/2/580

NEAS REF: DEA/EIA/0002050/2013

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Today's Impact | Tomorrow's Legacy

Project title: The proposed development of a 75MW photovoltaic solar farm, a 132kV power line and associated infrastructure on the Remaining extent of the Farm Onverwag No. 728 and Portion 2 of the Farm Vaalkranz No. 220, Welkom, Free State Province.	
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EXECUTIVE SUMMARY

The proponent Lebone Solar Farm (Pty) Ltd, proposes to establish a commercial photovoltaic (PV) energy facility (called Lebone Solar PV facility) with an output capacity of 75 megawatt (MW), as well as a 132kV overhead power line and associated infrastructure on a farm, approximately 18 km south-east of Welkom in the Free State Province. Based on a pre-feasibility analysis and environmental screening undertaken by Lebone Solar Farm (Pty) Ltd, a favourable area has been identified for consideration, which will be verified through an Environmental Impact Assessment (EIA) process.

Globally, there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as exploitation of non-renewable resources. South Africa currently depends on fossil fuels to supply approximately 90% of primary its energy needs. This reliance on fossil fuels to meet energy requirements is recognised, but as concerns about global climate change grow, South Africa also needs to be a responsible global neighbour.

The Lebone Solar Farm and associated infrastructure are proposed to be located on the Remaining Extent of the Farm Onverwag No. 728 and Portion 2 of the Farm Vaalkranz No. 220, about 18km south-east of Welkom, within the Matjhabeng Local Municipality in the Free State Province. A broader area of 630ha is considered within which the PV facility is to be constructed. The facility is envisaged to have a maximum export capacity of 75 MW power to be achieved through several arrays of PV panels and the following infrastructure:

- Mounting structures for the PV panels to be either rammed steel piles or piles with pre-manufactured concrete footing to support the PV panels.
- Cabling between the infrastructures components to be laid underground where practical.
- A new on-site substation to distribute the power from the PV facility into the Eskom grid.
- A loop-in-loop-out power line connection to the 132 kilovolt (kV) power line on the farm.
- Internal access roads and fencing.
- Workshop area for maintenance, storage and offices.

The proposed PV farm development requires a development footprint of approximately 240ha, and is to be located within the broader area of approximately 630ha. Therefore, the PV facility can be appropriately sited within the broader area such that any identified environmental sensitivities can be avoided.

Environmental Impact Assessment

In terms of section 24 and 24(D) of NEMA, as read with the EIA Regulations of Government Notice Regulation 543 (Regulations 26-35) and Regulation 545, a Scoping Study and EIA are required to be undertaken for this proposed project.

The relevant listed Activities that are triggered in form of the EIA Regulations 2010 are Activity 10 of Government Notice R544, Listing Notice 1 (18 June 2010), as well as Activity 1 and 15 of Listing Notice 2. In accordance with the Environmental Impact Assessment Regulations of 2010 (Government Notice R544 and R545 in Government Gazette No. 33306 of 18 June 2010), a full scoping and EIA process was conducted including a public participation process, scoping and plan of study and finally the Environmental Impact Assessment phase.

The overarching objective for the solar facility is to maximise electricity production through exposure to the solar resources, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. In order to delineate area of sensitivity within the broader site; this will serve to inform the design of the facility.

The Draft Environmental Impact Assessment Report is aimed at determining the significance of potential issues associated with the proposed project, and defining mitigation measures to manage these potential issues.

Brief Description of the Receiving Environment

The area is located within a typical Highveld climate with moderately wet, warm summers and cold dry winters.

The topography of the proposed study area can be described as relatively flat, with rolling plains and low hills. The topography slopes from east to west and the northern section of the plain slopes towards the north.

The land type of the proposed area is dominated by deep, yellow, well-drained sandy to loamy soils. The lower lying land type has shallower, clay rich, structured soils including vertic Land-use and Agricultural Potential. Another land type present on the lower lying areas, is a plinthic catena dominated by moderately deep to deep red and yellow loamy soils with a fluctuating water table in the subsoil.

Groundwater potential in the region is associated with the Karoo aquifer system, which can be subdivided into the following units: a shallow, weathered aquifer; a deeper, fractured, hard rock

aquifer; and an alluvial aquifer of limited extent. The deeper Karoo aquifer is associated with fracturing along dolerite dykes and sills which create conduits for groundwater movement (Baran & Dziembowski, 2003).

The natural vegetation in the study area is dominated by the Vaal-Vet Sandy Grassland. Much of these grasslands have been degraded throughout the region. Most of it has been transformed for cultivation and the rest under strong grazing pressure from cattle and sheep. The grassland is listed as endangered. Three different major plant communities occur on site. No Red Data listed or protected plant species have been noted on site. The footprint of the proposed development is big in terms of a local context but relatively small in terms of the regional context. The plant communities have a relatively low biodiversity and low conservation importance in a local, regional or national context.

No Red Data listed faunal species were identified within the proposed development area, although there might be different mammal, reptile, amphibian and avifaunal species within the extent of the development area.

An extensive wetland runs through the northern parts of the Farm Onverwag No. 728. A few small pans and an old quarry containing deeper holes with standing water, also occur within the proposed development area. As a result thereof, no development is allowed within 32m from the edge of the wetland.

Five archaeological and cultural heritage resources, as defined and protected by the NHRA 1999, were identified during the field assessment.

Most of the study area is underlain by Quaternary aged aeolian sand deposits. Sections of both farms are underlain by Permian aged sedimentary rocks of the Adelaide Subgroup, Beaufort Group, Karoo Supergroup. Two areas on Portion 2 of the Farm Vallkrans No. 220, are underlain by Jurassic aged Dolerite. The Adelaide Subgroup is known to contain a rich assemblage of fossil remains of plants and vertebrates and areas underlain by these sediments have thus been allocated a Moderate sensitivity rating. No fossils have been recorded from the Quaternary deposits in the study area and Low sensitivity rating has been allocated to these areas. Dolerite will not contain fossils, and these areas have been allocated a Low sensitivity rating.

The development of a PV plant on the proposed development farms and the associated infrastructure will have a low-medium visibility on observers within 3-5km from the facility.

Sensitive visual receptors identified include, residents on the perimeter of Saaiplaas on the east, residents on farmsteads and travellers along the roads. The undulating topography and tailing

dumps in the area provide some visual absorption capacity to mitigate the visual impact of these receptors.

More detailed viewshed analysis will be undertaken for the PV plant and all associated infrastructure, based on the final layout of the facility.

Socio-economic impacts represented the most significant impacts, rated between medium to high. Several key impacts such as job creation, long-term economic stability and earning, community empowerment and skills development are all impacts of a positive nature. The benefit of the proposed development is further exacerbated by the existing state of economic disrepair in the local community, in which high unemployment, access to water and food, and services are some of the key challenges face on a daily basis.

Project Description

The following key structures and infrastructure will form part of the proposed Lebone Solar Farm 75MW facility:

- The Photovoltaic facility comprising of a great amount of panels which are 1.95 m length X 0.99m height X 0.5m breathe. Each panel is protected by a narrow sheath of glass, supported by a steel structure foundation, with a structural height of approximately 3m – 4m above the ground.
- On-site switching substation including a control plant with protection, metering, telecontrol and SCADA (Supervisory Control and Data Acquisition), DC and Telecomms, and inverters;
- A storeroom, workshop, administration office and ablution facility;
- Internal access roads; and
- Point of Connection will be included in the Final EIR.

Evaluation of the Proposed Project

The potential environmental impacts identified, which are typically associated with solar energy projects, are associated with the construction, operational and decommissioning phases of the proposed project. The following potential environmental impacts was assessed during the Impact Assessment phase of this EIA Process:

- Potential impacts on the ecology and biodiversity. This impacts was assessed by an **Ecological specialist**.

- A **Soil and Agricultural Potential Assessment** was conducted by a specialist to assess the potential of soil erosion and the loss of agricultural potential as well as other potential impacts in this specialist field.
- An **Archaeological Impact Assessment** will be conducted by an Archaeologist to assess whether the construction of proposed project would have any impacts on significant artefacts.
- A Specialist **Traffic Impact Assessment** will be undertaken to assess the potential impacts of the proposed project on the existing road infrastructure during the construction and operational phases.
- A **Palaeontological Assessment** was done by a specialist to assess the possible impacts on any fossil that may be present within the study area.
- The **Visual impacts** of the PV facility will also be assessed.
- A **Social Impact Assessment** was conducted to assess the potential impacts on the surrounding areas.

Summary of specialist studies conducted and the main findings thereof.

Specialist Studies	Consultant	Main findings
Ecological Assessment	<ul style="list-style-type: none"> • Eco-Care Consultancy (Pty) Ltd 	<p>The natural grassland on the farm is very limited and is a remnant of the endangered Vaal-Vet Sandy Grassland. A wetland systems (seeps and pans) are present on the site. There are a number of pans on the farm and surrounding properties. A stream (Rietspruit) runs through the site. In terms of the environmental impact, the crop fields can be regarded as the ideal site for the solar plant.</p> <p>It is recommended that the proposed development be limited to the crop fields because they are already disturbed areas.</p>
Soil and Agricultural Potential Assessment	<ul style="list-style-type: none"> • Johann Lanz Soil Scientist 	<p>The proposed development will have low to medium negative impact on agricultural resources and productivity, but will also deliver low to medium positive impacts on agriculture.</p>

Specialist Studies	Consultant	Main findings
Archaeological Impact Assessment	<ul style="list-style-type: none"> A Phase 1 AIA was undertaken by Archaeomaps Archaeological Consultancy. 	Five archaeological and cultural heritage resources, as defined and protected by the NHRA 1999, were identified during the field assessment.
Palaeontological Assessment	<ul style="list-style-type: none"> The PIA was conducted by Dr Gideon Groenewald. 	<p>Most of the study area is underlain by Quaternary aged aeolian sand deposits. Sections of both farms are underlain by Permian aged sedimentary rocks of the Adelaide Subgroup, Beaufort Group, Karoo Supergroup. Two areas on Portion 2 of the Farm Valkranz No. 220 are underlain by Jurassic aged Dolerite. The Adelaide Subgroup is known to contain a rich assemblage of fossil remains of plants and vertebrates and areas underlain by these sediments have thus been allocated a Medium sensitivity.</p>
Visual impacts	<ul style="list-style-type: none"> Enviroworks Reviewed by the Environmental Assessment Research Group at North-West University. 	<p>The development of a PV plant on the proposed development farms and the associated infrastructure will have a low-medium visibility on observers within 3-5km from the facility. More detailed viewshed analysis will be undertaken for the PV plant and all associated infrastructure, based on the final layout of the facility which will be included within the Final EIR.</p>
Social Impact Assessment	<ul style="list-style-type: none"> Global Green 	Social Impact Assessments determined significant positive socio-economic impacts as a consequence of the development. These include long-term income and employment opportunity, skills development and empowerment and equitable community

Specialist Studies	Consultant	Main findings
		processes.

In consideration of the positive and negative impacts and, the main specialist findings as summarized above, the proposed facility constitutes **no environmental fatal flaws** that should prevent it from being constructed. A summary of impacts finds that the majority rates of medium – low significance and can be successfully mitigated to satisfactory levels. The severity of the associated environmental impacts are therefore considered to be **acceptable** and do not present constraints of such significance that the development should not proceed.

Public Participation

To enhance and inform the EIA process, public participation was an integral part throughout the entire process. The National Department of Environmental Affairs, together with other national, provincial, local authorities, stakeholders, interested and affected parties and local communities were consulted with to ensure that their requirements and concerns are addressed and to facilitate a transparent flow of information.

All registered I&APs will be informed of the availability of the draft and final documentation for comment (as referred to above) when it is made available.

This Draft Environmental Impact Assessment Report (DEIR) will be made available for comments for 40 calendar days from the **13th of February 2014** until the **24th of March 2014**.

Written comments on this DEIR must be submitted to Enviroworks Environmental Consultants on or before **24 March 2014**.

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ASSUMPTIONS, UNCERTAINCIES AND GAPS IN KNOWLEDGE LIMITATIONS

The following assumptions apply to this report:

- It is assumed that all information provided by the applicant and I&APs to the Environmental team was correct and valid at the time that it was provided.
- It is assumed that the development site is suitable and technically acceptable, based on the strategic level investigations undertaken by Lebone Solar Energy (Pty) Ltd prior to the commencement of the EIA process.
- It is assumed that the point of connection with the Eskom grid is feasible and that the grid has capacity to accommodate the additional load.
- It is assumed that the information provided by the applicant and specialists is accurate and unbiased.
- It is not always possible to involve all Interested and Affected Parties individually. However, every effort has been made to involve as many interested parties as possible.
- The scope of this investigation is limited to assessing the environmental impacts associated with the construction, operation and decommissioning of a Photovoltaic (PV) plant.

- The resolution of any soil map is dependent on the intensity of soil survey points, and there is always a degree of uncertainty because interpolation is used between sample points.
- The intensity of sample points used is considered adequate for the purposes of this study.
- A more detailed soil investigation is not considered likely to have added anything significant to the assessment of agricultural soil suitability for the purposes of determining the impact of the facility on agricultural resources and productivity.
- The assessment rating of impacts is based on theoretical predictions that cannot be 100 percent accurate. However the assessments for this study are based on sound information and have a high level of confidence.

- The biodiversity of the planned development footprint will be destroyed.
- Although the vegetation assessment was in December, it is still relatively dry.

GLOSSARY OF TERMS

Applicant: Any person who applies for an authorisation to undertake an activity or undertake an Environmental Process in terms of the Environmental Impact Assessment Regulations – National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as contemplated in the scheduled activities listed in Government Notice (GN) No R. 543, 544 and 545.

Archaeological resources: This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artifacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10 m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artifacts found or associated therewith, which is older than 60 years or which South African Heritage Recourses Act (SAHRA) considers to be worthy of conservation;
- features, structures and artifacts associated with military history which are older than 75 years and the site on which they are found.

Alluvial: Resulting from the action of rivers, whereby sedimentary deposits are laid down in river channels, floodplains, lakes, depressions etc.

Biodiversity: The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

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

Red Data species: All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

Scoping Report: An “issues-based” report, which forms the first phase of an Environmental Impact Assessment process.

Soil compaction: Soil becoming dense by blows, vehicle passage or other types of loading. Wet soils compact easier than moist or dry soils.

Ecology: The study of the interrelationships between organisms and their environments.

Environment: All physical, chemical and biological factors and conditions that influence an object.

Environmental Impact Assessment: In relation to an application, to which Scoping and Environmental Impact Assessment must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of the application.

Environmental Impact Report: In-depth assessment of impacts associated with a proposed development. This forms the second phase of an Environmental Impact Assessment and follows on from the Scoping Report.

Environmental Management Programme: A legally binding working document, which stipulates environmental and socio-economic mitigation measures that must be implemented by several responsible parties throughout the duration of the proposed project.

Heritage resources: This means any place or object of cultural significance. See also archaeological resources above.

Kilovolt (kV): a unit of electric potential equal to a thousand volts (a volt being the standard unit of electric potential. It is defined as the amount of electrical potential between two points on a conductor carrying a current of one ampere while one watt of power is dissipated between the two points).

Loop-in-loop-out: a closed electric or magnetic circuit through which a signal can circulate, as in a feedback control system.

ABBREVIATIONS

BID - Background Information Document

CAR - Civil Aviation Regulations

CARA - Conservation of Agricultural Resources Act

CIP - Climate Information Portal

CPV - Concentrating Photovoltaic

CSP - Concentrating Solar Power

DAFF - Department of Agriculture, Forestry and Fisheries

DEA - Department of Environmental Affairs

DEIR – Draft Environmental Impact Assessment Report

DEAT – Department of Environmental Affairs and Tourism

DETEA – Department of Economic Development, Tourism and Environmental Affairs (Free State)

DOE – Department of Energy

DSR – Draft Scoping Report

DWA - Department of Water Affairs

EA – Environmental Authorisation

EAP – Environmental Assessment Practitioner

ECO – Environmental Control Officer

EIA - Environmental Impact Assessment

EIR - Environmental Impact Report

EMP – Environmental Management Plan

FEIR – Final Environmental Impact Assessment Report

FSR – Final Scoping Report

GIS - Geographic Information System

GN – Government Notice

GW - gigawatt

ha - hectare

I&APs - Interested and Affected Parties

IDP - Integrated Development Plan

IEM – Integrated Environmental Management

IPP - Independent Power Producer

IRP – Integrated Resource Plan

IRR – Issues and Response Report

ISEP - Integrated Strategic Electricity Planning

km – Kilometre

kV - Kilo Volt

kWh/m² – kilowatt hour per square meter

LUPO - Land Use Planning Ordinance

MW - Megawatt

NEMA - National Environmental Management Act, 1998 (Act No. 107 of 1998)

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

NERSA – National Energy Regulator of South Africa

NIRP – National Integrated Resource Plan

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

POS - Plan of Study

PPP - Public Participation Process

PV - Photovoltaic

REIPPP – Renewable Energy Independent Power Procurement Program

SAHRA - South African Heritage Resources Agency

SANBI - South African National Biodiversity Institute

SDF - Spatial Development Framework

SKA - Square Kilometer Array

SR - Scoping Report

STC – Standard Test Conditions

STEP - Subtropical Thicket Ecosystem Plan

W – Watt

W/m² – Watt per square meter

ZTV – Zone of Theoretical Visibility

REPORT STRUCTURE

The Environmental Impact Assessment Report consists of the following sections:

Section	Description	Explanation
1.	Introduction	This section a general background and need for the project, explains the project proposal and the Environmental Impact Assessment Process.
2.	Description of the proposed project	This section summarises the project proposal and provides a detailed description of all project components and activities throughout the construction, operation, and decommissioning phases of the project.
3.	Project Alternatives	This section deals with the identified, feasible and reasonable alternatives for the proposed project.
4.	Legal Requirements	This section outlines legislation, policies and guidelines applicable to the proposed development.
5.	Scoping	Provides an introduction to scoping and describes to applied approach to Scoping and EIA.
6.	Public Participation Process	This section describes the methodology used for the Public Participation Process (PPP) and the findings or results of this PPP.
7.	Description of the Receiving Environment	Describes the environment as it currently stands to be affected.
8.	Assessment of Potential Environmental Impacts and Mitigation Measures	Describes the methodology applied, assesses alternatives, potential impacts and mitigation and the cumulative impact.
9.	Recommendations	Provides a list of suggested tasks and actions to enhance the development process during development phases.
10.	Conclusion	Provides an overall summary of key EIA process areas, with final outcomes and impact statement.
11.	Reference List	Lists all referenced sources of the EIAR
12.	Annexures	Supporting information for further clarity on technology to be employed and the Environmental Management Program.

1. INTRODUCTION

1.1. THE DEA&DP'S INFORMATION REQUIREMENTS

The Provincial Department of Environmental Affairs and Development Planning (DEA&DP) acknowledged receipt and accepted the Application for Authorisation for the proposed Lebone Solar Farm on the application area in a letter dated 2 August 2013. The DEA&DP also attached a document to this letter, which states the EIA information requirements for Solar Energy Facilities. The following information is required to appear on page 1 of either the Scoping or the EIA documents.

TABLE 1: EIA INFORMATION REQUIRED FOR SOLAR ENERGY FACILITIES.

Information Requirement:	Note/Reference:
Descriptions of all affected farm portions	<ol style="list-style-type: none"> 1. Remaining Extent of the Farm Onverwag No.728 2. Portion 2 of the Farm Vaalkranz No. 220
21 digit Surveyor General codes of all affected farm portions	<ol style="list-style-type: none"> 1. F03500000000072800000 2. F03500000000022000002
Coordinates of Farm Midpoint	<ol style="list-style-type: none"> 1. Latitude: 28°3'7.89"S, Longitude: 26°53'54.45"E 2. Latitude: 28°4'8.82"S, Longitude: 26°54'25.33"E
Copies of deeds of all affected farm portions	The Title Deeds will be sent to the DEA&DP as requested.
Photos of areas that give a visual perspective of all parts of the site	See the Photograph Report in Annexure B .
Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)	No sensitive visual receptors present.
Solar plant design specifications including: <ul style="list-style-type: none"> • Type of technology • Structure height • Surface area to be covered (including associated infrastructure such as roads) • Structure orientation • Laydown area dimensions (construction period and thereafter) • Generation capacity 	Refer to Section 2 and Annexures A5 and A6 of this report.
Generation capacity of the facility as a whole at delivery points	75MW

1.2. INTRODUCTION AND BACKGROUND

The proponent, Lebone Solar Farm (Pty) Ltd. is proposing to construct a 75 MW Photovoltaic solar facility, a 132kV power line and associated infrastructure on the Remaining Extent of the Farm Onverwag No. 728 and Portion 2 of the Farm Vaalkranz No. 220 near Welkom in the Free State Province. This project is to be known as the Lebone Solar Farm. Due to the nature of the proposed development, the applicant is required to apply for Environmental Authorisation prior to its commencement.

Globally there is an increasing pressure on countries to increase their share of renewable energy generation due to concerns such as exploitation of non-renewable resources. South Africa currently depends on fossil fuels to supply approximately 90% of its primary energy needs. This reliance on fossil fuels to meet energy requirements is recognized, but as concerns about global climate change grow, South Africa also needs to be a responsible global neighbour. In conjunction with the abovementioned, the current electricity imbalance in South Africa highlight the significant role that renewable energy can play in terms of power supplementation. South Africa experiences some of the highest levels of solar radiation in the world. The average daily solar radiation in South Africa varies between 4.5 and 6.5 kWh/m².¹ Given that renewables can generally be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.

In order to meet the long-term goal of a sustainable renewable energy industry, a target of 17.8 giga watt (GW) of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010 and incorporated in the Renewable Energy Independent Power Procurement Programme (REIPPP). The energy procurement through this programme will be produced mainly from wind, solar, biomass and small-scale hydro. This 17.8GW of power from renewable energy amounts to more or less 42% of all new power generation being derived from renewable energy forms by 2030.²

To contribute to the long term goal of a sustainable renewable energy industry Lebone Solar Farm (Pty) Ltd. proposed the development of a 75MW photovoltaic solar facility near Welkom in the Free State Province.

The proponent appointed Enviroworks Environmental Consultants as an Independent Environmental Assessment Practitioner (EAP) to complete the application for environmental

¹ The Department of Minerals and Energy. *White Paper on Renewable Energy*. November 2003.

² The Department of Minerals and Energy. *White Paper on Renewable Energy*. November 2003.

authorisation and to conduct the necessary and required studies to support the application, in the Environmental Impact Assessment (EIA) process. The EIA process undertaken in accordance with the EIA Regulations, 2010.

1.3. PURPOSE OF THIS REPORT

This report is intended to identify, predict, evaluate and mitigate the biophysical, social, and other relevant effects of the proposed development proposals, so that the DEA can decide to either grant or refuse the proposed development. The report further aims to describe the details of the public consultation process with key stakeholders, which includes both government authorities and interested and affected parties (I&APs), as identified in the scoping phase.

1.4. DETAILS OF THE PROJECT APPLICANT

The Applicant for this development is Lebone Solar Farm (Pty) Ltd, which is a South African private company active in the development and implementation of renewable energy projects. The applicant has undertaken various projects including Solar PV Energy in various parts of South Africa.

1.5. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Consultant: Enviroworks Environmental Consultants
Address: Suite 116
Private Bag X01
Brandhof
9324
Contact Person: Miss. Adél Groenewald
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1.6. DETAILS OF THE LANDOWNER

Landowner: National Government of the Republic of South Africa

1.7. PROJECT NEED AND DESIRABILITY

The proposed project shall benefit several key areas from broader international policy to local development goals and assist South Africa in meeting international greenhouse gas emission reduction targets as set under the Kyoto Protocol.

The proposed project will support goals and objectives of South African national policy on climate change and renewable energy provisions, such as the Integrated Resource Plan of 2010, as well as the mandate of the National Energy Regulator of South Africa (NERSA) and the Department of Energy (DoE) Independent Power Producers (IPP) procurement programme aims to capacitate clean energy generation through feed-in mechanisms.

The proposed project will give mobility to the Free State Province's Spatial Development Framework principles of promoting land use, of being a developmental state, aligning environmental management priorities and sustainable economic growth under the Free State Growth and Development Strategy.

The proposed project will aim at meeting the needs of the Matjhabeng Local Municipality's Integrated Development Plan (IDP), namely those of developing a positive contribution to sustainable growth and development and promoting human resources through training and implementation of new technological aids. The need for infrastructure development is further mentioned as an objective hereof;

- The local community shall benefit from long-term economic incentives including both short and long term job creation; and
- As a consequence to these economic incentives, positive social repercussions shall include skills development and community empowerment, increased social cohesion and family stability.

The following question and answer section has been modelled around those required by the DEA in terms of the EIA Guideline and Information Document Series' Draft Guideline on the Need and Desirability, and discusses and explains the need and desirability in further detail.

1.7.1. **NEED ("TIMING")**

Question 1: Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved spatial development framework (SDF) agreed to by the relevant environmental authority? (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP)?

Response: The proposed development is situated within the Matjhabeng Local Municipality. The compilation of the Spatial Development Framework for Matjhabeng is in progress and will be completed in phases in order to comply with the applicable legislative requirements.

The overall objectives of spatial development are efficiency, sustainability, equity, comfort and image. These in turn should be supported by specific objectives such as:

- To ensure sustainable use of environmental resources, their enhancement and replenishment; and
- To enhance the functionality of Matjhabeng municipality;

The identity of Matjhabeng is closely linked to the influence of its natural and cultural elements. The spatial development of Matjhabeng is aimed on continuing to value the role and prominence of the natural environment that sustains and informs Matjhabeng.

One of many key aspects to the future spatial development of Matjhabeng is that optimal utilisation of natural and infrastructural resources, and integrated planning principles should drive all development.

Question 2: Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occurs here at this point in time?

Response: The simple answer is yes.

The South African government's renewable energy IPP tender process is under way. The Department of Energy (DoE) indicated that government seeks to procure 3 725 MW of renewable energy for the first procurement phase.

This renewable energy project is aimed to form part of the allocated 1450 MW for solar photovoltaic production.

Furthermore, in accordance with the White Paper on Renewable Energy, November 2003, the Government has set an alternative energy target at 10 000 Gigawatt hour (GWh) (0.8 Million tons of oil equivalent (Mtoe)) renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro.

The White Paper also indicates that South Africa experiences some of the highest levels of solar radiation in the World and that the proposed application area is situated in one of South Africa's 4th highest annual solar radiation areas.

This illustrates why the need for a PV plant on this property is justifiable, as it will contribute to South Africa's alternative energy target and that this locality is also highly suitable in terms of the solar radiation potential.

Whilst South Africa, and indeed the rest of the world, has just experienced a deep economic recession, where unemployment rates have topped 25% at home, the South African Government

is encouraging economic growth. The timing of the proposed Lebone Solar Farm is believed to be well placed for the provision of job opportunities to give impetus to the anticipated upturn in economic growth.

The proposed development area is currently used for small scale farming. The full potential of the land is thus not being utilized. This proposed PV plant project will entail economic benefits for the surrounding communities as it will create direct and indirect jobs.

A social and economic impact assessment were conducted as part of this EIA process, and the impacts that this proposed project may have on the surrounding communities were investigated and reported on (refer to **Section 8.4** of this report).

It is therefore concluded that the proposed Lebone Solar Farm should indeed occur here (on the proposed development area) at this point in time because of the dire need for community upliftment and especially job creation for people of the area.

Question 3: Does the community/area need the activity and the associated land use concerned (is it a societal priority)? [This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate.)]

Response: The proposed development would be a very important development for the Welkom/Virginia/Riebeeckstad/Hennenman/Odendaalsrus area, which is in desperate need of job creation. The PV plant development could help to reduce the crime currently experienced in the area by offering some job opportunities and therefore social upliftment.

It is believed that approximately 160 full-time employees will have work as a result of some of the spin-offs of the PV plant development. This is apart from the direct job opportunities of the PV plant entailing security guard work, maintenance and panel cleaning opportunities. The proposed development is in line with all the long term planning visions for the area and it is anticipated that the local communities will support the proposed Lebone Solar Farm development.

By developing this PV Plant, it will contribute greatly to the area's already strained social problems. The White Paper on Renewable Energy states: *"The utilisation of renewable technologies, particularly in remote rural areas, where clinics and households will depend upon solar electricity for their power, have a potentially important role to play in tackling these important social issues".*³

³ The Department of Minerals and Energy. *White Paper on Renewable Energy*. November 2003.

This PV plant might not supply electricity directly to households or poor communities, but it will contribute to the national electricity grid, which in turn will solve issues such as load shedding.

Question 4: Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?

Response: The Proponent is currently in the process of obtaining confirmation from the Matjhabeng Local Municipality, stating that the necessary services will be available.

Sedibeng Water will act as the water service provider for the Thabong Solar Farm. Sedibeng Water confirmed that they will be able to provide 65.5 kiloliter water to the Lebone Solar Farm during the project life span (see **Annexure H1** for proof).

Wasteman holdings will be removing the solid waste to registered Municipal landfill sites (see **Annexure H3** for proof).

The sanitation on the site during both construction and operation will be processed by a waste water treatment plant. Ozone Services Industries (OSI) (Pty) Ltd. will provide the necessary equipment for the waste water treatment plant capable of treating up to 7,500 litres per day assuming a constant flow over a 24-hour period (see **Annexure H2** for proof).

Approval from the Municipality will be included within the Final EIR.

Question 5: Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)?

Response: The need stipulated within the Matjhabeng Local Municipality's Integrated Development Plan (IDP), is developing a positive contribution to sustainable growth and development and promoting human resources through training and implementation of new technological aids. The need for infrastructure development is further mentioned as an objective hereof;

- The local community shall benefit from long-term economic incentives including both short and long term job creation; and
- As a consequence to these economic incentives, positive social repercussions shall include skills development and community empowerment, increased social cohesion and family stability.

The proposed development will contribute to this goal, set by the Municipality, by creating long and short term jobs and the necessary training will be provided to unskilled employees. The PV plant

will also provide electricity generated from renewable energy resources, which is less expensive than electricity generated by non-renewable resources.

Question 6: Is this project part of a national programme to address an issue of national concern or importance?

Response: No, this project is financed by a private developer. Even though this project does not form part of a specific national programme, renewable energy development is a National priority, as discussed above.

1.7.2. DESIRABILITY (“PLACING”):

Question 1: Is the development the best practicable environmental option (BPEO) for this land/site?

Response: Several factors influence the decision in establishing the BPEO for a specific site. As far as the EIA Process is concerned, to answer this question sufficiently, one certainly has to look at the bigger picture in terms of environmental impacts on this site and its surrounds.

Therefore, because of this project’s magnitude in this particular area, scoping and impact phase specialist assessments were undertaken to assess the possible impacts that this development might have on the environment and to determine if this option is the BPEO for this site.

The property is zoned for Agricultural land-use and is not currently used for intensive agricultural purposes. An Agricultural Assessment Study was conducted as part of the Impact Assessment Phase, which is attached as **Appendix C1**. This study indicated that the negative impacts on farming will mainly be the temporary loss of agricultural land due to the construction of:

- The PV plant;
- Internal Access Roads;
- Electrical Substation;
- Construction Laydown Area.

These negative impacts should, however, be weighed against the possible gain in income for the farmer, and thus by implication, the possibility to invest in actions to increase the agricultural productivity of the farms Onverweg No. 728 and Vaalkranz No. 220

Further to the above, the main limiting factors for profitable farming in the study area on the farms Onverweg No. 728 and Vaalkranz No. 220 are:

- the **relative low suitability** of the soils for dry-land crop production;

- the **non-availability of irrigation water** for an economically acceptable crop-production scale; and
- the relative **small (i.e. un-economic) size** of the farming unit.

The Agricultural Assessment Study concluded that the negative effect of the envisaged project on the total agricultural production potential of the farm is **virtually ignorable**. This statement should be read in conjunction with the full report attached in **Appendix C1**. Therefore, if only the Agricultural Assessment Study is considered, the proposed PV plant in combination with continued cultivation on certain parts of the farm, seems to be the BPEO at present.

However, a collective view needs to be taken and all options need to be considered. It is therefore that an Environmental Impact Assessment process has been undertaken and that a host of specialist studies have been undertaken as part of the EIA, to assist in the establishment whether a specific project is the BPEO for the area.

The development of a renewable energy facility on this site seems, at this stage of the EIA process, to be an appropriate option for this site, based on the outcome of all the specialist studies and information gathered to date.

Question 2: Would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF as agreed to by the relevant authorities?

Response: The proposed development will not compromise the integrity of the existing approved IDP as the generation of alternative energy will enhance service delivery, increase job opportunities and produce business opportunities within the local community.

The Matjhabeng Municipality is currently in the process of compiling their Spatial Development Framework. The Municipality supports any efforts which will contribute to the provision of sustainable development initiatives and once approved this project will also form an integrated part of this plan.

Question 3: Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?

Response: An Environmental Management Framework (EMF) for the Matjhabeng Local Municipality has not yet been adopted by DETEA.

The approval of this application will not compromise the integrity of the environmental management priorities for the area, even if an EMF existed. The application area is on land that was previously

used for ostrich farming activities. A portion of the area, which is indicated as a 'Threatened Ecosystem' in the South African National Biodiversity Institute's BGIS network, does not contain species of botanical importance, but this was assessed by an ecologist during the EIA process. The findings of this assessment are included under **Section 8.2** of this report.

In terms of the sustainability of the development, the following key environmental objectives associated with this proposed development are taken into account:

- To provide a sustainable, non-polluting PV plant development that will contribute to the alleviation of unemployment in the area and provide much needed job opportunities to people residing in the area;
- To conserve significant social and cultural-historic characteristics (including archaeological and heritage resources) on and around the site, where applicable;
- To minimise the visual impact of the development on the surrounding environment;
- To optimise the social and economic benefits associated with the proposed project;
- To ensure the conservation and sustainable use of scarce water resources; and
- To ensure an integrated waste management programme by waste minimisation and recycling of all waste at source.

If these objectives can be met throughout the development's lifecycle, then it can be said that this development is environmentally justifiable.

Question 4: Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context.)

Response: Yes. The development proposes to harness the favourable solar resources offered by the project area. The proposed PV plant site is also strategically placed in close proximity to Eskom's Everest Substation to make use of the existing power line connection that exists over these farms, as previously mentioned.

The poverty stricken community of the surrounding areas will also be the beneficiary of the social upliftment and job-related benefits that the proposed PV plant will bring about in the area.

This proposed PV plant location is also situated favourably in terms of Municipal services, i.e. sewage trucks and waste removal as well as a water connection.

Question 5: How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?

Response: As already mentioned, specialist studies have been conducted on the proposed property for the PV Plant and the recommendations of the specialist studies are given in **Section 9** of this report. Sensitive vegetation occurs on the footprint area of the proposed PV plant. The findings of the specialist studies indicate the following impacts of the proposed development, namely: no impact on the heritage resources and minimal impact on the visual resources, with positive socio-economic spin-offs (job opportunities and other social upliftment benefits) to the surrounding communities.

Question 6: How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc)?

Response: A Photovoltaic Plant can be regarded as a non-polluting industry/infrastructure. These industries will not have any significant impact on people's health or wellbeing.

The necessity for the long term protection of visual resources, as well as the need for job creation development in and around Welkom and environs, is both acknowledged.

Question 7: Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?

Response: The opportunity cost results when an activity that provides a benefit occurs at the expense (cost) of some other activity. The proposed PV plant intends to enhance industrial activity in the area by ensuring a consistent flow of alternative electricity to existing and new industries within the Welkom and surrounding areas. The activity therefore does not detract from other envisaged uses of the site or within the area, but provides a cumulative positive benefit that creates sustainable levels of electricity provision.

The 132kV Eskom power line from the Eskom Everest electrical distribution substation is located southwest of the site, which makes the site ideal in terms of placement of a PV Plant for connectivity to the national grid.

Question 8: Will the proposed land use result in unacceptable cumulative impacts?

Response: It is not foreseen that the proposed Lebone Solar Farm development will have unacceptable negative cumulative impacts on the surrounding environment, based on the impact assessment results.

Several **positive impacts** on the local and regional economy will be realised if the proposed PV plant is to be constructed and operated in this area. This include direct and indirect job creation, positive impacts on unemployment rates and social vulnerability, and monetary benefit to the local

municipality. This will result in a **medium positive impact** (influence) on the surrounding environment, especially on the socio-economic environment of the area.

Therefore, cumulatively, the proposed Lebone Solar Farm will have a **positive impact** on the surrounding environment, due to its potential socio-economic value it will add to the local communities.

1.8. PURPOSE OF THE PROJECT

The objective of the Lebone Solar Farm is to contribute towards National and Provincial targets for renewable energy generation, in addition to South Africa's requirement to reduce greenhouse gas emissions, which contribute toward global climate change. Further to the above, the Lebone Solar Farm is being developed with the intention of promoting social and economic development in the Free State.

2. DESCRIPTION OF THE PROPOSED PROJECT

This section of the Environmental Impact Assessment Report summarises the Lebone Solar Farm project proposal and provides a detailed description of all project components and activities throughout the construction, operation, and decommissioning phases of the project.

2.1. PROJECT LOCATION

The Lebone Solar Farm is proposed to be located on the Remaining Extent of the Farm Onverwag No. 728 and Portion 2 of the Farm Vaalkranz No. 220, approximately 18km south-east of Welkom in the Matjhabeng Local Municipality of the Free State Province.

- The estimated footprint of the development would be 240ha. The broader area is approximately 630 ha;
- The proposed PV facility is envisaged to have a maximum export capacity of 75 MW to be achieved through several arrays of PV panels and the associated infrastructure; and
- The site is accessible by a gravel road from the R73 road to the west.

See **Annexure A1** for an A3 version of the Locality Map.

An A3 version of the Locality Map is included in **Annexure A3**.

GPS Coordinates for the midpoints of the farms:

- Onverwag No. 728 - Latitude: 28°3'7.89"S Longitude: 26°53'54.45"E
- Vaalkranz No. 220 - Latitude: 28°4'8.82"S Longitude: 26°54'25.33"E

The full photograph report with a panoramic view (in eight wind directions) of the Remaining Extent of the Farm Onverwag No. 728 and Portion 2 of the Farm Vaalkranz No. 220, is included in **Annexure B**.

2.2. PHOTOVOLTAIC (PV) SOLAR ENERGY FACILITIES

2.2.1. SOLAR ENERGY

Solar energy represents an inexhaustible clean energy source that can be tapped and converted into electric power using various technologies such as the photovoltaic (PV) technology. Solar is indeed the energy force that sustains life on Earth for all plants, animals, and people. The Earth is situated at the perfect distance and orbit from the Sun and is essentially a giant solar collector that receives radiant energy from the Sun in the form of electromagnetic radiation in the order of 1,000 watt/m², although availability varies with location on earth and time of year.

The Free State falls within the highest potential area for solar energy in South Africa, with an estimate 7.0 – 8 kWh/m², and it offers a very high potential for solar energy concentration using sun tracking Photovoltaic (PV) panels. Solar energy can be converted through chemical (e.g. photosynthesis), thermal, or electrical (i.e. PV) processes. Capturing solar energy typically requires equipment with a relatively high initial capital cost. However, over the lifetime of the solar equipment, these systems can prove to be cost competitive, especially because there are no recurring fuel costs, as compared to conventional energy technologies.

2.2.2. PHOTOVOLTAIC SYSTEMS

Solar electric power, or PV systems, is a cost-effective and viable solution to supply electricity for locations off the conventional electrical grid. PV power systems have been utilised almost everywhere. However, the higher capital cost of PV means it is most cost effective for remote sites where other, more conventional options are not competitive. There are often misperceptions regarding what constitute a good candidate PV application and site; thus, careful site consideration is necessary to eliminate unsuitable locations.

PV systems have both advantages and disadvantages that should be carefully considered by the project implementer and the end user. The success of PV projects is directly related to a clear knowledge of site conditions and resources, as well as an understanding of PV capabilities and limitations.

- **Solar cell**

The PV cell is the component responsible for converting light to electricity. Some materials (silicon is the most common) produce a PV effect, where sunlight frees electrons striking the silicon material. The freed electrons cannot return to the positively charged sites (“holes”) without flowing through an external circuit, thus generating current. Solar cells are designed to absorb as much light as possible and are interconnected in series and parallel electrical connections to produce desired voltages and currents.

- **PV module**

A PV module is composed of interconnected solar cells that are encapsulated between a glass cover and weatherproof backing. The modules are typically framed in aluminium frames suitable for mounting.

- **PV array**

PV modules are connected in series and parallel to form an array of modules, thus increasing total available power output to the needed voltage and current for a particular application. PV array may either be fixed, sun-tracking with one axis of rotation, or sun-tracking with two axes of rotation.

PV modules are rated by their total power output, or peak Watts. A peak Watt is the amount of power output a PV module produces at standard test conditions (STC) of a module operating temperature of 25°C in full noontime sunshine (irradiance) of 1,000 W/m². Keep in mind that modules often operate at much hotter temperatures than 25°C, thus reducing crystalline module operating voltage and power by about 0.5% for every 1°C hotter. Therefore, a 100 W module operating at 45°C (20° hotter than STC, yielding a 10% power drop) would actually produce about 90 W.

2.3. PROJECT COMPONENTS

The Lebone Solar Farm will be composed of the following infrastructure:

- Mounting structures for the PV panels to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels;

- Cabling between the project components to be laid underground where practical;
- A loop-in-loop-out power line connection to the existing 132kV power line from the Leander Substation;
- Internal access roads and fencing; and
- Associated buildings including a workshop area for maintenance, storage, and offices.

Some of the components and associated infrastructure are described in detail in the following section.

2.4. SUPPORTING INFRASTRUCTURE

2.4.1. ACCESS ROADS

The Solar Energy Facility will require a main access road to the facility, and a network of Internal access roads will link the solar photovoltaic module and to the main control room and administration office. Although there are already some existing access routes on the farm, these will need to be upgraded and constructed to a grade suitable for use by heavy delivery and maintenance vehicles and machinery.

2.4.2. POWER TRANSMISSION LINES

The internal transmission lines from the PV modules will be cables buried underground and grounding in cable trenches. All energy generated would then be exported into the existing local grid at the existing Eskom substation adjacent to the property.

The authorisation for connection into the grid at this substation shall be subject to Eskom's standard connection assessment and agreements between Eskom and the applicant.

2.4.3. SITE OFFICE AND CONTROL ROOM

The buildings and facilities needed to service a PV plant are; a control room, a general office, access control and security building, ablution facilities and kitchen area, a small workshop and a store.

2.4.4. WATER SUPPLY

Water will be sourced from the Matjhabeng Local Municipality. Sedibeng Water will act as the water service provider for the Thabong Solar Farm. Sedibeng Water confirmed that they will be able to provide 65.5 kiloliter water to the Lebone Solar Farm during the project life span (see

Annexure H1 for proof). Sedibeng Water could install a draw off point within the existing bulk supply line, running from the Saaiplaas pump station (or Saaiplaas Water Works) to the Dirksburg reservoir, under the following conditions:

- Approval from the Matjhabeng Local Municipality that Sedibeng Water can act as the water service provider;
- Consent from the owners of the neighbouring properties that have to be crossed for water collection.

Water will be trucked to the Lebone Solar Farm, therefore it will not be necessary to store the water for construction and operational purposes. Water will be stored in a small storage tank for drinking purposes only.

All of the above mentioned will be obtained from the relevant parties or authorities and proof thereof will be included within the Final EIR.

2.4.4.1. WATER USAGE DURING CONSTRUCTION

- The temporary water requirement for the construction stage of the PV plant will mainly be for the production of concrete for the footing structures of the PV panels. About 1000m³ (or 1 000 000 liter) of water will be used per annum. This is for the concrete mixing and for the general process, construction and dust control etc. The quantities of concrete, and hence water that will be required, depends largely on the technology used and the foundation design.

2.4.4.2. WATER USAGE DURING OPERATIONS

- A PV plant requires water for the operational phase, the domestic needs of the security and operational personnel and for the cleaning of the PV panels.
- Approximately 918m³ (918 000 liter) water will be sourced from the Matjhabeng Local Municipality, for operational purposes of the Lebone Solar Farm. Note that the majority of the water will be required for cleaning of PV panels.
- Alternatively, water could be procured from the Local Authority and brought to site by a vehicle equipped especially for the cleaning operation. The water for the “domestic” use could similarly be transported to site.

2.4.4.3. SANITATION AND WASTE WATER

Chemical toilets will be used during the construction phase of the project until such time that a small package sewage treatment plant is installed, which will then cater for the sewage treatment requirements for the operational phase of the proposed project.

The sanitation on the site during both construction and operation will be processed by a waste water treatment plant. Lebone Solar Farm (Pty) Ltd. will appoint Ozone Services Industries (OSI) (Pty) Ltd. to provide them with the necessary equipment for the waste water treatment plant (see **Annexure H2** for the confirmation letter from OSI). OSI is a member of the Water Institute of Southern Africa and SEWPACKSA.

OSI recommended a waste water treatment plant (WWTP) capable of treating up to 7,500 litres per day assuming a constant flow over a 24-hour period. The technology used to treat the sewage is submerged fixed-film aeration treatment. This process has proven itself over the past 40 year to be reliable and cost effective. The process uses bacteria and oxygen to reduce the BOD load as well as to provide nitrification and denitrification of ammonia, this allows treated effluent to be safely discharged into the environment.

The system, which generally takes 2-3 weeks to work optimally from start-up, combines three stages within the process. These stages are:

1. Anaerobic collection;
2. Biological treatment using SAFF technology; and
3. Clarifier and contact disinfection.

The system will require a concrete plinth of 3,000mm x 8,500mm, on which the WWTP will be established.

The system comprises of different components to make up the whole WWT, these components are:

- 2 x 5,000ℓ bioreactors aerated by 1 x 0.75kW pumps per reactor;
- a 1 x 1,200ℓ clarifier to separate suspended solids with a 1 x 0.37kw submersible recycle pump; and
- a 1 x 1,000ℓ sterilisation / irrigation tank prior to discharge by 1 x 0.37kw submersible pump.

- The raw effluent will be brought into the system inlet from the flow equalisation tank by means of a 1.1kW submersible sewerage feed pump and a 50mm CL6 uPVC or 50mm CL6 HDPE pipe.
- A 50Hz/220V single phase power supply in the form of 3-core armoured cabling will be provided to the plant, to operate the 1 x 1.1kw submersible sewerage feed pump, 2 x 0.75kW aeration pumps, 2 x a 0.35kW.
- Final polishing will be by means of chlorine dosing or Ozone generator.

The final biologically treated & sterilised water is ideal for re-use through irrigation. A water supply must be within reach to allow initial filling of the plant as well as for routine cleaning and servicing of the treatment system.

The operational cost of a Biozone WWTP is very low considering the fact that the only moving parts are the pumps. Once installed, the system will take some time to establish a good level of biomass, the bacteria which contribute to the biological treatment process. Depending on volume, nutrient loading and effluent chemical & biological toxicity, this may take anything from 3 – 6 weeks.

From a maintenance perspective, it is required that an operator inspects the plant at least once a week in order to ensure that the pumps are functioning correctly. A ½ℓ of treated water should be drawn from the test cock to ensure that the treated effluent is clear and odourless. This is the simplest indication that the system is functioning correctly. Should any of the pumps fail, these are very easily replaced by shutting off a stop cock on the pump and replacing the pump, which should take an artisan no more than 30-minutes. The pumps utilised are extremely robust and designed for continuous use in an application such as this.

These plants have been specifically designed to operate in rural areas under difficult conditions however one must understand that as with any installation, maintenance must be undertaken to ensure the optimum operation of a system. All components found to be faulty or defective will be replaced free of charge within the warranty period.

Operator training will be provided upon completion of the installation. All components used in our systems are SABS or better approved and are readily available at most hardware stores. Our plants feature a 5% sludge wasting frequency.

The following diagram is a schematic illustration of the WWTP.

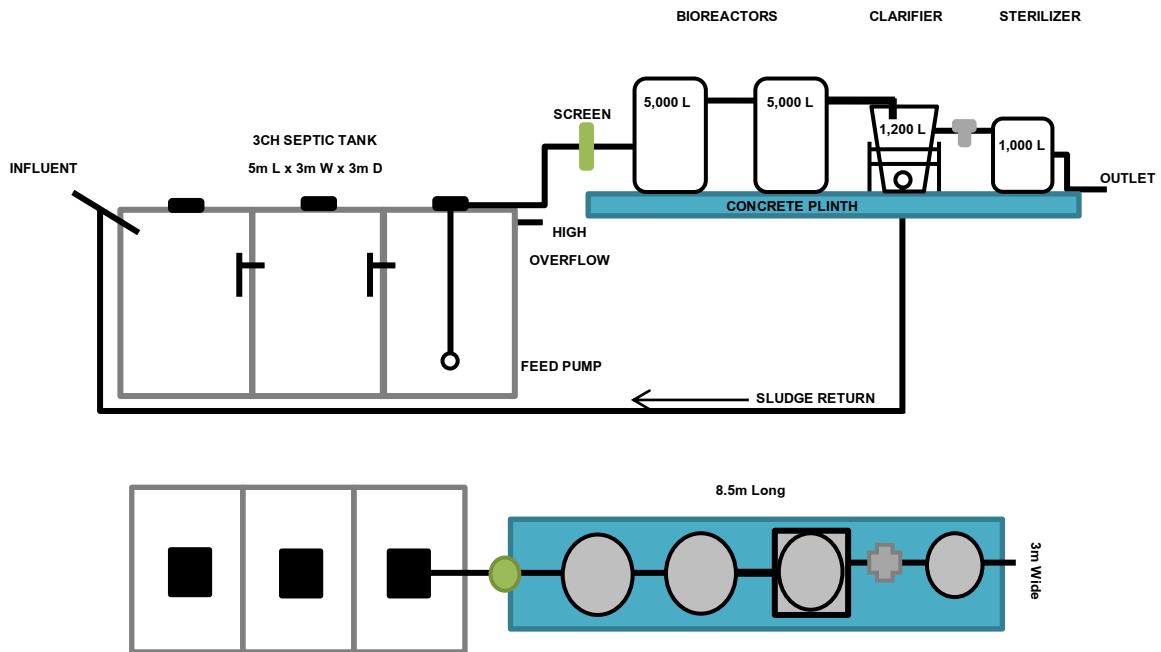


FIGURE 2: BIOZONE WASTE WATER TREATMENT PLANT LAYOUT.

2.4.4.4. Storm Water and Drainage

The development is not likely to significantly increase storm water runoff, however in areas which will be surfaced, especially the roads, storm water drains could be constructed to allow surface run-off to flow towards the natural watercourses and as much as possible not alter or interfere any natural watercourses or surface water flow direction.

The proposed drainage system will be a surface management system based on not collecting storm water but rather spreading or distributing it over the site to soak away or drain slowly, similarly to the normal pre-development flows. This will avoid soil erosion and downstream flooding problems normally associated with concentrated surface water flows.

A storm water management plan is included within the EMPr (see **Annexure E**).

2.4.5. SOLID WASTE

Waste will be generated during the course of the project development. It is proposed that the waste generated on site would be managed by reducing, reusing and recycling as far as possible. The waste will be disposed at a municipal waste facility. Lebone Solar Farm (Pty) Ltd. will appoint Wasteman Holdings (Pty) Ltd. to provide the necessary general waste collection services (see confirmation letter in **Annexure H3**).

2.5. CONSTRUCTION PHASE

2.5.1. CONSTRUCTION PROGRAMME

The construction of the proposed Lebone Solar Farm will be undertaken in a phased approach. Once the construction has been completed all the temporary site camps and works will, within the proposed construction laydown area, be removed from the site and a large portion of the land will be rehabilitated to its original condition before the operational phase commences.

2.5.2. SURVEYING AND DEMARCATION OF SITE

- Prior to the commencement of road and foundation construction as well as the PV panel structures' erection, a number of enabling works need to be undertaken. These will include final Engineering design and a geotechnical assessment for the construction works to be undertaken on the site.
- This activity will also include the demarcation of the site and designating the various key construction areas, access roads, site works, site camps etc.

2.5.3. CONSTRUCTION OF SITE CAMPS AND LAYDOWN AREAS

- A temporary site camp or construction compound and associated parking area will be set up on the site. The site camp will be used for the storing of materials and equipment such as PV modules, rack or tracker components, motors, gears, electrical devices, conduits for wires, transformers, switchgears, prefabricated structures etc., and will also serve as a gathering point for safety talks and will house office facilities for the staff involved in constructing the project.
- The site, including the parking area will be approximately 75m x 100m.
- Part of the site will be graded and used as a construction staging/laydown area.
- Establishment of the laydown area will involve the removal of vegetation and the stripping and stockpiling of topsoil.
- The laydown area will be decommissioned and all temporary facilities removed when construction is completed, although portions of the area may be retained to provide vehicle parking for maintenance personnel and equipment storage.
- The laydown area provision must be made for the safe working area, parking excavation and delivery vehicles etc.
- The laydown area of the operational phase would be smaller than during the construction phase.

2.5.4. ASSEMBLY AREAS

It is an area proposed for a safe and fast assembly of the racks. There, needed materials are laid out within the assembly area in order to streamline the assembly process. Once the rack is preassembled, a rough terrain vehicle will transport the tracker to its final position to finish the process (wiring connection, gear mounting etc.).

2.5.5. SITE CLEARING

- Owing to the relatively open or expansive nature of the PV plant and hence the construction process, no specific service or haul roads are envisaged.
- The site will be sufficiently cleared to allow access for the excavation equipment and the rough terrain vehicles that will deliver the site assembled PV rack or trackers structures to their positions.
- The development footprint portion of the site needed will be cleared, grubbed and graded by means of the necessary cuts and fills in order to condition the terrain to the maximum slopes allowed for buildings, roads and racks.
- Given the flat nature of the site there is very little cut and fill envisaged.
- Vegetative ground cover reduces dust which influences the PV panel efficiency. The re-growth of the ground cover or rehabilitation is thus important to the PV plant. It thus makes sense to minimise the disruption of the existing vegetative ground cover, however in general the entire site will be trampled and vegetation rehabilitation measures will need to be implemented.

2.5.6. CONSTRUCTION OF INTERNAL ROADS

- Sufficient space will be allowed at the access point to ensure that the vehicles do not stack up on the road while being processed through security. The road alignment and layout will take into account the safety precautions necessary for any road crossings.
- The access and internal roads shall be constructed as all-weather type road with wide, open side drains forming part of the drainage system.
- The road layout will be designed in order to ensure ease of access to every rack or tracker structure and the horizontal geometry will be designed to enable the turning of trucks.
- During the operational phase access around the site is generally only required for security and routine inspection. Access for cleaning operations or maintenance is very infrequent, thus generally the internal service roads need only be gravel tracks.
- The topsoil removed would be stored in accordance with best practice methods, and later used for site restoration. Soils needed for backfill would be stored temporarily adjacent to the

excavations until needed. Any remaining excavated material would be recycled to a local site needing clean fill material, or stockpiled for future use.

2.5.7. LABOUR AND WORKFORCE

- It is anticipated that approximately 161 people will be employed during the various stages of the construction phase. People from the local community shall also be appointed. This is aimed at temporary job creation in a manner similar to the goals of the extended public works projects that use labour intensive methods where applicable and practical.

2.5.8. TRAFFIC ON AND OFF SITE

- Access to the site shall be off the existing gravel trunk road R70 turning off into the site. This will be the entry point for all workers, construction equipment and PV components for the duration of the construction phase.
- During construction of the internal site roads and PV foundations, there would be an increase in truck traffic on the road leading to and from the project site. Increased dust is possible, although water trucks will continually dampen the roads and excavation areas in order to control dust.
- During delivery of the components, delivery of oversized loads may slow traffic flow. Every effort would be made to ensure that oversize loads are delivered during times of lowest area traffic. Road safety measures e.g. flaggers would be provided to coordinate traffic flow and ensure public safety.
- Delivery of materials and equipment would be phased throughout the construction period depending upon the specific construction activity.

2.5.9. CONSTRUCTION COMPLETION

Once all the construction, erection, and commissioning are completed and the project is in the start-up phase, all temporary works will be removed and any disturbed areas shall be rehabilitated and restored to the original state.

2.6. OPERATIONAL PHASE

- Once the solar energy facility is operational, there shall very minimal human and vehicle activity will be required on site.
- The internal site roads will be used for periodic maintenance, panel working and safety checks.

- A large notice board or signage board will be located at the entrance to the site. This signage will provide essential safety information such as emergency contacts and telephone numbers.
- Safety signs, such as speed limit and safety information, would also be installed throughout the Project Site. These signs will be maintained throughout the operational life of the solar farm.
- Scheduled maintenance work will be carried out several times each year throughout the operational phase.
- As an example, but not limited to, the following activities occur in the operational phase:
 - Checking and verifying of the electricity production;
 - Maintaining and monitoring a weather station;
 - Routine inspection of all equipment and systems;
 - Periodic maintenance;
 - Cleaning of PV modules; and
 - Security operations;
- The traffic generated by the PV plant during operation phase once the plant is generating electricity is minimal.

2.7. DECOMMISSIONING PHASE OR UPGRADE

After the 20 years of operation, the PV plant will either be upgraded if a new license is granted or the plant will be decommissioned. Upgrading the PV power plant will consist of replacing old PV modules with new modules, increasing the total peak power of the plant (a process called “Repowering”) or increasing the power of the plant by adding new elements such as trackers, PV modules or transformers.

If the plant is to be decommissioned then the site should be returned to close to its original state. Other than the concrete all of the components of a PV plant have an intrinsic value either for re-use or recycling.

This value will cover the cost of decommissioning the plant and rehabilitating the site.

- The PV panels will be removed from the trackers and sent to special recycling facilities without further disassembly at the site.
- The transformers and electrical control devices would either be removed for reuse, with or without re-conditioning, or sold as scrap after removal of the fluids.
- The electrical power management and conditioning equipment would be recycled or disposed of as scrap.
- The underground cable runs could be abandoned in place, or they could be pulled out. The cable has a very high scrap value so the latter is more likely.

- The steel in the fixed rack or tracker structures has high scrap value so these structures will be dismantled and removed for scrap.
- The steel tracker piles can be removed and sold as scrap. Alternatively the steel or the concrete piles can be cut off just below ground level and abandoned.
- The gravel or aggregate in the access road, on-site service roads, in the electrical substations, transformer pads, and building foundations could be removed and recycled for use in other fill operations if not abandoned.
- The buildings can be taken over by the farmer for his operations or all the re-usable material can be removed and the shell demolished and the rubble taken away to a commercial dump site. Temporary buildings can be removed or relocated.
- Disturbed land areas can be rehabilitated, the rubble removed, the soil scarified and reseeded or replanted with indigenous vegetation.

Part of the decommissioning and rehabilitation process would be the inspection for and documentation of the presence of industrial wastes in the soil from minor spills or leaks, and decontamination as necessary. If deemed necessary, soil testing would be conducted after decommissioning. Transportation activities during site decommissioning would be similar to, but less than those during site development and construction.

3. PROJECT ALTERNATIVES

In accordance with the requirements of the EIA Regulations, 2010 published in Government Notice R543 of 2 August 2010, it calls for feasible and reasonable alternatives to be considered during environmental impact assessment process. All identified, feasible and reasonable alternatives are required to be identified in terms of social, biophysical, economic and technical factors.

In terms of the EIA Regulations, 2010 the definition of “alternatives” 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; and
- e) the operational aspects of the activity.

The other critical aspects in the definition of project alternatives are terms such as ‘reasonable’, ‘practicable’, ‘feasible’ or ‘viable’. Given the understanding, there are essentially two types of

alternatives, the incrementally different (modifications) alternatives to the project; and the fundamentally (totally) different alternatives to the project.

- Fundamentally different alternatives are usually assessed at a strategic level and EIA practitioners recognise the limitations of project-specific EIAs to address fundamentally different alternatives. Electricity generating alternatives have been addressed as part of the National Integrated Resource Plan (NIRP) published by the National Energy Regulator of South Africa (NERSA) and the Integrated Strategic Electricity Plan (ISEP) undertaken by Eskom. Environmental aspects are considered and integrated into the NIRP and ISEP using the strategic environmental assessment approach, focusing on environmental life-cycle assessments, water-related issues and climate change considerations.
- Site-specific alternatives of the proposed Lebone Solar Farm were identified during the Environmental Impact Assessment phase and are described in detail in this Draft EIR.

3.1. STRATEGIC SITE SELECTION CRITERIA

A range of criteria has been considered, which affect the suitability of an area for a Solar Energy Facility and which could potentially constrain development. The criteria include technical, environmental, and land use considerations. The following is a comprehensive list of the criteria considered:

- Technical Considerations
 - Sufficient solar resource
 - Capacity of the local electrical distribution network
 - Proximity to Eskom substation
- Environmental Considerations
 - Proximity to provincial or nationally significant parks or wetlands
 - Proximity to natural areas and sensitive environments
 - Any other sensitive provincial or municipal designations
- Land Use Considerations
 - Available access to the land and suitable ground conditions
 - Other nearby land uses in the area
 - Proximity to residential properties, communities, and towns
- Planning Considerations
 - Municipality official plans and zoning by-law regulations
 - Provincial Policy Statement and regional planning ordinances

3.2. SITE ALTERNATIVES

Due to the nature of the development, the location of the project is largely dependent on technical factors such as solar irradiation, climatic conditions, extent to topography of the site and available grid connection. The proposed site was identified by the proposed developer as being technically feasible. **No feasible site alternative for this specific project were identified by the project developer.**

The following characteristics are considered when the feasibility of the proposed site is determined:

a) Site Extent

An area of approximately 240ha would be required for a facility of up to 75MW of export capacity. The proposed site which is approximately 630ha in extent, will therefore be sufficient for the development of the proposed facility, and should allow for the avoidance of any identified environmental and/or technical constraints in terms of the final design of the facility.

b) Land availability and site access

The land is currently leased by farmers who are beneficiaries to the land distribution objective of the Department of Rural Development and Land Reform. Access to the proposed area is gained by a gravel road that joins a secondary road (R73) between Hennenman and Virginia, and then the main road (R73) between Virginia and Welkom, approximately 9 km from the site. The site is therefore appropriately located for transport of components and equipment as well as labour traveling to and from the site.

c) Climatic Conditions

The economic viability of a PV solar farm is directly dependent on the annual direct solar irradiation values. The site has been indicated as an area of high irradiation, which indicates that the regional location of the project is appropriate for a solar energy facility.

d) Gradient

A relatively flat surface area is preferred for the installation of PV panels. The slope of the proposed site is considered to be acceptable from a development perspective, which reduces the need for extensive earthworks and associated levelling activities, thereby minimising environmental impacts.

e) Grid Connection

The proposed site is situated adjacent to a 132kV power line from the Eskom Everest substation. The electricity generated by the facility is expected to be fed into the power line using a loop-in-loop-out connection.

Through the construction of a loop-in-loop-out connection power line, the electricity generated at the PV facility could be extracted from the proposed on-site substation directly into the grid without the need for construction of power lines outside the boundaries of the Remaining Extent of the Farm Onverwag No. 728 and Portion 2 of the Farm Vaalkranz No. 220. The proponent needs to apply for a cost estimate letter from Eskom to determine where the point of connection will be on the 132 kV distribution line.

f) Environmental Sensitivity

Establishment of a PV solar facility requires a large amount of land, which may result in adverse impacts on the environment. No fatal flaws in terms of the environment were identified during the Impact Assessment. Wetlands present on the proposed development area will not be affected and the area has been previously disturbed.

Enviroworks undertook a site investigation with specialists, on the 18th of September 2013, to determine the site conditions and the potential impacts of the proposed 75 MW PV solar facility on the different environmental aspects. An impact assessment was conducted by the specialists to assess the suitability of the proposed area for the proposed solar facility (See Annexure A5, A6 and A7 for the Proposed Layout Maps).

3.3. LOCATION ALTERNATIVES

A scoping level assessment was undertaken by the specialist team to assess the suitability of the application area for the proposed solar plant. Two farm portions, the Remaining Extent of the Farm Onverwag No. 728 and Portion 2 of the Farm Vaalkranz No. 220, were initially identified for consideration for the proposed Lebone Solar Farm.

The proposed Lebone Solar Farm is expected to have a development footprint of approximately 240 ha, which is a lot smaller than the total area of 630ha. Therefore, the solar facility and associated infrastructure (i.e. internal roads, PV panels, power lines etc.) can be appropriately located to avoid sensitive areas (see **Annexure A7** for the Sensitivity Map) within the broader study area. The extent of the site therefore allows for the identification of design layout and sitting alternatives within the site boundaries (see **Annexures A5 and A6** for Proposed Layout Area Maps).

3.4. ACTIVITY ALTERNATIVES

Lebone Solar Farm Pty (Ltd). has only considered installing solar panels on the site as the most feasible option (the Preferred Alternative). **No other activity alternatives, other than the no-go option have been considered for this project.**

3.5. DESIGN AND LAYOUT ALTERNATIVES

A site development plan (SDP) will be prepared and added to the Final EIR. In the meantime the following alternatives were identified (see **Annexure A5 and A6** for the Proposed Layout Area maps):

- **Only one location alternative has been identified for the proposed substation/switching station.** The reason for this is because existing Eskom power line that is running through the Remaining Extent of the Farm Onverwag No. 728 and Portion 2 of the Farm Vaalkranz No. 220. Therefore, the substation would be located right next to the existing Eskom 132 kV power line in the south-west where the boundaries of two properties meet.
- **Two alternatives have been identified for the proposed laydown area and workshop and office area:**
 - The first alternative (the preferred alternative) is to locate these areas right next to the proposed substation area, the reason for this would be to minimize disturbance of the environment by keeping the footprint area as small as possible.
 - The second alternative is to locate these areas in the northern corner of the Remaining Extent of the Farm Onverwag No. 728, next to the road on the northern boundary of the property. This alternative is not the preferred alternative, as the laydown area and workshop and office area will be located too far away from the proposed substation area, which will increase traffic during the construction phase as well as an increased disturbance of the environment.

3.6. TECHNOLOGY ALTERNATIVES

Lebone Solar Farm (Pty) Ltd. intends to develop renewable energy projects as part of the Department of Energy's Renewable Energy Independent Power Procurement Programme (REIPPP), therefore only renewable energy technologies are being considered. Solar energy is considered to be the most suitable renewable energy resource for this specific site, based on the locality of the site, ambient conditions and the availability of energy resources, which in this case would be solar irradiation.

Photovoltaic (PV) solar technology was identified as the most suitable option for the proposed site as large volumes of water are not needed for power generation purposes compared to concentrated solar power technology (CSP). PV technology is also preferred when compared to CSP technology because of the lower visual profile.

Very few technological options exist as far as PV technologies are concerned; those that are available are usually differentiated by climatic conditions that prevail. The impacts of the different PV technologies on the environment are very similar. The construction, operation and decommissioning activities associated with the facility will also be the same, irrespective of the chosen technology. The different PV solar technologies are:

- Fixed or static PV panels;
- Tracking PV panels – these solar panels rotate to follow the sun's movement; and
- Concentrated PV Facilities

Fixed or tracking PV is being considered for the proposed Lebone Solar Farm. The preferred option will be determined by financial, technical and environmental factors.

3.6.1. **FIXED MOUNTED PV SYSTEM (PREFERRED ALTERNATIVE)**

In a fixed mounted PV System, the PV panels are installed at a pre-determined angle from which they will not move during the lifetime of the plant's operation. The **disadvantages** (limitations) imposed on this system due to its static placement are countered by the fact that the PV panels are able to absorb incident radiation reflected from surrounding objects. In addition, the misalignment of the angle of the PV panels has been shown to only marginally affect the efficiency of energy collection. There are more **advantages** which are gained from fixed mounted systems, and includes the following:

- The maintenance and installation costs of a fixed mounted PV system are lower than that of a tracking system, which is mechanically more complex given that these PV mountings include moving panels.
- Fixed mounted PV systems are an established technology with a proven track record in terms of reliable functioning. In addition, replacement parts are able to be sourced more economically and with greater ease than with alternative systems.
- Fixed mounted systems are robustly designed and able to withstand greater exposure to winds than tracking systems.

A typical fixed structure will have two rows of 20 modules (2 strings). The modules are placed in portrait arrangement. The foundation technology is usually a direct-driven (rammed) installation, with a ramming depth subject to the soil characteristics, or reinforced concrete strip footings.



FIGURE 3: FIXED SOLAR PV PANELS.

The design of the fittings for fixing the modules to the rack structures will enable thermal expansion of the metal without transferring mechanical loads that could affect the integrity of the modules. The structure will probably have anti-theft bolts.

3.6.2. DUAL AXIS TRACKING SYSTEM

In a dual axis tracking system, PV panels are fixed to mountings which track the sun's movement. There are various tracking systems. A 'single axis tracker' will track the sun from east to west, while a 'dual axis tracker' will in addition be equipped to account for the seasonal waning of the sun. These systems utilise moving parts and complex technology, including solar irradiation sensors to optimise the exposure of PV panels to sunlight. Tracking systems are a new technology and, as such, are less suitable to operation in South Africa. This is because (**disadvantages**):

- A high degree of maintenance is required due to the nature of the machinery used in the system, which consists of numerous components and moving parts. A qualified technician is required to carry out regular servicing of these tracking systems, which are normally located in remote areas.
- The cost of the system are necessarily higher than a fixed mounted system due to the maintenance required for this system and given that separate mountings need to be placed a distance apart to allow for their tracking movement.

- A power source is needed to mechanically drive the tracking system and this would offset a certain portion of the net energy produced by the plant.

3.6.3. PHOTOVOLTAIC MODULES

There are various types of PV modules defined according to the materials used:

- Si-Monocrystalline
- Si-Polycrystalline
- Thin Film
- High Concentrated

There are also a wide range of PV module manufacturers in the market. Currently the trend for utility scale facilities such as this is towards polycrystalline module technology. In the Independent Power Producer Procurement Programme an important bid criteria is local content and the use of locally manufactured or assembled PV modules is promoted to help the local economy, local job creation and the local communities. The current pricing of the local PV modules however means that imported PV modules are more likely to be used. The Contractor establishes rigorous quality control procedures for the PV modules suppliers. These procedures are applied to the origin of the supply, as well as during the supply.

See the section below on recycling the PV modules on re-powering or decommissioning the plant.

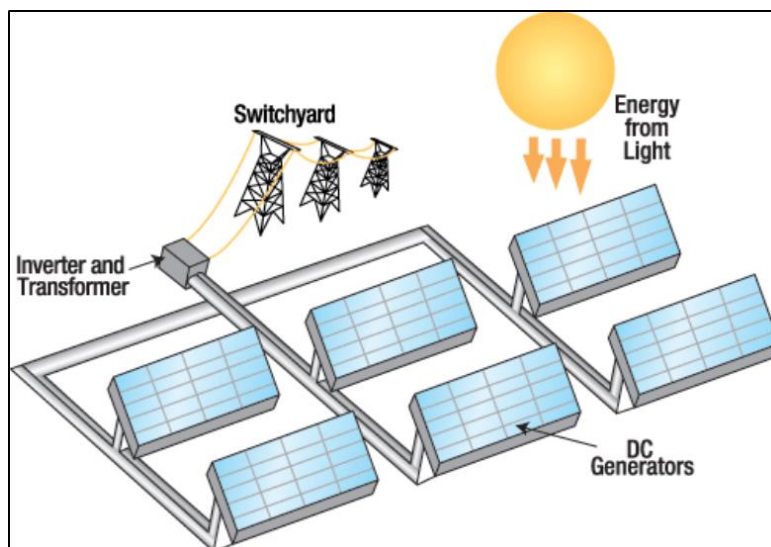


FIGURE 4: ILLUSTRATION OF KEY PROCESSES INVOLVED IN THE GENERATION OF ELECTRICITY THROUGH PV.

3.7. POWER LINE ROUTING ALTERNATIVES

The PV facility will be connected through a loop-in-loop-out connection of the new 132 kV power line to the existing Eskom 132 kV power line in the south-west where the boundaries of two properties meet (see **Annexures A6 and A7** for proposed connection point).

It is therefore not necessary to investigate alternative power line routes as the existing power lines already transect the application area.

3.8. THE “DO-NOTHING” ALTERNATIVE

The ‘no-go’ of ‘do-nothing’ alternative is the option of not constructing the proposed Lebone Solar Farm. Should this alternative be selected, then there will be impacts at a local and broader scale. From a local perspective, the identified site, which is zoned for agricultural purposes, would not be impacted on from an environmental perspective, and could be utilised for future agricultural activities. However, at a broader scale, the potential benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. Although the proposed facility is only proposed to contribute 75MW to the grid capacity, it would assist in meeting the growing electricity demand through the country and would also assist in augmenting government’s renewable energy goals.

The assessment of alternatives must at all times include the “no-go” option as a baseline against which all other alternatives must be measured. The option of not implementing the activity must always be assessed and to the same level of detail as the other feasible and reasonable alternatives. The “no-go” option is taken to be the existing rights on the property, including the approved PV facility, and this includes all the duty of care and other legal responsibilities that apply to the owner of the property. This alternative is assessed in section 8 of this report.

4. LEGISLATION AND GUIDELINES

4.1. CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA (ACT NO. 108 OF 1996)

The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996), has major 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 stand 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."

This section of the Constitution obliges industries and organisations that are responsible for generating waste, to manage the waste in a way that will not cause pollution and thus negatively affect the health and wellbeing of humans.

4.2. NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT NO. 107 OF 1998)

The overarching environmental legislation for the management of the environment in South Africa is the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and its amendments. This legislation states that sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of environmental decisions to ensure that development serves present and future generations. Chapter 5 of NEMA makes provisions for regulations to be formulated and published. The current EIA Regulations, 2010 were published in Government Notice No. R543, and supplemented by Notices 544, 545 and 546 of 2010. Section 28 of NEMA places a duty of care on all persons not to degrade and pollute the environment, and should any such pollution or degradation occur, remedial steps must be taken. The liability regime is such that employees, companies and directors may accrue personal liability for clean-up and in some instances criminal prosecution should an environmental crime be committed. Section 30 of NEMA prescribes the steps to be taken should an environmental emergency incident occur.

4.2.1. LISTED ACTIVITIES

Further to the above, the EIA Regulations in Government Notice No. R. 543 make reference to a schedule of listed activities, which may not commence prior to authorisation. These contemplated listed activities are identified in Government Notices No. R. 544, No. R. 545 and No. R. 546 of 2010 (also referred to as Listing Notice 1, 2 and 3 respectively).

The relationship of the listed activities and the EIA processes is as follows:

- All listed activities identified under Government Notices No. R. 544, and No. R. 546 of (Listing Notice 1 and 3), require a Basic Assessment Process to be undertaken as part of the application for authorisation; and
- All listed activities identified under Government Notices No. R. 545 (Listing Notice 2) require Scoping and Environmental Impact Assessment processes to be undertaken as part of the application for authorisation.

With respect to the proposed Lebone Solar Farm the following table summarises the listed activities, which the proposed development is likely to trigger, for which this Scoping Report and Application for Environmental Authorisation has been prepared.

TABLE 2: LISTED ACTIVITIES LIKELY TO BE TRIGGERED BY THE LEBONE SOLAR FARM.

Government Notice	Activity No.	Description of the Activity	Relevance to the Project
R544, 18 June 2010, Listing Notice 1.	10	The construction of facilities or infrastructure for the transmission and distribution of electricity – (i) Outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts;	The proposed Lebone Solar PV facility shall involve the construction of a 132 kV Power Line from the proposed Solar PV Power Plant to loop into the existing 132 kV Eskom Power Line near the site.
R545, 18 June 2010, Listing Notice 2.	1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.	The proposed project shall involve the Construction and Development of a 75 MW Solar Photovoltaic Power Plant and associated Substation for generation of renewable energy, outside the urban areas.
R545, 18 June 2010, Listing Notice 2.	15	Physical alteration of undeveloped, vacant or derelict land for	The proposed facility and associated linear structures including roads and

Government Notice	Activity No.	Description of the Activity	Relevance to the Project
		residential, retail, commercial, recreational or institutional use where the total area to be transformed is 20 hectares or more;	transmission lines shall be an extent of 240ha. A power line will be constructed along the existing Eskom power line from the Everest No. 1 substation to the North of the proposed development area.

Given the above listed activities that are likely to be triggered by the proposed development, whereby a number of activities fall within Government Notices No. 544, and some fall within Government Notices No. 545, the proposed development will be subjected to a detailed Scoping and Environmental Impact Assessment process.

The Environmental Impact Assessment will be undertaken in accordance with the Environmental Impact Assessment Regulations, 2010, published in the Government Gazette in terms of Section 24 (5) of NEMA as well as relevant regulations, legislation and guidelines mentioned above.

Four stages of the Environmental Impact Assessment process are followed. These include:

1. The scoping stage and plan of study for EIA aimed at identifying issues;
2. The Impact Assessment and Reporting stage including an EMP, involves the engagement of specialist input and studies;
3. The Final Environmental Impact Assessment Report and EMP, including all assessed impacts, is submitted to the Department of Environmental Affairs (DEA).
4. A decision making process is followed by the DEA, whereby Environmental Authorisation is issued.

The Scoping Study identified the potential positive and negative environmental impacts associated with the proposed development. Also identified were the specialist studies required to be undertaken as part of the EIA phase of the project.

4.3. CONSERVATION OF AGRICULTURAL RESOURCES ACT (ACT NO. 43 OF 1983)

The Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA) provides for control and conservation of the utilisation of the natural agricultural resources of South Africa in order to promote the conservation of the soil, water sources and vegetation and the combating of weeds

and invader plants; and for matters connected therewith. Land owners are obliged, by law, to eradicate alien vegetation on their properties.

The use of agricultural land for energy generation will need to be well motivated to the Department of Agriculture, since according to the Department, good productive agricultural land is in short supply in South Africa.

An **agricultural impact assessment** of the chosen site(s) was undertaken to determine the agricultural potential of the site for food production.

The Department of Agriculture has compiled a Guideline Document for the development of Wind Energy in South Africa. It is presumed that this Guideline Document will also be applicable to solar power plants.

The Department of Agriculture's Guideline Document excludes areas of high agricultural potential from being developed for wind generation energy purposes (and it is presumed that the same will apply for solar energy developments).

4.4. NATIONAL WATER ACT (ACT NO. 36 OF 1998)

The National Water Act, 1998 (Act 36 of 1998) (NWA) administered by the Department of Water Affairs (DWA) aims to manage and protect the national water resources to achieve sustainable use of water for the benefit of all water users. The purpose of this Act is to ensure that the nation's water resources are protected, used, developed, conserved, and managed in ways that take into account:

- Meeting the basic human needs of present and future generations;
- Promoting equitable access to water;
- Redressing the results of past racial discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for the growing demand for water use;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations;
- Promoting dam safety; and
- Managing floods and droughts.

4.5. NATIONAL ENVIRONMENTAL BIODIVERSITY ACT (ACT NO. 10 OF 2004)

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA. The NEMBA allows for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources and the establishment and functions of the South African National Biodiversity Institute (SANBI). Key elements of the NEMBA are:

- The identification, protection and management of species of high conservation value;
- The identification, protection and management of ecosystems and areas of high biodiversity value;
- Biodiversity initiatives such as the STEP (Subtropical Thicket Ecosystem Plan) and Biodiversity Conservation plans e.g. the Eastern Cape Biodiversity Conservation Plan.
- Alien invasive species control of which the management responsibility is directed to the landowner; and
- Section 53 of the Act identifies that any process or activity that is regarded as a threatening process in terms of a threatened ecosystem, requires environmental authorisation via a full Environmental Impact Assessment.

4.6. NATIONAL HERITAGE RESOURCES ACT (ACT NO. 25 OF 1999)

The National Heritage Resources Act, 1999 (Act 25 of 1999) was introduced to ensure protection of South Africa's important heritage features. The act covers the following areas of heritage value:

- Archaeology;
- Palaeontology;
- Meteorites;
- Old structures;
- Graves, both old and new; and
- Areas of historic cultural significance.

Tools used to conserve and manage these resources are the formal regulated EIA processes as well as permits issued by the South African Heritage and Resources Agency (SAHRA) to restrict and/or regulate development within a heritage environment. No heritage item may be removed, damaged or destroyed without authorisation. If the heritage assessment is performed as part of the EIA process, the comment of the responsible heritage agency must be obtained prior to a decision being made by the environmental authority.

4.7. AVIATION ACT (ACT NO. 74 OF 1962)

The Minister of Transport has under section 22(1) of the Aviation Act, 1962 (Act No 74 of 1962) promulgated the Civil Aviation Regulations (CAR's) of 1997. This legislation and regulations are primarily intended for ensuring safety of civil aviation. The key parts of these regulations, which are likely to have a direct bearing on the proposed solar farm, include the following:

CAR Part 139.01.33 - Obstacle limitations and marking outside aerodrome or heliport:

- Any structure exceeding 45m above ground level, or structures where the top of the structure exceeds 150m above the MEAN ground level, like on top of a hill, the mean ground level considered to be the lowest point in a 3 kilometre radius around such structure. Structures lower than 45m, which are considered as a danger or a potential danger to aviation, shall be marked as such when specified.
- Specified markers are to be used to highlight structures when it is impractical to make them conspicuous by painting.

Part 91.01.10 of the CAR of 1997 - endangering safety, which states "No person shall, through any act or omission endanger the safety of an aircraft or person therein, or cause or permit an aircraft to endanger the safety of any person or property".

Part 185.00.1(1) (f) makes non-compliance with the above-mentioned Regulation an offence.

An application to the Civil Aviation Authority (CAA) shall be submitted for the authorisation of the proposed wind farm component of the project, including the Meteorological mast.

4.8. OCCUPATIONAL HEALTH AND SAFETY ACT (ACT NO. 85 OF 1993)

The Occupational Health and Safety Act, 1993 (Act 85 of 1993) (OHSA) is South Africa's principle legislation concerning health and safety of employees. It also aims to protect persons who are not at work against hazard to health and safety arising out of or in connection with the activities of persons at work.

The Act places the responsibility on the employer to ensure a safe and healthy working environment and to cause every employee to be made conversant with health and safety requirements relevant to their work. At the same time the Act places the responsibility on the employee to follow its employer's health and safety procedures and instructions. A number of Regulations have been promulgated under the Act that are relevant to development including the following:

- General Administrative Regulations, 1994
- Asbestos Regulations, 2001
- Lead Regulations, 2003
- Regulations for Hazardous Chemical Substances, 1995
- Hazardous Biological Agents of 2001;
- General Safety Regulations, 1986
- Environmental regulations for workplaces (Department of Labour, 1994); and
- Construction Regulations, 2003.

4.9. NATIONAL FORESTRY ACT (ACT NO. 84 OF 1998)

This Act is relevant for managing protected trees. A list of protected trees has been identified and no tree on the list may be removed, destroyed or damaged prior to authorisation being obtained from Department of Agriculture, Forestry and Fisheries (DAFF).

4.10. FENCING ACT (ACT NO. 31 OF 1963)

Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to the protection of flora.

4.11. NATIONAL VELD AND FOREST FIRE ACT (ACT NO. 101 OF 1998)

The purpose of the Act is to prevent and combat wild fires, veld-, forest- and mountain fires throughout the Republic. A duty is placed on landowners to maintain firebreaks.

4.12. NATIONAL ENERGY ACT (ACT NO. 34 OF 2008)

The Act is aimed to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors.

The Act also provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feed stocks and carriers, adequate investment in, appropriate upkeep and access to energy infrastructure. The act also establishes an institution to be responsible for promotion of efficient generation and consumption of energy and energy research, and to provide for all matters connected therewith.

4.13. GUIDELINE DOCUMENTS

The following guideline documents were considered amongst others:

- DEAT (2005) Guideline 3: General Guide to Environmental Impact assessment Regulations 2005, Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- DEAT (2005) Guideline 4: Public Participation, in support of the EIA Regulations 2005, Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria; and
- DEAT (2006) Guideline 5: Assessment of Alternatives and Impacts in support of the Environmental Impact Assessment Regulations 2005, Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- Integrated Environmental Management (IEM) Guidelines

Changes to these guidelines following the amendments to NEMA and the EIA Regulations, 2010 have been considered.

The general approach to this study has been guided by the principles of Integrated Environmental Management (IEM). In accordance with the IEM Guidelines (Department of Environmental Affairs and Tourism (DEAT), 1992), an open, transparent approach, which encourages decision-making, that has been accountable, has been adopted. 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.

Further to the above guidelines, other best practice guideline documents from other provinces and also international sources have been used in the scoping process and the environmental impact assessment phase. Among these guidelines are those developed by the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP), which include:

- Guideline for Determining the Scope of Specialist Involvement in EIA Processes;
- Guideline for the Review of Specialist Input into the EIA Process;
- Guideline for Involving Biodiversity Specialists in EIA Processes;
- Guideline for Involving Heritage Specialists in EIA Processes;

- Guideline for Involving Visual and Aesthetic Specialists in EIA Processes;
- Guideline for Involving Economists in EIA Processes;
- Guideline for Involving Hydro Geologists in EIA Processes;
- Guideline for Environmental Management Plans; and
- Guideline for Involving Social Assessment Specialists in EIA Processes.
- Guideline on Need and Desirability
- International Guidelines used include:
- Guidelines for Landscape and Visual Impact Assessment (The Landscape Institute and the Institute of Environmental Management and Assessment, 2002);

The EAP and the specialists involved with the proposed Solar Energy Facility have and shall ensure these guidelines are used and implemented where applicable and appropriate.

4.14. POLICY ON RENEWABLE ENERGY

The White Paper on Renewable Energy supplements the government's overarching policy on energy as set out in its White Paper on the Energy Policy of the Republic of South Africa (DME, 1998), which pledges '*Government support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications*'.⁴

The Government's overall vision for the role of renewable energy in its energy economy is:

- An energy economy in which modern renewable energy increases its share of energy consumed and provides affordable access to energy throughout South Africa, thus contributing to sustainable development and environmental conservation.

The purpose of this White Paper is to set out government's principles, goals and objectives for renewable energy. It furthermore commits government to a number of enabling actions to ensure that renewable energy becomes a significant part of its energy portfolio over the next ten years.

With an increasing demand in energy predicted and growing environmental concerns about fossil fuel based energy systems, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimising the environmental impacts.

⁴ The Department of Minerals and Energy. *White Paper on Renewable Energy*. November 2003

4.15. LAND USE PLANNING LEGAL REQUIREMENTS

A registered town and regional planner has to submit an application for the rezoning of the site to special zone use with due consideration of the Land Use Planning Ordinance 15 of 1985 (LUPO) and the Development Facilitation Act (Act no. 67 of 1995).

5. THE SCOPING PHASE

The main purpose of the scoping process was to identify issues surrounding the proposed project. Issues were identified through:

- Review of available literature;
- Professional judgment;
- Impact Assessment; and
- A comprehensive public participation process.

Through this process the alternative development sites was identified by following the consideration of relevant natural and social environment elements. The alternative sites is discussed in detail within **Section 3** of this report.

5.1. SCOPING AND EIA APPROACH

The Environmental Impact Assessment was undertaken in accordance with the Environmental Impact Assessment regulations (2010) published in GN R 544, 545 in terms of Section 24 (5) of the National Environmental Management Act (Act 107 Of 1998) as well as relevant regulations, legislation and guidelines mentioned above.

Four stages of the Environmental Impact Assessment process are followed. These include:

1. The scoping stage and plan of study, aimed at identifying issues;
2. The Impact Assessment and Reporting stage, involves the engagement of specialist input and studies;
3. The Final Environmental Impact Assessment Report and EMP, including all assessed impacts is submitted the DEA.
4. A decision making process is followed by the DEA, whereby Environmental Authorization is issued.

5.1.1. SCOPING AND PLAN OF STUDY

The Scoping Study identified the potential positive and negative environmental impacts associated with the proposed development. Also identified were the specialist studies required to be undertaken as part of the EIA phase of the project. The Draft Scoping Report (DSR) was made available for public review and comment from Tuesday, 17 September 2013 until Tuesday, 8 October 2013. No comments were received on the DSR.

The Final Scoping Report (FSR) was made available for public comment and review for a period of 21 calendar days. The FSR and Plan of Study (POS) was submitted to the National Department of Environmental Affairs on 4 November 2013. The FSR and POS for EIA were approved and correspondence in this regard was received on Wednesday, 27 November 2013.

The following table provides conditions as set out by the approved scoping letter of the Department of Environmental Affairs.

Requirements set out in approved scoping letter	Comments
A. Details of the future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies.	The decommissioning phase of the proposed project is described in Section 2.7.
B. The total footprint of the proposed development should be indicated. Exact locations of the PV positions, power lines and associated infrastructure should be mapped at an appropriate scale.	The total footprint area is 240 ha. The Layout Plan is included in Annexures A5 and A6 .
C. Should a Water Use License be required, proof of application for a license needs to be submitted.	Construction will be undertaken within 500m of wetland areas, therefore the proponent will apply for a Water Use Licence (WUL) from the Department of Water Affairs. Proof of the WUL application will be included in the Final EIR.
D. Information on services required on the site, e.g. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained? Proof of these agreements must be provided.	These service agreements have been included in Annexure H , and discussed in the main report.
E. An environmental sensitivity map indicating environmental	The environmental sensitivity map is included in

Requirements set out in approved scoping letter	Comments
sensitive areas and features identified during the EIA process.	Annexure A7.
F. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	The layout maps is included in Annexures A5 and A6.
G. A construction and operational phase EMP to include mitigation and monitoring measures.	These requirements have been provided for in Annexure E.

5.1.2. **MAIN FINDINGS OF THE PLAN OF STUDY AND FINAL SCOPING REPORT**

The Plan of Study (POS) identified the need to conduct specialist studies to provide technical and scientific input in assessing the impacts of the proposed Lebone Solar Farm development. Subsequently the specialist's would provide recommendations on their specific study areas. Each of the specialists would provide a comparative analysis of the proposed development. The following specialists' studies were determined to be included in the final EIA report (EIR).

- Agricultural Impact Assessment
- Ecological Impact Assessment and Wetland Delineation
- Archaeological Impact Assessment
- Palaeontological Impact Assessment
- Social Impact Assessment

A number of possible or alternative for accomplishing the same objectives was identified and investigated. During the EIA phase of the project, the various alternatives identified during the Scoping are assessed in the Impact Assessment phase in terms of both environmental acceptability as well as economic feasibility. The layout alternatives for the proposed development will be discussed in the Final EIR.

The Final Scoping Report identified the following cumulative impacts during the undertaking of the specialists' studies in terms of the proposed development.

- Floral destruction;
- Habitat Loss and destruction;
- Faunal mortality and displacement; and
- Visual intrusion.

As a result of the key impacts identified during the Scoping phase and comments received from the I&APs and other stakeholders, various specialist studies were undertaken during the EIA phase of the project. The specialist studies include the following:

- Ecological Assessment;
- Soil, Agricultural Potential and Land capability Assessment;
- Visual Impact Assessment;
- Social Impact Assessment; and
- Heritage assessment.

Noise and traffic impact assessments were not conducted as these were found to be irrelevant to the activity, as little/no noise shall be generated by the facility and traffic shall not be affected by the development.

5.1.3. **ENVIRONMENTAL IMPACT ASSESSMENT**

The EIA of the project has focused on consulting with registered Interested and Affected Parties as well as undertaking specialists' studies to address the potential impacts identified during the scoping phase of the project.

The purpose of the EIA is to:

- Address issues that have been identified during the Scoping stage of the project;
- Address alternatives to the proposed activity in a comparison manner;
- Assess all identified impacts and determine the significance of each impact; and
- Formulate mitigation measures.

Following completion of the scoping stage, the Department of Environmental Affairs gave consideration of the Final Scoping Report and Plan of Study for Environmental Impact Assessment and agreed to the set out process to follow. The draft Environmental Impact Assessment process commenced from **13 February 2014** with public participation and specialist review as identified during the Scoping stage and in fulfilment of the Department of Environmental Affairs requests from their comments made on the Scoping stage and plan of study.

6. PUBLIC PARTICIPATION

The EIA Regulations, 2010 specify that a public participation process (PPP) must be conducted as an integral part of the EIA. This chapter outlines the public participation process followed during

the Scoping Phase of the Environmental impact Assessment process for the proposed Lebone Solar Facility. The aim and purpose of the public participation process is to:

- Ensure all relevant Key stakeholders and Interested and Affected Parties (I&APs) have been identified and invited to engage in the scoping phase;
- Raise awareness, educate and increase understanding of stakeholders about the proposed project, the affected environment and the environmental process being undertaken;
- Create a platform for Key stakeholders and I&APs to freely communicate any issues or concerns and suggestions for enhancing potential benefits and/or to prevent or mitigate impacts;
- Accurately document all opinions, concerns and queries raised regarding the project; and
- Ensure the issues and concerns of the stakeholders and I&APs related to the project are addressed in an adequate manner.

Details of the public participation process that were followed during the course of the EIA process are attached as **Annexure C**.

6.1. IDENTIFICATION OF KEY STAKEHOLDERS AND REGISTRATION OF I&APs

The first step of the PPP was to identify the key stakeholders and I&APs, and to create a registration database, which will be used for ongoing communication during the course of the EIA process. The identified stakeholders and I&APs were encouraged to register their interest, concerns and issues in writing, so that these can be included in the submissions made to the competent authority as part of the Final EIR.

The following summarises the methods used to identify and notify the key stakeholders in the project:

- Placement of Site notices;
- Preparation and Distribution of a Background Information Document;
- Placement of Newspaper Advertisements;
- Consultation with the Local Ward Councillor and community leaders;
- Consultation with Local Authority and Magisterial District Authority;
- Win-Deed Search for surrounding and neighbouring landowners;
- Notification of Neighbours by telephonic/facsimile and email communication;
- Review of other databases for projects undertaken in the area;
- Our local knowledge of the area;

- Completion of IRR.

6.2. COMMENT DURING THE PUBLIC PARTICIPATION PROCESS

The Public Participation Process shall be conducted in accordance with the EIA Regulations, 2010, and Guidelines for Public Participation DEA, 2006. However, it was noted that the general interest in the project from stakeholders and I&APs was surprisingly very low to date. This could be attributed to the fact that the project is located in a rural and low-income area, with low population levels. The public participation process will continue to be used as a platform to create awareness with the community.

6.3. PHASE 1: PUBLIC ANNOUNCEMENT OF THE PROJECT

6.3.1. BACKGROUND INFORMATION DOCUMENT

A Background Information Document (BID), which briefly describes the proposed project and provides information on how to participate as an I&AP, was prepared. The BID was distributed to all surrounding land owners and identified and registered I&APs and stakeholders.

A copy of the BID is included in **Annexure C**.

6.3.2. SITE NOTICES

Site Notices were prepared in English and were placed on the fence of the proposed development site and placed at the Matjhabeng Local Municipality Building in Welkom on the **8th August 2013**.

6.3.3. NEWSPAPER ADVERTISEMENTS

The project was announced through the publication of a media advertisement in two newspaper on respective dates;

- The Vista Newspaper on Thursday, **8th August 2013 (Annexure C, Figure 4)**
- The Volksblad Newspaper on Friday, **9th August 2013 (Annexure C, Figure 5)**

6.3.4. NOTIFICATION OF NEIGHBOURING LAND OWNERS

Due to the very limited response to the site notices, BIDs, and newspaper advertisement, the BID of the project was hand delivered to the neighbouring farms.

TABLE 3: SURROUNDING AND NEIGHBOURING FARM OWNERS NOTIFIED OF THE EIA PROCESS.

Farm Owner	Farm Name	Contact Details
Mr Buks Ferreira	Ayah No. 737	To be made available to the Competent Authority if requested.
Mr Naudé Ferreira	Erasme No. 714	To be made available to the Competent Authority if requested.
Me Poppy Mopholo	Zommersveld No. 395	To be made available to the Competent Authority if requested.

6.3.5. **AUTHORITIES AND STAKEHOLDER CONSULTATION DURING PUBLIC ANNOUNCEMENT PHASE**

A number of stakeholder and authorities were contacted and notified of the proposed development and were requested to submit their comments to the EAP by **23rd September 2013**, as follows:

- Department of Economic Development, Tourism and Environmental Affairs Free State
- Department of Energy Free State
- Department of Water Affairs (DWA): Deputy Director Lower Orange Water Management Area
- Department of Mineral Resources Free State
- Department of Water Affairs Free State
- Department of Rural Development and Land Reform, Welkom
- Department of Rural Development (Land Claims Commission)
- Department of Archaeology, Cape University of Technology, South African Archaeological Society
- Department of Agriculture, Forestry and Fisheries (DAFF)
- Free State Department of Agriculture
- South African Civil Aviation Authority (CAA)
- South Africa Square Kilometre Array (SKA)
- Eskom (Free State – Regional Office)
- Eskom (National Office)
- Speakers Office (Ward Councillor – Ward No. 3)
- Matjhabeng Local Municipality

Key stakeholders, who included the abovementioned sectors, were directly informed of the proposed development by e-mail or fax on Thursday, **9th August 2013**.

Proof of correspondence with stakeholders is included in **Annexure C**.

6.3.1. **CONCERNS OR COMMENTS RAISED BY I&AP'S DURING THE PUBLIC ANNOUNCEMENT PHASE**

No issues were raised to date. The EIA Regulations, 2010 specify that I&APs must have an opportunity to verify that their issues have been captured, which they had through the FSR.

Details of the correspondence with and comments received from I&APs, thus far, are attached as **Annexure C**.

6.4. **PHASE 2: PUBLIC PARTICIPATION DURING THE DRAFT SCOPING REPORT**

6.4.1. **PUBLIC REVIEW ON DRAFT SCOPING REPORT**

The Draft Scoping Report was made available for public review from the **17th September to the 13th October 2013**. The report was placed at the Welkom Public Library for ease of access.

Proof of correspondence with I&APs is included in **Annexure C**.

A copy was placed on Enviroworks Environmental Consultants' website: www.enviroworks.co.za. Key Stakeholders and I&APs have been informed of the placement of the DSR and reminded to submit any comments before the **28th September 2013**.

6.4.2. **AUTHORITY AND STAKEHOLDER CONSULTATION DURING DRAFT SCOPING PHASE**

All the stakeholders and authorities were informed of the availability of the DSR on the 18th of September 2013. The DSR was submitted to DEA on 18th of September 2013. The DEA acknowledged receipt of the DSR on the 4th of October 2013. Correspondence with DEA is included in **Annexure C**.

6.4.3. **COMMENT ON THE DRAFT SCOPING REPORT**

All the stakeholders, governmental authorities and I&AP's were informed on the availability of the DSR on the 25th of September 2013. No comments received or issues raised up to date.

6.5. **PHASE 3: PUBLIC PARTICIPATION DURING THE FINAL SCOPING REPORT**

The Final Scoping Report was made available for public review from the **31st of October 2013 to the 20th of November 2013**. The report was placed at the Welkom Public Library for ease of access.

Proof of correspondence with I&APs is included in **Annexure B**.

A copy was placed on Enviroworks Environmental Consultants' website: www.enviroworks.co.za. Key Stakeholders and I&APs have been informed of the placement of the FSR and reminded to submit any comments before the **20th of November 2013**.

6.5.1. AUTHORITY AND STAKEHOLDER CONSULTATION DURING FINAL SCOPING PHASE

All the stakeholders and authorities were informed of the availability of the FSR on the 31st of October 2013. The FSR was submitted to DEA on 20th of November 2013. The DEA acknowledged receipt of the FSR on the 18th of November 2013. Correspondence with DEA is included in **Annexure H**.

6.5.2. COMMENT ON THE FINAL SCOPING REPORT

All the stakeholders, governmental authorities and I&AP's were informed on the availability of the FSR on the 31st of October 2013. No comments received or issues raised up to date.

6.6. PHASE 4: PUBLIC PARTICIPATION DURING THE DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

The Draft Environmental Impact Assessment Report will be made available for public review from the **13th of February 2014 until the 24th of March 2014**. The report will be placed at the Welkom Public Library for ease of access.

A copy will be placed on Enviroworks Environmental Consultants' website: www.enviroworks.co.za. Key Stakeholders and I&APs have been informed of the placement of the DEIR and reminded to submit any comments before the **24th of March 2014**.

6.7. COMMENTS ON DRAFT EIR FROM I&APs.

The Draft EIA Report will be updated, where relevant, with the I&AP comments received within the 40 calendar day review period provided to the public. That I&APs will then have 21 days to comment on the Final EIA Report, which will be available at the Welkom Public Library and on the website of Enviroworks Environmental Consultants. The Final EIR together with the comments received on this report will thereafter be submitted to the DEA for decision making.

6.8. ISSUES AND RESPONSE REPORT (IRR)

An IRR would have been prepared, which would have detailed all the comments raised during the public participation process, if any were received. No comments were received during the Scoping Phase comment period and therefore no issues are captured in a I&RR.

7. DESCRIPTION OF THE ENVIRONMENT

7.1. CLIMATE

The Welkom area is in a typical Highveld climate with moderately wet, warm summers and cold dry winters. Based on collated climate data from the Climate Information Portal (CIP):

- The average monthly temperature for Welkom is 17 °C in summer and 5 °C in winter.
- The average annual rainfall is 490 mm.
- The coldest month is July when temperatures drop to 0 °C.
- Frost conditions are most common in winter from middle May to the first week of September.

South African Weather data for wind speed and direction recorded for Kroonstad between 2000 and 2003, averages a **north, northeast and easterly winds**, with an approximate 12.8 and 15% frequency of occurrence of each for the total period. Wind speeds average between 1m/s to 8m/s with calm periods (1m/s) occurring for 3.4% of the time.⁵

Rainfall for the site is given as 532 mm per annum with a standard deviation of 113 mm according to the South African Rain Atlas (Water Research Commission, undated). The average monthly distribution of rainfall is shown in Table 4. In terms of the relationship between rainfall and evaporation the site is classified as semi-arid, which is a limitation to agriculture. The local farmers also identify the reliability of rainfall, in terms of both amount and distribution in relation to the growing season, as a major limitation. The past season was a particularly poor one in terms of rainfall.

TABLE 4: AVERAGE MONTHLY RAINFALL FOR THE PROPOSED DEVELOPMENT AREA (28 04' S 26 55' E) IN MILLIMETRES.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
80	74	75	46	21	9	7	10	22	47	66	75	532

7.2. TOPOGRAPHY

The regional topography of the Northern Free State can be described as relatively flat, with rolling plains and low hills extending into the Welkom area. The rolling plain elevations range from 1 260 meters above mean sea level (amsl) to 1 460 metres amsl. The topography slopes from east to

⁵ South African Weather Service. (2013). Climate at SAWS.

west and the northern section of the plain slopes towards the north and the Vaal River. The general slope of the terrain ranges from 1:250 to 1:100.

See Contour Map in **Annexure A2** for a broader view of the slope of the area.

7.3. GEOLOGY AND SOILS

The information regarding the geology and soils of the proposed development area were sourced from the Soil & Agricultural Potential Assessment undertaken by the specialist, Mr. Johann Lanz (please refer to **Appendix C1** for the full report).

The proposed Lebone Solar Farm, lies in the Highveld region of the African plantation surface. The regional surface geology consists of three geological units:

- Witwatersrand Supergroup,
- Ventersdorp Supergroup; and
- Karoo Supergroup.

The Witwatersrand Supergroup comprises of Randian age sedimentary rocks with several thousand meters of thickness (Baran, 2003). These sedimentary rocks consist of shale, mudstone quartzite and conglomerate.

The Ventersdorp Supergroup consists of an assemblage of sedimentary and volcanic rocks of the Randian age, which are subdivided into the Klipriviersberg Group and Platberg Group. The rocks occur under thick Karoo cover in the Free State Goldfields where they overly the Witwatersrand Supergroup. The Platberg Group, formed by debris flow sediments, lies at the top, and the Klipriviersberg Group with heavy basaltic to andesitic lavas is at the bottom. There are three land types present across the site.

- Land type Bd20 is dominated by deep, yellow, well-drained sandy to loamy soils. The lower lying land type Dc8, has shallower, clay rich, structured soils including vertic Land-use and Agricultural Potential.
- Land type Bc30 is a plinthic catena dominated by moderately deep to deep red and yellow loamy soils with a fluctuating water table in the subsoil.

A map indicating land types and soils is shown in **Figure 5**.

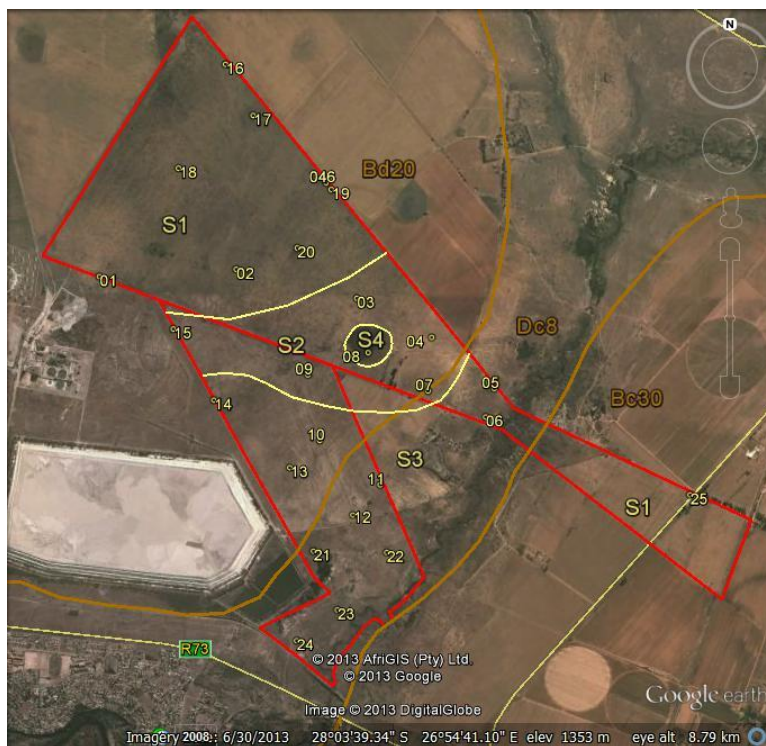


FIGURE 5: LAND TYPE AND SOIL DISTRIBUTION ACROSS THE SITE.

Land type boundaries and labels are given in darker brown; Soil sample positions and soil lines are indicated in light yellow text and lines; Soil types are indicated by larger light yellow labels according to the following: S1 = deep, well-drained red and yellow soils of land types Bd20 and Bc30; S2 = Less well drained Avalon soils of land type Bd20; S3 = shallow soils with underlying clay (Valsrivier form); S4 = Vertic, wetland soils (Arcadia form).

The upper parts of the site are classified as having low susceptibility to water erosion, while the shallower soils on the slopes have low to moderate susceptibility.

The major limitation to agriculture is the aridity and uncertainty of rainfall. Shallow soils are an additional major limitation to agriculture in those parts of the farm where they occur.

Sensitivity to development in terms of the potential of agricultural land and the related significance of the loss of agricultural land has been classified across the site.

7.4. LAND-USE AND AGRICULTURAL POTENTIAL

The information regarding the land-use and agricultural potential of the proposed development area were sourced from the Soil & Agricultural Potential Assessment undertaken by the specialist, Mr. Johann Lanz (please refer to **Appendix C1** for the full report).

Potential maize yield is a good indication of agricultural potential across the area. The majority of the site has a marginal maize yield of 0.6 to 1.4 tons per hectare. Most of the site, except for a small portion in the east, is not currently used as cultivated land and is only used as grazing land.

Most of the farm is currently uncultivated, and is used for grazing of cattle and sheep, but this is largely due to the farmer having significant limitations in terms of resources for cultivation. Some of the land has been cultivated in the last 10 years. Surrounding land use is the same – maize and other crop cultivation on suitable soils with cattle grazing on less suitable ones. There is no irrigated land on the site. There is little development at the site and only informal housing, no farmstead.

The most viable agricultural land use is cultivation (of maize, sunflowers etc.) on the more suitable soils with cattle grazing on the less suitable ones. Alternative agricultural land uses are limited.

7.5. ECOLOGY

The information below regarding the ecology of the proposed development area were sourced from the Ecological and Wetland Assessment study undertaken by the specialist, Prof. Johan du Preez (please refer to **Appendix C3** for the full report).

7.5.1. FLORA

The natural vegetation in the proposed development area is dominated by the Vaal-Vet Sandy Grassland vegetation type. This vegetation unit has a conservation status as endangered due to the low percentage under conservation and the threat of destruction due to agricultural activities, especially crop production (Mucina & Rutherford, 2006). Much of these grasslands have been degraded throughout the region. Most of it has been transformed for cultivation (ploughed for commercial crops) and the rest under strong grazing pressure from cattle and sheep.

Three plant communities occur on the proposed development area. The following is a summary of the Species Richness and Ecological Sensitivity of the plant communities:

TABLE 5: SUMMARY OF THE SPECIES RICHNESS AND ECOLOGICAL SENSITIVITY OF THE PLANT COMMUNITIES.

Plant community	Species Richness	Sensitivity
1. <i>Themeda triandra</i> – <i>Eragrostis chloromelas</i> Grassland	Medium	Medium
2. <i>Acacia karroo</i> – <i>Lycium hirsutum</i> tree community	Low	Medium
3. <i>Eragrostis plana</i> – <i>Panicum coloratum</i> wetland	Low	Medium

***Themeda triandra* – *Eragrostis chloromelas* Grassland**

This plant community occurs on undulating plains dominated by sandy loam soils. The grassland is in a degraded condition. The ground layer is dominated by grassland vegetation mixed with a number of forbs and bulbous species. *Themeda triandra*, *Eragrostis chloromelas*, *E. curvula*, *E. gummiflua*, *E. superba* dominate. Other grass species are *Hyparrhenia hirta*, *Aristida congesta* and *Heteropogon contortus*. The forbs are *Crabbea acualis*, *Felicia muricata*, *Tripteris aghilliana*, *Ledebouria luteola*, *Pentzia globosa*, *Hermannia depressa*, *Helichrysum rugulosum*, *Vernonia oligocephala* and *Rhychosia totta*.

No Red data or protected species were found on the site. The total community has a medium sensitivity.

***Acacia karroo* – *Lycium hirsutum* shrub community**

This vegetation type is limited to the seasonal drainage canal. Overall the vegetation cover is good on the stream banks. The dominant shrubs are *Acacia karroo*, *Lycium hirsutum* and *Asparagus larycinus*.

No Red data species were found and the community has a medium sensitivity.

***Eragrostis plana* – *Panicum coloratum* wetland (Fig A3)**

This community is present in various pans and drainage lines on the site. Typical species are the grasses *Leptochloa fusca*, *Eragrostis plana*, and *Cynodon hirsutus*. Stands of *Phragmites australis* occur in the Rietspruit stream.

No protected or Red data species were found and the community. This community is sensitive because of its wetland functions.

7.5.2. FAUNA

The faunal survey focused mainly on mammals, birds, reptiles and amphibians of the proposed development area.

7.5.2.1. AMPHIBIANS

Amphibians are an important component of South Africa's exceptional biodiversity (Siegfried

1989). The majority of frog species in the Free State Province can be classified as explosive breeders emerging after sufficient summer rainfall between October and March. Explosive breeding frogs utilise ephemeral pans or inundated grasslands for their short duration reproductive cycles.

As the survey was undertaken for a brief period during the spring the majority of species are in torpor or hibernating. Ideally, a herpetological survey should be undertaken throughout the duration of the wet season (October-March). It is only during this period accurate frog lists can be compiled.

Amphibian Species of Conservation Concern

The Giant Bullfrog (*Pyxicephalus adspersus*) is a protected frog species whose conservation status has been revised and will be included as a Red Data Species under the category 'Lower Risk near threatened'. Giant Bullfrogs have been recorded breeding at suitable sites around Virginia area. Bullfrogs breed in the shallow margins of seasonal pans and dams. Bullfrogs may occasionally also breed in shallow seasonally inundated depressions.

7.5.2.2. REPTILES

Reptile lists require intensive surveys conducted for several years. Reptiles are extremely secretive and difficult to observe even during intensive field surveys conducted over several seasons. The majority reptile species are sensitive to severe habitat alteration and fragmentation. Due to previous agricultural activities in the area coupled with increased habitat destruction for urban expansion, degradation (alien plant invasion) and disturbances are all causal factors in the alteration of reptile species occurring in these areas. The indiscriminate killing of all snake species as well as the illegal collecting of certain species for private and the commercial pet industry reduces reptile populations especially snake populations drastically.

The frequent burning of the site will have a high impact on remaining reptiles. Fires during the winter months will severely impact on the hibernating species, which are extremely sluggish. Fires during the early summer months destroy the emerging reptiles as well as refuge areas increasing predation risks. Continual destruction of suitable habitats especially crop production, and has resulted in the disappearance of numerous reptile species on the Highveld.

Reptile Species of Conservation Concern

No reptile species of conservation concern were found on the property however suitable habitats for Sungazer Lizards (*Cordylis giganteus*) are present. This is a Red Data species with an endangered status.

7.5.2.3. AVIFAUNA/BIRDS

Due to the extensive destruction of the Vaal-Vet Highveld sandy Grassland for maize production the bird population on the site is limited to typical grassland birds which adapted to the transformed environment. Guineafowl, Long-tailed Widowbirds, Crowned Plovers, Swainson's Spurfowl, Red-billed Queleas, Egyptian Geese, and Spur-winged Geese are common in the area. Rarer birds such as raptors frequent the area on a seasonal basis but the habitat is not suitable for them to become resident. No Red Data species were recorded on the proposed development area.

7.5.2.4. MAMMALS

No small mammal trappings were conducted during brief field survey. The area was traversed by vehicle and on foot to ascertain the presence of available refuges. Refuges such as burrows, limited loose rock and stumps were investigated. Fieldwork was augmented with previous surveys in similar habitats as well as published data. The majority of larger mammal species are likely to have been eradicated or have moved away from the area, as a result of previous agricultural activities, hunting and poaching as well as habitat alteration and degradation. Porcupine, Blacked-Back Jackal and Caracal have however been recorded from surrounding grasslands.

Mammal species recorded within the study area as well as those that may occur within the study area, on the basis of available distribution records are included in the Ecological Report attached in **Annexure C**.

Mammal Species of Conservation Concern

No sensitive or endangered mammals were recorded within the study area. The majority of larger mammal species are likely to have been eradicated or have moved away from the area, as a result

of hunting and poaching as well as habitat alteration and degradation. Smaller mammal species are extremely vulnerable to snares and poaching activities as well as feral cats and dogs.

According to the “South African Red Data Book of Terrestrial Mammals” (Smithers 1986) and Skinner and Smithers (1990), the study area falls within the distribution ranges of a number of species which are placed into one of known threatened species (Endangered, Vulnerable and Rare). Due to the high level of human activity surrounding the study area it is however unlikely that the study area comprises significant habitat for any species of threatened larger mammals.

TABLE 6: RED LISTED FAUNA SPECIES FOR THE REGION.

Scientific name	Common name	Threatened Status
<i>Atelerix frontalis</i>	South African Hedgehog	NT
<i>Poecilogale albinucha</i>	African Weasel	DD
<i>Pedetes capensis</i>	Spring Hare	VU
<i>Mastomys albicaudatus</i>	White-tailed mouse	VU

7.6. GROUND WATER

Groundwater potential in the region is associated with the Karoo aquifer system, which can be subdivided into the following units: a shallow, weathered aquifer; a deeper, fractured, hard rock aquifer; and an alluvial aquifer of limited extent. The groundwater for the shallow weathered aquifer is often perched on impermeable clay or shale horizons and may be artesian in places. The shale layers often restrict the downward infiltration of rainwater into the aquifer. The borehole yields in this aquifer are generally low due to the low permeability of the clayey weathered aquifer material. The ground water quality is good, especially in undisturbed areas due to the rainfall recharge.

The deeper Karoo aquifer is associated with fracturing along dolerite dykes and sills, which create conduits for groundwater movement. Occasional high yielding boreholes can be intersected, but most of them are unable to sustain large-scale pumping and irrigation. The groundwater quality is generally poor due to the concentration of salts and slower rate of recharge.

Water for stock and for human use is obtained from boreholes on the farms. There is no water available for irrigation, and no irrigated land on the farms.

7.7. WETLANDS

Prof. P.J. du Preez, undertook the Wetland Assessment for the proposed development (**Appendix C3**).

During the assessment seasonal systems which only have water during the raining season were identified. The wetland runs through the northern parts of the Farm Onverwag No. 728. A few small pans also occur within the proposed development area. An old quarry containing deeper holes with standing water were also identified within the proposed development area. No permanently wet areas fed by springs, occur within the proposed development area.

The soil within the wetland areas is mostly clayey and the drier soils are of the Bloemdal form. The vegetation of these areas is characterized by various wetland species such as *Cyperus longus*, *Leptochloa fusca*, *Eragrostis plana*, *Panicum coloratum*, *Pseudognaphalium luteo-album* and *Oenothera rosea*. The wetland is from a vegetation point of view regarded as being degraded with large sections transformed, especially in the wetland area itself – probably due to previous soil disturbances as well as the fact that it is a seasonal wetland.

Also during the assessment, the Ecological Importance and Sensitivity (EIS) and functions of the wetlands were calculated using the new draft DWA guidelines and model, as developed by M. Rountree. Information was contained from the South African National Biodiversity Institute's (SANBI) SIBIS and VEGMAP products.

By means of using the abovementioned guidelines and model, it was determined that the wetlands is regarded as not being ecologically important or sensitive with a low biodiversity and plays a low role in moderating water quality and quantity.

Although the wetland is currently in a degraded state, the Free State Department of Economic Development, Tourism and Environmental Affairs (DETEA), regards all wetland areas as sensitive ecosystems.

7.8. SOCIAL ECONOMIC STRUCTURE OF THE AREA

The information below regarding the social economic structure of the proposed development area were sourced from the Social Impact Assessment undertaken by the specialist, Prof. Francois Retief (please refer to **Appendix C5** for the full report).

The Matjhabeng Local Municipality incorporates Welkom, Odendaalsrus, Virginia, Hennenman, Allanridge and Ventersburg with a combined population of 406461 people.⁶ The economy of the Matjhabeng Municipality area centres around the mining activities located in and around

⁶ Census 2011.

Allanridge, Odendaalsrus, Welkom and Virginia. Manufacturing associated with the mining sector exists to a limited extent in the towns mentioned above. Other manufacturing activities are limited.

In terms of economic contribution, the Matjhabeng Local Municipality is the most important Local Municipality in the district. The Matjhabeng Local Municipality accounts for almost 72% of the district's economic output.

Matjhabeng Local Municipality is one of five local municipalities within the Lejweleputswa District Municipality. It is the largest contributor to the district economy. Cumulatively, around 72% of the district's economic output is generated by Matjhabeng; however a general decline in the economic contribution of Matjhabeng is evident due to the decline of the mining sector.

In terms of future economic development, there is likely to be a decline in the role played by mining, which will also impact negatively on employment in the Free State Province.

7.8.1. SOCIO-ECONOMIC DEVELOPMENT

7.8.1.1. POPULATION

The 2011 Stats SA data shows that the Free State Province accommodates 5.3% and the Matjhabeng Local Municipality 0.8 % of the total South African population. The decline in the provincial population is attributed to a number of factors, including the declining contribution of the mining and agricultural sectors whereas HIV AIDS has also been identified as a contributing factor (FSPDGS, 2005).

TABLE 7: POPULATION OF THE MATJHABENG AREA.

Area	Black African	Coloured	Indian or Asian	White
Matjhabeng	356098	8904	474	42694

(Source: Stats SA, 2011 & Community Survey, 2007)

7.8.1.2. EDUCATION

A general increase in the proportion of the population with higher education and Grade 12/Matric qualifications while a general reduction in the population with no schooling is also evident. Lejweleputswa district municipality experienced the same increase in the proportion of the population with higher education and Grade 12/Matric qualifications from 2001 to 2011 (Stats SA, 2011).

However the education level of the Free State Province is low in comparison to the education level of South Africa, this might have a negative impact on the ability of the province to promote economic growth (FSPDGS, 2005).

TABLE 8: HIGHEST LEVEL OF EDUCATION.

Year	Lejweleputswa			Free State		
	1996	2001	2011	1996	2001	2011
No schooling	14.9%	15.3%	6.8%	16.0%	16.0%	7.1%
Grade 12/ Matric	11.3%	15.7%	26.1%	13.5%	17.5%	27.1%
Higher	4.4%	4.8%	7.4%	5.9%	6.3%	9.4%

(Source: Stats SA, 2011)

7.8.2. **ECONOMY, DEVELOPMENT & EMPLOYMENT**

7.8.2.1. **ECONOMY**

Free State Province represented 5.3 % of South Africa's total GDP in 2011 leaving the Free State Province with the second smallest provincial economy in South Africa. The Free State contribution to the national GDP has slightly declined from 1996 to 2011, possibly due to the in reduced contribution of the mining sector.

It needs to be taken into account that the Free State is not surrounded by a prosperous economic environment of big businesses and industries as compared to some other provinces with huge infrastructural and economic activities (FSPGDS, 2005).

With regarding to sector contribution, the 'general government services' sector is the largest contributor (15%) to the economy of the Free State province, followed by the 'mining' and 'finance' sectors (Stats SA, 2011).

7.8.2.2. **AVERAGE HOUSEHOLD INCOME**

With the effects of inflation as well as the increasing access to jobs and a growing economy, the average annual household income quite substantially increased in the Free State Province since 2001 to 2011 (Stats SA, 2012). The average household income of less than R80 000 per annum (for 2011) for the Free State province, compare well with other provinces in South Africa.

7.8.2.3. LABOR MARKET

The unemployment rate for the Free State province peaked in 2006 with an unemployment rate of 34.1%, however the unemployment rate declined slightly in 2011 to 33 %. Lejweleputswa District Municipality, where the study area is located, is the district municipality with the highest unemployment rate in the Free State province for the year 2011, possibly due to the declining contribution of the mining sector.

The number of employees in the Free State province reached its lowest point of less than 600 000 employees, in 2001 with an increase to approximately 700 000 employees in 2007. The number of unemployed citizens of the Free State Province reached a peak of more than 400 000 in 2001, with a gentle decline towards 2011 whilst the number of economically inactive citizens in the Free State Province increased from 1996 reaching a peak of more than 700 000 in 2011 (Stats SA, 2011).

7.9. HERITAGE

The information below regarding the heritage of the proposed development area were sourced from the Archaeological and Palaeontological Impact Assessments undertaken by the specialists (please refer to **Annexures C2 and C4** for the full reports).

The Archaeological and Palaeontological Assessments forms part of the Heritage Impact Assessment and complies with the requirements of the South African National Heritage Recourse Act (Act No. 25 of 1999) (NHRA). The area was assessed to identify possible archaeological and historical material and to establish the potential impact on any cultural material that might be found.

7.9.1. ARCHAEOLOGICAL ASSESSMENT

The Phase 1 AIA assessment of the approximate 630ha proposed development area was undertaken by Me. Karen van Ryneveld, on the 8th and the 9th of October 2013.

Five archaeological and cultural heritage resources, as defined and protected by the NHRA 1999, were identified during the field assessment:

- A small cement dam, inferred to pre-date 60 years of age and by implication formally protected by the NHRA 1999. The dam measures approximately 4-5m in diameter. The structure is rather overgrown and no longer in use;

- The site comprises of 2 rows of vegetation running approximately 70m apart parallel in a rough north-east to south west direction for more or less 160m. the eastern line of vegetation comprise primarily of Eucalyptus trees while 'garingboom' (*Agave Americana*) clusters characterize the western rough alignment of vegetation. It is inferred that the vegetation were planted as wind breaks and perhaps used as small livestock enclosures. Cultural landscapes are formally protected by the NHRA 1999;
- The remains of a Colonial Period farmstead but contemporary cultural overlay is evident at the site, having impacted on Colonial Period site features and resulted in additional contemporary features having been placed amidst the Colonial Period features radically decreasing the heritage significance of the site;
- The partial foundation remains of a rectangular stone built structure measuring approximately 4x3m in size. It is inferred that the site is directly linked to the remains of a Colonial Period farmstead and may well represent an outbuilding of the original farmstead. Ruined remains may thus well date to the rough 1880's or soon thereafter and is formally protected by the NHRA 1999; and
- The railway bridge is situated just outside the proposed study site and will not be impacted on by development. The bridge can reasonably be inferred to date to the 1949 period when the railway siding was constructed, implying that the bridge constitutes a structure older than 60 years and thus formally protected by the NHRA 1999.

7.9.2. PALEONTOLOGICAL ASSESSMENT

Within the palaeontological assessment study undertaken by Dr. Gideon Groenewald, it was found that most of the study area is underlain by Quaternary aged aeolian sand deposits. Sections of both farms are underlain by Permian aged sedimentary rocks of the Adelaide Subgroup, Beaufort Group, Karoo Supergroup. Two areas on Portion 2 of the Farm Vallkrans No.220 are underlain by Jurassic aged Dolerite.

Quaternary sand deposits (Qs)

This deposit is characterised by red to grey aeolian dune sand deposits.

Dolerite (Jd)

Dolerite is a very hard igneous rock that intruded the sedimentary layers during the Jurassic Period and occurs either as sills or as dykes. Sills can be from a few meters to tens of meters thick.

Adelaide Subgroup (Pa)

The Adelaide Subgroup consists mainly of blue-grey mudstone and shale with very fine to coarse grained buff-white to white sandstone and subordinate conglomerate. It is interpreted as a mixed fluvial.

8. ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

8.1. ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS

The overarching environmental legislation for the management of the environment in South Africa is the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and its amendments. This legislation states that sustainable development requires the integration of social, economic and environmental factors in the planning, implementation and evaluation of environmental decisions to ensure that development serves present and future generations. Chapter 5 of NEMA makes provisions for regulations to be formulated and published and these became effective from August 2010.

These EIA Regulations, 2010 replaced the Environmental Impact Assessment Regulations promulgated in 2006. Section 24 (F) of the NEMA prohibits a listed activity from commencing prior to the authorisation thereof by the competent authority.

The purpose of these Regulations is “to regulate procedures and criteria as contemplated in Chapter 5 of the National Environmental Management Act for the submission, processing, consideration and decision of applications for environmental authorisation of activities and for matters pertaining thereto.”

In terms of these EIA Regulations, 2010, there are two major categories of Environmental Impact Assessment Processes namely:

- Basic Assessments Process; and
- Scoping and Environmental Impact Assessment Process (commonly referred to as Full EIAs) – *the process applicable to this application.*

8.2. POTENTIAL ENVIRONMENTAL IMPACTS

This chapter describes the environmental issues and impacts as identified by the Environmental Assessment Practitioner (EAP).

The construction and operation of Photovoltaic modules on a large scale can result in negative local environmental impacts e.g. on birds, landscapes and sustainable land use (including protected areas, etc.). The negative environmental impacts from solar energy installations are much lower in intensity than those produced by conventional energies, but they still have to be assessed and mitigated.

On the other hand, solar generated power also has a number of positive impacts when considering the greater scheme of electricity generation. One of these is the fact that solar power is one of the cleanest renewable resources available. So while many of the negative impacts may be on a local scale, the positive impacts may have a global reach. This chapter discusses the impacts (negative and positive) likely to be associated with the project.

8.2.1. ENVIRONMENTAL SCREENING CRITERIA CHECKLIST

In order to identify and effectively assess the potential environmental impacts of the proposed development, an environmental screening criteria checklist was used and completed as follows.

TABLE 9: IDENTIFICATION OF POTENTIAL IMPACTS (ENVIRONMENTAL SCREENING).

Criteria	Yes	No	Description and Comments
1. Surface water and Groundwater			
1.1	Yes		<ul style="list-style-type: none"> • The project could involve construction or decommissioning activities within surface watercourses during construction. • Mitigation measures will have to be put in place during the construction of the crossings and in areas close to water courses to ensure that there is limited or no significant impact on the water quality and flow of the streams. • Surface water turbidity, EC, and TDS may be increased by the erosion of construction areas (limited to construction and decommissioning phases only). • The construction and operation of the development will not involve any abstraction of water from a watercourse and will also not involve the usage or storage of significant amounts of water. • Surface runoff patterns will not be significantly altered by

Criteria		Yes	No	Description and Comments
				the project.
1.2	Negative effect on groundwater quality and water flow	Yes		<ul style="list-style-type: none"> The project will not involve any groundwater abstraction. There is potential for groundwater contamination due to accidental spills of hazardous substances during the construction, maintenance, and decommissioning phases of the project. The impact on groundwater quality and flow is therefore likely to be of very low significance.
2.	Soils (geology) and topography			
2.1	Negative impact of soil contamination, and compaction of soils	Yes		<ul style="list-style-type: none"> The project will involve the construction of concrete foundations for the PV panels and other site associated infrastructure, which is likely to have impact on topsoil loss, compaction of soils, soil erosion etc. Although the total area to be disturbed (foundation foot print) is minimal compared to typical construction sites, mitigation measures will have to be put in place to manage these impacts. The more significant impact on soil, will come from the construction of roads, and trenches for the cabling.
2.2	Loss of agricultural land use	Yes		<ul style="list-style-type: none"> Land will be occupied by PV panels and other infrastructure, including roads, for the duration of the project in all the phases of the project. Land will be unavailable for agricultural production purposes.
2.3	Soil erosion due to alteration of the surface run-off characteristics.	Yes		<ul style="list-style-type: none"> Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, the establishment of hard standing areas and roads, and the presence of panel surfaces. Erosion will cause loss and deterioration of soil resources and may occur during all phases of the project.
3.	Ecological Impact			
3.1.	Negative impact on vegetation and other flora?	Yes		<ul style="list-style-type: none"> The project will entail vegetation clearance and ground cover clearing during the construction phase. This is

Criteria		Yes	No	Description and Comments
				<p>likely to have some type of impact on vegetation and flora on the site.</p> <ul style="list-style-type: none"> A detailed ecological impact assessment will be undertaken to determine the significance of this impact. However from the site visits undertaken as part of the scoping report, the site appears to be in an already transformed or impacted state.
3.2	Negative impact on wetlands and riparian vegetation		No	<ul style="list-style-type: none"> The project site has wetlands and watercourses, the ecological impact investigation will be conducted to report findings. However construction areas will be designated such that they stay away from any sensitive wetland or marshy areas, which shall be deemed as NO-GO Areas.
3.3	Negative impact on Birds and Avian Species		No	<ul style="list-style-type: none"> Solar PV projects are not known to have negative impacts on birds.
4.	Heritage Impact			
4.1	Negative impact on graveyards, rock art, historical buildings, archaeological site and artefacts etc.		No	<ul style="list-style-type: none"> Based on the SDF and a desktop assessment, there was no evidence of any sites or features of heritage, archaeological and cultural importance observed or noted. A phase 1 archaeological impact assessment will be conducted during the EIA phase in order to confirm this.
5.	Noise Impact			
5.1	Negative impact of noise on surrounding receptors (residential areas, institutions, and business sites).	Yes		<ul style="list-style-type: none"> The construction of the PV structures is likely to have some noise impact on the surrounding but there is generally no sensitive receptors near the site. The Operation phase of Solar PVs is not known to have any significant noise impact.
6.	Visual Impact			
6.1	Negative impact on Aesthetically pleasing and scenic landscape	Yes		<ul style="list-style-type: none"> The construction of PV structures is likely to have some impact on the viewscape especially since the site is located in a fairly rural natural landscape. The PV panel are generally located at heights close to

Criteria		Yes	No	Description and Comments
				<p>the ground level and might not be visible from far distances.</p> <ul style="list-style-type: none"> This issue will be addressed by a screening level visual impact assessment study.
7.	Socio-economic Impact			
7.1	Negative impact on neighbourhood and community character	Yes		<ul style="list-style-type: none"> There are currently no PV facilities in the area so neighbourhood and community character will change the agricultural and rural character of the community. However, it is important to note that neighbourhood or community effects are subjective in nature.
7.2	Negative impact on local businesses, institutions or public facilities		No	<ul style="list-style-type: none"> No negative impact anticipated
7.3	Negative impact on local Tourism		No	<ul style="list-style-type: none"> No negative impact anticipated, as there is currently no tourism in the immediate local area or surrounding the site.
7.4	Negative impact on the local economy or the municipal economy?		No	<ul style="list-style-type: none"> No negative impact anticipated, but rather a positive economic impact as a result of increased tax base, job creation, increased capacity of electricity in the area, especially green power. There is also likely to be some jobs created during the construction of the project, up to 30 people, especially youths and women, are likely to be employed during this phase.
8.	Traffic Impact			
8.1	Negative impact on traffic	Yes		<ul style="list-style-type: none"> During construction and decommissioning, delivery and removal of equipment to the site will result in a temporary increase in local traffic. The operational phase is not likely to have any significant impact on local traffic.
8.2	Negative impact on public health and safety.	Yes		<ul style="list-style-type: none"> Health and Safety risk related to construction work and electrical installation will be possible during the construction and decommissioning phase.

Criteria		Yes	No	Description and Comments
				<ul style="list-style-type: none"> Mitigation measures based on Occupational Health and Safety Act, will be put in place to manage these risks. All power generation and electrical installations have got significant health and safety risks. However, this facility will be a high security and controlled access facility to ensure that any unauthorised person does not access it.

Yes = Means the impact is identified as a potential impact and are discussed further in this EIA Report.

8.2.2. **POTENTIAL KEY OR SIGNIFICANT IMPACTS ON THE RECEIVING ENVIRONMENT**

Further to the above issues, the following key environmental impacts emerged as the more pertinent and substantive issues, as were identified by the EIA project team.

8.2.2.1. **IMPACT ON FLORA**

Three plant communities occur on site where the proposed development is planned. They are the *Themeda triandra – Eragrostis chloromelas* Grassland, *Acacia karroo – Lycium hirsutum* tree community, *Eragrostis plana – Panicum coloratum* wetland. No Red Data species occur on the site. All three plant communities can be regarded as sensitive plant communities.

The proposed development will destroy the vegetation within the footprint area of the proposed development.

8.2.2.2. **IMPACT ON FAUNA AND IMMEDIATE ENVIRONMENT**

The proposed development of the Lebone Solar Farm, will most likely have a **medium-high** negative, long-term impact on the remaining (albeit limited) faunal component, residing in or utilising the affected natural areas. Alteration of the grassland vegetation along the proposed development will directly, and indirectly, impact on the smaller sedentary species (insects, arachnids, reptiles, amphibians and mammals) adapted to their ground dwelling habitats. Larger, more agile species (birds and mammals) will try and re-locate in suitable habitats away from the development. In case the proposed development is going to take place on the existing crop fields, the impact on the faunal populations will be reduced significantly.

8.2.2.3. IMPACT ON BIRDS

Solar Energy PVs are also not generally associated with negative impacts on birds and bats, unless there is overhead power lines, which may represent a risk to both resident and migratory birds. However the construction phase may pose some impacts such as:

- Habitat disturbance: Construction and maintenance work can displace birds from preferred habitats and the breeding success rate may be reduced;
- Interference with birds' movements between feeding, wintering, breeding and molting habitats, could result in additional flights consuming more energy; and
- Reduction or loss of available habitat. The impacts on birds cannot be generalized for several reasons:
 - Impacts are very site-specific (depending on landscape topography, solar farm layout, season, types of resident and migratory birds in the area, etc.).
 - Impacts vary among the different bird species.

In the case of this project these impacts are anticipated to be very low since most of the electrical reticulation shall be underground. There will also be a power line constructed above ground. The area is also already crisscrossed by a number of high voltage and medium voltage lines and hence the contribution of the project is not likely to be significant at all.

8.2.2.4. IMPACT ON WETLANDS

The wetland area is regarded as being not ecologically important or sensitive as it has a low biodiversity and does not play a significant role in moderating water quality and quantity. No development is allowed within 32m from the edge of the wetland.

8.2.2.5. VISUAL IMPACT

The development of a PV plant on the proposed development farms and the associated infrastructure will have a low-medium visibility on observers within 3-5km from the facility.

Sensitive visual receptors identified include, residents on the perimeter of Saaiplaas on the east, residents on farmsteads and travellers along the roads. The undulating topography and tailing dumps in the area provide some visual absorption capacity to mitigate the visual impact of these receptors.

More detailed viewshed analysis will be undertaken for the PV plant and all associated infrastructure, based on the final layout of the facility.

8.2.2.6. NOISE IMPACT

Apart from the construction phase, the operation of the proposed Solar PV project is not likely to generate any significant Noise. Therefore in this case we do not consider Noise as a significant potential aspect and hence no detailed Noise Impact Assessment will be undertaken during the EIA phase.

8.2.2.7. IMPACT ON GEOLOGY, SOILS AND AGRICULTURAL POTENTIAL

From a land use point of view, the key questions that need to be answered are whether the project:

- Will be compatible with existing or planned adjacent land uses;
- Whether it will negatively modify the overall character of the surrounding area;
- Whether it will disrupt established communities; and
- Whether it will be integrated into the existing landscape.

Given the location of the proposed Solar Facility land use may be changed through the introduction of the proposed Project, and could trigger the construction of similar projects in the area, which may have a cumulative negative impact on land value, agricultural potential, visual impact etc. The significance of these impacts would be cumulative and a function of the amount of development attracted to the area.

It is assumed that the land use within the immediate vicinity of the Project would continue to be agricultural in nature e.g. grazing, and that the level of cumulative impact of the project on the environment would be minimal.

8.3. METHODOLOGY FOR IMPACT ASSESSMENT

This section provides a detailed description of the methodology used to complete the environmental impact assessment study for the proposed Lebone Solar Farm.

8.3.1. ENVIRONMENTAL IMPACT ASSESSMENT CRITERIA

For the purpose of assessing, rating and assigning significance to the potential impacts, an impact assessment criteria has been developed. The assessment of impacts was based on the EAP's and specialists' expertise, professional judgment, field observations and desktop analysis.

The criteria for assessing the identified potential environmental impacts or impact prediction, aims at providing a basis for determining the likely significance of each impact. This involves the use of

any number of recognised methods to forecast the significance of the potential impacts. In order to assess the potential impacts as objectively as possible, the following assessment criteria will be used:

8.3.1.1. *MAGNITUDE OF SEVERITY OF IMPACTS*

This criterion considers the severity of the impact in terms of how it impacts on the receiving environment, taking into account the degree to which the impact may cause **irreversible damage** or **irreplaceable** loss to the resource.

TABLE 10: EXPLANATION OF SIGNIFICANCE RATINGS AND ASSOCIATED REQUIRED ACTIONS.

Type of criteria	1 - Low	2 - Medium	3 - High
Quantitative	0 – 33%	34 – 66%	67 – 100%
Qualitative	Insignificant / Non-Harmful	Significant / Harmful	Disastrous / Extremely Harmful
Irreversibility	Very low cost to mitigate / High potential to mitigate impacts to level of insignificance / Easily reversible	Substantial cost to mitigate / Potential to mitigate impacts / potential to reverse impact	Prohibitive cost to mitigate / Little or no mechanism to mitigate impact irreversible
Biophysical (Air quality, water quantity and quality, waste production, fauna and flora)	Insignificant change / deterioration or disturbance	Significant change / deterioration or disturbance	Disastrous change / deterioration or disturbance

8.3.1.2. *SPATIAL EXTENT OF THE IMPACT*

This criterion refers to the **spatial influence** of an impact as local (extending only as far as the activity, or will be limited to the site and its immediate surroundings), regional (will have an impact on the region), national (will have an impact on a national scale) or international (impact across international borders).

TABLE 11: EXTENT RATING.

Score & Rating	Description
1 - Low	Site specific or confined to project footprint.
2 – Medium	Extending beyond the boundaries of the project site and its buffer zone, affecting neighbours, town, local authority, district and even province.
3 – High	Affecting areas beyond the province, and country borders.

8.3.1.3. EXPLANATION OF FREQUENCY RATINGS.

Frequency refers to how often the specific activity, related to the event, aspect or impact, is undertaken.

TABLE 12: FREQUENCY RATINGS.

Score & Rating	Description
1 - Low	Once a year or once / more during operation / LOM
2 - Medium	Once / more a month
3 - High	Daily

8.3.1.4. DURATION OF IMPACTS

This criterion refers to the **amount of time** that the environment will be affected by the event, risk or impact, if no intervention, e.g. remedial action or mitigation takes place.

TABLE 13: DURATION SCALE.

Score & Rating	Description
1 – Short Term	Short term / will disappear with mitigation or completion of phase, or up to 2 years.
2 – Medium Term	Medium Term/ Persists beyond one phase but can be negated afterward. Typically more than 2 years but less than 15 years.
3 – Long Term or Permanent	More than 15 years or beyond facility's lifespan and/or no form of mitigation can result in the impact to be considered

8.3.1.5. CONSEQUENCE OF IMPACTS

The total consequence of any given impact is obtained by adding the severity, spatial scale and duration figures, i.e. **Total Consequence = (Magnitude + Spatial Scale + Duration)**.

TABLE 14: CONSEQUENCE SCORING MATRIX.

	Magnitude			
Spatial Extent	3	4	5	Duration
	5	6	7	
	7	8	9	

Where:

Low	Medium	High
3 – 4	5 – 7	8 - 9

8.3.1.6. PROBABILITY OF ACTIVITY

This criterion considers the probability of the occurrence of the activity leading to the potential impact.

TABLE 15: PROBABILITY RATING.

Score & Rating	Description
1 - Improbable	0 – 30% chance to occur
2 – Probable	31 – 60% chance to occur
3 – Definite	61 – 100% chance to occur

8.3.1.7. SIGNIFICANCE OF IMPACTS

In this method the significance of any given impact is predicted as a **product of the consequence and the probability** of that impact as per the example in the Table 12:

TABLE 16: SIGNIFICANCE RATING.

	Significance Rating & Score		
	Low (1)	Medium (2)	High (3)
Impact Magnitude	Impact poses no risk to environmental aspects. Completely acceptable for development.	Impact poses a risk to environmental aspects but can be accepted with mitigation.	Impact is of the highest order possible. No-Go area. Off limits for development
Action Required	Maintain current management measures. Where possible improve.	Implement monitoring. Investigate mitigation measures and improve management measures to reduce risk where possible.	Impact is of the highest order possible. No-Go area. Off limits for development

8.3.1.8. IMPACT RATING MATRIX

The matrix table below illustrates the summary of the results of the assessment for each activity and impact.

TABLE 17: IMPACT RATING TABLE.

Project phase: Construction/Operational/Decommissioning			
Status: Positive			
Nature of Impact		Impact	Mitigation
		Severity	
Extent			
Frequency			
Duration			

		Probability		
Percentage & Category Rating (without Mitigation)	%	Total Significance Rating	/15	/15
Significance:				
Mitigation:				
			%	

8.4. ASSESSMENT AND PROPOSED MITIGATION MEASURES OF THE POTENTIAL IMPACTS

The following impact assessments were done by the specialists in their different fields, they also suggested the relevant mitigation measures for identified issues. The sections below therefore summarises the findings and recommendations of the specialist studies undertaken as part of this impact assessment process.

8.4.1. AMBIENT AIR QUALITY

The only impact to be associated with air quality is **dust** generation from construction and decommissioning related activities.

8.4.1.1. DUST GENERATION AND SUPPRESSION

Construction and decommissioning phases.				
Status: Negative				
Nature of Impact		Impact	Mitigation	
The generation of dust from construction areas, may affect human health and to a low degree the quality of surface water during the Summer rainfall period.	Severity	2	1	
	Extent	1	1	
	Frequency	2	1	
	Duration	2	1	
	Probability	3	1	
Percentage & Category Rating (without Mitigation)	66%	Total Significance Rating	10/15	5/15
Significance: Medium				
The frequent upwelling of dust as consequence of construction may have an impact on workers causing asthma and other respiratory conditions. The impact of dust on water courses would be low since none exists in the immediate surrounds, however surface water may be affected during the Summer rainfall season.				
Mitigation:				

<ul style="list-style-type: none"> Apply dust control measures; Ensure that vehicles stay on designated roads; and Dust masks must be supplied to workers. 				
With mitigation the significance rating shall be Low .			33%	
Operational Phase				
Status: Negative				
Nature of Impact		Impact	Mitigation	
The generation of dust from the operational phase, may affect human health and to a low degree the quality of surface water during the Summer rainfall period.		Severity	1	1
		Extent	1	1
		Frequency	1	1
		Duration	1	1
		Probability	1	1
Percentage & Category Rating (without Mitigation)	33%	Total Significance Rating	5/15	5/15
Significance: Low				
As a result of disturbance of the affected footprint area relating from operational activities such as the use of vehicles on or adjacent to the facility on unpaved areas.				
Mitigation:				
<ul style="list-style-type: none"> Apply dust control measures; and Ensure that vehicles stay on designated roads. 				
With mitigation the significance rating shall be Low .			33%	
"No-go" Alternative				
Nature of Impact		Impact	Mitigation	
The status quo will remain		Severity	-	-
		Extent	-	-
		Frequency	-	-
		Duration	-	-
		Probability	-	-
Percentage & Category Rating (without Mitigation)	0%	Total Significance Rating	0/15	0/15
Significance:				
Mitigation:				
N/A				
			0%	

8.4.2. SOIL AND AGRICULTURAL POTENTIAL

In terms of the specialist study by Johann Lanz, the following are identified as potential impacts of the development on agricultural resources and productivity, and assessed in the table formats

below. The most important factor that influences the significance of agricultural impacts is the fact that the facility can be positioned on land of limited agricultural potential that is suitable only as grazing land.

See **Appendix C1** for the Soil and Agricultural Potential Specialist Study.

8.4.2.1. IMPACT ON AGRICULTURAL POTENTIAL AND SOIL CAPABILITY

Construction, operational and decommissioning phases.				
Status: Negative				
Nature of Impact		Impact	Mitigation	
Loss of agricultural land use, caused by direct occupation of land by footprint of energy facility infrastructure, and having the effect of taking affected portions of land out of agricultural production.		Severity	2	1
		Extent	1	1
		Frequency	3	3
		Duration	2	2
		Probability	3	3
Percentage & Category Rating (without Mitigation)	73%	Total Significance Rating	11/15	10/15
Significance: Medium				
Since the agricultural potential of the proposed area is limited, the construction disturbance will have a low impact on this status. In addition, this will only be kept to the minimum footprint required for construction, and it will be temporary of nature as the area will be re-instated to its original status after construction.				
Mitigation:				
Position footprint of facility on agricultural land with low potential.				
With mitigation the significance rating shall be Medium during these phases, but lower than without mitigation.			66%	
"No-go" Alternative				
Nature of Impact		Impact	Mitigation	
The non-realization of the opportunity to generate farming development capital via yearly lease agreement payments.		Severity	2	2
		Extent	1	1
		Frequency	3	3
		Duration	2	2
		Probability	3	3
Percentage & Category Rating (without Mitigation)	73%	Total Significance Rating	11/15	5/15
Significance: High				
Mitigation:				
No mitigation would be applicable without the development.				
With mitigation the significance rating shall be High .			73%	

8.4.2.2. CHANGE IN LAND-USE

Construction, operational and decommissioning phases.				
Status: Positive				
Nature of Impact		Impact	Mitigation	
Generation of multiple land use income, caused by the multiple land use of energy facility rental on less agriculturally suitable land combined with agricultural use of better land and having the effect of providing land owners with increased cash flow to support agricultural activities.		Severity	3	3
		Extent	2	2
		Frequency	3	3
		Duration	3	3
		Probability	3	3
Percentage & Category Rating (without Mitigation)	93%	Total Significance Rating	14/15	14/15
Significance: High A great amount of people locally and provincially shall benefit indirectly from employment during construction, operation and decommissioning respectively.				
Mitigation: None				
With mitigation the significance rating shall be High Positive .			93%	
"No-go" Alternative				
Nature of Impact		Impact	Mitigation	
The land use will not change and the site will remain unchanged, i.e. vacant and underutilized. No PV plant and the creation of job opportunities in the area.		Severity	0	0
		Extent	1	1
		Frequency	0	0
		Duration	3	3
		Probability	1	1
Percentage & Category Rating (without Mitigation)	33%	Total Significance Rating	5/15	5/15
Significance: Low				
Mitigation: The only mitigation to be applied will be the eradication of alien vegetation. Veld could be left to undergo natural succession or farming practices can be undertaken with due care.				
With mitigation the significance rating shall be Low .			33%	

8.4.2.3. SOIL EROSION

Construction, operational and decommissioning phases.			
Status: Negative			
Nature of Impact		Impact	Mitigation
Soil Erosion caused by alteration of run-off characteristics due to panel surfaces and access roads and having the effect of loss and deterioration of soil resources. Note: The erosion risk is fairly low due to low erodibility.		Severity	2
		Extent	1
		Frequency	3

		Duration	2	2
		Probability	2	1
Percentage & Category Rating (without Mitigation)	66%	Total Significance Rating	10/15	7/15
Significance: Medium				
Mitigation: Implement an effective system of run-off control which collects and disseminates run-off water from hardened surfaces and prevents potential down slope erosion. This should be in place and maintained during all phases of the development.				
With mitigation the significance rating shall be Low during these phases.			46%	
“No-go” Alternative				
Nature of Impact			Impact	Mitigation
The land use will not change and the site will remain unchanged, i.e. vacant and underutilized. No PV plant and the creation of job opportunities in the area.		Severity	0	0
		Extent	1	1
		Frequency	0	0
		Duration	3	3
		Probability	1	1
Percentage & Category Rating (without Mitigation)	33%	Total Significance Rating	5/15	5/15
Significance: Low				
Mitigation: The only mitigation to be applied will be the eradication of alien vegetation. Veld could be left to undergo natural succession or farming practices can be undertaken with due care.				
With mitigation the significance rating shall be Low .			33%	

8.4.2.4. SOIL DISTURBANCE

Construction and Operational phases.				
Status: Negative				
Nature of Impact			Impact	Mitigation
Loss of topsoil caused by poor topsoil management (burial, erosion, etc.) during construction related soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.) and having the effect of loss of soil fertility on disturbed areas after rehabilitation.		Severity	2	1
		Extent	1	1
		Frequency	3	1
		Duration	2	1
		Probability	2	1
Percentage & Category Rating (without Mitigation)	66%	Total Significance Rating	10/15	5/15
Significance: Medium Soils will be disturbed as excavation must be done to establish the plant				
Mitigation: 1. Strip and stockpile topsoil from all areas where soil will be disturbed.				

2. After cessation of disturbance, re-spread topsoil over the surface.	
3. Dispose of any sub-surface, clay spoils from excavations where they will not impact on agricultural land, or where they can be effectively covered with topsoil.	
With mitigation the significance rating shall be Low during these phases.	33%

8.4.3. ECOLOGICAL IMPACT

The information below regarding the ecological impact of the proposed project on the proposed development area were sourced from the Ecological and Wetland Assessment study undertaken by the specialist, Prof. Johan du Preez (please refer to **Appendix C3** for the full report).

8.4.3.1. VEGETATION LOSS

Construction Phase				
Status: Negative				
Nature of Impact			Impact	Mitigation
Destruction of vegetation at solar site	Severity		3	3
	Extent		1	1
	Frequency		3	2
	Duration		3	3
	Probability		3	3
Percentage & Category Rating (without Mitigation)	86%	Total Significance Rating	13/15	12/15
Significance: High Natural vegetation will be destroyed as excavation must be done to establish the plant				
Mitigation: Minimise the footprint to the smallest possible area by sticking to specific construction roads				
With mitigation the significance rating shall be High during these phases.			80%	
Operational Phase				
Status: Negative				
Nature of Impact			Impact	Mitigation
Destruction of vegetation at solar site	Severity		3	3
	Extent		1	1
	Frequency		3	2
	Duration		3	2
	Probability		3	2
Percentage & Category Rating (without Mitigation)	86%	Total Significance Rating	13/15	10/15
Significance: High Natural vegetation will be destroyed as excavation must be done to establish the plant				

Mitigation: Minimise the footprint to the smallest possible area by sticking to specific construction roads	
With mitigation the significance rating shall be Medium during these phases.	66%

8.4.3.2. EROSION

Construction Phase				
Status: Negative				
Nature of Impact		Impact	Mitigation	
Erosion of bare areas such as dirt roads	Severity	2	1	
	Extent	2	1	
	Frequency	3	1	
	Duration	3	1	
	Probability	3	1	
Percentage & Category Rating (without Mitigation)	86%	Total Significance Rating	13/15	5/15
Significance: High Bare areas may be disturbed due to construction activities. Runoff water can cause erosion of roads.				
Mitigation: <ul style="list-style-type: none"> Minimise the footprint to the smallest possible area by sticking to specific construction roads Construct berms to take water away from roads 				
With mitigation the significance rating shall be low during these phases.		33%		

8.4.3.3. DUST

Construction Phase				
Status: Negative				
Nature of Impact		Impact	Mitigation	
Dust generation by construction vehicles	Severity	2	1	
	Extent	2	1	
	Frequency	3	1	
	Duration	3	1	
	Probability	3	1	
Percentage & Category Rating (without Mitigation)	86%	Total Significance Rating	13/15	5/15
Significance: High The frequent upwelling of dust as consequence of construction may impact on workers causing asthma and other respiratory conditions. The impact of dust on water courses would be low since none exist in the immediate surrounds, however surface water may be affected during the Summer rainfall season.				
Mitigation: <ul style="list-style-type: none"> Minimise the dust by means of dust suppression measures 				
With mitigation the significance rating shall be low during these phases.		33%		

8.4.3.4. CROP FIELDS

Construction Phase				
Status: Negative				
Nature of Impact		Impact	Mitigation	
Destruction of crops at solar site	Severity	1	1	
	Extent	1	1	
	Frequency	1	1	
	Duration	1	1	
	Probability	3	3	
Percentage & Category Rating (without Mitigation)	46%	Total Significance Rating	7/15	7/15
Significance: Medium Bare areas may be disturbed due to construction activities. Runoff water can cause erosion of roads.				
Mitigation: <ul style="list-style-type: none"> Minimise the footprint to the smallest possible area by sticking to specific construction roads 				
With mitigation the significance rating shall be medium during these phases.			46%	

8.4.3.5. "NO-GO" ALTERNATIVE IN TERMS OF THE ECOLOGICAL IMPACTS

"No-go" Alternative				
Nature of Impact		Impact	Mitigation	
The land use will not change and the site will remain unchanged, i.e. agricultural stock grazing.	Severity	0	0	
	Extent	1	1	
	Frequency	0	0	
	Duration	3	3	
	Probability	1	1	
Percentage & Category Rating (without Mitigation)	33%	Total Significance Rating	5/15	5/15
Significance: Low				
Mitigation: Eradication of alien vegetation and implementation of appropriate farming practices.				
With mitigation the significance rating shall be Low .			33%	

8.4.4. HERITAGE IMPACT

The information below regarding the impact of the proposed project on the heritage of the proposed development area were sourced from the Archaeological and Palaeontological Impact Assessments undertaken by the specialists (please refer to **Annexures C2 and C4** for the full reports).

8.4.4.1. DESTRUCTION OF HERITAGE RESOURCES

Construction and Operational Phases				
Status: Negative				
Nature of Impact		Impact	Mitigation	
Destruction or damaging of archaeological and cultural heritage resources	Severity	1	1	
	Extent	1	1	
	Frequency	1	1	
	Duration	1	1	
	Probability	1	1	
Percentage & Category Rating (without Mitigation)	33%	Total Significance Rating	5/15	5/15
Significance: Low It is highly unlikely that any heritage resources will be influenced by activities undertaken during the project lifespan.				
Mitigation:				
<ul style="list-style-type: none"> For conservation the site should be temporary fence off and permanent signposting should be applied to the area If destruction is necessary, it must be carried out under a SAHRA / FS-PHRA Site Destruction Permit. 				
With mitigation the significance rating shall be low during these phases.			33%	

8.4.4.2. DISCOVERING OF HERITAGE RESOURCES

Construction and Operational Phases				
Status: Positive				
Nature of Impact		Impact	Mitigation	
Discovering of any archaeological or cultural heritage resources, including human remains / graves, as defined and protected by the NHRA 1999, and not reported in this report during the course of the development.	Severity	1	1	
	Extent	1	1	
	Frequency	1	1	
	Duration	1	1	
	Probability	1	1	
Percentage & Category Rating (without Mitigation)	33%	Total Significance Rating	15/15	5/15
Significance: High The discovering of any archaeological or cultural heritage resources, including human remains / graves, as defined and protected by the NHRA 1999, would have a high positive significance in terms of Heritage findings.				
Mitigation:				
The developer should immediately cease operation in the vicinity of the find and report the site to SAHRA and an ASAPA accredited CRM archaeologist. Human remains confirmed younger than 60 years are to be reported directly to the nearest police station.				
With mitigation the significance rating shall be low during these phases.			33%	

8.4.4.3. "NO-GO" ALTERNATIVE IN TERMS OF HERITAGE IMPACTS

"No-go" Alternative				
Nature of Impact			Impact	Mitigation
No impact.		Severity	0	0
		Extent	0	0
		Frequency	0	0
		Duration	0	0
		Probability	0	0
Percentage & Category Rating (without Mitigation)	0%	Total Significance Rating	0/15	0/15
Significance: Low				
Mitigation:				
With mitigation the significance rating shall be Low .			0%	

8.4.5. SOCIAL IMPACT

As identified by the Social Impact Assessment undertaken by the specialist, Prof. Francois Retief (please refer to **Appendix C5** for the full report), the following impacts have been recognized to occur in each of the development phases. An overall summary of the social impact, is that both positive and negative impacts will occur as a consequence of the proposed development. Negative impacts are of a largely low significance whilst positive ones remain largely of a high significance. When considered in terms of benefit to the marginalized and impoverished local community through job creation, equity and empowerment, social impacts can be considered highly positive.

8.4.5.1. JOB CREATION

Construction Phase				
Status: Positive				
Nature of Impact			Impact	Mitigation
The proposed development will create job opportunities during the construction phase for mainly local labourers.		Severity	3	3
		Extent	2	2
		Frequency	2	2
		Duration	1	1
		Probability	2	2
Percentage & Category Rating (without Mitigation)	66%	Total Significance Rating	10/15	10/15
Significance: Medium				
The positive impact of the proposed development on job creation will be an advantage, in the community, with a current				

unemployment rate of 37%.				
Mitigation:				
<ul style="list-style-type: none"> A local employment policy will be applied in the appointment of construction workers with low skilled workers appointed within 10km (mainly Welkom community) and semi-skilled workers within 80km from the site. 				
With mitigation the significance rating shall be Medium .				66%
Operational Phase				
Status: Positive				
Nature of Impact		Impact	Mitigation	
The proposed development will create job opportunities during the operational phase for mainly local labourers.		Severity	1	1
		Extent	2	2
		Frequency	2	2
		Duration	3	3
		Probability	2	2
Percentage & Category Rating (without Mitigation)	73%	Total Significance Rating	11/15	11/15
Significance: Medium				
The positive impact of the proposed development on job creation will be an advantage, in the community, with a current unemployment rate of 37%.				
Mitigation:				
A local employment policy will be applied in the appointment of construction workers with low skilled workers appointed within 10km (mainly Welkom community) and semi-skilled workers within 80km from the site.				
With mitigation the significance rating shall be Medium .				73%

8.4.5.2. EMPOWERMENT AND SKILLED DEVELOPMENT

Construction Phase				
Status: Positive				
Nature of Impact		Impact	Mitigation	
Through work opportunities, local community members will benefit through skills development and empowerment.		Severity	3	3
		Extent	2	2
		Frequency	2	2
		Duration	1	1
		Probability	2	2
Percentage & Category Rating (without Mitigation)	66%	Total Significance Rating	10/15	10/15
Significance: Medium				
Through the relevant experience, members of the local community will be able to provide skills for future development in the area and region. They will further be able to uplift themselves through remuneration received from such jobs.				
Mitigation:				
<ul style="list-style-type: none"> Training and other forms of education of the workers shall enhance their ability and this impact. 				
With mitigation the significance rating shall be Medium .				66%

8.4.5.3. PRESENCE OF CONSTRUCTION WORKERS

Construction Phase

Status: Negative				
Nature of Impact		Impact	Mitigation	
Presence of construction workers and competition for available jobs with the local community. Impacts include increased crime rate, competition for limited jobs and competition for housing.	Severity	2	2	
	Extent	1	1	
	Frequency	1	1	
	Duration	1	1	
	Probability	2	2	
Percentage & Category Rating (without Mitigation)	47%	Total Significance Rating	7/15	7/15
Significance: Low It is expected that the influx of construction workers will have a relatively minor impact on the community. This is because most of the low-skilled workers will be employed from the community itself and the semi-skilled and skilled workers will commute daily from Welkom. This should minimize the impact of the construction activities on social change.				
Mitigation:				
<ul style="list-style-type: none"> A local-skilled and semi-skilled employment policy will be applied as far as possible. 				
With mitigation the significance rating shall be Low .			47%	

8.4.5.4. INFLUX OF JOB SEEKERS

Construction Phase				
Status: Negative				
Nature of Impact		Impact	Mitigation	
Influx of construction workers, competing for available jobs with the local community.	Severity	1	1	
	Extent	1	1	
	Frequency	1	1	
	Duration	1	1	
	Probability	1	1	
Percentage & Category Rating (without Mitigation)	33%	Total Significance Rating	5/15	5/15
Significance: Medium The positive impact of the proposed development on job creation will be an advantage, in the community, with a current unemployment rate of 37%.				
Mitigation:				
<ul style="list-style-type: none"> A local employment policy will be applied in the appointment of construction workers with low skilled workers appointed within 10km (mainly Welkom community) and semi-skilled workers within 80km from the site. 				
With mitigation the significance rating shall be Medium .			33%	
Operational Phase				
Status: Positive				
Nature of Impact		Impact	Mitigation	
The proposed development will create job opportunities during the	Severity	1	1	

operational phase for mainly local labourers.		Extent	1	1
		Frequency	1	1
		Duration	1	1
		Probability	2	2
Percentage & Category Rating (without Mitigation)	40%	Total Significance Rating	6/15	6/15
Significance: Low The positive impact of the proposed development on job creation will be an advantage, in the community, with a current unemployment rate of 37%.				
Mitigation: A local employment policy will be applied in the appointment of construction workers with low skilled workers appointed within 10km (mainly Welkom community) and semi-skilled workers within 80km from the site.				
With mitigation the significance rating shall be Low .			40%	

8.4.5.1. RISK OF THEFT AND DAMAGE TO INFRASTRUCTURE

Construction Phase				
Status: Negative				
Nature of Impact		Impact	Mitigation	
Theft and damage to infrastructure.		Severity	1	1
		Extent	1	1
		Frequency	1	1
		Duration	1	1
		Probability	1	1
Percentage & Category Rating (without Mitigation)	33%	Total Significance Rating	5/15	5/15
Significance: Low Because of the location of the development near a low income community, theft and damage to infrastructure is a concern.				
Mitigation: <ul style="list-style-type: none"> An independent security company shall be contracted to secure the infrastructure. 				
With mitigation the significance rating shall be Low .			33%	

8.4.5.2. NUISANCE DUE TO LENGTHY CONSTRUCTION PERIOD

Construction Phase				
Status: Negative				
Nature of Impact			Impact	Mitigation
Noise, health and safety impacts due to the lengthy construction period.		Severity	2	1
		Extent	2	1
		Frequency	2	1
		Duration	1	1
		Probability	2	1
Percentage & Category Rating (without Mitigation)	60%	Total Significance Rating	9/15	5/15
Significance: Medium Due to the duration period, related impacts are a concern if not mitigated.				
Mitigation:				
<ul style="list-style-type: none"> Construction management plan will be required to mitigate the nuisance as well as health and safety related impacts. 				
With mitigation the significance rating will be Low .			33%	
Decommissioning Phase				
Status: Negative				
Nature of Impact			Impact	Mitigation
Noise, health and safety impacts due to the decommissioning of the proposed project.		Severity	2	1
		Extent	2	1
		Frequency	1	1
		Duration	1	1
		Probability	2	1
Percentage & Category Rating (without Mitigation)	53%	Total Significance Rating	8/15	5/15
Significance: Medium Due to the duration period, related impacts are a concern if not mitigated.				
Mitigation:				
Decommissioning management plan will be required to mitigate the nuisance as well as health and safety related impacts.				
With mitigation the significance rating will be Low .			33%	

8.4.5.3. INCOME GENERATION

Operational Phase				
Status: Positive				
Nature of Impact			Impact	Mitigation
Affected parties (landowners and workers) will receive a monthly income in the form of a lease amount for the land areas utilized and dividends declared by the project company.		Severity	1	1
		Extent	3	3
		Frequency	2	2
		Duration	3	3
		Probability	3	3
Percentage & Category Rating (without Mitigation)	80%	Total Significance Rating	12/15	5/15
Significance: High Encourage entrepreneurship in the community, to generate of income streams.				
Mitigation:				
<ul style="list-style-type: none"> The project company will obtain shares in the development company. 				
With mitigation the significance rating shall be Low .			80%	

8.4.5.4. LOSS OF INCOME AND EMPLOYMENT

Decommissioning Phase				
Status: Negative				
Nature of Impact			Impact	Mitigation
Affected parties (landowners and workers) will receive a monthly income in the form of a lease amount for the land areas utilized and dividends declared by the project company.		Severity	3	1
		Extent	2	1
		Frequency	1	1
		Duration	1	1
		Probability	2	1
Percentage & Category Rating (without Mitigation)	60%	Total Significance Rating	9/15	5/15
Significance: Medium				
<ul style="list-style-type: none"> To mitigate the potential impact the provision of a viable pension and savings plan over a period of 25 years is recommended; and During the lifespan of the project the employers should be able to provide for the education of their children leading to increased employment mobility. 				
Mitigation:				
<ul style="list-style-type: none"> The project company will obtain shares in the development company. 				
With mitigation the significance rating shall be Low .			33%	

8.4.5.5. "NO-GO" ALTERNATIVE IN TERMS OF SOCIAL IMPACTS

"No-go" Alternative

Nature of Impact		Impact	Mitigation
No additional impact linked to project site will be realised	Severity	0	0
	Extent	0	0
	Frequency	0	0
	Duration	0	0
	Probability	0	0
Percentage & Category Rating (without Mitigation)	0%	Total Significance Rating	0/15
Significance: N/A			
Mitigation: N/A			
		0%	

8.5. SUMMARY OF IMPACTS

In response to the previously listed impacts and mitigation, the following table (Table 18) provides a summary thereof according to their category rating.

TABLE 18: SUMMARY OF IDENTIFIED IMPACTS WITH ASSOCIATED IMPACTS RATINGS AND PROPOSED MITIGATION.

Nature	Impact without mitigation	With Mitigation	Rating Type
Anticipated Risks Relating to Ambient Air Quality			
Dust Generation and Suppression	Medium	Low	Negative
Anticipated Risks Relating to Soil and Agricultural Potential			
Agricultural Potential and Soil Capability	High	Medium	Negative
Change in Land-use	High	High	Positive
Soil Erosion	Medium	Low	Negative
Soil Disturbance	Medium	Low	Negative
Anticipated Risks Relating to Ecological Impacts			
Vegetation Loss (Construction Phase)	High	High	Negative
Vegetation Loss (Operational Phase)	High	Medium	Negative
Erosion	High	Low	Negative
Dust Generation	High	Low	Negative
Crop Fields	Medium	Medium	Negative
Anticipated Risks Relating to Social Aspects			

Nature	Impact without mitigation	With Mitigation	Rating Type
Job creation (Construction phase)	Medium	Medium	Positive
Job creation (Operational Phase)	Medium	Medium	Positive
Empowerment and skills development	Medium	Medium	Positive
Presence of construction workers.	Low	Low	Negative
Influx of Job Seekers (Construction Phase)	Low	Low	Negative
Influx of Job Seekers (Operational Phase)	Low	Low	Negative
Theft and damage to infrastructure	Low	Low	Negative
Nuisance (Construction Phase)	Medium	Low	Negative
Nuisance (Decommissioning Phase)	Medium	Low	Negative
Income Generation	High	High	Positive
Loss of Income and Employment	Medium	Low	Negative
Anticipated Risks Relating to Heritage Aspects			
Palaeontological Impacts			
Quaternary deposits	Low	Low	Negative
Dolerite	Low	Low	Negative
Adelaide Subgroup	Medium	Low	Negative
Archaeological Impacts			
Destruction of archaeological and cultural heritage resources	Low	Low	Negative
Discovering of Heritage resources	Low	Low	Positive

In the Light of Table 18 it is clearly visible that the anticipated risk and impacts relating to soil and agricultural potential; ecology and heritage are of low to medium significance. Dissimilar to these, positive social aspects at a local level are of a high significance. Therefore, the overall highest impacts are those of a positive nature, whilst most impacts can be mitigated to reach acceptable levels of impact.

8.6. HABITAT SENSITIVITY

The map included below illustrates the habitat sensitivity of the affected area based on ecological, soil, agricultural potential and heritage impact areas. A summary of sensitive areas as depicted by the specialists are portrayed here. An A3 version of this map can be found in **Annexure A7**.

This overall area was found to be of medium-high ecological sensitivity due to the presence of drainage lines, wetlands, and heritage artefacts. The following sensitivity rating is in terms of loss of agricultural land:

- Green = High sensitivity, cultivated land;
- Yellow = Medium sensitivity, currently uncultivated, but reasonable potential agricultural land; and
- Red = low potential agricultural land.

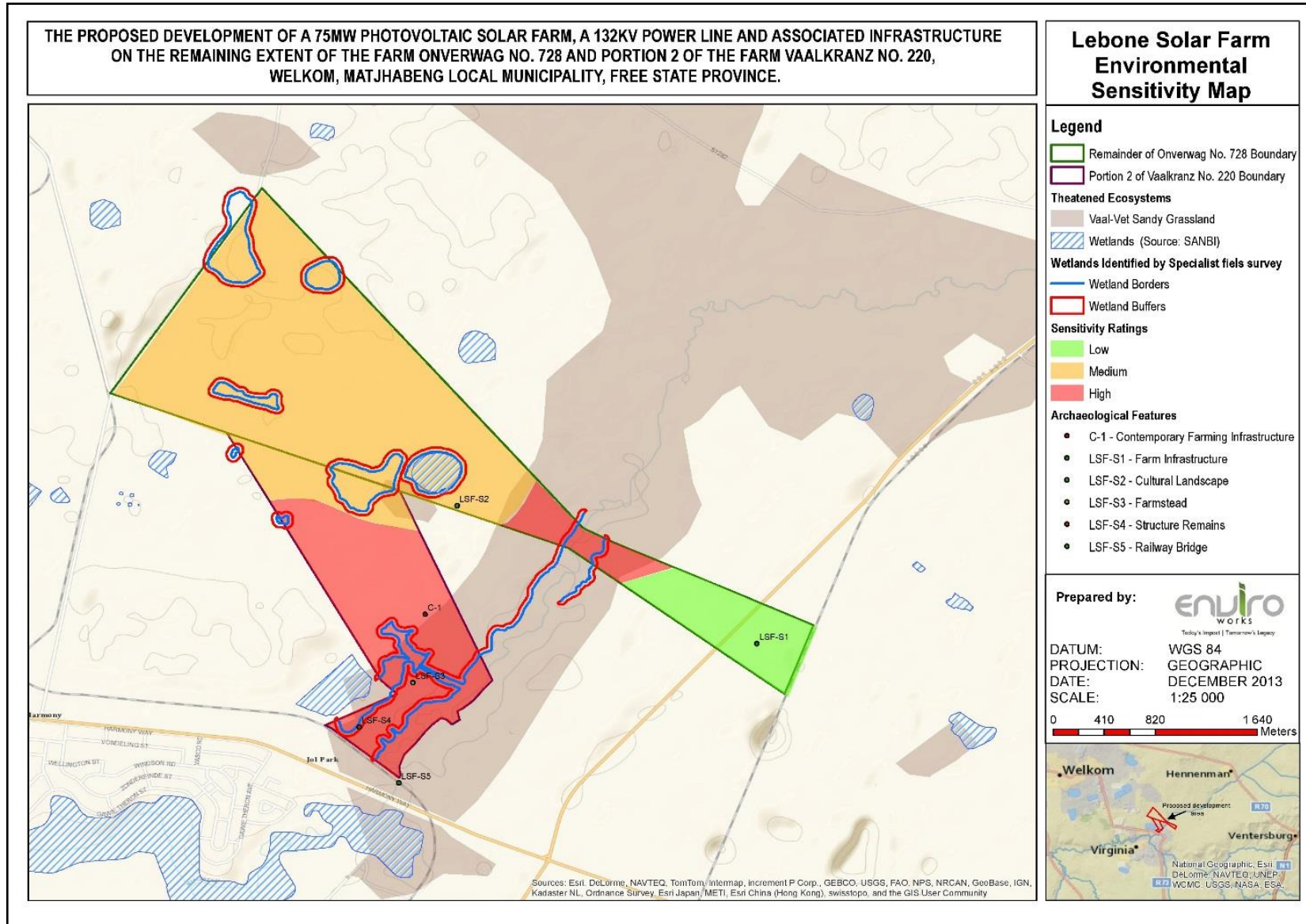


FIGURE 6: ENVIRONMENTAL SENSITIVITY MAP ILLUSTRATING THE ECOLOGICAL SENSITIVITY AND ACCOMPANYING STATEMENT.

8.7. CUMULATIVE AND INDIRECT IMPACTS

This section describes the likely cumulative impacts of the project on the environment. It identifies the potential cumulative environmental effects, which require associated mitigation measures to be addressed during the EIA phase.

8.7.1. CUMULATIVE IMPACTS

Cumulative impacts are those Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project (EU, 1999).

Cumulative Socio-Economic Impact

Negative: The potential negative visual impact and demand for resources will be compounded with additional new developments in the immediate location. Similarly, the potential influx of job - seekers and increased local crime will be compounded if other new developments in the area are taken forward and come to fruition.

Positive: The benefits of a number of new developments will also be compounded, especially with regards to new employment and business development opportunities. The contribution toward economic income could provide a catalyst for further economic development, whilst reliable electricity could attract large industries to the Metjabeng area.

8.7.2. INDIRECT IMPACTS

Indirect Impacts on the environment are those impacts, which are not a direct result of the project, often produced away from or as a result of a complex pathway. Sometimes referred to as second or third level impacts, or secondary impacts.

One indirect negative impact of solar energy facilities is a possible reduction in the available area for nesting and feeding by birds avoiding solar farm installations. During construction, species can be displaced from their original habitat, but in most cases they return during the operational phase. However, exclusions may occur for other species during the breeding period.

The proposed project will not only supply renewable electricity to the National grid, but also contribute to the sustainable development of the local community. This includes the supply of zero-emitting renewable energy to the national grid, saving the coal and water resources and improving the local energy infrastructure.

Very few direct new jobs will be created by solar energy during their operation. However, both skilled and unskilled labour is required during the construction of supporting service infrastructure, such as the roads.

8.8. MITIGATION OF IMPACTS

This section only highlights some of the mitigation measures. Detailed mitigation measures will be outlined in the Environmental Management Programme (EMPr), which was compiled as part of the EIA phase. The EMPr is included in **Annexure E**.

Mitigation of impacts in this report will follow the following approach:

- **Avoiding or preventing** the impact through the early consideration of opportunities and constraints and development alternatives (positive planning) and by modifying the proposal accordingly;
- **Reducing or minimising** negative impacts and maximising benefits, by considering alternatives and modifying the proposal;
- **Rectifying** negative impacts by restoring the affected environment to its previous condition, or rehabilitating it for a different land use; and as a 'last resort',
- **Providing an offset to compensate** for the residual negative impact on biodiversity or ecosystem services, by replacing or providing 'like for like or better' substitutes for these impacts. In cases where residual impacts affect threatened, unique or irreplaceable biodiversity, offsets are not an option as substitutes do not exist.

9. RECOMMENDATIONS

- Should further amendments to the design of the facility be made, a copy of the revised layout (must be submitted to the Department of Environmental Affairs for approval prior to the commencement of construction.
- A comprehensive storm water management plan should be completed prior to the initiation of construction, for effective handling and diversion of rain and surface water.
- Monitoring by means of an independent Environmental Control Officer to enforce the Environmental Management Program should be undertaken during the construction phase of the activity.
- Disturbed areas should be rehabilitated as soon as possible after the construction and decommissioning periods.
- Erosion control measures should be implemented during the all phases of the proposed project.

- Effective topsoil covering to conserve soil fertility on all disturbed areas, should be ensured.
- The use of designated roads should be maintained under all circumstances, except under exceptional circumstances.
- No development is allowed within 32m from the edge of the wetland.
- It is recommended that the PVR plant be limited to the crop fields because they are already disturbed areas.
- Systematic Archaeological recording and test pitting under a SAHRA Excavation Permit, is recommended at the time of construction rather than full Phase 2 archaeological mitigation.
- Several sites of heritage importance including a farmstead, contemporary farming infrastructure, cultural landscape and structure remains post-date 60 years of age, exist within the proposed site. It is suggested that these be temporary fenced off and sign posted.
- The Environmental Control Officer (ECO) of the project team should be made aware of the possible occurrence of fossils. If any fossils are recorded during initial field visits, a trained palaeontologist must be notified to assess the finds.
- Where construction is envisaged on areas with a medium sensitivity rating, a palaeontological site inspection by a qualified palaeontologist needs to be done to assess the presence of fossils.
- The establishment of a third party trust to advise and administer income and a retirement fund option during operations, so as to buffer social impacts after decommissioning.
- The facility and compliance with the Environmental Management Program should be monitored sporadically during the operational phase of the project.
- An independent Environmental Control Officer should be instated to monitor the decommissioning of the facility, in accordance with the Environmental Management Program.

9.1. EAP'S PROFESSIONAL OPINION AND RECOMMENDED AUTHORISATION CONDITIONS

The following section describes the environmental consultant's professional opinion as to whether the activity and/or activities should or should not be authorised, as well as conditions that should be made in respect of an authorisation. In terms of Section 31(2)(o) of Regulation 543, published under the National Environmental Management Act (NEMA), Act 107 of 1998, the environmental assessment practitioner (EAP) undertaking an EIA is required to provide this statement as part of an EIA Report.

EAP's Professional Opinion

In Enviroworks' view the information contained in this DEIR and the documentation attached hereto should be sufficient for the Public to comment on the proposed project. It has been assessed that significant positive environmental impacts would arise from the development of the proposed Lebone Solar farm. Similarly it has been assessed that significant negative environmental impacts should not result from this development. Sufficient mitigation can be applied to enhance positive impacts and reduce negative impacts. We believe that the proposed PV plant will be sustainable for the duration of the operational phase (20-25 years) and that the proposed development will be an asset to the Matjhabeng regions, and to the broader South African Society (production and use of alternative energy).

Recommended Authorisation Conditions

Various mitigation recommendations are contained in the EMP (**Annexure E**) and should form part of the "conditions of approval" of this application.

An Environmental Control Officer (ECO) must be appointed by the developer to compile environmental compliance checklists at least once per month to ensure that the construction phase of the development is implemented according to the recommendations of the EMP, and that construction of the development (PV plant) complies with the conditions of approval to be issued by the DEA.

The results of the appointed ECO's checklists should be used to inform an Environmental Audit Report, which should be submitted to the DEA at the end of the construction period, once all site rehabilitation has been completed.

10. CONCLUSION

Environmental Impact Assessment Criteria

In terms of the NEMA Regulations of 2010, triggered activities could be considered of a scope and nature which may be detrimental to the environment. A full Scoping study and Environmental Impact Assessment process therefore ensued to address potential issues associated with the project and assess these through identification of site alternatives and mitigation measures in the report and Environmental Management Program (EMPr).

Key stages in the EIA process included:

- **The notification stage**, whereby authorities, stakeholders and interested and affected parties were informed of the proposed development through various media including a newspaper advert, site notices and public meetings. A process of dialogue and

communication was then engaged with these parties to determine their comments and concerns;

- **The Scoping stage**, during which potential issues relating to the development were identified and specialist needs determined. A plan of study on how to conduct the Environmental Impact Assessment stage was in addition, presented to the department of Environmental Affairs for consideration;
- **The EIA stage**, represented the final chapter of this process through engaged of specialist input to assess key impact areas, public participation deliberations and assessment of alternatives and mitigation, culminating in the completion of an EMPr.

The Receiving Environment

In terms of the Remaining Extent of the Farm Onverwag No. 728 and Portion 2 of the Farm Vaalkranz No. 220, the receiving environment represents one of high to low sensitivity. This was ascertained through the engagement of specialist studies, findings impacts from the proposed development not to be significant.

Through the assessment of impacts and mitigation, impacts were rated on a scale of low to high significance. To offset the impacts, mitigation measures were determined and paired to determine a final rating outcome. Overall findings thereof was that impacts on the geology, soil and agriculture potential would be low to medium negative impact due to the reduced productivity of the land in the absence of available surface water and overgrazing at the site.

Ecological impacts were determined to be high to medium, due to the presence of sensitive habitats present on the proposed development area. Three different major plant communities occurred and also no Red Data listed or protected plants were found within the proposed development area.

Further, the plant communities have a relatively low biodiversity and low conservation importance in a local, regional or national context.

The Heritage investigations consist of the Archaeological and Palaeontological studies, undertaken by the relevant specialist in these fields.

The Archaeological assessment determined five archaeological and cultural heritage resources within the site boundaries. Of the identified resources four are located within the study area, while the Industrial Period railway bridge is situated just outside the study area. A contemporary farming infrastructure post-dating 60 years of age, was also discovered within the study area. These findings led to the conclusion that development proceed without the application for a SAHRA site destruction permit.

The Palaeontological assessment revealed that most of the study area is underlain by Quaternary aged aeolian sand deposits. Sections of both farms are underlain by Permian aged sedimentary rocks of the Adelaide Subgroup, Beaufort Group, Karoo Supergroup. Two areas on Portion 2 of the Farm Vallkrans No. 220 are underlain by Jurassic aged Dolerite. The Adelaide Subgroup is known to contain a rich assemblage of fossil remains of plants and vertebrates and areas underlain by these sediments have thus been allocated a medium sensitivity rating.

Visual impact of the proposed development seems as low to medium due to the height of the facility receiver tubes. More detailed viewshed analysis will be undertaken for the PV plant and all associated infrastructure, based on the final layout of the facility.

Socio-economic impacts represented the most significant impacts, rated between medium to high. Several key impacts such as job creation, long-term economic stability and earning, community empowerment and skills development are all impacts of a positive nature. The benefit of the proposed development is further exacerbated by the existing state of economic disrepair in the local community, in which high unemployment, access to water and food, and services are some of the key challenges face on a daily basis.

Public Consultation

To support public interest and inform the EIA process, a public consultation process proceeded throughout the lifetime of the assessment. A diverse mix of authorities, stakeholders and interested and parties were consulted during this time, representing the environment, social, economic and political realms of local, regional and national bodies. No comments or concerns was raised to date, by any authority, stakeholder or interested and parties.

A period of 40 days will be made available for public comment on the Draft Environmental Impact Assessment Report (DEIR). The availability of the DEIR will be announced through the distribution of letters, faxes and e-mails to all the registered I&APs on the distribution list. In addition, a copy of the report will be placed at the Welkom Community Library, it will be hand delivered to the relevant authorities and downloadable versions will, available on the website <http://www.enviroworks.co.za>.

Environmental Impact Statement

In terms of the overall significance of the impacts of the proposed establishment of the proposed Lebone Solar Farm, **no environmental fatal flaws** were identified to be associated with the proposed project. If the recommended mitigation measures contained in the attached EMPr (**Annexure E**) are applied, there should be no lasting significant negative environmental impacts arising from the development of the PV plant (Construction Phase) and/or the Operational and/or Decommissioning Phases.

No Go Alternative

The only significant impact of the no-go alternative would be the opportunity cost, i.e. the loss of potential financial benefits for the landowner, social upliftment of local communities and for society in general by the loss of the generation of alternative energy.

In terms of the above, a **high negative** impact (mainly loss of potential income from the PV plant and loss of construction phase and operational phase jobs) is envisaged should the no-go alternative be implemented, viz., where the status quo would remain.

Cumulatively, the proposed Lebone Solar farm will have a **positive impact** on the surrounding environment, due to its potential socio-economic value it will add to the local communities.

Please Comment

This Draft Environmental Impact Report for the proposed Lebone Solar farm is submitted to the Organs of State and registered I&APs for their review and comment from **Thursday, 13 February 2014 to Monday, 24 March 2014**.

The comments on this FEIR must reach Withers Environmental Consultants on or before **Monday, 24 March 2014**.

11. LIST OF REFERENCES

- Baran E., Dziembowski Z.M., 2003: An Explanation of the 1:500 000 General Hydrogeological Map (Kroonstad 2725). Department of Water Affairs and Forestry.
- Climate Information Portal (CIP): Long term climate data for Welkom. Website: cip.csag.uct.ac.za/. Accessed 9 September 2013.
- The Department of Minerals and Energy. White Paper on Renewable Energy. November 2003.
- Du Plessis, E & Qinisile, M. Golder Associates Africa (Pty) Ltd, 2009: Environmental Management Programme (Project Saints Phase 1) – The Proposed re-mining and processing of tailings facilities at the operation of Harmony Gold Mining Company Limited in the Welkom area.
- Free State Premier's Advisory Council (PEAC). 2005. Free State Provincial Growth and Development Strategy of 2004-2014.
- Mucina L. & Rutherford M.C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
- South African Weather Service. (2013). Climate at SAWS. Available: <http://www.weathersa.co.za/web/>. Last accessed 20th August 2013.
- Statistics South Africa. 2011. Regional economic growth.
- Tekle S.A., 2004: A soilscape survey to evaluate land for in-field rainwater harvesting in the Free State province, South Africa. Bloemfontein.
- The Department of Minerals and Energy. 2003. White Paper on Renewable Energy.
- The Environmental Conservation Act. Act No. 73 of 1989.
- The National Environmental Management Act No. 107 of 1998.
- The National Heritage Resources Act. No. 25 of 1999.
- The Conservation of Agricultural Resources Act. No. 43 of 1983
- The National Water Act. 1998.

ANNEXURES

Annexure A: Maps & Images

- Annexure A1: Locality Map
- Annexure A2: Contour Map
- Annexure A3: Regional Map
- Annexure A4: Google Earth Image of the Proposed Site
- Annexure A5: Layout Map Alternative 1
- Annexure A6: Layout Map Alternative 2
- Annexure A7: Sensitivity Map

Annexure B: Photograph Record

Annexure C: Specialist Reports (including terms of reference)

- Annexure C1: Agricultural Assessment
- Annexure C2: Archaeological Impact Assessment
- Annexure C3: Ecological and Wetland Assessment
- Annexure C4: Palaeontological Impact Assessment
- Annexure C5: Social Impact Assessment
- Annexure C6: Visual impact Assessment

Annexure D: Public Participation Process

Annexure E: Environmental Management Programme (EMPr)

Annexure F: Details of EAP and expertise

Annexure G: Specialist's declaration of interest

Annexure H: Additional Information

- Annexure H1: Letter of Consent from Sedibeng Water
- Annexure H2: Confirmation letter from Ozone Service Industries
- Annexure H3: Confirmation letter from Wasteman Holdings