ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT EIA REPORT

PROPOSED WATERBERG PHOTOVOLTAIC PLANT ON A SITE NEAR VAALWATER, LIMPOPO PROVINCE

(DEA REF No: 12/12/20/1913)

DRAFT FOR PUBLIC REVIEW
29 October 2010 – 29 November 2010

Prepared for:
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PROJECT DETAILS

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Title	:	Environmental Impact Assessment Process Draft Environmental Impact Assessment Report: Proposed Waterberg Photovoltaic Plant and Associated Infrastructure on a Site near Vaalwater, Limpopo Province
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INVITATION TO COMMENT ON THE DRAFT EIA REPORT

The Draft Environmental Impact Assessment Report is available for review and comment by Interested and Affected Parties (I&APs) and stakeholders at the following public places within the project area from **29 October 2010 – 29 November 2010**:

» Vaalwater Library
» Modimolle Local Municipality
» Waterberg District Municipality

The report is also made available on:
» www.savannahSA.com

Please submit your comments to
Ingrid Snyman of Batho Earth PO Box 148 Sunninghill, 2157 Tel: 082 779 2750 Fax: 086 684 0547 E-mail: ingrid@bathoearth.co.za
The due date for comments on the Draft EIA Report is 29 November 2010

Comments can be made as written submission via fax, post, or e-mail.

EXECUTIVE SUMMARY

Thupela Energy, an Independent Power Producer, proposes the establishment of a commercial solar energy facility and associated infrastructure to generate electrical power from solar radiation on a site near Vaalwater. This proposed development is referred to as the **Waterberg Photovoltaic Plant**. The site that has been identified for the establishment of the facility is located approximately 24 north-east of Vaalwater in the Limpopo Province and falls within the Modimolle Local Municipality.

The proposed facility, which will be primarily contained within this identified farm portion, will have a developmental footprint of approximately 20 ha (and not exceeding 30 ha). The facility will have a generating capacity of 5 MW and will be comprised of:

» Several 'strings' of PV panels
» A switching station for the "turn in" to Eskom's existing Mink power line which crosses the site
» Associated infrastructure (i.e. low volume water supply pipeline; access roads; workshop, laydown and storage areas; visitors centre, crèche and kitchen/dining utilising a water-less sanitation system

The nature and extent of this facility, as well as potential environmental impacts associated with the construction and operation of a facility of this nature are explored in more detail in this Environmental Impact Assessment (EIA) Report which consists of the following chapters:

Chapter 1 provides background to the proposed facility and the EIA process.
Chapter 2 provides an overview of the proposed project.
Chapter 3 provides an overview of the Regulatory and Legal Context for electricity generation projects
Chapter 4 outlines the process which was followed during the EIA Phase, including the consultation program that was undertaken and input received from interested parties and stakeholders.
Chapter 5 describes the existing biophysical and socio-economic environment.
Chapter 6 presents the assessment of environmental impacts associated with the facility and its associated infrastructure.
Chapter 7 presents the assessment of environmental impacts associated with the project alternatives.
Chapter 8 presents the conclusions of the EIA process, as well as an impact statement on the proposed project
Chapter 9 provides a list of references and information sources used in undertaking the studies for this EIA Report.

The EIA Phase addressed those identified potential environmental impacts and benefits (direct, indirect, and cumulative impacts) associated

with all phases of the project including design, construction, and operation. The EIA Phase recommends appropriate mitigation measures for potentially significant environmental impacts.

The EIA report aims to provide sufficient information regarding the potential impacts and the acceptability of these impacts in order for the Competent Authority (i.e. the National Department of Environmental Affairs) to make an informed decision regarding the proposed project.

The release of a draft EIA Report provides stakeholders with an opportunity to verify that the issues they have raised through the EIA process have been captured and adequately considered. The final EIA Report will incorporate all issues and responses raised during the public review of the draft EIA Report prior to submission to DEA.

The conclusions and recommendations of this EIA are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all stakeholders in the study area.

The most significant environmental impacts associated with the proposed project, as identified through the EIA, include:

» Potential **visual** impacts - The construction and operation of the proposed facility will have a visual impact on the natural scenic resources of this region. However, it is not likely to detract from the regional tourism appeal, numbers of tourists or tourism potential of the existing centers and destinations. The facility may, in fact add to the plethora of attractions within the region. Within natural areas, the nature of recreational activities (game viewing, quad biking, arts and crafts viewing etc) undertaken in the region is not likely to be influenced. The facility further has a novel and futuristic design that invokes a curiosity factor not generally present with other conventional power generating plants. The advantage being that the solar facility can become an attraction or a landmark within the region that people would actually want to come and see. Despite the high visual absorption capacity of the surrounding vegetation and the potential for screening (i.e. at the sensitive receptor itself), it is generally difficult to hide a facility of this nature as the panels cannot be shaded. As it is impossible to hide the facility and therefore the only option would be to promote it.

» Potential **social** impacts - The potential negative impacts associated with the construction

phase are typical of construction related projects and are expected to respond to the mitigation measures proposed. The possible job creation and skills development are regarded as a significant positive injection into the area, especially for the majority of poor households in the study area with low skills levels and low household income profiles. The 'sense of place' is difficult to quantify as the intensity would depend on each individual's perception and experience of the area. It is, not anticipated that the project would alter the host community's standard of living or quality of life or directly negatively affect the activities undertaken on these properties, even though it would have a negative impact on the sense of place.

» Potential **socio-economic** impacts - The project would result in significant positive economic spin-offs for the local area and region primarily because of the labour intensive operational practices that would be associated with it. While risks to tourism and property value are present, they are considered acceptably low with mitigation particularly when compared with the potential benefits associated with the project. The plant actually has the potential to contribute to the tourism packages on offer through its potential to enhance the 'sustainable tourism' or 'eco-friendly' brand of the area. Therefore considered as a whole, the key potential drivers of negative tourism impacts (i.e. primarily visual impacts) do not seem to be significant enough to provide any clear basis to conclude that the project would entail more than a low level of risk for tourism.

The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the application for the proposed Waterberg Photovoltaic Plant can be mitigated to an acceptable level. With this in mind the EIA project team support the decision for environmental authorisation.

The following conditions would be required to be included within an authorisation issued for the project:

- All mitigation measures detailed within this report and the specialist reports contained within Appendices E to K should be implemented to limit the negative impacts and enhance the positives.
- The draft Environmental Management Plan (EMP) as contained within Appendix L of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
- As the area could experience an inflow of outside jobseekers, the project proponent, local leaders and the Modimolle Local Municipality should jointly develop a strategy to minimise the influx of jobseekers to the area
- During construction, unnecessary disturbance to surrounding habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
- The project proponent should not just use the possible employment opportunities to obtain support from the local communities, but should be committed to creating long term employment and capacity building, thereby ensuring long-term sustainable development in the area.
- Although the functional design of the structures cannot be changed in order to reduce visual impacts, it is proposed that the standard height of the units be set at 3 – 4 m and that a 6 m height should only be used on exception where necessary. This will reduce the facility's visual intrusion and increase the vegetations' ability to mask the facility.
- Receptor sites exposed to visual impact may mitigate this impact by planting a vegetation screen similar in form and density to the natural vegetation of the receiving environment. It should be noted, however, that this measure will only be effective if the screen is planted in close proximity to the receptor. This means that the visual impact must be screened at the property which is experiencing the impact, rather than at the development site itself. It is recommended that the visual screen be planned and specified by a planning professional in order to maximise the screening

benefit. In addition, it is imperative that the species of plants utilised be ecologically appropriate for the natural environment.

» Ancillary infrastructure (i.e. the switching station, the internal access roads, the pipeline, the workshop/storage area, and the visitor's centre) must be properly planned with due cognisance of the topography, that all disturbed areas be properly rehabilitated, and that all infrastructure and the general surrounds be maintained in a neat and appealing way.
» The water supply pipeline should be placed underground with proper re-instatement and re-vegetation to avoid additional visual clutter.
» The proponent should keep communication channels with neighbouring farmers open and consider the establishment of a local land owners' forum in which concerns and issues associated with the plant can be raised and dealt with pro-actively.

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ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CO_2	Carbon dioxide
DEA	National Department of Environmental Affairs
DoE	Department of Energy
DM	District Municipality
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPC	Engineering, Procurement and Construction
FIT	Feed-in Tariffs
GDP	Gross Domestic Profit
GDPR	Gross Domestic Profit of the Region
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GHG	Green House Gases
GWh	Giga Watt Hour
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IPP	Independent Power Producer
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
LM	Local Municipality
MA	Million years before present
MAR	Mean Annual Rainfall
MLM	Modimolle Local Municipality
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NERSA	National Energy Regulator of South Africa
NGOs	Non-Governmental Organisations
NT	Not Threatened
NWA	National Water Act (Act No. 36 of 1998)
REFIT	Renewable Energy Feed-in Tariffs
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited

VAC Visual Absorption Capacity
VU Vulnerable

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Clean development mechanism (CDM): An arrangement under the Kyoto Protocol allowing industrialised countries with a greenhouse gas reduction commitment (called Annex 1 countries) to invest in projects that reduce emissions in developing countries as an alternative to more expensive emission reductions in their own countries. The most important factor of a CDM project is that it establishes that it would not have occurred without the additional incentive provided by emission reductions credits. The CDM allows net global greenhouse gas emissions to be reduced at a much lower global cost by financing emissions reduction projects in developing countries where costs are lower than in industrialised countries. The CDM is supervised by the CDM Executive Board (CDM EB) and is under the guidance of the Conference of the Parties (COP/MOP) of the United Nations Framework Convention on Climate Change (UNFCCC) (refer http://unfccc.int/kyoto_protocol/mechanisms/items/2998.php).

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. the land, water and atmosphere of the earth;
ii. micro-organisms, plant and animal life;
iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management plan: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Feed-in tariffs: Feed-in Tariffs (FIT) have been set to promote socio-economic and environmentally sustainable growth. They are essentially guaranteed prices for electricity supply as opposed to conventional consumer tariffs. The basic economic principle underpinning the FIT is the establishment of a tariff that covers the cost of generation plus a "reasonable profit" to entice independent power producers to invest in generation projects.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Integrated Energy Plan: A plan commissioned by the DME in response to the requirements of the National Energy Policy, in order to provide a framework in which specific energy policies, development decisions and energy supply trade-offs can be made on a project-by-project basis. The framework is intended to create a balance between the energy demand and resource availability to provide low cost electricity for social and economic development, while taking into account health, safety, and environmental parameters.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Kyoto protocol: The Kyoto Protocol calls for developed countries to reduce their green house gas emissions during the commitment period (2008 - 2012) by 5.2% compared to 1990 levels. Developing countries, like South Africa, do not have a limit on their emissions.

National integrated resource plan: Commissioned by NERSA in response to the National Energy Policy's objective relating to affordable energy services, in order to provide a long-term, cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social, and economic policies.

Photovoltaic cell: Semiconductors which absorb solar radiation to produce electricity

Photovoltaic effect: Electricity can be generated using photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells that absorb

solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Renewable energy feed-in tariff: REFITs are used to promote renewable energy and have been adopted in over 36 countries worldwide. The establishment of the REFIT in South Africa provides the opportunity for an increased contribution towards the sustained growth of the renewable energy sector, and to promote competitiveness between renewable and conventional energies in the medium and long-term. Under the National Energy Regulator Act (Act No. 40 of 2004), the Electricity Regulation Act (Act No. 4 of 2006), and all subsequent relevant amendment acts, the National Energy Regulator of South Africa (NERSA) has the mandate to determine the prices at and conditions under which electricity must be supplied by licence.

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

INTRODUCTION CHAPTER 1

Thupela Energy is proposing the establishment of a commercial solar energy facility on a site located approximately 24 km north-east of the town of Vaalwater in the Limpopo Province (refer to Figure 1.1). This is to be known as the Waterberg Photovoltaic Plant. From an extensive site identification process undertaken by Thupela Energy, an area which falls within the Modimolle Local Municipality between Vaalwater and Vier-en-Twintig Riviere has been identified for consideration within an Environmental Impact Assessment (EIA) process.

The proposed facility will comprise an array of tracking photovoltaic (PV) panels and ancillary infrastructure to be constructed over an area of approximately 20 ha (and not more than 30 ha) within the broader study area of 50 ha. The facility is proposed to be constructed over a single phase of approximately six - nine months, and will have a maximum generating capacity of up to 5 MW. The facility is intended to be operated as a commercial power generating facility and would include the following infrastructure.

» The **PV panels** will be placed on mounts, which will be sited a certain distance away from each other to allow sufficient room to mitigate shading issues. The electrical output from individual panels will be summed, initially into "strings," then further summed, and changed to AC power using inverters. The panel mounts will be secured into the ground by the use of concrete feet.
» A **switching station** of approximately 4 m x 4 m will be established for the "turn in" to Eskom's existing Mink power line which crosses the site. It has been determined through preliminary discussions with Eskom that this line has capacity to receive the power from the proposed facility. A switching station is a smaller version of a substation and contains a single transformer to step up the generated power into a voltage suitable for the existing power line (i.e. 22 kV in this case).
» An **extraction point** and **low volume water supply pipeline** from an existing on-site borehole will be established for occasional cleaning of the PV panels and for general, limited water use at the kitchen, crèche, and visitors centre.
» **Access roads** within the site will be established for the purposes of construction and limited maintenance activities.
» Workshop, laydown and storage areas

» A Visitors Centre, crèche and kitchen/dining utilising a water-less sanitation system[1]

The nature and extent of this facility, as well as potential environmental impacts associated with the construction of a facility of this nature is assessed in more detail in this Draft Environmental Impact Assessment (EIA) Report. This report consists of the following sections:

» **Chapter 1** provides background to the project and the EIA process
» **Chapter 2** provides an overview of the project, describes solar energy as a power option, provides insight to solar technologies and describes the project scope (i.e. activities associated with the project)
» **Chapter 3** outlines the process followed during the EIA Phase
» **Chapter 4** describes the existing biophysical and socio-economic environment of the identified study site
» **Chapter 5** presents the assessment of environmental impacts associated with the proposed facility and the associated infrastructure, and details of recommended mitigation measures
» **Chapter 6** presents an Impact Statement and the conclusions and recommendations of the EIA Report
» **Chapter 7** contains a list of references for the EIA Report and the specialist reports

1.1. Justification for Renewable Energy Projects

Countries worldwide are being pressured to increase their share of renewable energy generation due to concerns related to climate change and the on-going, unsustainable exploitation of natural resources such as gas and coal. Grid connected renewable energy is currently the fastest growing sector in the global energy market. Targets for the promotion of renewable energy now exist in more than 58 countries, of which 13 are developing countries. The South African Government has recognised the country's high level of renewable energy potential and presently has in place targets of 10 000 GWh of renewable energy by 2013 (to be produced mainly from biomass, wind, solar and small-scale hydro). This amounts to approximately 4% (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

Renewable energy is recognised internationally as a major contributor in protecting our climate, nature, and the environment as well as providing a wide

[1] A system of this nature does not utilise water and reduces the waste to approximately 10 % of the original volume through a process of dehydration. This water-less method is preferred due to the proximity of the Melk River which runs east of the site and the rural nature of the site which would render extensive plumbing impractical.

range of environmental, economic, and social benefits that will contribute towards long-term global sustainability. It is considered viable that long-term benefits for the community and/or society in general can be realised should this site near Vaalwater prove acceptable, from a technical and environmental perspective, for the establishment of a solar energy facility. In the event of the Waterberg Photovoltaic Plant being developed, it will contribute to and strengthen the existing electricity grid for the area[2].

In addition, the proposed project will aid in achieving the goal of a 30% share of all new power generation being derived from independent power producers (IPPs).

1.2. Justification for the proposed Waterberg Photovoltaic Plant

From a local and regional perspective, the proposed facility will serve to strengthen the electricity grid in the region. The Waterberg area receives its electricity from the Matimba Power Station in Lephalale and the Vaalwater Substation receives its power from Modimolle. The system is unstable and the area frequently experiences power outages due to the length of the transmission and distribution lines stretching from Lephalale to Modimolle and Vaalwater. The evacuation of the electricity from the proposed PV plant will serve to supply a back feed into the Vaalwater – Sterkstroom (VS) line, which feeds power to the Vaalwater Substation, in order to stabilise the voltage.

[2] The evacuation of power at the proposed site will serve to stabilise the voltage within the VS (Vaalwater – Sterkstroom) Line which is subject to regular losses and outages by virtue of its length.

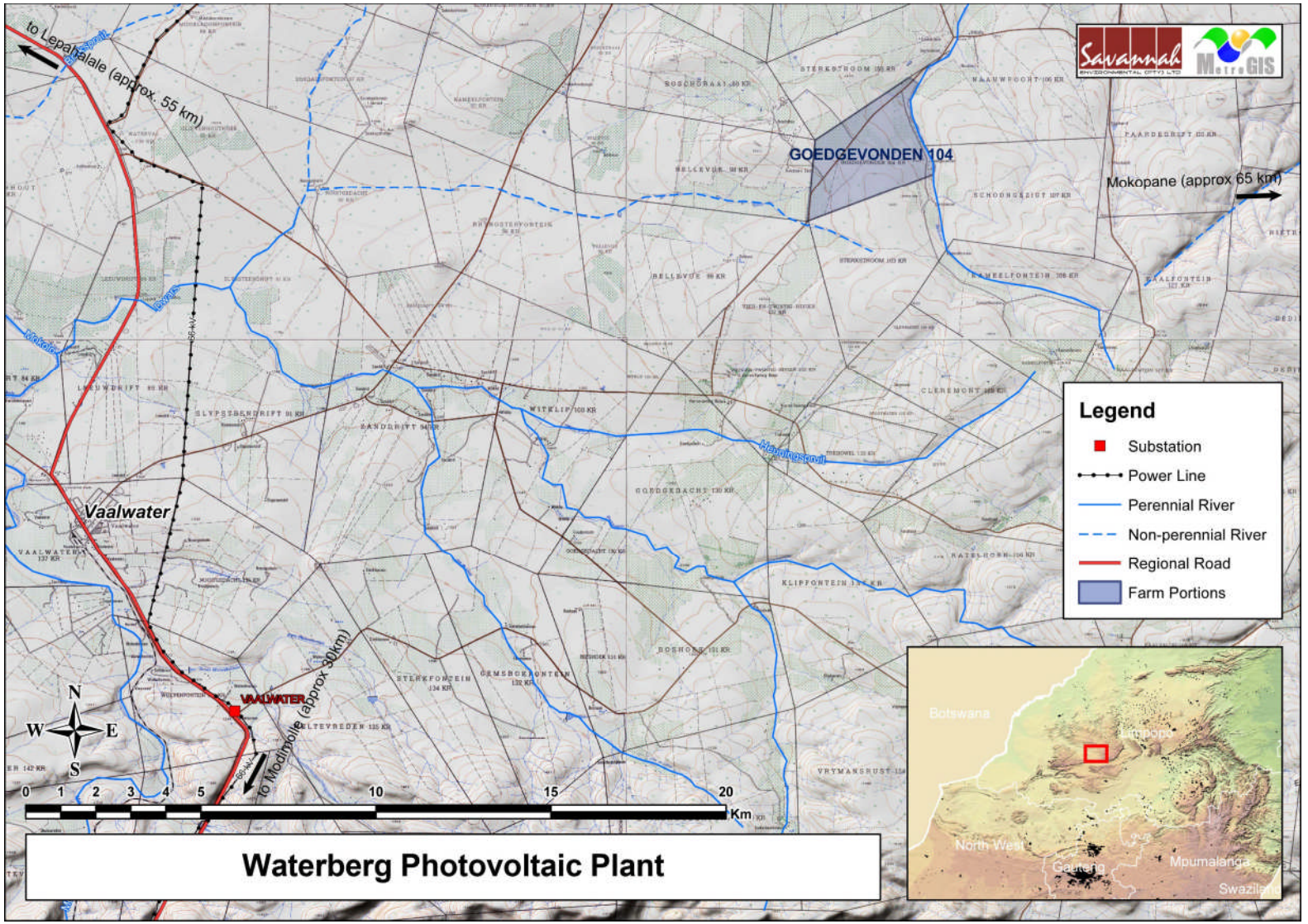

Figure 1.1: Map indicating the location of the proposed development site for the Waterberg Photovoltaic Plant and its location within the Limpopo Province

1.3. Project Overview

The proposed development site being investigated is located near the town of Vaalwater in the Limpopo Province, and falls under the jurisdiction of the Modimolle Local Municipality. Eco-tourism, agriculture, and hunting practises dominate the general land use character of this region. However, the site itself has been transformed for agricultural practices (refer to Figure 1.2). The study site is situated approximately 24 km north-east of Vaalwater and approximately 70 km west of Mokopane (falls within the quarter degree grid 2428AB). The study site includes Portion 2 of the Farm Goedgevonden KR 104.

The overarching objective for the proposed solar energy facility is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. As local level environmental and planning issues were not assessed in sufficient detail through Thupela Energy's site identification process, these issues have now been considered within site-specific studies and assessments through the EIA process in order to delineate areas of sensitivity within the broader site and ultimately inform the placement of the PV panels and associated infrastructure within the site.

As the performance of the PV panels is affected by shading, they must be appropriately positioned within the facility to minimise the potential for reduced efficiency. This has been achieved through a preliminary design layout which includes several panel mounts which will be positioned as offset rows or strings running from east to west. This preliminary design layout has been considered within this EIA (refer to Chapter 2 for more details). The exact positioning or detailed layout of the components of the proposed solar energy facility within the broader site will be finalised by taking cognisance of environmental sensitivities and technical constraints identified through the EIA process. A final layout of the facility components would be prepared prior to construction.

The scope of works, including details of all elements of the project (i.e. during the construction, operation, and decommissioning phases) is discussed in more detail in Chapter 2.

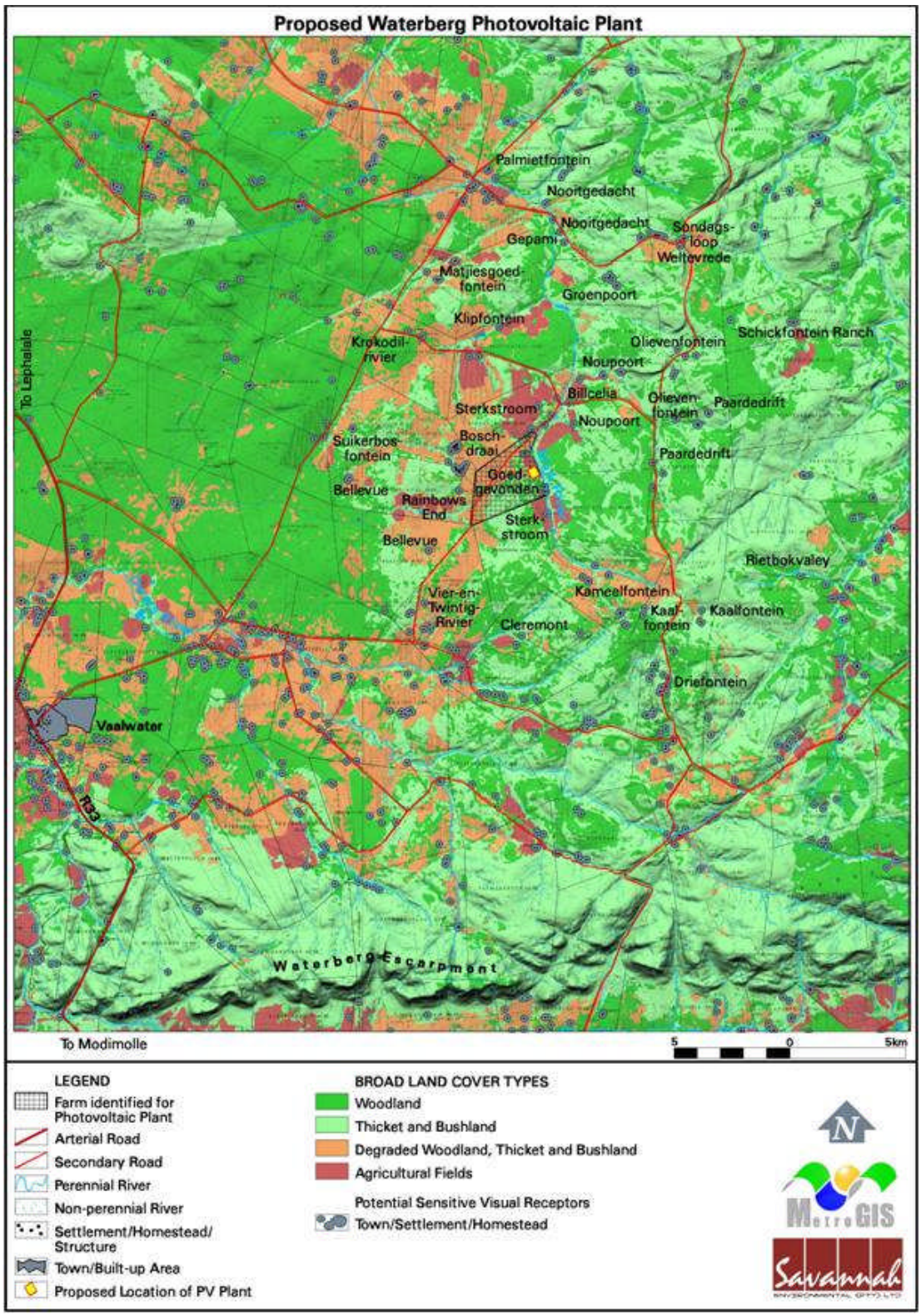

Figure 1.2: Land cover types within the Waterberg Region, showing the agricultural fields, and subsequently transformed nature of the vegetation at the identified site.

1.4. Requirement for an Environmental Impact Assessment Process

In order to assess local level environmental and planning issues in sufficient detail, site-specific studies and assessments are required to be undertaken during the EIA process in order to delineate areas of sensitivity within the broader site and ultimately inform the placement of the PV panels and associated infrastructure.

The proposed Waterberg Photovoltaic Plant project is subject to the requirements of the Environmental Impact Assessment Regulations (EIA Regulations) published in terms of Section 24(5) of the National Environmental Management Act (NEMA, No 107 of 1998). This section provides a brief overview of EIA Regulations and their application to this project.

NEMA is the national legislation that provides for the authorisation of certain controlled activities known as "listed activities." In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. As this is a proposed electricity generation project (which is considered to be of national importance) the National Department of Environmental Affairs (DEA) is the competent authority for this project. An application for authorisation has been accepted by DEA (under **Application Reference number 12/12/20/1913**). Through the decision-making process, the DEA will be supported by the Limpopo Department of Economic Development, Environment, and Tourism (LEDET).

The need to comply with the requirements of the EIA Regulations ensures that decision-makers are provided the opportunity to consider the potential environmental impacts of a project early in the project development process, and assess if environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the competent authority with sufficient information in order for an informed decision to be taken regarding the project. Thupela Energy appointed Savannah Environmental to conduct the independent EIA process for the proposed Waterberg Photovoltaic Plant.

An EIA is an effective planning and decision-making tool for the project proponent. It allows for the identification and management of environmental impacts / issues that may occur through the establishment and operation of a technical facility. Furthermore, it allows for resolution of the issue(s) reported on in the Scoping and EIA reports as well as dialogue with affected parties.

In terms of sections 24 and 24D of NEMA, as read with Government Notices R385 (Regulations 27–36) and R387, a Scoping and EIA are required to be undertaken for this proposed project as it includes the following activities listed in terms of GN R386 and R387 (GG No 28753 of 21 April 2006):

Relevant Notice	Activity No	Description of listed activity
Government Notice R387 (21 April 2006)	*1(a)*	*The construction of facilities or infrastructure, including associated structures or infrastructure, for the generation of electricity where (i) the electricity output is 20 megawatts or more; or (ii) the elements of the facility cover a combined area in excess of 1 hectare*
Government Notice R387 (21 April 2006)	*2*	*Any development, activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be 20 ha or more.*
Government Notice R386 (21 April 2006)	*1(a)*	*The construction of facilities or infrastructure, including associated structures or infrastructure, for:* *(a) the generation of electricity where the electricity output is more than 10 megawatts but less than 20 megawatts;*
Government Notice R386 (21 April 2006)	*12*	*The transformation or removal of indigenous vegetation of 3 hectares or more or of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).*
Government Notice R386 (21 April 2006)	*14*	*The construction of masts of any material of type and of any height, including those used for telecommunications broadcasting and radio transmission, but excluding (a) masts of 15m and lower exclusively used by (i) radio amateurs; or (ii) for lightening purposes (b) flagpoles; and (c) lightening conductor poles.*
Government Notice R386 (21 April 2006)	*15*	*The construction of a road that is wider than 4 m or that has a reserve wider than 6 m, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 m long.*
Government Notice R386 (21 April 2006)	*16(b)*	*The transformation of undeveloped, vacant or derelict land to residential mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare.*

This EIA report documents the assessment of environmental impacts that may occur through the construction and operation of the proposed facility. This EIA phase, which follows the Scoping Phase, was conducted in accordance with the requirements of the EIA Regulations in terms of Section 24(5) of NEMA (Act No 107 of 1998).

1.5. Objectives of the Environmental Impact Assessment Process

The **Scoping Phase** of the EIA process refers to the process of identifying potential impacts and benefits associated with the proposed project, and defining the extent of studies required within the EIA Phase. This was achieved through an evaluation of the proposed project in order to identify and describe potential environmental impacts. The Scoping Phase included input from the project proponent, specialists with experience in the study area as well as in EIAs for similar projects, as well as a public consultation process with key stakeholders that included both government authorities and interested and affected parties (I&APs).

The **EIA Phase** addresses those identified potential environmental impacts and benefits (direct, indirect, and cumulative) associated with all phases of the project including design, construction, operation and decommissioning. The EIA Phase also recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA Report aims to provide the competent environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The release of the draft EIA Report provides stakeholders with an opportunity to verify that issues they have raised through the EIA process have been captured and adequately considered. The final EIA Report will incorporate all issues and responses raised during the public review of the draft EIA Report prior to submission to DEA.

1.6. Details of Environmental Assessment Practitioner and Expertise to conduct the Scoping and EIA

Savannah Environmental was contracted by Thupela Energy as an independent consultant to undertake an EIA process for the proposed project, as required by the NEMA EIA Regulations. Neither Savannah Environmental, nor any its specialist sub-consultants on this project are subsidiaries of, or are affiliated to Thupela Energy. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consulting company providing a holistic environmental management service, including environmental assessment and planning to ensure compliance and evaluate the risk of development; and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

The Savannah Environmental team has considerable experience in environmental assessment and environmental management and have been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures.

Savannah Environmental has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation projects through their involvement in related EIA processes. Savannah Environmental has undertaken the EIA process and received authorisations for:

» The Eskom Wind Energy Facility on the West Coast
» The Umoya Energy Hopefield Wind Energy Facility in the Western Cape
» The African Clean Energy Development Cookhouse Wind Energy Facility in the Eastern Cape

Savannah Environmental is currently undertaking the EIA process and reporting for *inter alia*:

» The !Khi CSP South Africa Upington Solar Thermal Plant in the Northern Cape
» The !KaXu CSP South Africa Pofadder Solar Thermal Plant in the Northern Cape
» The VentuSA Energy Wag'nbiekiespan Solar Energy Facility in the Free State
» The VentuSA Energy Sishen Solar Energy Facility in the Northern Cape
» The Renewable Energy Investments South Africa Kathu Solar Energy Facility in the Northern Cape

Savannah Environmental has developed a valuable understanding of impacts associated with such facilities. Savannah Environmental has successfully managed and undertaken EIA processes for other power generation projects throughout South Africa. Curricula vitae for the Savannah Environmental project team consultants are included in Appendix A.

In order to adequately identify and assess potential environmental impacts, Savannah Environmental has appointed several specialist consultants to conduct specialist studies, as required. The curricula vitae for the EIA specialist consultants are also included in Appendix A.

OVERVIEW OF THE PROPOSED PROJECT CHAPTER 2

This chapter provides details regarding alternative options for the proposed facility, including the "do nothing" option. It also explores solar energy as a power generation technology and the need for such a facility in light of South Africa's energy requirements. Lastly, it examines the scope of works for the proposed facility which includes the construction, operation, and decommissioning activities.

2.1. Alternatives

From an extensive site identification process[3] undertaken by Thupela Energy, Portion 2 of the Farm Goedgevonden KR 104, which falls within the Modimolle Local Municipality between Vaalwater and Vier-en-Twintig Riviere was identified for consideration within an Environmental Impact Assessment (EIA) process (refer to Figure 1.1). In determining a preferred development site for the establishment of a commercial PV solar facility, Thupela Energy regarded the proposed site as highly desirable based on pre-feasibility analyses of potential sites in the Vaalwater region. The site displays characteristics which make it a preferred site for a solar energy facility, both from a regional and a local perspective, these include:

» **Climatic conditions**: The economic viability of a PV plant is directly dependent on the annual direct solar irradiation values. The level of irradiation available in the area is approximately 2 170 kWh/m^2 for a horizontally oriented square meter.
» **Topography**: A relatively flat surface area is required for the placement of the PV panels. This flat surface area will also facilitate construction of the plant.
» **Extent of site:** Space is a restraining factor for the development of solar facilities[4]. The broader site under investigation is approximately 50 ha in extent, while the developmental footprint (i.e. the PV panels as well as the associated infrastructure) is approximately 20 ha (and not more than 30 ha) in extent. Therefore the identified broader site is considered sufficient for the establishment of the entire facility.
» **Power transmission considerations:** the Vaalwater Substation is nearing maximum capacity, and evacuating the power from the PV facility directly to

[3] Several sites with the Waterberg district where assessed for potential suitability for a proposed PV plant. However, based on several site specific characteristics the identified farm portion was preferred (refer to Section 2.1).
[4] For example a 1 MW PV plant utilising fixed panels requires approximately 1 - 3 ha.

this substation was therefore not considered further. However, Eskom's Mink power line traverses the site. It has been determined through preliminary discussions with Eskom that this line has capacity to receive the power from the proposed facility. Furthermore, Thupela Energy has been advised through discussions with Eskom that the proposed site is preferred for the placement of the facility as it would serve to strengthen the existing Vaalwater - Sterkstroom Line (refer to Appendix D for the minutes of the relevant meeting held with Eskom). Therefore a switching station is proposed which will allow Thupela Energy to "turn in" to this existing power line in order to evacuate the power from the PV facility to the grid.

» **Environmentally suitable:** The broader site under investigation has been transformed through agricultural practices (i.e. the entire site has been disturbed using centre pivot irrigation systems). It is preferable, from an ecological perspective, to utilise a transformed site, as this will minimise impacts on biodiversity. From a technical perspective, it is preferable to utilise an area devoid of woody vegetation as shading would reduce the efficiency of the PV panels. Further to this, the proposed development site is located outside of the Waterberg Biosphere Reserve therefore presenting no direct risk to its ecological integrity.

Based on the above considerations, the proposed site was considered by Thupela Energy to be highly preferred for the establishment of the proposed facility. Due mainly to the preference expressed by Eskom in terms of grid connection, no further siting alternatives have been identified. This identified site has therefore been investigated in this EIA process as the only feasible alternative for construction of the proposed facility. No site alternatives have been investigated.

However, based on the requirements of the EIA Regulations, the following alternatives were investigated:

» **Site-specific alternatives**: This alternative refers to the design or layout of the proposed facility and lists alternative positions of the PV panels and associated infrastructure within the site.
» **'Do nothing' alternative**: In this situation Thupela Energy will not establish the proposed Waterberg Photovoltaic Plant on the identified site near Vaalwater (maintain status quo).

2.1.1. Site-specific or Layout Design Alternatives

The overall aim of the planning process was to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operation, and maintenance costs, and social and environmental impacts. Through the process of determining constraining factors, the layout of the PV

panels within the broader site was planned. In addition, feasible sites for the switching station, workshop, visitors centre, and internal access roads were also provided to inform the specialist impact assessments. The preliminary layout assessed within this EIA Report has been largely informed by visual impact considerations of the proposed facility, as this is expected to be a primary impact associated with a facility of this nature within this environment.

2.1.2. The 'do-nothing' Alternative

The 'do-nothing' alternative is the option of not constructing the proposed solar energy facility on the identified site near Vaalwater. This alternative would result in no environmental impacts on the site or surrounding area.

The increasing electricity demand in South Africa is placing ever-increasing pressure on the existing power generation capacity. Therefore additional electricity generation options, however minor, need to be developed throughout the country. The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least-cost energy service in many cases - and more so when social and environmental costs are taken into account.

In South Africa the generation of electricity through renewable energy resources offers a range of socio-economic and environmental benefits. These benefits are explored in further detail in the South Africa Renewable Energy Feed-in Tariff (REFIT) Regulatory Guideline published by NERSA (March 2009), and include:

» **Increased energy security:** The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of power supplementation. In addition, given that renewables can often 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.
» **Resource saving:** Conventional coal fired plants are major consumers of water during their requisite cooling processes. It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres, when compared with wet cooled conventional power stations; this translates into revenue savings of R26.6 million. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability.
» **Exploitation of our significant renewable energy resource:** At present, valuable national resources including biomass by-products, solar radiation and

wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio.

» **Pollution reduction:** The release of by-products from the burning of fossil fuels for electricity generation has a particularly hazardous impact on human health, and contributes to ecosystem degradation.

» **Climate friendly development:** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner, contributing to the mitigation of climate change through the reduction of greenhouse gas emissions. South Africa as a nation is estimated to be responsible for 1% of global GHG emissions and is currently ranked 9th worldwide in terms of per capita CO_2 emissions.

» **Support for international agreements and enhanced status within the international community:** The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol, and for cementing its status as a leading player within the international community.

» **Employment creation:** The sale, development, installation, maintenance, and management of renewable energy facilities have significant potential for job creation in South Africa.

» **Acceptability to society:** Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.

» **Support to a new industry sector:** The development of renewable energy offers the opportunity to establish a new industry within the South African economy.

» **Protecting the natural foundations of life:** The development of renewable energy projects can play an important role in the prevention of climate change through the reduction of our carbon footprint. In turn, this will secure the natural foundations of life for generations to come.

At present, South Africa is some way off from exploiting the diverse gains from renewable energy and from achieving a considerable market share in the renewable energy industry. South Africa's electricity supply remains heavily dominated by coal based power generation, with the country's significant renewable energy potential largely untapped to date.

Within a policy framework, the development of renewable energy in South Africa is supported by the White Paper on Renewable Energy (November 2003), which has set a target of 10,000 GWh renewable energy contributions to final energy consumption by 2013. The target is to be achieved primarily through the development of wind, biomass, solar and small-scale hydro. DME's macroeconomic study of renewable energy, developed under the now completed

Capacity Building in Energy Efficiency and Renewable Energy (CaBEERE) project, has established that the achievement of this target would provide a number of economic benefits, including increased government revenue amounting to R299 million, increased GDP of up to R1 billion per year and the creation of an estimated 20,500 new jobs. In addition, the development of renewable energy beyond the 10,000 GWh target holds further employment benefits and would maximise the number of jobs created per TWh (South Africa Renewable Energy Feed-in Tariff (REFIT) Regulatory Guideline published by NERSA (March 2009)).

Through research undertaken by the developer, the technical viability of a solar energy facility has been established, and Thupela Energy proposes that up to 5 MW can be generated. This power will be fed into the existing Vaalwater-Sterkstroom power line which crosses the site, thereby stabilising the power supply in the area. The 'do nothing' alternative will result in continued instability of the local electricity supply network and not assist the South African government in reaching their set targets for renewable energy.

This is, therefore, not a preferred alternative and is not assessed in further detail in this EIA report.

2.1.3. Technology Alternatives

The economics of a solar energy project depend on the solar resource at the site. Detailed and reliable information about this resource is vital when considering the installation of a solar plant and the type of technology to be installed. The selection of a preferred technology will be made from multifaceted decision-making framework. These include the outcome of the REFIT for PV technologies and the Engineering, Procurement, and Construction (EPC) partner whom Thupela Energy selects. However, the current technology alternatives include:

» Silicon PV modules (multicrystalline or single crystal) or
» First Solar's CdTe thin film technology

2.2. Photovoltaic Plants as a Power Generation Technology

Solar energy plants operate by converting solar energy into electricity. The use of solar energy for electricity generation is classified as a non-consumptive use of a natural resource and consumes no fuel for its continuing operation. Solar power produces an insignificant quantity of greenhouse gases over its lifecycle as compared to conventional coal-fired power stations. The operational phase of a solar facility does not produce carbon dioxide, sulfur dioxide, mercury, particulates, or any other type of air pollution, as do fossil fuel power generation technologies.

2.3. Functionality of a Grid Connected Photovoltaic Facility

PV facilities use semiconductors (PV cells) which absorb solar energy to produce electricity through the "**Photovoltaic Effect**." This physical process was discovered in 1839 by Edmund Becquerel who found that certain materials (i.e. silicon) produce electric current when exposed to light. Sunlight is composed of photons or "packets" of energy and when these photons strike the PV cells, they may be reflected or absorbed, or they may pass right through. When a photon is absorbed, its energy is transferred to an electron in an atom of the semiconductor). Thereafter, the electron is able to escape from its normal position associated with that atom to become part of the current in an electrical circuit. Special electrical properties of the solar cell provide the voltage needed to drive the current through an external load (i.e. a light bulb) (refer to Figure 2.3).

Individual **PV cells** are commonly constructed from silicon and are linked together and placed behind a protective glass sheet to operate in unison as a PV panel. A single PV cell is sufficient to power a small device such as an emergency telephone, however to produce 5 MW of power, the proposed plant will require numerous cells arranged in multiples/arrays which will be fixed to **support structures**. In order to maximise the electricity generated these structures need to be angled in such a fashion so to receive the maximum amount of solar radiation throughout the year. The preferred angle of the panels (which is dependent on the latitude of the proposed facility) may be adjusted to optimise for summer or winter solar radiation characteristics. This is further optimised through the utilisation of tracking technology, whereby the PV panels are able to 'track' the sun during the day.

The generated power can then be evacuated into a local electricity grid to meet the load requirements. In the case of the latter, the electricity is evacuated to either a substation or a switching station which houses an inverter. The **inverter** converts the electricity, which is produced as direct current, into alternating current which can be used by individuals drawing power from the national electricity grid.

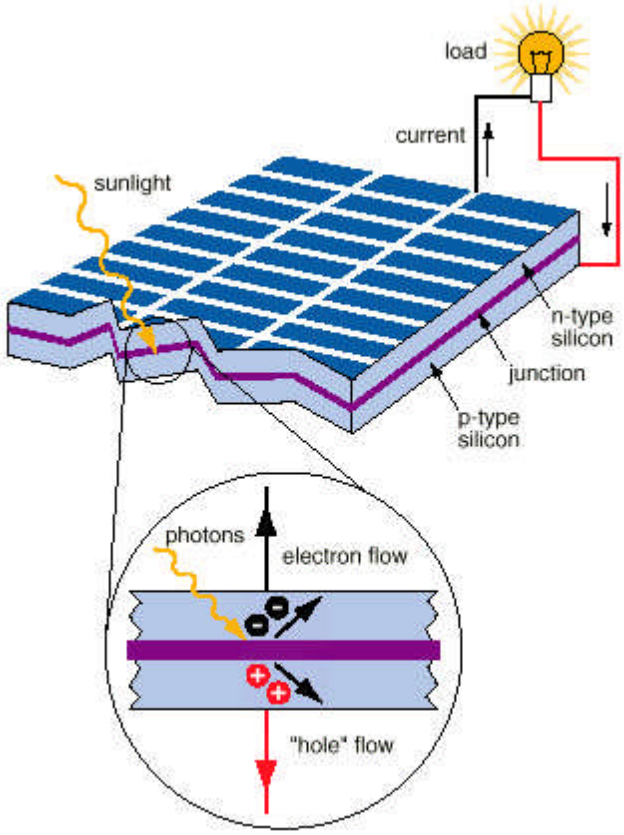

Figure 2.3: Basic operational mechanism behind the Photovoltaic Effect

2.3.2. Operating Characteristics of a Photovoltaic Panel

Four primary factors affect the efficiency of a PV cell, these include:

» **The operational temperature of the PV cell:** Higher ambient temperatures reduce the performance of PV panels. For example standard silicon panels lose about 0.5% of efficiency for every 1 degree increase (calculated by assuming efficiency at 25°C of 100%). Therefore a 15% efficient panel at 25°C would turn in to a 13.5% panel at 45°C. PV cells get significantly hotter than the ambient temperature (i.e. 25°C hotter under normal conditions).

» **The intensity of the incoming solar radiation:** The performance of a PV cell is directly proportional to the intensity of the solar radiation. Therefore the efficiency is affected by the intensity of the sunlight on an optimally oriented panel at the specific location, at the specific time. Clouds cover would cause a decrease in efficiency of approximately 10%.

» **The orientation of the panels with respect to the angle of the sun:** For optimal performance, PV systems aim to maximise the time they face the sun. Solar trackers aim to achieve this by moving PV panels to follow the sun. The increase can be by as much as 20% in winter and by as much as 50% in summer. Static mounted systems can be optimised by analysis of the sun's

path. Panels are often set to latitude tilt, an angle equal to the latitude, but performance can be improved by adjusting the angle for summer or winter. In standard PV applications trackers are used to minimise the angle of incidence between the incoming light and the PV panel. This increases the amount of energy produced from a fixed installed power generating capacity. Various tracker technologies are available and include single axis trackers (i.e. have one degree of freedom that acts as an axis of rotation) or Dual Axis trackers (i.e. have two degrees of freedom that act as axes of rotation). Compared to a fixed mount, a single axis tracker increases annual output by approximately 30% and a dual axis tracker by an additional 6%.

» **The I-V operation point:** The power a panel delivers depends on the load it is supplying. Modern PV systems use maximum power point trackers which change the input impedance of the load for the panels to match changes in the panels due to sun light changes. This means the right resistance that the panels are outputting into is required in order to generate maximum power.

2.4. Project Construction Phase

The construction phase is expected to take six - nine months in total and will entail a series of activities including:

» The **pre-construction phase** will include conducting surveys; undertaking site preparation and transporting the required components and equipment to site.
» The **construction phase** will include the establishment of internal access roads; erecting the arrays of PV panels, constructing the switching station, visitors centre, canteen facilities, and workshop/administrative/security offices as well as establishing the connections between the PV panels, the switching station, and the existing power line.
» The **post-construction phase** will include site remediation.

2.4.1 Conduct Surveys

Prior to initiating construction, a number of surveys will be required including, but not limited to a **site survey** (which will include an assessment of the site-specific topography), confirmation of the **micro-siting footprint** (i.e. the precise location of the PV panels and the plant's associated infrastructure) and a **geotechnical survey**. The micro-siting footprint will consider any environmental sensitivity identified during the EIA investigations. Geotechnical surveys are executed by geotechnical engineers and geologists to acquire information regarding the physical characteristics of soil and rocks underlying a proposed site. The purpose is to design earthworks and foundations for structures and to execute earthwork repairs necessitated due to changes in the subsurface environment. A

geotechnical examination includes surface and subsurface exploration, soil sampling, and laboratory analysis.

2.4.2 Establishment of Access Roads to the Site

The identified farm portion for the proposed facility can be accessed via the R33 from Modimolle to Vaalwater, then via the Melkrivier/Vier-en-Twintig Riviere roads. Thereafter an existing gravel farm road of approximately 2 km can be used to access the proposed facility. These roads will be used for construction purposes and for daily site access by staff members as well as for tourists utilising the Visitors Centre. It is not envisaged that any new access roads will be required to access the site. However, internal roads will be required to access the individual components within the facility (i.e. the Visitors Centre, canteen facilities, workshops/storeroom and administrative/ security offices). It has not yet been determined whether these proposed internal access roads will be comprised of gravel tracks or whether access track construction would comprise of compacted rock-fill with a layer of higher quality surfacing stone on top. Should the latter be required, the strength and durability properties of the rock strata at the proposed site would need to be assessed during the geotechnical surveys. Depending on the results of these studies, it may be possible, in some areas, to strip off the existing vegetation (i.e. pastures) and level the exposed ground surface to form an access track surface.

2.4.3 Undertake Site Preparation

Site preparation activities will commence with the construction of a security fence around the perimeter of the site and the creation of fire breaks. Thereafter activities will include clearance of vegetation for infrastructure footprints (i.e. the visitor's centre, the kitchen/dining facilities, the workshops/storerooms, the crèche, as well as the administrative/security offices) and the establishment of the internal access roads.

The PV panels will have feet/supports which will sit on panel mounts (i.e. shallow concrete blocks of 30 – 50 cm deep). The vegetation between the panels will not be cleared and will most likely be grazed by sheep during the operational phase, or will be mowed. Clearing activities, where required, will involve the stripping of topsoil which will need to be stockpiled and/or spread on site as per the recommendations of the EMP.

2.4.4 Transport of Components and Equipment to Site

The components for the proposed facility will be brought to site in sections by means of trucks. The individual components are unlikely to be classified as

abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989) by virtue of their limited dimensions (i.e. length and weight). Conventional construction equipment will be required and will include inter alia excavators, trucks, graders, compaction equipment, cement trucks. It is unlikely that any specialised construction and/or lifting equipment will be needed. The equipment will be transported to the site using appropriate national/provincial roads (most likely via the N1 national road from Pretoria, then via the R33 and Melkrivier road lastly via the existing farm roads to the site itself). The dimensional requirements of the load during the construction phase (length/height) are not expected to require alterations to the existing road infrastructure.

2.4.5 Establishment of Construction Camps

Once the required equipment has been transported to site, a dedicated construction camp will need to be established. The purpose of this camp is to confine activities and storage of equipment to one designated area in order to limit the potential impacts associated with this phase of the project. The storage of fuel for the on-site construction vehicles and equipment will need to be secured in a temporary bunded facility so to prevent the possibility of leakages and soil contamination. The amounts of concrete needed will be low (i.e. each PV panel mount will be less than a cubic meter). These small quantities will be mixed close to the point of use. The water for the concrete batching will be sourced from the existing borehole uphill of the plant. Said borehole has an output of approximately 5000 litres per hour.

2.4.6 Construct Foundations

Due to the very sandy nature of the soil within the study site, it is most likely that the buildings (i.e. the visitor's centre) will be constructed with raft-type foundations. In this design no deep foundations are constructed, but instead a complete interconnected, re-enforced, 'raft' foundation is constructed on which the buildings can sit. If the sands should shift, the whole building will move with the raft, preventing cracking. The raft is positioned typically no more than 30 cm deep into the sand.

Concrete foundations will be constructed for the 'feet' of the PV panels. Foundation holes will be mechanically excavated to a depth of approximately 30 - 50 cm. The concrete foundation will be poured and will then be left for up to a week to cure.

2.4.7 Establishment of PV Panels

The electrical output from the individual panels will be summed, initially into "strings," then further summed, and changed to AC power using inverters. If one 'string' should require maintenance or should it break down, then the generation capabilities of the whole facility will not be compromised. Each 'string' will be sited a certain distance away from each other for the following reasons: Firstly, the proposed tracking panels will require sufficient room to move as the position of the sun changes during the day and from season to season. Secondly, as the panels move during the course of the day, sufficient spacing will prevent shadows falling in an easterly direction from shading adjacent panels (i.e. to the west).

2.4.8 Construct Switching Station

A switching station of approximately 4 m x 4 m will be required for the "turn in" into Eskom's existing Mink power line which crosses the site. A switching station is a smaller version of a substation and usually contains just a single transformer to step up the generated power into a voltage suitable for the existing power line (i.e. 132 kV in this case). The output of the panels will be dependent on the technology provider selected. The construction of the switching station would include the construction of the foundations, erection, and installation of equipment (including the transformer) and connection of the necessary conductors.

2.4.9 Establishment of Ancillary Infrastructure

The Visitor's Centre (i.e. 10 m x 20 m), ablution facilities (4 m x 5 m), workshop (6 m x 8 m); storage areas (6 m x 8 m); administrative and security facilities (6 m x 10 m); kitchen and dining facilities (10 m x 15 m) and a crèche (6 m x 8 m) will also be established. Their establishment will require the clearing of vegetation and levelling of the development site and the shallow excavation of foundations prior to construction.

2.4.10 Connection of PV panels to the Switching Station

The PV panels will be connected to the switching station via cabling (these will be laid underground where practical). The installation of these underground cables will require the excavation of trenches of approximately 30 cm deep within which they can then be laid. The underground cables will be planned to follow the internal access roads, as far as possible.

2.4.11 Connect Switching Station to Mink Power Line

The generated power that is stepped up in the switching station will then be evacuated to the Mink power line. The location of the switching station to the power line will be determined in the EIA Phase. The power line will be isolated at some point along the an existing Eskom line, and then new line of approximately 10 m will be connected from the transmission line to the switching station. This will allow for the evacuation of power into the line and extraction of power out of the line in both directions.

2.4.12 Undertake Site Rehabilitation

As construction is completed in an area, and as all construction equipment is removed from the site, the site must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operation phase will be closed and prepared for rehabilitation. The methodology for site rehabilitation is referred to in the Draft EMP which is included as part of the detailed EIA Report. The EMP will provide objectives for returning the site to the pre-establishment conditions and will provide measures to mitigate/manage the potential impacts expected during the construction phase (refer to Appendix L).

2.5. Project Operation Phase

The operational phase is proposed to run for a period of approximately 30 - 50 years. It is anticipated that during this time a full time security, maintenance, supervision, and monitoring teams will be required on site. The photovoltaic plant will be operational during daylight hours only. However, it will not be operational under circumstances of mechanical breakdown, extreme weather conditions, or maintenance activities. No energy storage mechanisms (i.e. batteries) which would allow for continued generation at night or on cloudy days are proposed.

2.5.1 Staff Component

A staff component of up to 45 - 50 staff members are expected to be required during the operational phase (i.e. at any one time). Two shifts of approximately 40 manual panel operators are proposed to work on alternate days. The remaining staff members and the 24 hour security teams will operate in three shifts which amounts to a total of 90 employed. Personnel at the facility would include supervisors, managers, security personnel, cooks, cleaning and administrative personnel.

The likely transport logistics and routes during the operation phase as follows:

» One small vehicle will be used 3 times per day for security from Vaalwater to Goedgevonden and back (i.e. 6 times on the route per day) and 1 security vehicle permanently on site
» One medium seater bus (i.e. seating approximately 22 people) will be used once a day from Boschdraai village to Goedgevonden and back (i.e. twice on the route per day)
» One medium seater bus (i.e. seating approximately 22 people) will be used once a day from Vaalwater to Goedgevonden and back (i.e. twice on the route per day)

2.5.2 Maintenance Activities

Maintenance during the life cycle of the facility would include emergency repairs, routine panel maintenance, and cleaning during the night whereby large dusters or compressed air would be used. When necessary, the panels would have to be cleaned with water. Security measures on site would involve CCTV monitoring, a minimum of three security personnel on site (full-time) and security back-up from a larger armed security organisation. The canteen facility proposed would be a small facility where food can be prepared for the personnel.

2.5.3 Visitor's Centre

The primary aim of the visitors centre would be educational with the following activities anticipated to take place:

» A tour of the site and the opportunity to experience the operation of the facility
» An audio visual display focusing on the construction and operation of the facility and solar power and climate change in general
» An opportunity to manipulate a solar panel and experience the generation of electricity
» Visitors would have the opportunity to buy and/or even make their own souvenirs which use solar power to take with them

2.6. Project Decommissioning Phase

Depending on the economics of the development following the operational period, the plant will either be decommissioned or the operational phase will be extended. If it is deemed financially viable to continue, existing components would be dissembled and replaced with more appropriate technology/ infrastructure available at that time. However, if the decision is made to

decommission the facility the following activities will form part of the project scope.

2.6.1. Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate the required decommissioning equipment.

2.6.2. Disassemble and Replace Existing PV Panels

The components of the plant will be disassembled and removed. Thereafter they will be reused and recycled (where possible) or disposed of in accordance with regulatory requirements.

REGULATORY AND LEGAL CONTEXT CHAPTER 3

3.1 Policy and Planning Context for Solar Energy Facility Development in South Africa

The need to expand electricity generation capacity in South Africa is based on **national policy** and informed by on-going strategic planning undertaken by the Department of Energy (DoE), the National Energy Regulator of South Africa (NERSA) and Eskom. The hierarchy of policy and planning documentation that support the development of renewable energy projects such as solar energy facilities is illustrated in Figure 3.1. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the proposed PV plant's development.

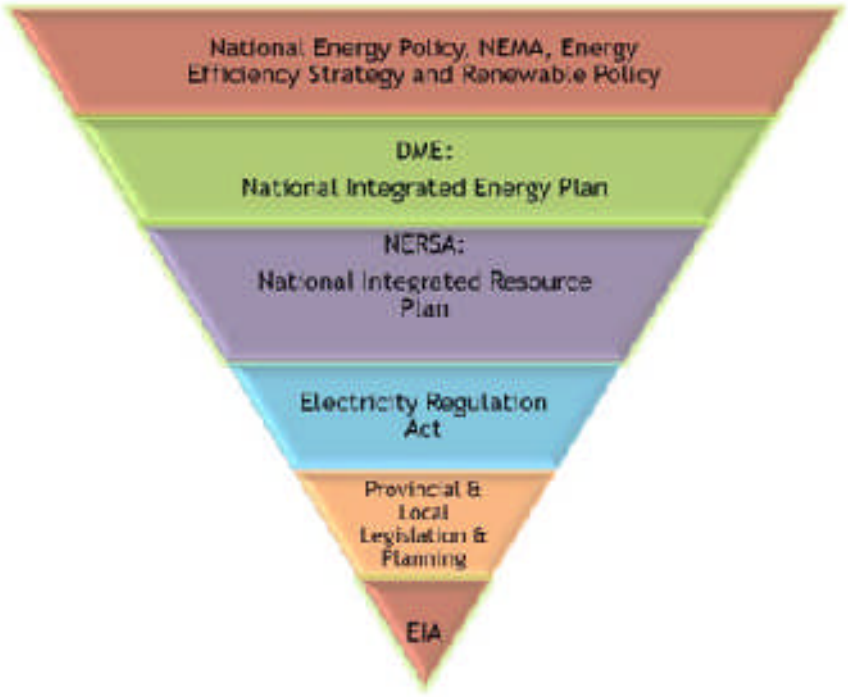

Figure 3.1: Hierarchy of electricity policy and planning documents

3.1.1 White Paper on the Energy Policy of the Republic of South Africa, 1998

Development within the energy sector in South Africa is governed by the White Paper on a National Energy Policy (the National Energy Policy), published by the Department of Minerals and Energy (DME) in 1998. This White Paper identifies key objectives for energy supply within South Africa, such as increasing access to

affordable energy services, managing energy-related environmental impacts and securing energy supply through diversity.

Investment in renewable energy initiatives, such as the proposed PV plant, is supported by the White Paper on Energy Policy for South Africa. In this regard the document notes that government policy is based on an understanding that renewable energy sources have significant medium - long-term commercial potential and can increasingly contribute towards a long-term sustainable energy future in South Africa. The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly ***solar*** and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

3.1.2 Renewable Energy Policy in South Africa, 1998

The White Paper on Renewable Energy (DME, 2003) supplements the Energy Policy, and sets out Government's vision, policy principles, strategic goals, and objectives for promoting and implementing renewable energy in South Africa. The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology); more so when social and environmental costs are taken into account. Government policy on renewable energy is therefore concerned with meeting economic, technical, and other constraints on the development of the renewable industry.

In order to meet the long-term goal of a sustainable renewable energy industry, the South African Government has set the following 10-year target for renewable energy: "*10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1 667 MW) of the estimated electricity demand (41 539 MW) by 2013"* (DME, 2003).

The White Paper on Renewable Energy states "*It is imperative for South Africa to supplement its existing energy supply with renewable energies to combat Global Climate Change which is having profound impacts on our planet*."

3.1.3 Integrated Energy Plan, 2003

In response to the requirements of the National Energy Policy, the DME commissioned the Integrated Energy Plan (IEP) to provide a framework in which specific energy policies, development decisions and energy supply trade-offs can be made on a project-by-project basis. The framework is intended to create a balance between the energy demand and resource availability to provide low cost electricity for social and economic development, while taking into account health, safety, and environmental parameters.

The current IEP recognises that South Africa is likely to be reliant on coal for at least the next 20 years as the predominant source of energy. However, there is potential and a need to diversify energy supply through increased use of natural gas and new and renewable energies.

3.1.4 National Integrated Resource Plan, 2003/2004

In response to the National Energy Policy's objective relating to affordable energy services, NERSA commissioned a National Integrated Resource Plan (NIRP) in order to provide a long-term (from 2003 to 2022), cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social and economic policies. The planning horizon for the study was from 2003 to 2022. The objective of the NIRP is to determine the least-cost supply option for the country, provide information on the opportunities for investment into new power generating projects, and evaluate the security of supply. The Long-term Electricity Planning goal is to ensure sustainable development considering technical constraints, economic constraints, social constraints, and externalities (http://www.energy.gov.za/files/irp_frame.html).

Various demand side management and supply-side options are considered in the NIRP process, prior to identifying the least cost supply options for South Africa. The outcome of the process confirmed that coal-fired options are still required over the next 20 years and that additional base load plants will be required from 2010.

The first and interim IRP was developed in 2009 by the Department of Energy. The initial four years of this plan was promulgated by the Minister of Energy on 31 December 2009, updated on 29 January 2010. The Department of Energy is currently revisiting and revising the IRP, and a draft document is currently available for public comment. The IRP2010 is expected to be promulgated by the end of 2010. .

3.1.5 Electricity Regulation Act, 2006

To contribute towards the renewable energy target set by the Government, socio-economic and environmentally sustainable growth, and kick start and stimulate the renewable energy industry in South Africa, Renewable Energy Feed-in Tariffs (REFIT) have been set by the National Energy Regulator of South Africa (NERSA). REFITs are, in essence, guaranteed prices for electricity supply rather than conventional consumer tariffs. The basic economic principle underpinning the REFITs is the establishment of a tariff (price) that covers the cost of generation plus a "reasonable profit" to induce developers to invest. This is quite similar to the concept of cost recovery used in utility rate regulation based on the costs of capital. Feed-in tariffs to promote renewable energy have now been adopted in over 36 countries around the world. The establishment of the Renewable Energy Feed-In Tariff (REFIT) in South Africa provides the opportunity for an increased contribution towards the sustained growth of the renewable energy sector in the country, the region and internationally, and promote competitiveness for renewable energy with conventional energies in the medium- and long-term. Under the National Energy Regulator Act, 2004 (Act No 40 of 2004), the Electricity Regulation Act, 2006 (Act No 4 of 2006) and all subsequent relevant Acts of Amendment, NERSA has the mandate to determine the prices at and conditions under which electricity may be supplied by licence to Independent Power Producers (IPPs).

3.2. Regulatory Hierarchy for Energy Generation Projects

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels.

At National Level, the main regulatory agencies are:

Department	Responsibilities
Department of Energy (formerly DME)	This department is responsible for policy relating to all energy forms, including renewable energy. Solar energy is considered under the White Paper for Renewable Energy and the Department undertakes research in this regard. It is the controlling authority in terms of the Electricity Act (Act No 41 of 1987).
National Energy Regulator of South Africa (NERSA)	This body is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses for solar energy developments to generate electricity.

Department	Responsibilities
Department of Environmental Affairs (DEA)	This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
The South African Heritage Resources Agency (SAHRA)	The National Heritage Resources Act (Act No 25 of 1999) and the associated provincial regulations provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes.
South African National Roads Agency (SANRAL)	This department is responsible for all National road routes.

At Provincial Level, the main regulatory agencies are:

Department	Responsibilities
Provincial Government of the Limpopo Province – Department of Economic Development, Environment and Tourism (LEDET)	This Department is responsible for environmental policy and is the Provincial authority in terms of NEMA and the EIA Regulations. The LEDET is the commenting authority for this project.
Department of Transport and Public Works	This department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.

At a Local Level, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use, and the environment. In the Limpopo, both Municipalities and District Municipalities play a role. The local municipality is the *Modimolle Local Municipality*, which forms part of the Greater *Waterberg District Municipality*.

» In terms of the Municipal Systems Act (Act No 32 of 2000) it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.
» Bioregional planning involves the identification of priority areas for conservation and their placement within a planning framework of core, buffer, and transition areas. These could include reference to visual and scenic resources and the identification of areas of special significance, together with visual guidelines for the area covered by these plans.
» By-laws and policies have been formulated by local authorities to protect visual and aesthetic resources relating to urban edge lines, scenic drives, special areas, signage, communication masts, etc.

There are also numerous non-statutory bodies and environmental lobby groups that play a role in various aspects of planning and the environment that will influence solar energy development.

3.3 Legislation and Guidelines that have informed the preparation of this EIA Report

The following legislation and guidelines have informed the scope and content of this Draft EIA Report:

- National Environmental Management Act (Act No 107 of 1998)
- EIA Regulations, published under Chapter 5 of the NEMA (GN R543, GN R544 and GN R546 in Government Gazette 33306 of 18 June 2010)
- Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Guideline 3: General Guide to Environmental Impact Assessment Regulations, 2006 (DEAT, June 2006)
  - Guideline 4: Public Participation in support of the Environmental Impact Assessment Regulations, 2006 (DEAT, May 2006)
  - Guideline 5: Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations, 2006 (DEAT, June 2006)

Acts, standards or guidelines which have informed the project process and the scope of issues assessed within this EIA are summarised in Table 3.1.

Table 3.1: Relevant legislative permitting requirements applicable to the Waterberg PV Plant

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	National Legislation		
National Environmental Management Act (Act No 107 of 1998)	» EIA Regulations have been promulgated in terms of Chapter 5 where activities which may not commence without an environmental authorisation are identified. » In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. » In terms of GNR 387 of 21 April 2006, a scoping and EIA process is required to be undertaken for the proposed project	» National Department of Environmental Affairs – lead authority » LEDET - commenting authority	» This EIA report is to be submitted to the DEA and Provincial Environmental Department in support of the application for authorisation.
National Environmental Management Act (Act No 107 of 1998)	» In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised. » It has become the legal duty of a project proponent to consider the cumulative effect of a variety of impacts.	» Department of Environmental Affairs (as regulator of NEMA)	» While no permitting or licensing requirements arise directly by virtue of the proposed project, this section will find application during the EIA phase and will continue to apply throughout the life cycle of the project.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
Environment Conservation Act (Act No 73 of 1989)	» S20(1) provides that where an operation accumulates, treats, stores or disposes of waste on site for a continuous period, it must apply for a permit to be classified as a suitable waste disposal facility.	» National Department of Environmental Affairs » Department of Water Affairs	» As no waste disposal site is to be associated with the proposed project, no permit is required in this regard.
Environment Conservation Act (Act No 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)	» National Department of Environmental Affairs » LEDET- commenting authority » Local Authorities » District & Local Municipality	» There is no requirement for a noise permit in terms of the legislation. Noise impacts are expected to be associated with the construction phase of the project and are likely to present an intrusion impact to the local community. On-site activities should be limited to 6:00am to 6:00pm Monday – Saturday (excluding public holidays). Should activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from the DEA and the Local Municipality.
National Water Act (Act No 36 of 1998)	» Water uses must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation.	» Department of Water Affairs	» The use of water from the on-site borehole is unlikely to trigger a water use (as defined in terms of S21 of the NWA) due to the volumes being abstracted.

National Water Act (Act No 36 of 1998)	» In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.	» Department of Water Affairs (as regulator of NWA)	» This section will apply throughout the life cycle of the project.
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	» A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act. » Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.	» Department of Minerals and Energy	» As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained.
Atmospheric Pollution Prevention Act (Act No 45 of 1965)	» In terms of S27, the Minister may declare certain areas dust control areas. (The project study area has not been declared a dust control area). » Part V of Act regulates pollution generated by vehicle fumes.	» National Department of Environmental Affairs	» Although there is no legal obligation relating to the activities to be undertaken it is suggested that best practice means should be used to prevent dust generation from the roads and excavations during construction.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	» S18, S19 and S20 of the Act allow certain areas to be declared and managed as "priority areas" » Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards	» National Department of Environmental Affairs	» While no permitting or licensing requirements arise from this legislation, this act will find application during the operational phase of the project. » The Act provides that an air quality officer may require any

			person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.
National Heritage Resources Act (Act No 25 of 1999)	» S38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including » The construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; » Any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent » The relevant Heritage Resources Authority must be notified of developments such as linear developments (such as roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m^2; or the re-zoning of a site exceeding 10 000 m^2 in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided. » Stand alone HIAs are not required where	» South African Heritage Resources Agency (SAHRA) – National heritage sites (grade 1 sites) as well as all historic graves and human remains	» A permit may be required should identified cultural/heritage sites on site be required to be disturbed or destroyed as a result of the proposed development. » S4 of the NHRA provides that within 14 days of receipt of notification the relevant Heritage Resources Authority must notify the proponent to submit an impact assessment report if they believe a heritage resource may be affected.

	an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of S38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		
Nature Conservation Ordinance (Act 19 of 1974)	» Article 63 prohibits the picking of certain flora (including cutting, chopping, taking, gathering, uprooting, damaging, or destroying). » Schedule 3 lists endangered flora and Schedule 4 lists protected flora. » Articles 26 to 47 regulate the use of wild animals.	» National Department of Environmental Affairs	» Compliance requirements
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» In terms of S57, the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. » In terms of GNR 152 of 23 February 2007: Regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA phase of the project to incorporate the legal provisions as well as the regulations	» National Department of Environmental Affairs	» As the applicant will not carry on any restricted activity, as is defined in Section 1 of the Act, no permit is required to be obtained in this regard. » Specialist flora and fauna studies are required to be undertaken as part of the EIA process. These studies have been undertaken as part of the previously EIAs undertaken for the power station site. »

	associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements at an early stage of the EIA phase.		
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Regulation 15 of GNR1048 provides for the declaration of weeds and invader plants, and these are set out in Table 3 of GNR1048. Weeds are described as Category 1 plants, while invader plants are described as Category 2 and Category 3 plants. These regulations provide that Category 1, 2 and 3 plants must not occur on land and that such plants must be controlled by the methods set out in Regulation 15E.	» Department of Agriculture	» While no permitting or licensing requirements arise from this legislation, this Act will find application during the EIA phase and will continue to apply throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented.
National Veld and Forest Fire Act (Act 101 of 1998)	» In terms of Section 21 the applicant would be obliged to burn firebreaks to ensure that should a veldfire occur on the property, that it does not spread to adjoining land. » In terms of section 12 the applicant must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material.	» Department of Water Affairs	» While no permitting or licensing requirements arise from this legislation, this act will find application during the operational phase of the project.

	» In terms of section 17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.		
Hazardous Substances Act (Act No 15 of 1973)	» This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising, or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance » Group IV: any electronic product; and » Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license.	» Department of Health	» It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.

Development Facilitation Act (Act No 67 of 1995)	» Provides for the overall framework and administrative structures for planning throughout the Republic » Sections 2- 4 provide general principles for land development and conflict resolution.	» Local Municipality, District Municipality	» The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the DFA.
Subdivision of Agricultural Land Act (Act No 70 of 1970)	» Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the province	» Local Municipality, District Municipality	» Subdivision will have to be in place prior to any subdivision approval in terms of Section 24 and 17 of LUPO. » Subdivision is required to be undertaken following the issuing of an environmental authorisation for the proposed project.
National Environmental Management: Waste Act (Act No 59 of 2008)	» The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. » The Minister may amend the list by— *(a)* adding other waste management activities to the list; *(b)* removing waste management activities from the list; or 55 *(c)* making other changes to the particulars on the list.	» National Department of Environmental Affairs (DEA)	» The volumes of waste to be generated and stored on the site during construction and operation of the facility will not require a waste license (provided these remain below the prescribed thresholds).
Promotion of Access to	» All requests for access to information held	» National Department of	» No permitting or licensing

Information Act (Act No 2 of 2000)	by state or private body are provided for in the Act under S11.	Environmental Affairs (DEA)	requirements
Promotion of Administrative Justice Act (Act No 3 of 2000)	» In terms of S3 the government is required to act lawfully and take procedurally fair, reasonable and rational decisions » Interested and affected parties have right to be heard	» National Department of Environmental Affairs (DEA)	» No permitting or licensing requirements

APPROACH TO UNDERTAKING THE ENVIRONMENTAL IMPACT ASSESSMENT PHASE CHAPTER 4

An EIA process refers to the process dictated by the EIA Regulations which involves the identification of and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project. The EIA process comprises two phases: **Scoping Phase** and **EIA Phase**. The EIA process culminates in the submission of an EIA Report (including an environmental management plan (EMP)) to the competent authority for decision-making. The EIA process is illustrated below.

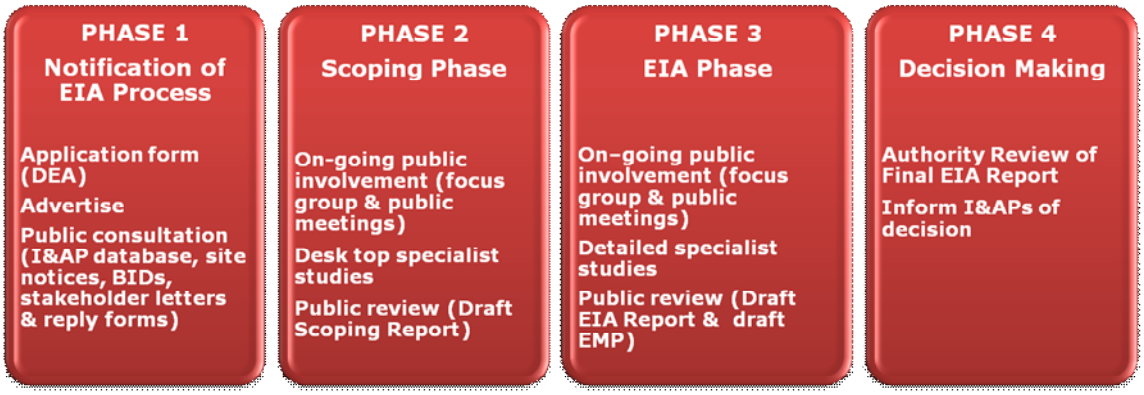

Figure 4.1: Phases within the EIA process

The EIA Phase for the proposed Waterberg Photovoltaic Plant has been undertaken in accordance with the EIA Regulations published in Government Notice 28753 of 21 April 2006, in terms of Section 24(5) of NEMA (Act No. 107 of 1998). The environmental studies for this proposed project were undertaken in two phases, in accordance with the EIA Regulations.

4.1. Phase 1: Scoping Study

The Scoping Study, which was completed in September 2010 (i.e. acceptance of the Final Scoping Report), provided interested and affected parties (I&APs) with the opportunity to receive information regarding the proposed project, to participate in the process and raise issues or concerns.

The Scoping Report aimed at detailing the nature and extent of the proposed facility, identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA Phase. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and I&APs. In accordance with the requirements of

the EIA Regulations, feasible project-specific alternatives were identified for consideration within the EIA process. These alternatives are detailed in Chapter 2.

The Draft Scoping Report was made available for public review and comment at the Vaalwater Library, the Waterberg District Municipality, and the Modimolle Local Municipality and on the Savannah Environmental website (www.savannahSA.com) for I&AP review and comment. All the comments, concerns, and suggestions received during the Scoping Phase and the review period were included within the Final Scoping Report. The Final Scoping Report and Plan of Study for EIA were submitted to the National Department of Environmental Affairs (DEA) in July 2010. The Final Scoping Report was accepted by the DEA, as the competent authority, on 01 September 2010. In terms of this acceptance, an EIA was required to be undertaken for the proposed project.

4.2. Phase 2: Environmental Impact Assessment

Through the Scoping Study, a number of issues requiring further study for all components of the project were highlighted. These issues have been assessed in detail within the EIA phase of the process.

The EIA Phase aims to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Comparatively assess identified feasible alternatives put forward as part of the project.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA addresses potential environmental impacts and benefits associated with all phases of the project including design, construction, operation, and decommissioning, and aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The EIA process followed for this project is described in detail below.

4.3. Overview of the EIA Phase

The EIA Phase has been undertaken in accordance with the EIA Regulations published in Government Notice 28753 of 21 April 2006, in terms of NEMA[5]. Key tasks undertaken within the EIA phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Undertaking a public participation process throughout the EIA process in accordance with Regulation 56 of Government Notice No R385 of 2006 in order to identify any additional issues and concerns associated with the proposed project.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 59 of Government Notice No R385 of 2006).
» Undertaking of independent specialist studies in accordance with Regulation 33 of Government Notice No R385 of 2006.
» Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 32 Government Notice No R385 of 2006.

These tasks are discussed in detail below.

4.3.1 Authority Consultation

The National DEA is the competent authority for this application. A record of all authority consultation undertaken prior to the commencement of the EIA Phase is included within the Scoping Report and this EIA report. Consultation with the regulating authorities (i.e. DEA and LEDET) has continued throughout the EIA process. On-going consultation included the following:

» Submission of a Final Scoping Report (i.e. September 2010) following a 30-day public review period (and consideration of stakeholder comments received)
» Ad hoc discussions with DEA and LEDET in order to clarify the findings of the Scoping Report and the issues identified for consideration in the EIA process.

The following will also be undertaken as part of this EIA process:

» Submission of a Final Environmental Impact Assessment (EIA) Report following the 30-day public review period
» Provision of an opportunity for DEA and LEDET representatives to visit and inspect the proposed site, and the study area

[5] Note that this EIA process is being conducted in accordance EIA Regulations that were current at the time of application for authorisation (i.e. the EIA Regulations of April 2006)

- Consultation with Organs of State that may have jurisdiction over the project, including:
  - Provincial and local government departments (including South African Heritage Resources Agency, Department of Water Affairs, South African National Roads Agency Limited, Department of Agriculture, etc)
  - Government Structures (including the Department of Public Works, Roads and Transport, etc)
- Modimolle Local Municipality and Waterberg District Municipality
- Potentially affected and neighbouring landowners and tenants
- Local authorities
- Parastatals (i.e. Eskom Distribution)
- Conservation authorities (i.e. Waterberg Nature Conservancy, Waterberg Biosphere Reserve, WESSA)
- Industry and Business
- Community Based Organisations and Non-governmental Organisations (i.e.

A record of all authority consultation undertaken prior to the commencement of the EIA Phase is included within the Scoping Report. A record of the consultation in the EIA process is included within Appendix B.

4.3.2 Public Involvement and Consultation

The aim of the public participation process was primarily to ensure that:

- Information containing all relevant facts in respect of the proposed project was made available to potential stakeholders and I&APs.
- Participation by potential I&APs was facilitated in such a manner that all potential stakeholders and I&APs were provided with a reasonable opportunity to comment on the proposed project.
- Comment received from stakeholders and I&APs was recorded and incorporated into the EIA process.

Through on-going consultation with key stakeholders and I&APs, issues raised through the Scoping Phase for inclusion within the EIA study were confirmed. All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to Appendix C). While I&APs were encouraged to register their interest in the project from the onset of the process, the identification and registration of I&APs has been on-going for the duration of the EIA process and the project database has been updated on an on-going basis.

In order to accommodate the varying needs of stakeholders and I&APs, as well as ensure the relevant interactions between stakeholders and the EIA specialist team,

the following opportunities were provided for I&APs issues to be recorded and verified through the EIA phase, including:

» Focus group meetings (stakeholders invited to attend) (refer to Table 4.1)
» Public meeting (advertised in the local press)
» Written, faxed or e-mail correspondence

Table 4.1: Meetings undertaken thus far during the EIA Process

Date	Meeting Description	Attendees
21 June 2010	Scoping Phase: Focus Group Meeting	Batho Earth Savannah Environmental Thupela Energy Mark Jurgens
28 June 2010	Scoping Phase: Public Meeting	Refer to attendance register in Appendix D
28 June 2010	Scoping Phase: Focus Group Meeting – Waterberg District Municipality	Batho Earth Savannah Environmental Waterberg District Municipality
2 – 3 August 2010	Consultation with property owners	Multiple landowners – refer to Appendix D
2 August 2010	Focus Group Meeting	Batho Earth Thupela Energy Waterberg District Municipality and Modimolle Local Municipality
21 September 2010	Focus Group Meeting – Water District Municipality Planning Forum	Refer to attendance register in Appendix D

In addition, during the EIA Phase, a **stakeholder meeting** will be held in order to provide feedback of the findings of the EIA studies undertaken. Stakeholders were invited to attend the stakeholder meeting held on:

Date: 12 November 2010
Time: 14:00 – 16:00
Venue: Vaalwater - corner of Voortrekker Street and the new Lephalale Road (opposite the Total Garage & Spar)

Records of all consultation undertaken are included within Appendix E.

4.3.3 Identification and Recording of Issues and Concerns

Issues and comments raised by I&APs over the duration of the EIA process have been synthesised into Comments and Response Reports (refer to Appendix E for the Comments and Response Reports compiled from both the Scoping and EIA Phases).

The Comments and Response Reports include responses from members of the EIA project team and/or the project proponent. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view is provided.

4.3.4 Assessment of Issues Identified through the Scoping Process

The site is currently used for pasture purposes and there is no remaining natural vegetation on-site. Furthermore there are not likely to be any sensitive, protected or Red List flora species or habitats on site since these are usually only found in natural (untransformed) habitat. The site is not situated within a Plant Centre of Endemism and therefore it is unlikely that there are many species of plants with restricted distribution to be found anywhere near the site. In the unlikely event that indigenous plant species are affected by the proposed project, they are likely to be widespread or common species. Therefore, based on the findings of the Scoping Study, the potential ecological issues were identified as being of low significance, and do not require further investigation within the EIA.

Issues which require further investigation within the EIA phase, as well as the specialists involved in the assessment of these impacts are indicated in Table 4.2.

Table 4.2: Specialist studies undertaken within the EIA phase

Specialist	Area of Expertise	Refer to Appendix
Agricultural Research Council: Institute for Soil Climate and Water	Agricultural potential	E
Outeniqua Geotechnical Services	Geology, soil & erosion potential	F
Johnny van Schalkwyk	Heritage	G
MetroGIS	Visual	H
Bigen Africa	Road	I
Batho Earth	Social	J
Independent Economic Researchers	Socio-economic	K

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of the proposed Waterberg Photovoltaic Plant. Issues were assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected, and how it will be affected
- The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high)
- The **duration**, wherein it is indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2
  - medium-term (5–15 years) – assigned a score of 3
  - long term (> 15 years) - assigned a score of 4
  - permanent - assigned a score of 5
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment
  - 2 is minor and will not result in an impact on processes
  - 4 is low and will cause a slight impact on processes
  - 6 is moderate and will result in processes continuing but in a modified way
  - 8 is high (processes are altered to the extent that they temporarily cease)
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen)
  - Assigned a score of 2 is improbable (some possibility, but low likelihood)
  - Assigned a score of 3 is probable (distinct possibility)
  - Assigned a score of 4 is highly probable (most likely)
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures)
- The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high
- The **status**, which is described as either positive, negative or neutral
- The degree to which the impact can be reversed
- The degree to which the impact may cause irreplaceable loss of resources
- The degree to which the impact can be mitigated

The **significance** is determined by combining the criteria in the following formula:

S = (E+D+M) P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
» **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area)

As Thupela Energy has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. A draft Environmental Management Plan (EMP) is included as Appendix L.

4.3.5 Assumptions and Limitations

The following assumptions and limitations are applicable to the studies undertaken within this EIA Phase:

» All information provided by Thupela Energy and I&APs to the Environmental Team was correct and valid at the time it was provided.
» It is assumed that the development site identified by Thupela Energy represents a technically suitable site for the establishment of the proposed PV facility.
» It is assumed correct that the proposed connection to the National Grid is correct in terms of viability and need.
» Studies assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in Appendices E – K for study specific limitations.

4.3.6 Public Review of Draft EIA Report and Feedback Meeting

The **Draft EIA Report** has been made available for public review from **29 October 2010 – 29 November 2010**at the following locations:

» Vaalwater Public Library
» Modimolle Local Municipality
» Waterberg District Municipality
» www.savannahsa.com

All registered I&APs were notified of the availability of the report by letter.

4.3.7 Final EIA Report

The final stage in the EIA Phase entails the capturing of responses from I&APs on the Draft EIA Report in order to refine it. It is this final report upon which the decision-making environmental authorities make a decision regarding the proposed project.

DESCRIPTION OF THE AFFECTED ENVIRONMENT CHAPTER 5

This section of the Draft EIA Report provides a description of the environment that may be affected by the proposed facility. This information is provided in order to assist the reader in understanding the possible effects of the proposed project on the environment. Aspects of the biophysical, social, and economic environment that could directly or indirectly be affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as collected field data, and aims to provide the context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist reports contained within Appendices F - K.

5.1 Waterberg Environmental Management Framework

The National Department of Environmental Affairs (DEA) in partnership with the Limpopo Department of Economic Development, Environment and Tourism (LEDET), commissioned the Waterberg District Municipality (WDM) to undertake the compilation of an Environmental Management Framework (EMF). Amongst other things the EMF aimed to:

» Develop a support system for development in the area to ensure that environmental attributes, issues, and priorities are taken into account
» Indicate the kind of activities that would have a significant impact on the attributes in the area and those that would not.

The proposed site identified for the Waterberg Photovoltaic Plant falls within Zone 9. This zone represents areas with a strong rural agricultural character that is surrounded by areas of generally high natural, visual, and cultural quality that has significant potential for the development of nature and/or culture based tourism in addition to agriculture. It also forms the area from which the conservation use in zone 1 can be explored and experienced

This zone is regarded as undesirable for energy generation plants, with the exception of those that provide carbon free energy to the local area on disturbed areas in a manner that does not have a negative impact on the sense of place of the area, being particularly sensitive to not breaking the skyline or impeding on views'. The following must also be taken into consideration:

» Energy generation plants with the exception of those that provide carbon free energy to the local area on disturbed areas in a manner that does not have a

negative impact on the sense of place of the area, being particularly sensitive to not breaking the skyline or impeding on views
» The EMF is only in draft format and is still open for comment
» This is only a guideline document
» Ultimately the decision as to the placement of a facility of this nature will lie with DEA.

5.2 Regional Setting: Location of the Study Area

The identified site is situated approximately 24 km north-east of the town of Vaalwater on the farm Goedgevonden 104 KR. The study site is located within the Modimolle Local Municipality which forms part of the Waterberg District Municipality within the Limpopo Province. The Modimolle Local Municipality area consists mainly of farming areas with a number of small concentrations of communities scattered over vast distances. Towns and settlements within the municipal boundaries include Alma, Antjiesdrift, Kraalingen, Loubad, Melkrivier, Middelfontein, Modimolle, Palala, Rankin's Pass, Sondagsloop, Vaalwater, and Vier-en-Twintig Riviere. Vaalwater, the town nearest to the proposed development, is seen as a service centre of the municipality. It is situated in the upper reaches of the Mokolo River, and is the major town in the Waterberg area.

Neighbouring farms around the identified study site include, *Boschdraai KR 60/1, Sterkstroom KR 105, Sterkstroom KR 103, Naauwpoort KR 106, Schoongezigt KR 107, Bellevue KR 98 and Bellevue KR 99, Vier-en-Twintig-Rivier KR 102.*

The predominant economic activity within the study area is cattle and game farming with some irrigated and dryland agricultural activities occurring at a less intensive degree. The north-western beacon of the Goedgevonden farm boundary borders the Waterberg Biosphere Reserve's buffer zone and a small portion of the overall farm is located within the transition zone of the Biosphere Reserve. The area to be utilised for the proposed facility however does not fall within the Biosphere Reserve (refer to Figure 5.2). The study region is characterised by natural woodland, thicket, and bushland. However, the site-specific vegetation has been transformed for agricultural practises.

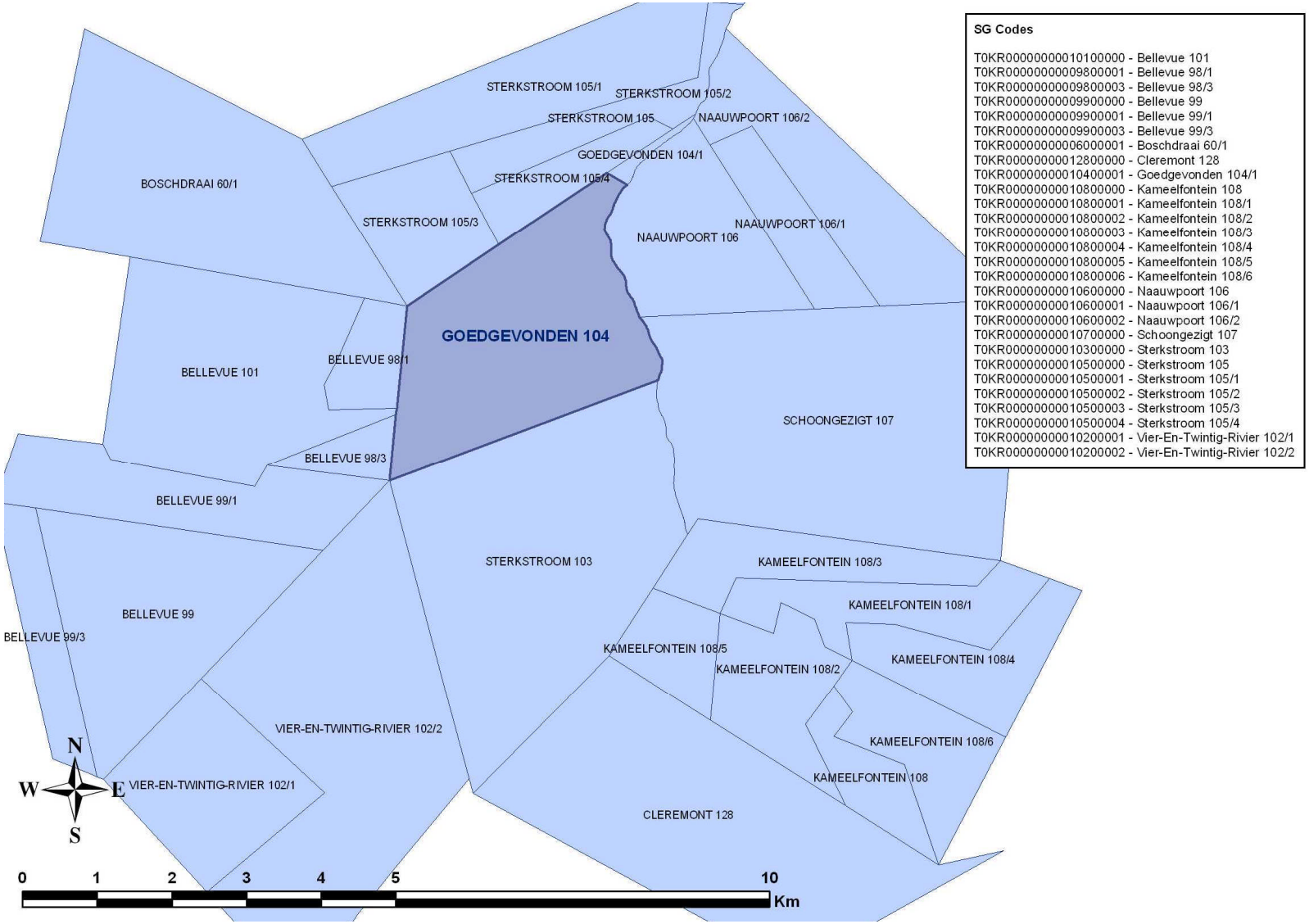

Figure 5.1: Farm portions surrounding the identified site

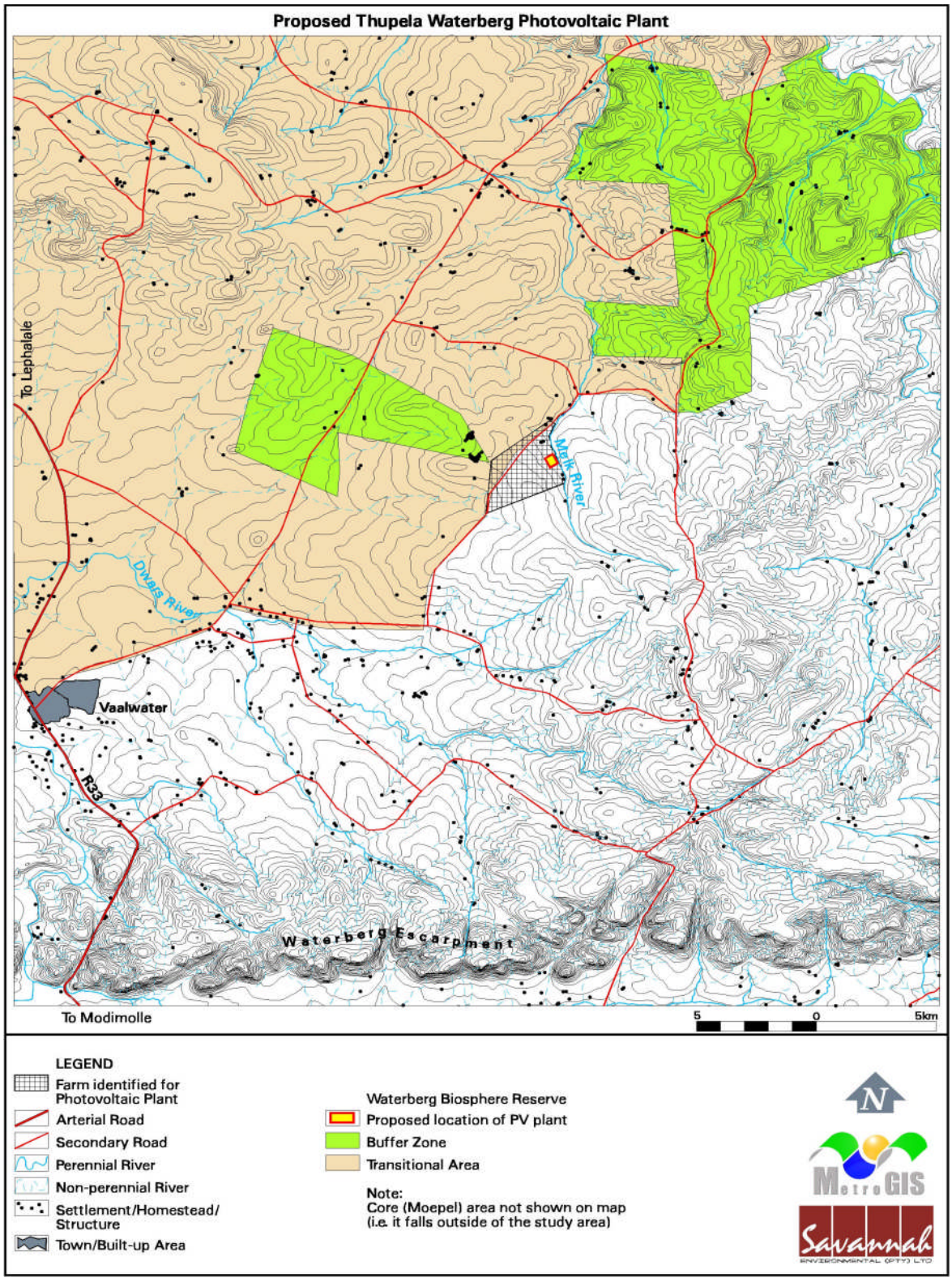

Figure 5.2: Map illustrating the location of the proposed Waterberg Photovoltaic Plant outside of the Waterberg Biosphere Reserve (i.e. although the Farm Goedgevonden falls within the transition zone, the developmental footprint of the facility does not

5.2 Climatic Conditions

The climate of the study area is semi-humid with mean annual precipitation for this region being approximately 500 - 700 mm, falling mainly in October to April, with occasional showers during the winter months. Temperatures range from 1°C to 39°C, with an average of 18°C and occasional frost during the winter months. The mean annual evaporation (S-Pan) for the area ranges between 1600 - 1800 mm per year.

5.3. Biophysical Characteristics of the Study Area and Surrounds

5.3.1 Topography

The region in which the identified site is located is referred to as the Waterberg massif which is located within the Waterberg Plateau. The Waterberg massif can best be described as an 'inverted saucer' stretching from Modimolle and Mokopane in the east as far as Thabazimbi and Lephalale in the west. This vast basin plateau is dissected by numerous rivers including the Melk River, the Dwars River and the Mokolo River. The area lies on the west bank of the Melk River, a perennial river which flows northward from the Waterberg towards the Limpopo River.

The elevation of the study area ranges between 1360 m and 1420 m above mean sea level (refer to Figure 5.3). The site specific terrain slopes gently and can be described as lowlands with hills.

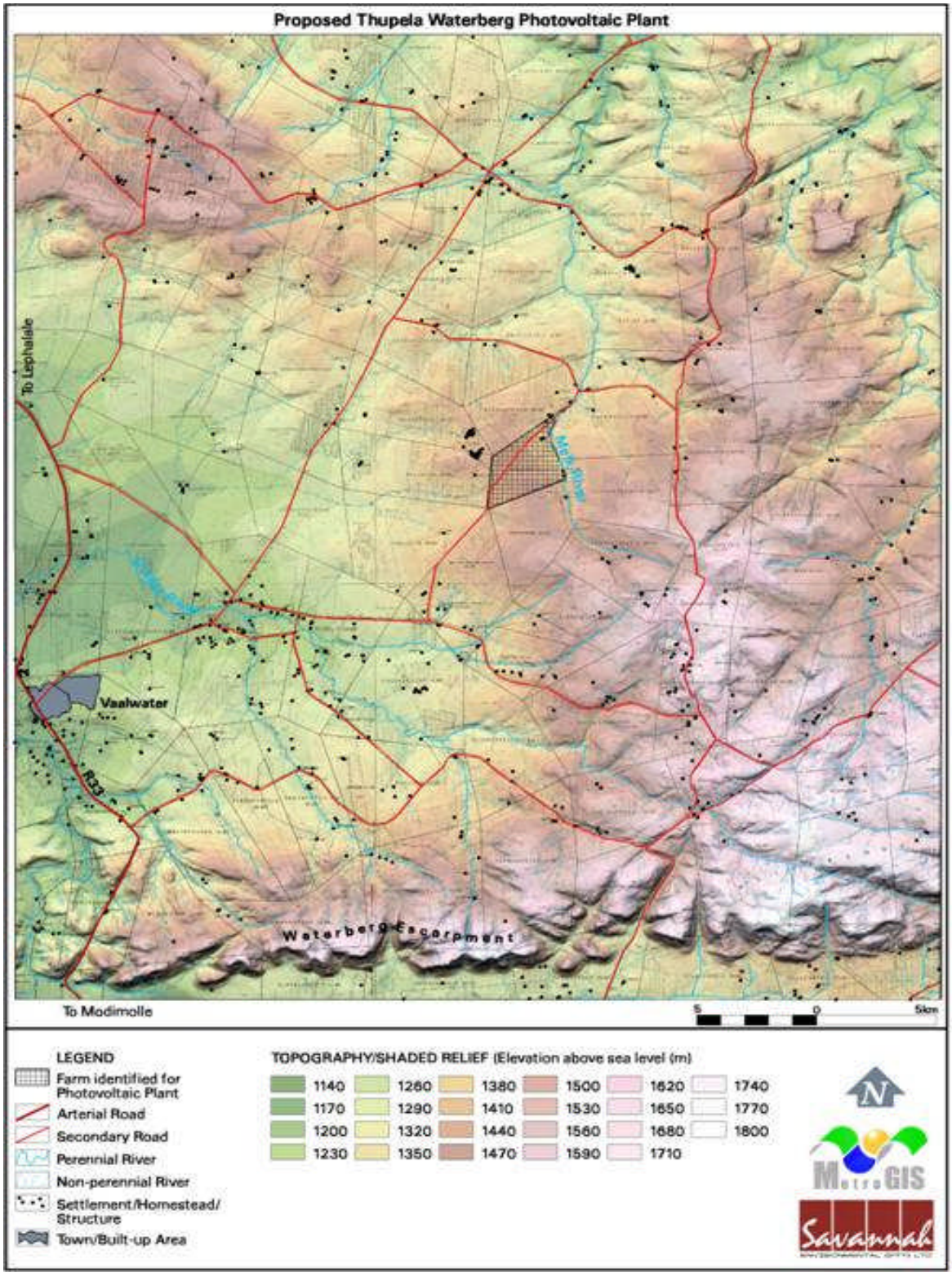

Figure 5.3: Shaded relief map (indicating the location of the proposed PV plant and the topography and elevation above sea level) of the broader study area

5.3.2 Geology of the Study Area

The plateau that makes up the Waterberg consists of a thick sequence of sandstone and conglomerate. The study area is underlain by the Cleremont Formation (of the Kransberg Subgroup, Waterberg Group) which predominantly consists of coarse grained white sandstone. The Weinert Climatic N-number for the area, which is between 4 and 5, indicates that the climate is semi-humid and chemical and mechanical weathering processes are at play, the former being slightly dominant.

Outcrops of dark to light red orange or light brown, profusely cross bedded sandstone occur only in the northwestern corner of the site. On the remaining majority of the site, this sandstone bedrock is covered by dark red orange to light brown, fine to medium grained, silty sand which exceeds 1 m thick. The expected soil types include medium to coarse grained sandy soils with a variable silt fraction. Surficial (occurring on or near the surface of the earth) soil permeability is expected to be moderate to high with a perched water table potentially developing on weathered sandstone at fairly shallow depths.

The Erosion Index for South Africa indicates that the site is ranked between 11 and 15 on a scale from 1 (highest potential) to 19 (lowest). This means that the erodibility potential is low to moderate. This indication is primarily based on geology and soil types (i.e. the site specific soil type is sandy). Erosion is chiefly affected by vegetation cover and the thickness, texture and consistency of the soil, which is related to the underlying geology. No severe water erosion features are mapped on the 1:50 000 topography maps nor are any visible on the aerial or site photogr

5.3.3 Agricultural Potential

The study area is underlain by coarse-grained sandstone of the Cleremont Formation of Waterberg Group and contains one land type, **Bb87** (non-red, low to medium base status soils with plinthic subsoils, usually deep).

The prevailing climate of the area is reasonably well suited to dryland, or rain-fed agriculture. The soils are generally very suitable and have a favourable depth and texture. The advantage of the site from an agricultural perspective is that it lies immediately adjacent to the Melk River, so that supplementary irrigation should be available.

5.3.4 Ecological Profile

The vegetation type within which the study area is situated is referred to as Waterberg Mountain Bushveld, which is classified as Least Threatened. This threat status is based on the proportion transformed or disturbed at a national scale.

The proposed development site has been used for agricultural purposes, which is confirmed by the presence of two large centre-pivot irrigation fields and cultivated, transformed, or disturbed areas in-between. The site is currently used for pasture purposes and there is no remaining natural vegetation on-site. There are not likely to be any sensitive, protected or Red List flora species or habitats on site since these are usually only found in natural (untransformed) habitat. The site is not situated within a Plant Centre of Endemism and therefore it is unlikely that there are many species of plants with restricted distribution to be found anywhere near the site.

5.4 Social Characteristics of the Study Area and Surrounds

5.4.1 Heritage Profile

No systematic heritage surveys have been done in the study region. However, some sites dating to the Stone Age, some of which contain rock art are known from the area. These sites are usually found in river valleys where small rock shelters were carved out by streams. In addition, it can be expected that some Iron Age sites can be identified in the more flat open regions near the river (on the western boundary of the site). However, yet there are no reports of the existence of such sites in the study area. Lastly, sites dating to historic times are known to exist in the study area. Typical of these would be farmsteads with old buildings and associated farming related features, as well as informal cemeteries. An exception is the St. Johns Anglican Church at Vier-en-Twintig- Rivier south of the study area; this church was designed by Sir Herbert Baker and was consecrated in 1914. However, no heritage sites were found to exist in the study area.

In terms of Section 7 of the National Heritage Resources Act (Act No. 25 of 1999), all the sites currently known or which are expected to occur in the study area are evaluated to have Grade III significance[6].

[6] The NHRA stipulates the assessment criteria and grading of archaeological sites. Grade III refers to 'Other heritage resources worthy of conservation, on a local authority level'.

5.4.2 Waterberg District Municipality

The Waterberg District Municipality is located in the western part of the Limpopo Province. The Waterberg District Municipality struggles with unemployment, challenges associated with HIV/Aids, especially among the youth, high levels of poverty and poor educational outcomes. The dispersed settlement pattern makes the provision of infrastructure and services difficult and expensive. The tourism potential of the district is high due to its rich history and cultural heritage resources as well as bio-physical features. Tourism activities are well developed and the main destinations and activities are concentrated within and around the Waterberg Biosphere Reserve, the Makapan Caves and the Nylsvlei wetland. This district municipality comprises six local municipalities (LM), namely the Mogalakwena LM, Lephalale LM, Bela- Bela LM, Modimolle LM, Thabazimbi LM, and Mookgopong LM. Agriculture, tourism, and mining are key sectors within the area and play an important role in the district economy.

5.4.3 Modimolle Local Municipality

The Modimolle Local Municipality is a category B municipality[7] within the Waterberg District and functions as the administrative capital of this district. This local municipality consists of towns, smaller settlements, informal settlements, and farms and can therefore be classified as predominantly rural in nature. Modimolle is the nodal growth point of the municipality, while Vaalwater and Alma act as service points. The study area falls within Ward 3, although attention would also be given to Ward 1 (Vaalwater and Leseding) due to its close proximity to the site and possible source of local labour.

The Modimolle Local Municipality has a population of approximately 52 605 people with a large proportion of youths which indicates a very high requirement for employment in the area and increased pressure on the demand for social services and infrastructure (i.e. educational etc.). The majority of residents in the area are South African citizens, with a very low influx of citizens from SADC countries. Therefore it does not seem as if the area is challenged by a massive inflow of immigrants to the area. This could be due to the lack of urbanisation in the area and limited job opportunities when compared to urbanised and industrialised areas. Crime in the Modimolle Local Municipality area, as well as the study area is said to be low, which creates an encouraging environment for economic growth, especially concerning tourism facilities and recreational activities.

The economy of the Modimolle Local Municipality and the Vaalwater area is dominated by agricultural activities (i.e. game, cattle, and crop farming). The game

[7] A category-B municipality is defined as a municipality that shares executive and legislative authority in its area with a category- C municipality within whose area it falls.

farming and hunting industries have grown over the past fifteen years with numerous farmers converting from cattle to game farming. This sector provides the majority of employment opportunities in the area, followed by trade and accommodation, community services, government services and construction industries. Although the unemployment figures in the area are lower than the national average, local unemployment remains a concern. The unemployment rate in the municipal area is 22% and the employment rate is 60%. The percentage of the population which falls within the not economically active group is 18%, which includes those persons that are either not able to work or those who choose not to work.

There is a great need for poverty alleviation projects and employment creation, especially in the rural areas under the Modimolle Local Municipal's jurisdiction due to the proportion of youths in the area. According to the Modimolle Local Municipality IDP (2009/2010) some of the economic weaknesses in the area include the unavailability of skills to match the economic comparative sectors, as well as the fact that there is no clear marketing strategy to encourage and support business development and investment in the area. The Waterberg area has significant potential for further development (especially tourism, hunting and eco-tourism activities) due to its favourable location, distance from main centres like Gauteng, the absence of malaria as well as the scenic beauty and natural diversity of this area. The area's economic base, as indicated in the Economic Development Plan (EDP) for the Limpopo Province, lies largely within the tourism sector. In addition, the Waterberg District Council prioritises the tourism sector. The Modimolle area also has various deposits of silica and investigations are underway to determine the exploitability of this reserve.

ASSESSMENT OF IMPACTS: PHOTOVOLTAIC PLANT & ASSOCIATED INFRASTRUCTURE — CHAPTER 6

The generation of electricity from the proposed Waterberg Photovoltaic Plant will be achieved through the establishment of a single facility which will be comprised of:

» The **PV panels** will be placed on mounts, which will be sited a certain distance away from each other to allow sufficient room to mitigate shading issues. The electrical output from individual panels will be summed, initially into "strings," then further summed, and changed to AC power using inverters. The panel mounts will be secured into the ground by the use of concrete feet.
» A **switching station** of approximately 4 m x 4 m will be established for the "turn in" to Eskom's existing Mink power line which crosses the site. It has been determined through preliminary discussions with Eskom that this line has capacity to receive the power from the proposed facility. A switching station is a smaller version of a substation and contains a single transformer to step up the generated power into a voltage suitable for the existing power line (i.e. 22 kV in this case).
» **Associated infrastructure** including:
  - An extraction point and low volume water supply pipeline from an existing on-site borehole will be established for cleaning the PV panels and for general, limited water use at the kitchen, crèche, and visitors centre.
  - Workshop, laydown and storage areas
  - A Visitor's Centre, crèche and kitchen/dining utilising a water-less sanitation system[8]

The establishment of the proposed facility will be comprised of several phases, including pre-construction, construction, operation, and decommissioning. The **construction activities** involved for the proposed facility will include the following:

» Conduct pre-construction surveys
» Establishment of access roads
» Undertaking site preparation (i.e. including clearance of vegetation; and stripping of topsoil)
» Transportation of solar components and equipment to site
» Establishment of construction camps; laydown and hard standing areas (i.e. including storage facilities)

[8] A system of this nature does not utilise water and reduces the waste to approximately 10 % of the original volume through a process of dehydration. This water-less method is preferred due to the proximity of the Melk River which runs east of the site and the rural nature of the site which would render extensive plumbing impractical.

» Construct foundations
» Establishment of PV panels
» Construct switching station
» Establishment of ancillary infrastructure
» Connection of PV panels to the switching station
» Connect switching station to the Mink power line
» Undertake site remediation

The **operational activities** will include the following:

» The operation of the PV panels field in conjunction with the switching station
» The operation of the Visitors Centre; and the kitchen, dining, and crèche facilities
» The abstraction of water through the low volume water supply pipeline to provide the Visitors Centre; and the kitchen, dining and crèche facilities
» Site operation and maintenance

The **decommissioning activities** will include the following:

» Extension of the operational phase or removal of project infrastructure
» Site rehabilitation

The construction and decommissioning activities have the potential to impact on the receiving environment in terms of soil degradation and/or pollution; erosion potential; heritage sites; visual aesthetics; and the social / socio-economic environment. Environmental issues specific to the operation phase of a PV plant include, amongst others, impacts related to visual aesthetics and the socio-economic environment.

These and other environmental issues which were identified during the Scoping Phase evaluation have now been assessed during the EIA Phase. This EIA process has involved key input from specialist consultants, the project developer, and from key stakeholders and interested and affected parties. The significance of impacts associated with a facility of this nature is always project specific, and therefore impacts may vary significantly between facilities.

This chapter serves to assess the identified potentially significant environmental impacts associated with the development of the proposed facility, and to make recommendations for the management of these impacts for inclusion in the draft Environmental Management Plan (Refer to Appendix K).

6.1 Methodology for the Assessment of Potentially Significant Impacts associated with the proposed Photovoltaic Plant

In order to assess the potential impacts associated with the proposed facility, it was necessary to understand the extent of the affected area which will include the solar infrastructure (i.e. PV panels and associated switching station) and associated infrastructure (i.e. the water supply pipeline; Visitors Centre, crèche; and kitchen/dining facilities.).

A broader site of 50 ha was originally identified by the project developer for establishing the proposed facility. However, the developmental footprint is likely to cover an extent of approximately 20 ha, but not more than 30 ha, which will be sited with respect to identified environmental and technical preferences and sensitivities (refer to Figure 6.1). This smaller portion is likely to suffer disturbance, particularly during the construction phase, as the establishment and operation of a PV plant may result in whole-scale disturbance to significant portions of the affected site where infrastructure is located.

Permanently affected areas within the boundaries of the Farm Goedgevonden are summarised as follows.

Permanent Component	**Approximate extent (in ha)**
PV panels	20
Switching station	0.002
Visitor's centre	0.02
Crèche, dining/kitchen facilities	0.02
Workshop and storage areas	0.01
Admin and security	0.006
Ablution facilities	0.002
TOTAL (ha)	(of a total area of 50 ha) **≈ 40% of site**

Temporarily affected areas within the identified farm portion comprise laydown areas for construction equipment, construction camps, and temporary storage areas are summarised as follows:

Facility Component –Temporary Component	**Approximate area/extent (in ha)**
Laydown areas	0.5
Construction camps	0.5
Temporary storage areas	0.5
TOTAL	(of a total area of 50 ha) **≈ 3% of site**

In order to assess the potential impacts that could occur, a site layout was produced, which is illustrated below in Figure 6.1.

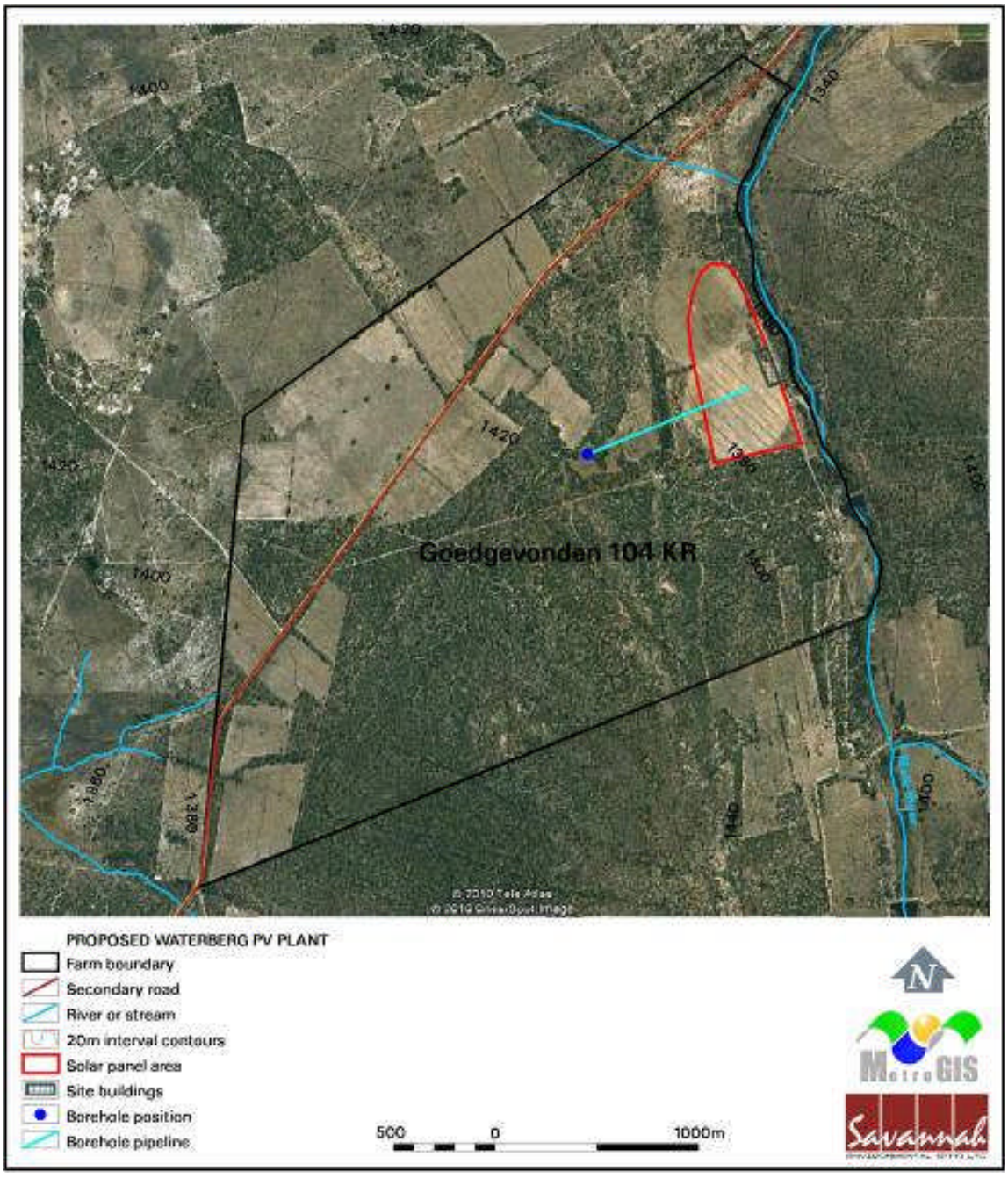

Figure 6.1: Aerial map illustrating the proposed layout of the Waterberg Photovoltaic Plant

6.2 Assessment of the Potential Impacts associated with the Construction and Operation Phases

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed Photovoltaic Plant on the identified site. Issues were assessed in terms of the criteria detailed in Chapter 4 (section 4.3.4). The nature of the potential impact is discussed; and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

6.2.1 Potential Impacts on Ecology

The proposed development site has been used for agricultural purposes, which is confirmed by the presence of two large centre-pivot irrigation fields and cultivated, transformed, or disturbed areas in-between. The broader site is currently used for pasture purposes and there is no remaining natural vegetation on-site. Therefore, the likelihood of sensitive, protected or Red List flora species or habitats occurring on site is low as these are almost always only found in natural (untransformed) habitat. In the unlikely event that indigenous plant species are affected by the proposed project (e.g. by the proposed water supply pipeline), they are likely to be widespread or common species. Therefore, impacts are expected to be of low significance. No detailed ecological assessment was carried out during the EIA Phase, as per the recommendation of the ecological specialist study conducted in the scoping phase.

6.2.2 Potential Impacts on Geology, Soils and Erosion Potential

The impact of soil erosion[9] and degradation[10] during the construction phase (i.e. through stockpiling; mixing; wetting; filling; compaction; and pollution) is considered the most significant direct impact. An important potential constraint which has been identified includes the availability of local construction material.

The potential for soil erosion is considered moderate since the site is underlain by transported silty sands. However, the topography is favourable and the vegetation is currently aiding the stability of the soil. As a result, there is no sign of significant on-site erosion. This will most likely change during construction due to the removal of

[9] The predominantly fine-grained nature of the soil on-site will make it particularly susceptible to wind and water erosion and the removal of natural vegetation will allow accelerated erosion.

[10] The stripping of vegetation, excavations, stockpiling and compaction of soils will contribute to degradation which will negatively affect soil formation, natural weathering processes, moisture levels, soil stability, humus levels, and biological activity.

vegetation, and the envisaged impacts will carry a moderate significance which can be mitigated to a resultant low significance rating.

Impact tables summarising the significance of impacts on geology, soil, and erosion potential (with and without mitigation)

Nature: Soil degradation Removal of vegetation and topsoil under footprint of structures and access roads affecting soil formation processes on the site		
	Without mitigation	***With mitigation***
Extent	Local (1)	N/A
Duration	Permanent (5)	
Magnitude	Low (4)	
Probability	Definite (5)	
Significance	Moderate (**50**)	
Status (positive or negative)	Negative	
Reversibility	Irreversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	No	
Mitigation: » N/A		
Cumulative Impacts: » The surrounding area is largely undeveloped agricultural land and there is no other development planned for the near future. The cumulative impact is therefore considered low at this stage.		
Residual Impacts: » N/A		

Nature: Soil degradation Pollution, salinisation, acidification, or water-logging of natural soil in construction areas affecting soil formation processes.		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Medium term (3)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Moderate (**30**)	Low (**21**)
Status (positive or negative)	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources	Minor	Insignificant

Can impacts be mitigated	Yes
Mitigation: » Minimise disturbance areas by limiting construction activities to designated construction areas » Minimise activity within disturbance areas » Rehabilitate soil and vegetation. » Stage earthworks in phases across site so that exposed areas are minimised. » Keep to existing roads, where practical, to minimise impacts on undisturbed ground	
Cumulative Impacts: » The surrounding area is undeveloped agricultural land and there is no other development planned in the near future. Therefore the cumulative impact is considered low at this stage.	
Residual Impacts: » Minor negative residual impacts are expected due to the slow regeneration of vegetation and soil.	

Nature: ***Soil degradation***
Mixing, stockpiling and compaction of topsoil affecting soil formation processes

	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Medium term (3)	Very short term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Moderate (**40**)	Low (**24**)
Status (positive or negative)	Negative	
Reversibility	Partially reversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	Yes	

Mitigation:
» Minimise disturbance areas over which mixing, stockpiling occurs
» Minimise activity within disturbance areas (prevent unnecessary excavations and stockpiling)
» Restrict slope of stockpiles to reduce compaction as this is important to minimise erosion
» Re-use soil from excavations for landscaping or remove off site – don't leave stockpiles after construction on-site
» Restrict number of access roads and minimise traffic
» Rehabilitate soil and vegetation in areas of activity
» Keep to existing roads, where practical, to minimise impact on undisturbed ground
» Stage earthworks in phases to minimise exposed ground

Cumulative Impacts:
» The surrounding area of the broader property is undeveloped agricultural land and

there is no other development planned in the near future. The cumulative impact is considered low at this stage.
Residual Impacts:
» Minor negative residual impacts are expected due to the slow regeneration of soil processes in and under topsoil.

Nature: Soil degradation Increased sheet, rill or gulley erosion and deposition down-slope due to the removal of vegetation and other activity in construction areas		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Medium term (3)	Medium term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	Moderate (**40**)	Moderate (**32**)
Status (positive or negative)	Negative	Negative
Reversibility	Practically irreversible	Practically irreversible
Irreplaceable loss of resources	Moderate	Minor
Can impacts be mitigated	Yes, to a certain extent	
Mitigation: » Restrict the size of disturbance areas » Minimise activity within designated disturbance areas » Implement effective erosion control measures, such as log terraces, erosion barriers/silt fences, etc » Stage construction in phases to minimise exposed ground » Keep to existing roads, where practical, to minimise impact on undisturbed ground » Ensure stable slopes of stockpiles/excavations to minimise slumping		
Cumulative Impacts: » The surrounding area of the broader property is undeveloped agricultural land and there is no other development planned in the near future. The cumulative impact is considered low at this stage.		
Residual Impacts: » Minor residual impacts are expected due to the localised movement of sediment and slow regeneration of soil processes		

Nature: Degradation of parent rock Excavations and or blasting causing degradation to local geology and instability		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Minor (2)

Probability	Improbable (2)	Improbable (2)
Significance	Low (**18**)	Low (**16**)
Status	Negative	Negative
Reversibility	Irreversible	
Irreplaceable loss of resources	Insignificant	
Can impacts be mitigated	To a certain degree	
Mitigation: » Restrict zone of disturbance and plan excavations carefully » Keep to existing roads, where practical, to minimise impacts on undisturbed ground.		
Cumulative Impacts: » The surrounding area of the broader property is undeveloped agricultural land and there is no other development planned in the near future, therefore the cumulative impact is considered low at this stage.		
Residual Impacts: » The residual impacts are considered insignificant		

Implications for Project Implementation

» The presence of shallow rock or low rock outcrops has a significant reducing effect on the erosion potential on the north-western corner of the site and therefore this area has a low erosion potential.
» The rest of the site has a moderate erosion potential, but with effective implementation of mitigating measures the impacts can be reduced to a low level.
» Degradation of geo-sites is unlikely as there are no known important or prominent geological features and the parent rock is unlikely to be detrimentally affected by the proposed activity, as no deep excavations are planned
» A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more information.

6.2.2 Potential Impacts on Agricultural Potential

From the perspective of agricultural potential, the proposed infrastructure will not involve any significant earth-moving processes or large-scale topsoil removal. However, the loss of agricultural land will be total for the life of the project, although the site should be able to be returned to its natural state at a future stage without significant problems.

Impact tables summarising the significance of impacts on agricultural potential (with and without mitigation)

Nature: Loss of agricultural land		
	Without mitigation	***With mitigation***
Extent	High (3)	Low (2)
Duration	Medium-term (4)	Medium-term (4)
Magnitude	Moderate (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**33 (Medium)**	**30 (Medium)**
Status (positive or negative)	Negative	
Reversibility	Low	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Mitigation: Construction activities should be confined, as far as possible, to the higher parts of the study area, where soils of slightly lower agricultural potential are located.		

6.2.3 Assessment of Potential Impacts on Heritage Sites

No heritage sites have been identified on the proposed development site. Therefore, no impact is expected in this regard from the proposed development. Therefore the necessity of a significance rating is not required.

Implications for Project Implementation

» Should archaeological sites or graves be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner so that an investigation and evaluation of the finds can be made.

6.2.4 Assessment of Potential Visual Impacts

Potential visual impacts associated with the construction phase

The construction phase will last for approximately 6 – 9 months, depending on several external factors. During this time, construction related traffic (i.e. in terms of traffic and construction workers) will frequent the area and may cause a visual nuisance to other road users and landowners in the area. Visual impacts associated with the construction phase, albeit temporary, should be managed according to the following principles:

» Reduce the construction period through careful planning and productive implementation of resources.
» Restrict the activities and movement of construction workers and vehicles to the immediate construction site.
» Ensure that the general appearance of construction activities, construction camps (if required) and lay-down areas are maintained by means of the timely removal of rubble and disused construction materials.
» Restrict construction activities to daylight hours (if possible) in order to negate or reduce the visual impacts associated with lighting.

Potential visual impacts associated with the operational phase

Site visits were undertaken to source information regarding land use, vegetation cover, topography, and general visual quality of the affected environment. It further served the purpose of verifying the results of the spatial analyses. The visual impact assessment set out to identify and quantify the possible visual impacts related to the proposed facility and its related infrastructure, as well as to offer potential mitigation measures, where required. The following methodology was applied

Determine potential visual exposure

The visibility or visual exposure of any structure or activity is the point of departure for the visual impact assessment. It stands to reason that if the proposed PV plant and associated infrastructure were not visible, no impact would occur. Viewshed analyses of the proposed PV plant facility and the related infrastructure, based on a 20 m interval digital terrain model of the study area, to indicate the potential visibility. This was done based on a worst case scenario of potential visibility of the full 50 ha site as the placement of the panel area will only be confirmed once an Engineering and Procurement Contractor (EPC) has been selected.

Determine visual distance / observer proximity to the facility

In order to refine the visual exposure of the facility on surrounding areas/receptors, the principle of reduced impact over distance was applied in order to determine the core area of visual influence for the facility. Proximity radii for the proposed development site were created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment. The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly negative visual perception of the proposed facility.

Determine viewer incidence / viewer perception

The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers or if the visual perception of the structure is favourable to all the observers, there would be no visual impact.

It is therefore necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed PV plant and its related infrastructure. It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer; regularity of sighting, cultural background, state of mind, and purpose of sighting which would create a myriad of options.

Determine the visual absorption capacity of the natural vegetation

The Visual Absorption Capacity (VAC) is the capacity of the receiving environment to absorb or screen the potential visual impact of the proposed facility. The VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC. The digital terrain model utilised in the calculation of the visual exposure of the facility does not incorporate the potential visual absorption capacity (VAC) of the natural vegetation of the region. The VAC of the natural vegetation cover (*woodland* and *thicket and bushland*) is considered high for this study area.

Determine the visual impact index

The results of the above analyses were merged in order to determine where the areas of likely visual impact would occur. These areas are further analysed in terms of the previously mentioned issues (related to the visual impact) and in order to judge the severity of each impact.

Results of the Visual Assessment

The facility would be exposed to a relatively small and localised area due to the small dimensions of the facility's components and due to the VAC of the surrounding vegetation. A scattered area of visual exposure will be limited to higher lying areas (e.g. hilltops and ridges) located to the north-east and south-east of the proposed plant. This is due to the plant's proposed location on agricultural land adjacent to the Melk River (i.e. at a relatively low elevation in relation to other areas within the farm) as well as the structure dimensions (i.e. a maximum height of 6 m).

The plant is not expected to be visible from any major roads (i.e. the R33 arterial road) but may be comfortably visible to observers travelling along secondary roads where the natural vegetation cover permits (i.e. from the secondary road traversing the farm Goedgevonden 104 KR). The so-called 'Waterberg Meander' is routed along

the R33, which bypasses the site some 20 km to the west. This route falls outside of the potential viewshed zone, but some of the tourist destinations within the study area are listed attractions as part of the Meander.
Visibility may be possible from the following homesteads/settlements where the natural vegetation cover permits (i.e. where the natural vegetation had been removed):

» Kameelfontein
» Kaalfontein
» Goedgevonden
» Billcelia
» Paardedrift
» Noupoort
» Olievenfontein

It is envisaged that the structures, where visible from short distances, would be easily and comfortably visible from residences located nearby, especially within a 4 km radius of the plant. What would be visible is a relatively expansive surface area (approximately 20 ha, but not more than 30 ha) utilised by the PV infrastructure, notwithstanding the constrained vertical dimensions of the PV plant.

Viewer incidence is relatively low within a 16 km radius of the proposed plant. However, the region has a high tourism value and inherent sense of place based on culture, game farming and history. A portion of Goedgevonden falls within the transition zone of the Waterberg Biosphere Reserve, although the proposed development footprint for the facility itself does not. The development will, however, potentially be visible from a section of the Waterberg Biosphere Reserve's buffer zone where the natural vegetation cover permits (refer to Figure 6.2).

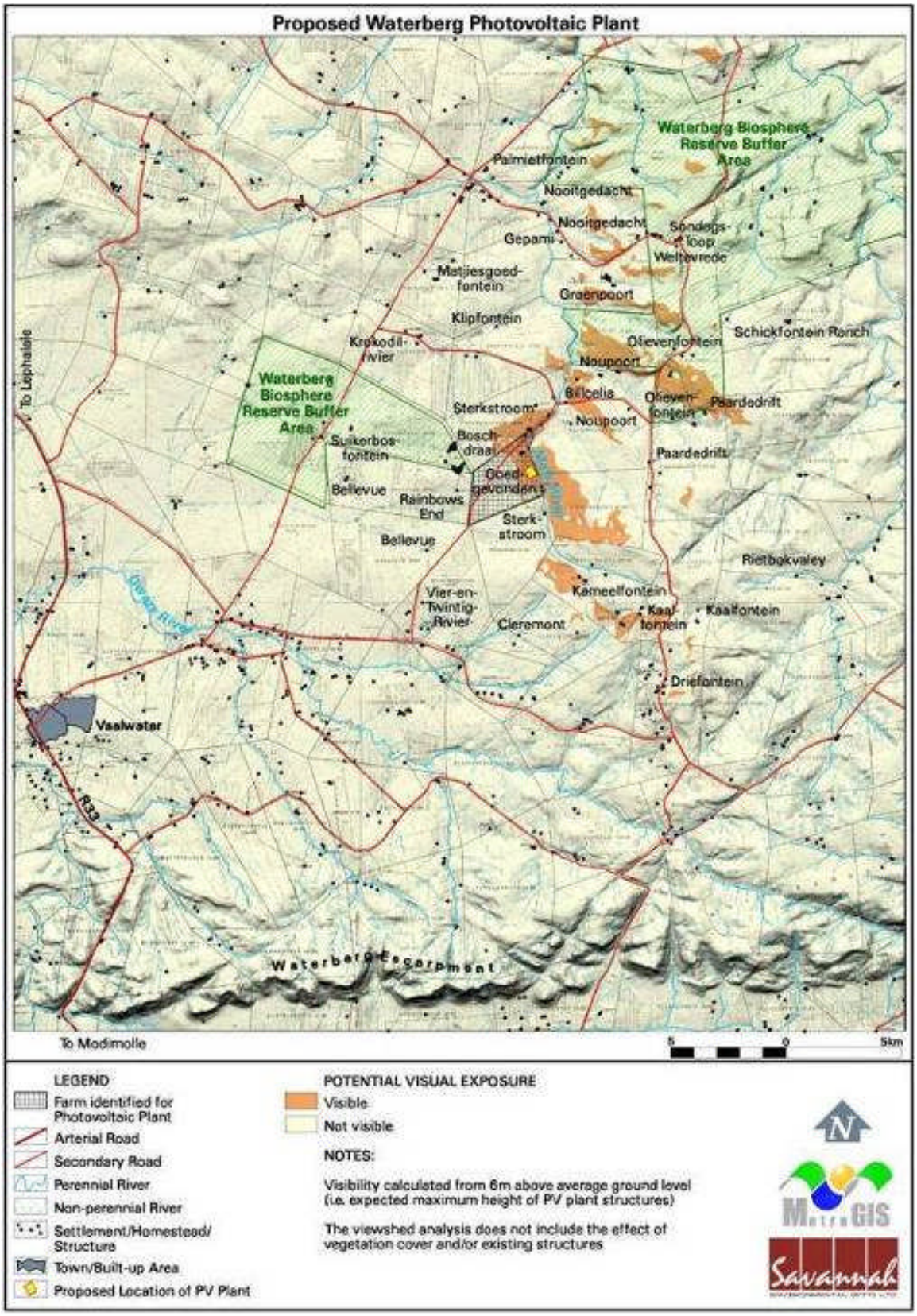

Figure 6.2: Potential visual exposure of the proposed PV plant, assuming no vegetation absorption capacity (VAC), the pink shading indicates areas from which the facility or parts thereof could be visible

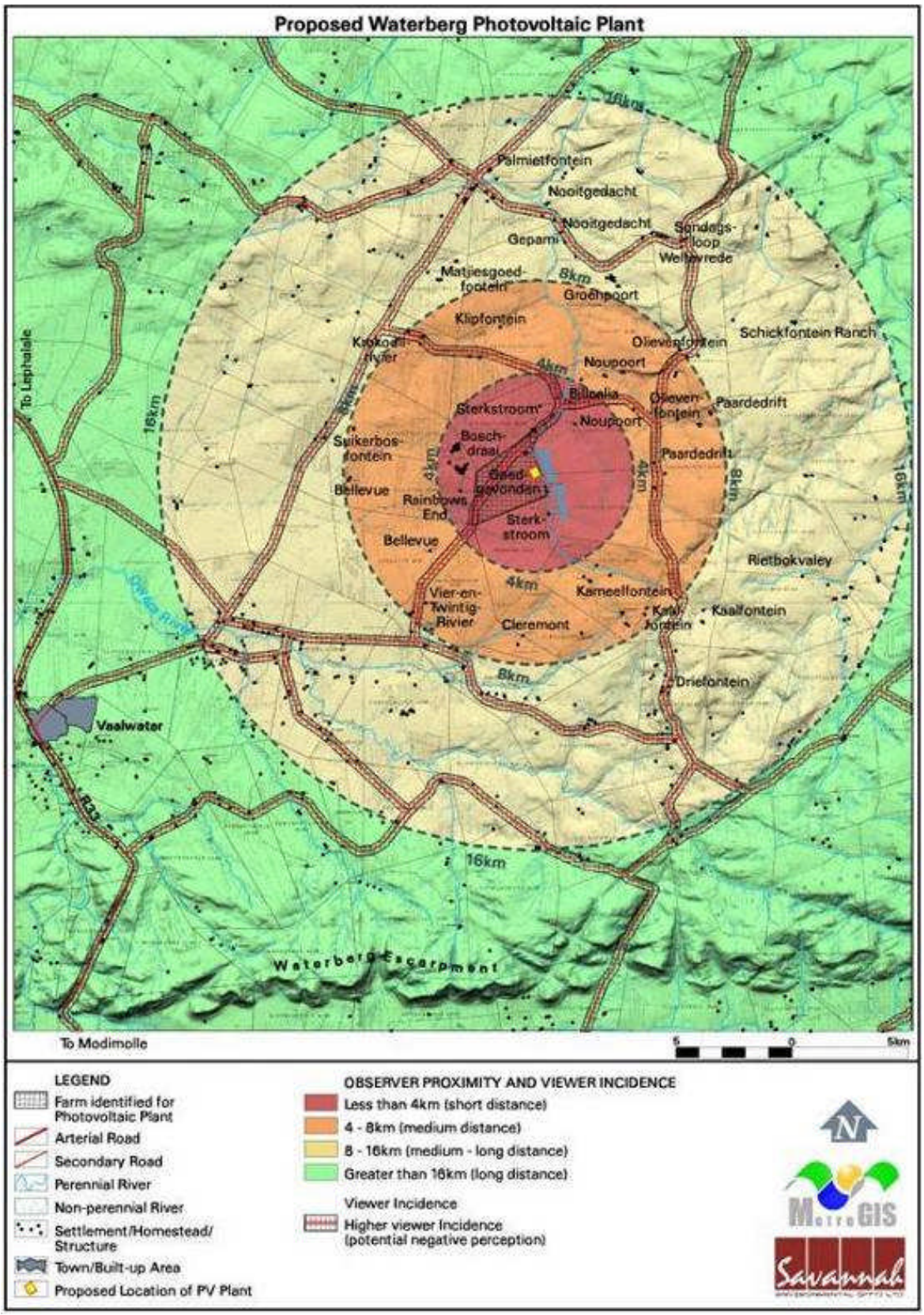

Figure 6.3: Observer proximity to the proposed Waterberg PV plant and areas of potentially high viewer incidence

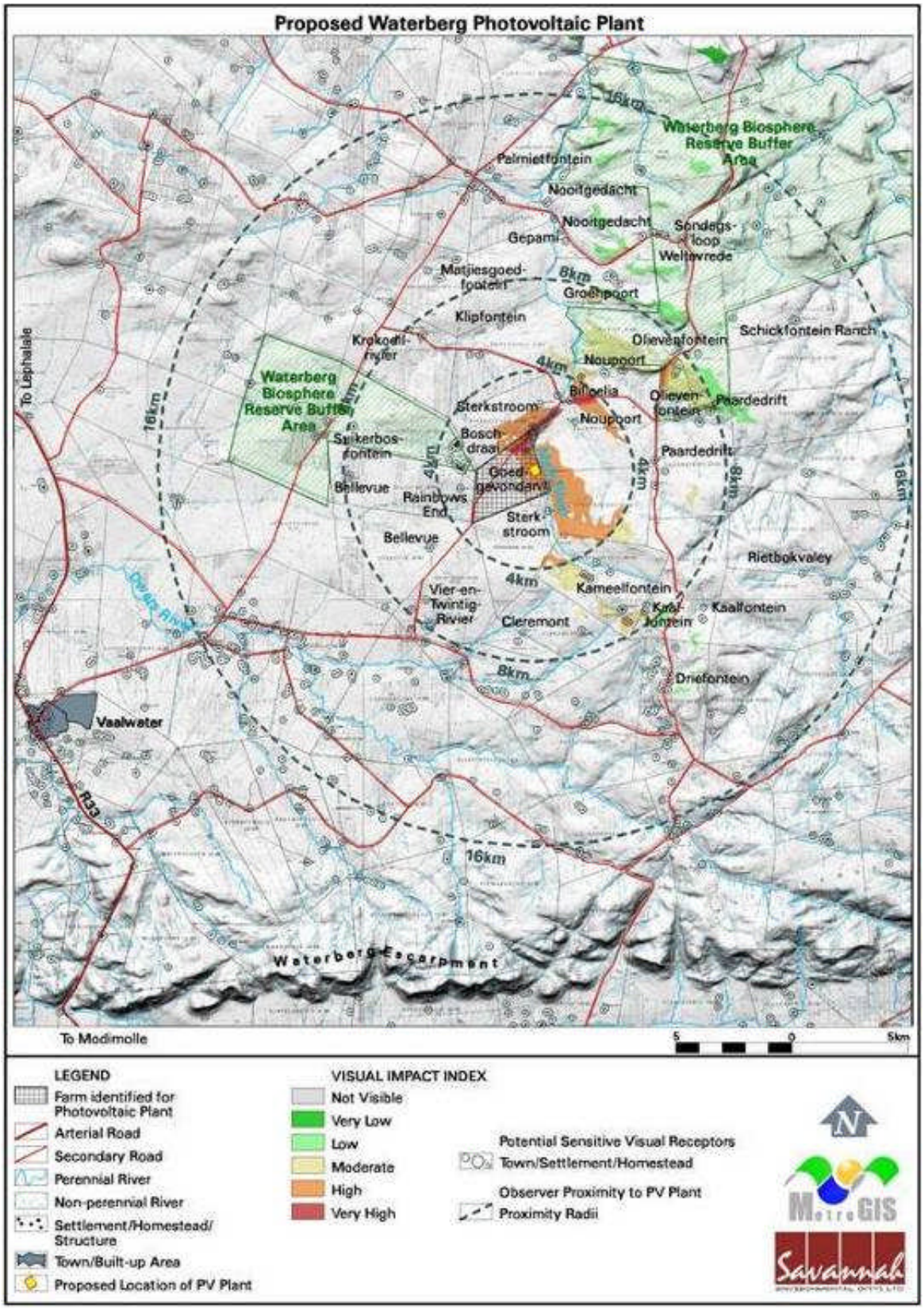

Figure 6.4: Visual impact index of the proposed PV plant assuming no VAC

Observers in close proximity to the facility (within 4 km) would have the highest visual experience of the facility and would be exposed to a **high** visual impact.

Observers travelling along the limited stretch of the access road to the facility and on the D2747 secondary road could experience **very high** visual impact where the natural vegetation cover permits. Although these roads do not carry a large number of motorists, they provide thoroughfare and access to a number of tourism destinations and stopping points off the Waterberg Meander. It is, however, envisaged that many people travelling along this road would more than likely be visiting the facility (which would be an attraction of sorts) or be local farmers/workers travelling to town.

Settlements and farmsteads surrounding the facility (mostly concentrated to the north-east) would be impacted on at distances of between 4 and 8 km and may experience **moderate** visual impact. Other smaller settlements and farmsteads (some as close as 2 to 3 km from the facility) as well as settlements and sites along the D579, D2416 and D1959 secondary roads would either not be able to see the PV plant or would at best catch glimpses of the facility. This is due the plant's low-lying location in the landscape (i.e. close to the Melk River).

Figure 6.4: Panoramic view of the development site looking from the western boundary of the Farm Sterkstroom 105/4.

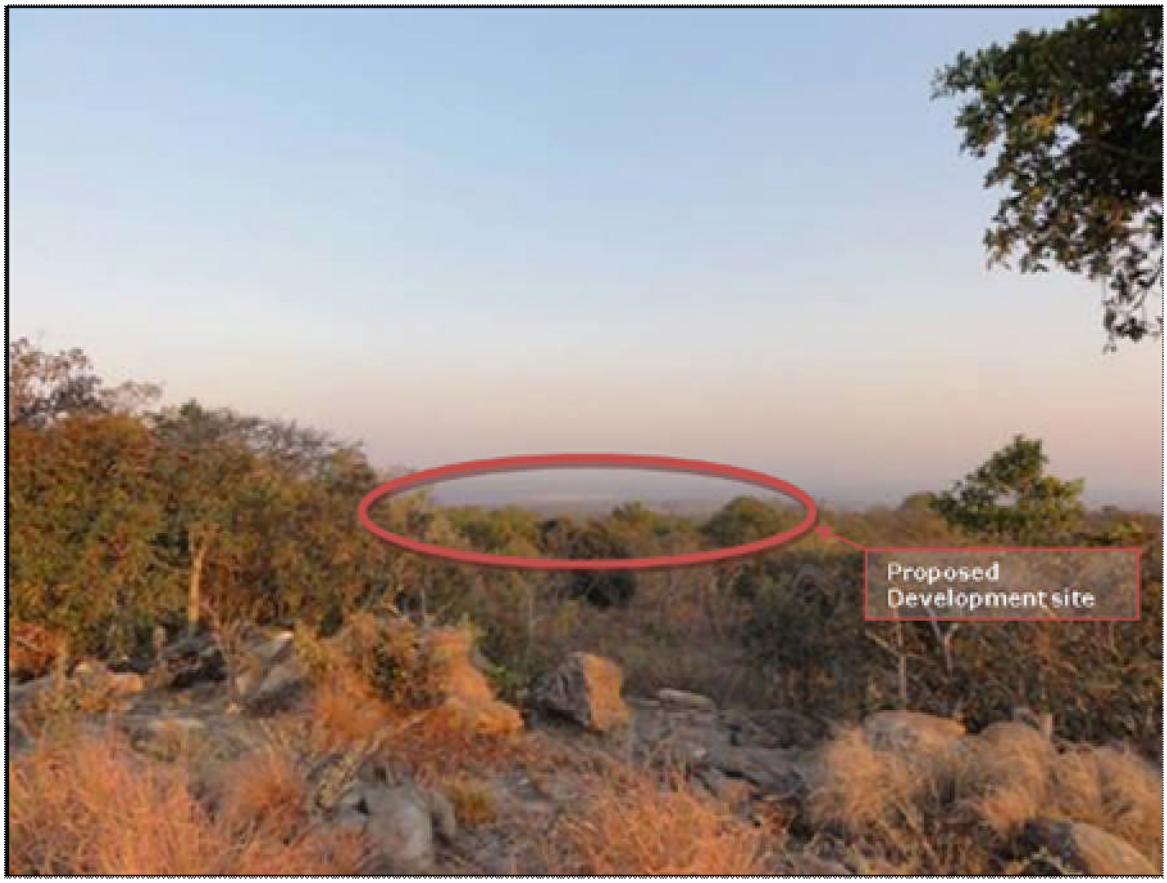

Figure 6.4 Photographic long distance view of the proposed site from a koppie within the Farm Schoongezigt 107 (proposed site for future lodge)

Impact tables summarising the significance of visual impacts (with and without mitigation)

Nature: Potential visual impact on users of secondary roads in close proximity of the PV plant The PV plant would be visible from various secondary roads and potential tourist routes within the region, although not from the R33. The observers' purpose for visiting the region (nature oriented tourism) and the industrial nature of the facility's structure will be in conflict. This applies to the D2747, D2416, and D579 that will have a short distance view (i.e. within 4km) of the proposed development site, constituting a high visual impact. If VAC and mitigation are taken into account, this impact is expected to be medium.		
	VAC considered	***Mitigation considered***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	Very High (5)	Very High (5)
Probability	Medium (3)	Low (2)
Significance	Medium **(48)**	Medium **(32)**
Status (positive or	Negative	

negative)	
Reversibility	Recoverable (3)
Irreplaceable loss of resources	No
Can impacts be mitigated during the operational phase	No
Mitigation: » Decommissioning: removal of the PV plant and ancillary infrastructure after 30 years.	
Cumulative Impacts: » No cumulative impacts are expected.	
Residual Impacts: » No residual impacts are expected as the visual impact will be removed after decommissioning.	

Nature: Potential visual impact on residents of settlements within the region

The PV plant will not be visible from any built up areas within close proximity of the development site. The closest town (Vaalwater) to the facility is situated approximately 30 km away as the crow flies. Other settlements in the region (i.e. between 4 km and 8 km from the proposed PV plant) may experience a medium visual impact, even with VAC being taken into account. Many of the settlements that are not envisaged to be visually affected are situated behind hillocks/undulations and are effectively shielded by the topography. Settlements located beyond the 8 km radius have not been reflected in the table below as views from these are expected to be insignificant.

	VAC considered	***Mitigation considered***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (3)	Moderate (3)
Probability	Medium (3)	Low (2)
Significance	Medium **(39)**	Low **(26)**
Status (positive or negative)	Negative	
Reversibility	Recoverable (3)	
Irreplaceable loss of resources	No	
Can impacts be mitigated during the operational phase	No	
Mitigation: » Decommissioning: removal of the PV plant and ancillary infrastructure after 30 years.		
Cumulative Impacts: » No cumulative impacts are expected.		

Residual Impacts: » No residual impacts are expected as the visual impact will be removed after decommissioning.		
Nature: Potential visual impact on protected areas in close proximity of the PV plant The PV plant will potentially affect very limited parts of the transition zone of the Waterberg Biosphere Reserve. Within these very limited areas, visual impact is anticipated to be low.		
	VAC considered	***Mitigation considered***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	High (4)	High (4)
Probability	Improbable (1)	Improbable (1)
Significance	Low **(15)**	Low **(15)**
Status (positive or negative)	Negative	
Reversibility	Recoverable (3)	
Irreplaceable loss of resources	No	
Can impacts be mitigated during the operational phase	No	
Mitigation: » Decommissioning: removal of the PV plant and ancillary infrastructure after 30 years.		
Cumulative Impacts: » No cumulative impacts are expected.		
Residual Impacts: » No residual impacts are expected as the visual impact will be removed after decommissioning.		

Nature: Potential visual impact on tourist routes and destinations within the region Some of the farms adjacent to the proposed facility have been set aside for game farming/cattle farming and tourism destinations. These and other 'points of interest' off the Waterberg Meander could result in a medium visual impact. Certain stretches along the D579, D2416, D2747, and D1959 may be similarly impact on. This impact remains of medium significance when considering the VAC.		
	VAC considered	***Mitigation considered***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (4)	High (4)
Probability	Medium (3)	Low (2)
Significance	Medium **(42)**	Low **(28)**
Status (positive or	Negative	

negative)	
Reversibility	Recoverable (3)
Irreplaceable loss of resources	No
Can impacts be mitigated during the operational phase	No
Mitigation: » Decommissioning: removal of the PV plant and ancillary infrastructure after 30 years.	
Cumulative Impacts: » No cumulative impacts are expected.	
Residual Impacts: » No residual impacts are expected as the visual impact will be removed after decommissioning.	

Nature: Potential visual impact of ancillary infrastructure on visual receptors in close proximity of the PV plant

The ancillary infrastructure associated with the PV plant includes a switching station, internal access roads, and a low volume water supply pipeline from an on-site borehole, workshop/storage area, and a visitor's centre. These structures will not significantly add to the visual impact of the PV plant, as they will all be modestly sized, and will thus not exceed the visual exposure of the primary PV infrastructure. The impacts of this ancillary infrastructure are expected to be medium. This impact has a low significance when considering VAC.

	VAC considered	***Mitigation considered***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	High (4)	High (4)
Probability	Low (2)	Low (2)
Significance	Low **(30)**	Low **(30)**
Status (positive or negative)	Negative	
Reversibility	Recoverable (3)	
Irreplaceable loss of resources	No	
Can impacts be mitigated during the operational phase	No	
Mitigation: Decommissioning: removal of the PV plant and ancillary infrastructure after 30 years.		
Cumulative Impacts: No cumulative impacts are expected.		
Residual Impacts: None. The visual impact will be removed after decommissioning		

Nature: Potential visual impact of lighting on visual receptors in close proximity of the PV plant The area earmarked for the placement of the facility has a relatively small number of populated places (towns, settlements and farmsteads). Although these are not densely populated areas, the light trespass and glare from the security and after-hours operational lighting will have some significance. Furthermore, the sense of place and cultural ambiance of the local area increases its sensitivity to such lighting intrusions. However, it is reported that in terms of security lighting, no high mast lights will be installed on site as these would interfere with the operations of the plant due to shading. It is planned that infrared security cameras will be used, and that maintenance activities would likely be undertaken with the use of torches. The anticipated impacts of lighting are expected to be moderate, and becomes of low significance when considering VAC.		
	VAC considered	***Mitigation considered***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Low (2)	Low (2)
Significance	Low **(26)**	Low **(26)**
Status (positive or negative)	Negative	
Reversibility	Recoverable (3)	
Irreplaceable loss of resources	No	
Can impacts be mitigated during the operational phase	No	
Mitigation: Decommissioning: removal of the PV plant and ancillary infrastructure after 30 years.		
Cumulative Impacts: No cumulative impacts are expected.		
Residual Impacts: None. The visual impact will be removed after decommissioning		

Implications for Project Implementation

» The existing high quality natural and rural views from receptors surrounding the site will be transformed for the entire operational lifespan (approximately 30 years) of the facility.
» The potential visual impact on users of secondary roads in close proximity to the proposed PV plant will be of medium significance after VAC and mitigation have been taken into account.
» Within the region, the potential visual impact on residents and on tourist routes and destinations will be of low significance after VAC and mitigation have been taken into account. The significance of the potential visual impact on protected areas in close proximity to the facility will also be low.

» This anticipated visual impact is not, however, considered to be a fatal flaw from a visual perspective, considering the relatively low incidence of visual receptors in the region, and the contained area of potential visual exposure.

» This impact is not likely to detract from the regional tourism appeal, numbers of tourists or tourism potential of the existing centers and destinations. The facility may, in fact add to the plethora of attractions within the region. Within natural areas, the nature of recreational activities (game viewing, quad biking, arts and crafts viewing etc) undertaken in the region is not likely to be influenced.

6.2.5 Assessment of Potential Road Related Impacts

Due to concerns raised during the Scoping Phase, a road impact assessment was commissioned in order to evaluate the potential road related impacts, primarily during the construction phase. The nature of the impact of the additional vehicles during the construction phase will be to add to the wear and tear of the gravel roads. This will increase the severity of the corrugation and occurrence of potholes. Due to the short period over which busses and trucks will be carting workers and materials to and from the construction site, the impact it will have on these isolated local gravel roads is estimated to be low in magnitude. Nevertheless, without the correct attention to the prevailing conditions, and similar future issues with the gravel roads, it is highly probable that the impact of these vehicles will add to the further deterioration of the road conditions. If the correct remedial and maintenance measures are applied over the construction period it is highly likely that all of the above issues can be negated.

During the operation phase, the effect of the daily traffic will be negligible. If required, contributions will be made as far as the maintenance policy that is already in place. This may be an agreement between the local residents, farmers, and businesses using the road or the local roads authority. The transport modes and frequency to the proposed site is estimated as follows:

» 1 small vehicle transporting security personnel, 3 trips/day, from Vaalwater to Goedgevonden and back
» 1 Security patrol vehicle on site
» Bus 1 - 2 trips/ day (22 people/bus), from Boschdraai village to Goedgevonden and back
» Bus 2 - 2 trips/day, from Vaalwater to Goedgevonden and back

The routes for the busses will be as follows (refer to Figure 6.5):

» *Bus 1 - Boschdraai Village to Goedgevonden* - travel via a 4 km gravel farm road, to the east, through Bellevue to the D2747 gravel road. Turn left and travel north on the D2747 road for 3.3 km to the Goedgevonden entrance on the right. This amounts to a total distance of 7.3 km.
» *Bus 2 and Security Vehicle - Vaalwater to Goedgevonden* - there are two possible routes to Goedgevonden as is described below:
  * *Alternative 1:* From Vaalwater, travel 24.1 km northeast on D972 tar road. Thereafter turn right and travel east for 9 km on the D2416 gravel road (Sterkstroom turnoff). Thereafter turn right and travel south for 2 km on the D2747 gravel road to the Goedgevonden entrance on the left. This amounts to a total distance of 35.1 km with a 24.1 km paved section of road and an 11 km gravel section.
  * *Alternative 2:* From Vaalwater, travel 9.6 km northeast on the D972 tar road. Thereafter turn right and travel east for 8.3 km on the D973 gravel road (24 Rivers turnoff). Thereafter turn left and travel north for 10.5 km on the D2747 gravel road to the Goedgevonden entrance on the right. This amounts to a total distance of 28.4 km with a 9.6 km paved section and 18.8 km gravel section.

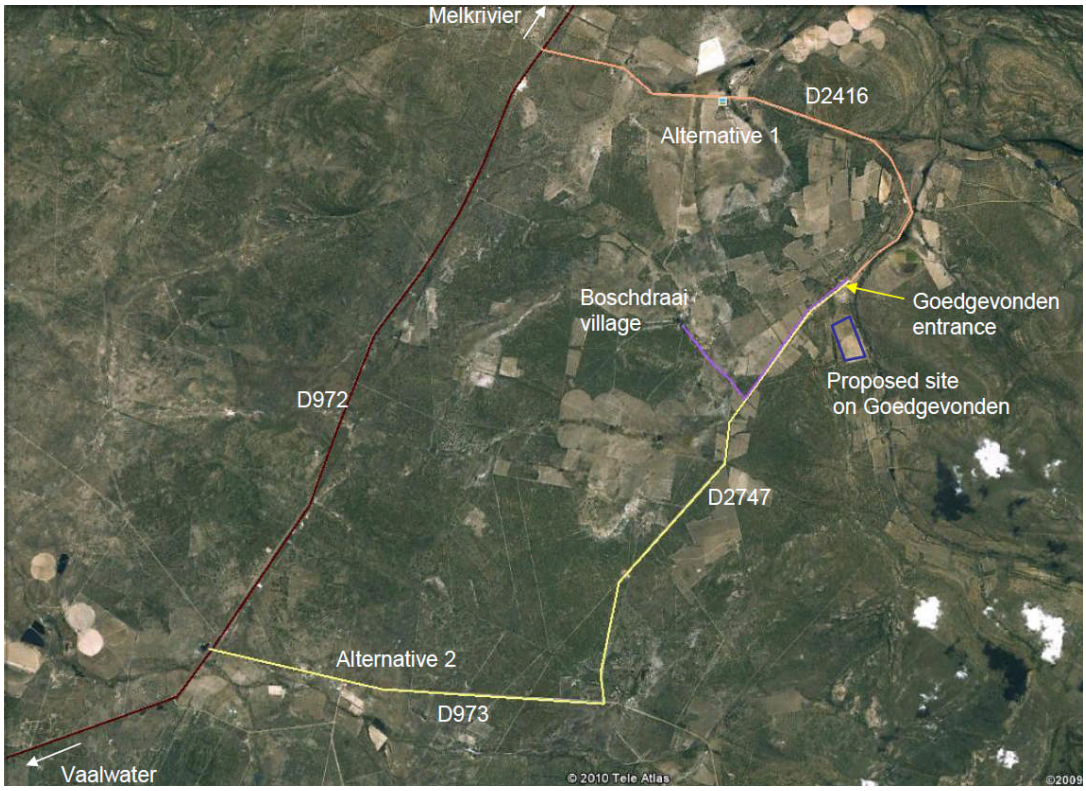

Figure 6.5: Proposed routes during the operational phase

Impact tables summarising the significance of impacts on the roads during the construction phase (with and without mitigation)

Nature: Impact of the construction vehicles will be to add to the wear and tear to the gravel roads		
	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (4)	Probable (2)
Significance	**28 (Low)**	**10 (Low)**
Status (positive or negative)	Neutral	Positive
Reversibility	Low	High
Irreplaceable loss of resources	Yes	No
Can impacts be mitigated	Yes	
Mitigation: Immediate blading of road, repairing of potholes, adding extra gravel materials were indicated by engineer and cutting of drainage furrows. Planning a maintenance schedule for the period during construction.		
Cumulative Impacts: Vehicles will worsen existing conditions of road thereby making it unsafe for large vehicles (busses) to transport passengers and goods.		
Residual Impacts: Farms and local businesses cannot operate effectively and added wear and tear to vehicles using roads		

Implications for Project Implementation

» The evaluation of gravel road D973 describes the road as unsafe and in need of maintenance over 50% of the approximately 8km travelled way.
» Road D2416 and the majority of road D2747 are almost in the same poor condition for the transportation of passengers and materials by busses and trucks respectively.
» Failure to implement recommended remedial and maintenance works will add to the prevailing conditions mentioned above. This could result in the increased financial burden on the local community as well as loss of human life.

6.2.6 Assessment of Potential Social Impacts

Impacts on the social environment are expected to be both positive and negative during the construction and operational phases of the facility.

The key **positive** social issues associated with the **construction phase** include creation of employment, and business opportunities; the opportunity for skills

development and on-site training; and the opportunity to address skills inequities. The key **negative** social issues associated with the construction phase include the following potential negative impacts inflow of an outside workforce; inflow of job seekers; impacts on agricultural practises; traffic related impacts; impacts on tourism; impact on infrastructure and services. In most cases these impacts could respond to the mitigation measures proposed.

The key **positive** social issues affecting the **operational phase** include creation of employment and business opportunities; opportunities for skills development and training; the opportunity to address skills inequities; and impacts related to the promotion of renewable energy and energy efficiency. The key **negative** social issues affecting the operational phase include impacts on the sense of place; on surrounding property owners; on tourism activities; on the Waterberg Biosphere Reserve; traffic patterns; impacts of rezoning; health related impacts; noise impacts and lighting pollution.

Impact tables summarising the significance of social impacts (with and without mitigation measures)

Nature: Employment creation, skills inequities[11], capacity building and skills training during the construction phase A large part of the construction activities would entail manual labour for approximately 50 - 100 construction workers. Based on current education levels and employment statistics for the area, unskilled and semi-skilled labour could be sourced from the residents of Boschdraai and Leseding, and possibly from the immediate environment. Workers would receive induction training on-site to undertake the various repetitive tasks.		
	Without mitigation	***With mitigation***
Extent	Regional (4)	Regional (4)
Duration	Very short duration (1)	Very short duration (1) – Medium term (3)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	Medium **(44)**	Medium **(55) –** High **(65)**
Status	Positive	
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Positive impacts can be enhanced	
Mitigation: » Employment of local community members (e.g. Boschdraai and Leseding or the immediate environment) should be undertaken where possible		

[11] Economic inequities refer to the degree to which employment opportunities match the actual job skills present in the local communities.

- The applicant and its Engineering and Procurement Contractor should ensure an equitable process whereby locals and previously disadvantaged individuals (i.e. women) are taken into account
- The project proponent and contractors should create conditions that are conducive for the involvement of entrepreneurs, small businesses, and SMME's during the construction process.
- Tender documentation should contain guidelines for the involvement of labour, entrepreneurs, businesses and SMME's from the local sector
- A local labour desk should be set-up (if not already established) in the beneficiary communities to co-ordinate the process of involving local labour
- Communication efforts concerning job creation opportunities should refrain from creating unrealistic expectations
- A broad-based approach should be followed to identify and involve relevant organisations which could assist the main contractor and project proponent in identifying people whose skills may correspond with the job specifications
- In cases for the semi-skilled jobs, where the relevant skills do not exist, training should be provided to willing local community members to enable them to fill the positions
- Capacity building initiatives could link in with the planned capacity building and skills training initiatives to be undertaken as part of the Waterberg Biosphere Reserve's outreach programmes
- The contribution of funds for the initiation phase of the Waterberg Biosphere Reserve's Skills Training Facilitation Project should be considered

Cumulative Impacts:

- Improvement in quality of life even if only for a short duration (i.e. through employment and enhancement of skills levels)
- Possible economic downfall of individuals after the period of employment has lapsed as they have become used to a certain income level
- Capacity building and skills development of those involved in the construction phase of the project

Residual Impacts:

- Capacity building and skills development of those involved in the construction phase of the project

Nature: Employment creation, skills inequities, capacity building and skills training during the operational phase

Approximately 40 - 80 individuals would be employed during the operation phase. Long-term direct job opportunities for locals exist while secondary employment opportunities would refer to the security personnel and catering services. Over and above the direct employment opportunities that would be created during the operational phase of the facility, a number of downstream benefits may emerge due to the increased income of some, although it is not possible to determine in which sectors it would be spent.

The majority of skills required for the operation and management of the facility fall within the unskilled to semi-skilled category, although some highly skilled personnel would also be required.

Individually tailored made training programmes would be embarked upon which would be undertaken in association with accredited training operators. Employees will be given paid leave to attend, and attendance will be seen as part of their work, and thus compulsory. Should employees leave the facility in search of work elsewhere in the field they would be equipped with portable skills.

	Without mitigation	***With mitigation***
Extent	Regional (3 - 4)	Regional (3 - 4)
Duration	Short (2) - Long term (4)	Medium (3) - Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	Medium **(48 - 52)**	High **(65)**
Status	Positive	
Reversibility	Yes, in some instances	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Positive impacts can be enhanced	

Mitigation:

» Employees should be sourced from Ward 3 and Ward 1 of the MLM, and then from the wider area
» Contractors should capacitate locals where practical
» The project proponent should consider training and capacity building programmes to lessen the skills disparity
» The skill requirements should be communicated to the local community leaders and community based organisations
» Local recruitment agencies or other relevant community based organisations should be used where possible to obtain a list of jobseekers
» An equitable process whereby minorities and previously disadvantaged individuals (i.e. women) are taken into account should be implemented
» In cases for the middle to lower skilled jobs, where the relevant skills do not exist, training should be provided to willing local community members to enable them to fill the positions
» Capacity building initiatives could link in with the planned capacity building and skills training initiatives to be undertaken as part of the Waterberg Biosphere Reserve's outreach programmes
» Contribution to the initiation phase of the Waterberg Biosphere Reserve's Skills Training Facilitation Project should be considered
» School excursions to the visitors centre should be arranged between the project proponent and local school representatives

Cumulative Impacts:

» Through the employment of locals other anticipated negative social impacts could be mitigated
» Improved quality of life of those employed
» Increased purchasing power of those employed through the project.
» Indirect benefits to businesses
» Stimulation of local economy
» Capacity building through skills development as part of the project

Residual Impacts:

» Skilled and capacitated individuals
» Capacity building through skills development as part of the project

Nature: Influx of outside workforce & influx of job seekers during the construction phase

An average number of 50 – 100 construction workers would be required on-site on a daily basis during the construction phase of the facility. Impacts associated with the inflow of temporary workers to the area could result in various negative impacts on the surrounding property owners and possibly on local communities. The intensity would depend on whether local labour would be used and the actual percentage of workers that would be sourced from the local labour

The majority of negative social impacts associated with the inflow of jobseekers are usually experienced if the jobseekers, especially those not originally from the area, remain in the area for long periods or even after construction has stopped. This could result in added pressure on the existing infrastructure and services and even in an increase in crime levels and conflict between locals and the jobseekers.

	Without mitigation	***With mitigation***
Extent	Development site & surrounding area (2)	Development site & surrounding area (2)
Duration	Very short (1) - Medium term (3)	Very short (1) - Short term duration (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	Medium **(36 - 44)**	Low **(27) –** Medium **(30)**
Status	Negative	
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation:

» Local labourers should be employed where possible
» Local labourers should remain at their existing residences and no workers can be allowed on site during night time
» No workers should be accommodated on site at night
» Working hours should be kept to legislated working hours as per the Draft EMP
» Before construction commences, representatives from the MLM, community leaders, community-based organisations and the surrounding property owners, should be informed of the details of the contractors, size of the workforce and construction schedules
» Construction workers should be easily identifiable by wearing uniforms and even identity tags
» Local community organisations and policing forums / neighbourhood watches must be

informed of the presence of the outside workforce » Care should be taken to avoid conflict between the local communities and the "outside" workforce » Sufficient water and sanitation facilities should be provided for the workers on site during the construction period » The construction site should be properly managed to avoid any environmental pollution (due to inadequate water and waste infrastructure and services) and littering » No informal vending stations should be allowed on or near the construction site. Construction workers should preferably receive daily meals and beverages to avoid the need for a vending station » Information distributed as part of the existing HIV/Aids awareness campaigns should again be focused on and communicated to the local workforce » Thupela Energy, local leaders and the MLM should jointly develop a strategy to minimise the influx of jobseekers to the area » Maximise the use of local labour and contractors where possible by developing a strategy to involve local labour in the construction process » The recruitment process and the use of contractors should be clearly communicated to the local communities » The communication strategy of the Thupela Energy and its EPC partner regarding the proposed project should ensure that unrealistic employment expectations are not created » A representative of Thupela Energy or its EPC partner could attend community meetings arranged within the various wards to discuss the employment and recruitment process
Cumulative Impacts: » Capacitated individuals » Enhancement of skills levels of individuals involved in construction process » Added pressure on service delivery and the existing infrastructure with resultant additional socio-economic burdens for the MLM and surrounding property owners
Residual Impacts: » Capacitated individuals » Enhancement of skills levels of individuals involved in construction process » Possible permanent settlement of job seekers in the area with associated cumulative impacts as indicated above

Nature: Impacts on agricultural practices from a biophysical perspective

The site proposed for the construction of the PV facility is currently used for harvesting of cattle fodder (i.e. pasture purposes). This agricultural practice would thus have to cease and could result in negative economic impacts if the fodder harvested here cannot be substituted elsewhere or if alternative grazing areas cannot be found for the cattle currently being fed on the fodder. It is however planned to allow the grazing of sheep on site between the panels which would result in some agricultural practices continuing on site. As the property owner of the farm Goedgevonden KR 104 also owns other properties in the area it is assumed that this negative impact has been considered and that it can be successfully mitigated.

	Without mitigation	***With mitigation***
Extent	Site of development (1)	Site of development (1)

Duration	Medium term (3)	Short term (2)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Improbable (2)
Significance	Medium (**44**)	Medium (**30**)
Status	Negative	
Reversibility	Yes	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	Yes	
Mitigation: » Fodder harvested on site should be substituted elsewhere » Alternative grazing areas should be found		
Cumulative Impacts: » None expected		
Residual Impacts: » None expected		

Nature: Impacts on tourism from a social perspective

During the construction phase one could expect some impacts on the tourism industry due to the increased construction vehicle movement, noise pollution, and negative visual impacts associated with the construction site. Some short term negative impacts in this regard could thus be experienced by some of the surrounding property owners as these intrusions would be more marked where tourism related facilities are in close proximity to the actual construction site. The intensity of this impact would be dependent on the experience of the tourist of the quality of the area and sense of place. It is however, believed that these temporary negative impacts would not result in long term negative financial impacts for the local tourism sector or for the property owners who occasionally entertain visitors on their guest farms. It should furthermore be noted that local accommodation facilities in close proximity to the site could benefit during the construction period, as the members of the specialist construction team or any outside workers could make use of local establishments for the duration of their stay in the area.

During the operational phase visitors to the farm Sterkstroom KR 103 and the farm Schoongezigt KR 107 would have a clear view of the facility as they would pass directly in front of the entrance to the site. It is anticipated that it would only result in a temporary negative impact on these visitors. Should they, however, be able to continuously have a clear view of the facility (which is unlikely) when undertaking activities on the farms, such as cycling, game and bird viewing and so forth it could impact on their wilderness experience. The probability is rather likely that tourists would return to an area where PV facilities are present if they had a pleasant overall holiday experience.

	Without mitigation	***With mitigation***
Extent	Local (3)	Local (3)
Duration	Very short (1) – Long term (4)	Very short (1) – Long term (4)
Magnitude	Moderate (6)	Moderate (6)

Probability	Highly probable (4) – Probable (3)	Probable (3) - Highly probable (4)
Significance	Medium (**39 - 40**)	Medium (**33 - 52**)
Status	Negative and/or Positive	
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation:

» Mitigation measures concerning the anticipated traffic related impacts would also be applicable
» The construction phase should preferably not coincide with the main tourist season (if any) to limit the temporary impact on the tourism industry
» Construction activities should be limited over weekends, on public holidays and specific tourist related activities, festivals and/or events held in the area
» Members of the specialist construction teams should preferably be accommodated at guest farms or lodges in the area
» Investigate and promote the role which the visitors centre and PV facility could play with regards to the local tourism industry.
» The project proponent should work closely with the above mentioned role players when developing the visitors centre.
» Repeat visits to the area, PV facility and visitors centre should be encouraged.
» Guest farms, guest houses, camp sites, lodges, game farms and so forth could use the presence of the proposed PV facility for "green tourism" marketing purposes
» The presence of the PV facility could be included in the Waterberg tourism bureau's information leaflets and visitors guides, as well as in the publications of the Waterberg Meander.

Cumulative Impacts:

» Possible further positive economic spin-offs and returns of members of the specialist teams to the area as tourists
» Exposure of the Waterberg area to various individuals with possible future positive impacts on the tourism sector
» Increased visitors to the area with positive financial impacts on the local tourism sector

Residual Impacts:

» None anticipated

Nature: Impacts on safety and security

During the construction phase impacts related to safety and security would most probable be related to the influx of construction workers.

During the operational phase it is not anticipated that the proposed facility would result in severe safety and security impacts, however, should children or other individuals be gained unauthorised access to the site it could, however, create safety risks. The concerns of property owners concerning illegal pouching of game on the surrounding properties remain an issue which is difficult to respond to mitigation. An inflow of people to an area creates an

opportunity for criminal elements. The fire fighting services in the district is currently understaffed and there is a need for additional personnel in the Vaalwater area.

	Without mitigation	***With mitigation***
Extent	Local (3)	Local (3)
Duration	Very Short (1) – Long Term (4)	Very Short (1) – Long Term (4)
Magnitude	Moderate (6)	Low (4) - Moderate (6)
Probability	Highly probable (4) – Probable (3)	Probable (3)
Significance	Medium (**36 - 40**)	Medium (**30 - 33**)
Status	Negative	
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes to some extent	

Mitigation:

» Employing local community members could minimise the potential for criminal activity or perceived perception of an increase in criminal activity due to the presence of an outside workforce
» Screening of workers that apply for work could be useful to lessen perceived negative perceptions about the outside workforce
» Construction workers should be easily identifiable by wearing uniforms and even identity tags
» Local community organisations and policing forums must be informed of the presence of the outside workforce
» Care should be taken to avoid conflict between the local communities and the "outside" workforce
» The property owners surrounding the construction area should be involved during the construction process by communicating the construction schedule and movement of workers with these representatives
» Property owners and their workers, as well as local communities (e.g. Boschdraai due to their location to the site) and their community structures should be motivated to be involved in crime prevention and by reporting crimes
» The site should be fenced
» Permanent security personnel should be at the site for the duration of the construction period
» Security personnel should be aware of the possibility of animal theft and poaching and should be able to identify possible criminal elements and/or criminal activities in this regard
» Procedures and measures to prevent, and in worst cases, attend to fires should be developed in consultation with the surrounding property owners
» Schoolchildren visiting the visitors centre should be supervised at all times to avoid accidents
» Normal operational safety guidelines should be adhered to

Cumulative Impacts:

» Possible increase in crime levels with subsequent possible economic losses or in worst-

case scenarios loss of lives of animals and individuals
Residual Impacts:
» As above

Nature: Health related impacts

The proposed PV facility would not result in any air pollution, the subsequent health impacts on communities and property owners in close proximity or sensitive receptors are deemed insignificant. Additional waste would however be generated by the employees on site. This impact is expected to be mitigated through the proper design of the facilities on site.

On a global scale the project is anticipated to have positive social and health related impacts through the "greener" technology that will be used (limited noise / no emissions and so forth).

	Without mitigation	***With mitigation***
Extent	Local (2)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (1)	Probable (3)
Significance	Low (**8**)	Low (**27**)
Status	Positive	
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes, positive impacts can be enhanced	

Mitigation:

» Marketing of the "green" technology to be used can assist in awareness creation about the benefits of "green" technology.
» Engineering aspects and the design of the facility should ensure no environmental pollution. Proper waste, water and sanitation infrastructure and facilities must thus be installed.

Cumulative Impacts:

» Wider awareness of "green" technology

Residual Impacts:

» As above

Nature: Impacts of rezoning

Concerns about the rezoning of the land refer to the perception that the change in land use would be an intrusion on the existing land-uses in the area which mainly include game and cattle farming. Other concerns relate to the possibility that the proposed project could expand or could create a precedent for other similar developments in the area. Property owners are furthermore concerned that rezoning would influence the status of their farms and their rights as property owners (e.g. the reimbursement for damages suffered in the event of fires) and even possible devaluation of their properties.

	Without mitigation	***With mitigation***
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	Medium (**36**)	Medium (**36**)
Status	Negative	
Reversibility	Yes	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	Yes, to some extent	
Mitigation: » Any application for expansion of the facility should be carefully dealt with. Any possible expansion of the PV facility would have to be clearly communicated to the surrounding property owners and the relevant legislative processes would have to be followed.		
Cumulative Impacts: » Cumulative impacts include the possibility that the proposed PV facility create possibilities for other developments to be established in the area.		
Residual Impacts: » Distinct change in land-use		

Nature: Impacts on traffic

During the construction phase the construction vehicles (e.g. excavators or bulldozers) would probably be stored on site and movement of these vehicles between the construction site and source areas would be kept to the minimum. A large number of delivery vehicles (large trucks of some being between 20 to 30 tons) would have to access the site for the delivery of the mounts, panels, and electrical equipment. If concrete footings would be used cement and sand would also have to be brought to site. At this stage the number of vehicles is estimated at a minimum of 150 trucks and a maximum of 200 trucks for the duration of the construction period which would result in approximately two heavy vehicles per day.

The construction related vehicles would most probably make use of the tarred Modimolle-Vaalwater Road (R33) and the tarred Vaalwater-Melkrivier Road (R518) and then turn-off onto the Sterkstroom or Vier-en-Twintig-Riviere gravel roads to access the site.

	Without mitigation	***With mitigation***
Extent	Local (3)	Local (3)
Duration	Short term (2)	Very short duration (1)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	Medium (**44**)	Medium (**30**)
Status	Negative	
Reversibility	No	
Irreplaceable loss of resources	No	

Can impacts be mitigated	Yes to some extent
Mitigation: » The contractor should arrange meetings with affected residents (farm owners) before construction commences. During these meetings, the contractor's plans, procedures and schedules, as well as the anticipated intrusion impacts should be clarified. » Residents of the farms Schoongezicht KR 107 and Sterkstroom KR 103 should be allowed access to their properties at all times. » The movement of construction vehicles through the local area should be limited to off-peak periods (if possible) to minimise adverse impacts on the movement of pedestrians (individuals walking to and from work and schoolchildren) and to a lesser extent on private vehicular traffic. » Signs should preferably be erected at strategic locations throughout the area, warning residents, and visitors about the hazards around the construction site and the presence of heavy vehicles. » Strict vehicle safety standards should be implemented and monitored. » Construction vehicles should keep to the speed limits. » The local gravel access roads should be graded by the project proponent to limit the degradation of the road surface.	
Cumulative Impacts: » Poor road and surface conditions which are unlikely to be attended to by the MLM	
Residual Impacts: » Poor road and surface conditions which are unlikely to be attended to by the MLM	

Implications for Project Implementation

» The potential negative impacts associated with the construction phase are typical of construction related projects and not just focused on the construction of the facility.
» Given the socio-economic profile of the population within the area, the possible job creation during the construction phase and operational phase of the proposed project is deemed as a significant positive injection into the area. It is anticipated that the unskilled and semi-skilled positions could be filled by local labourers.
» The majority of households in the study area live under severe poor conditions with low skills levels and low household income profiles. The proposed project could therefore assist in improving this situation for those who could obtain permanent employment at the facility. Even if it would only be a small contribution to the economic well-being of the larger population it should still be seen as a major positive impact on those affected.
» Failure to involve the local population, emerging contractors, and SMME's during construction could lead to negative attitude formation against the proposed project and the project proponent.
» An inflow of outside jobseekers to the construction site is likely and could result in various negative impacts, but mainly if the jobseekers remain in the area after the construction has been completed.

» Negative impacts on the local tourism sector are possible during the construction and operational phase although it is anticipated that these can be successfully mitigated and would not result in long-term negative financial implications. The local tourism industry can even benefit during the construction phase due to lodge occupancy by some construction team members. It is thus anticipated that the facility would rather be beneficial to the local tourism sector in the long term with potential subsequent positive financial impacts for those involved in this sector.
» Anticipated safety and security impacts during the construction phase remain a concern and should be sensitively and thoroughly dealt with.
» It is, not anticipated that the proposed project would alter the host community's standard of living or quality of life or directly negatively impact on the activities undertaken on these properties, even though it would have a negative impact on the sense of place.
» The proposed facility would not be detrimental to the health of the host community, even though it would change the character of the area due to the visual impact associated with such a facility.
» It should be noted that the visual impact is a concern for the several property owners and this issue is not expected to be successfully mitigated.
» It is expected that the negative intrusion impacts associated with the project on the lifestyle within the area and activities undertaken on the farms, would remain high on the agenda of the surrounding residents, and directly affected landowners.
» The proposed facility could become a major tourist attraction in its own right and complement the existing tourism attractions in the area, thereby resulting in promoting a positive image of the area with resultant positive impact on the local tourism industry, economy, and environment.
» The project is anticipated to have positive social and health related impacts through the "greener" technology that will be used (limited noise / no emissions and so forth).

6.2.7 Assessment of Potential Socio-Economic Impacts

As a result of concerns raised during the Scoping Phase, a Socio-Economic study was commissioned. Impacts on surrounding farms in terms of agricultural potential will be neutral as no significant pollution or other external factors have been identified and therefore production and related activities will be able to continue as present. However, this assumes high levels of management and control of worker, sub-contractors and visitors access to the site and behaviour on the site and in surrounding areas.

The development would make a significant change to the current sense of place of the immediate surrounding area and would not be without tourism risks. However, considering the relatively low lying structures that are proposed for the facility; the site's relatively low visual exposure potential and the high potential for screening and

mitigation within the landscape; these negative impacts would be of low significance in terms of tourism in the wider area with mitigation.

The net tourism impacts (i.e. positive and negative) on properties in close proximity to the proposed facility (i.e. high potential for visual exposure) with mitigation would be very low negative for the Sterkstroom 103 and Schoongezicht 107 farming unit and very low to low negative for Sterkstroom 105/4. The key reasons for greater risks to Sterkstroom 105/4 are:

» The significantly greater overall visual exposure to the site associated with Sterkstroom 105/4
» The greater visual exposure from the lodge on Sterkstroom 105/4 when compared to the existing lodge and planned future lodge on Schoongezicht 107.
» The smaller size of Sterkstroom 105/4 allowing for less flexibility in the siting of future tourism facilities
» To a greater degree than for the wider area, both farms would be in a position to use the PV plant as an eco-friendly marketing tool and an attraction for guest to visit which would counter negative impacts. The solar initiative at Aquila Safari Lodge in the Western Cape shows that this is a possibility. It is, however, also recognised that the scale of the proposed PV plant on Goedgevonden would be larger than is ideal from the perspective of neighbouring tourism establishments.

Impacts on property values in the wider local area and region have been give a very low negative to neutral impact significance rating. In terms of property values for properties in close proximity, primarily because of the prediction of relatively minimal risks to tourism, it is deemed highly unlikely that there would be more than a low level of risk for property values in the area.

The project has the potential to have a highly significant positive impact on economic activity in the local area and sub-region given the size of the new spending injection associated with it and the need for economic opportunities.

Power in the Modimolle Municipality is supplied from the Matimba Power Station in Lephalale and is distributed via a sub-station in Modimolle. The proposed plant would therefore provide some level of diversification which would assist in establishing greater supply security particularly in the surrounding farming area and Vaalwater. For instance, if the area experienced shortages or temporary supply cuts from Matimba, it would essentially be in a position to draw from the PV plant as a form of back-up option during daylight hours. This would enable those in the area to handle power outages far better as critical functions would still be possible such as the pumping of water for farming and the maintenance of minimal levels of cooling in refrigeration equipment.

Impact tables summarising the significance of socio-economic impacts (with and without mitigation measures)

Nature: Impacts on the tourism potential of the wider area

Tourism impacts are often driven by changes in the attractiveness or sense of place in an area. The proposed development thus has the potential to impact on tourism as its nature dictates that it should impact on the character of the area (i.e. from a visual perspective).

Considered as a whole, the key potential drivers of negative tourism impacts (primarily visual impacts) do not seem to be significant enough to provide any clear basis to conclude that the project would entail more than a low level of risk for tourism. With mitigation, it is considered possible that this risk would be off-set by the positive attraction and eco-friendly image enhancement provided by the project. It is therefore predicted that the net tourism impacts (i.e. positive and negative) associated with the project would be low negative to neutral with mitigation.

	Without mitigation	***With mitigation***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Medium (6)	Low to neutral (2)
Probability	Probable (3)	Probable (3)
Significance	Medium **(39)**	Low negative – neutral **(27)**
Status	Negative	Negative - neutral
Reversibility	High	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation:

» Impacts on tourism are dependent on how the site is developed and managed to minimise negative impacts. The measures recommended in other specialist reports to minimise biophysical and social impacts (primarily the minimisation of visual and ecological impacts) would thus also minimise tourism impacts.
» Once the visitor centre is established on the site, the proponent should publicise its existence widely in tourism circles and be open to the use of the PV plant in promotional material for the area.
» The proponent should keep communication channels with neighbouring farmers open and consider the establishment of a local land owners' forum in which concerns and issues associated with the plant can be raised and dealt with pro-actively.

Cumulative Impacts:

No cumulative impacts are expected.

Residual Impacts:

No residual impacts are expected.

Nature: Impacts on agricultural activities on surrounding farms

Impacts on farms surrounding the site will be neutral from an agricultural production point of view.

	Without mitigation	***With mitigation***
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (3)	Neutral
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Neutral**
Status	Negative	Neutral
Reversibility	High	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation:

» The proponent will need to apply high levels of management and control of worker, sub-contractors, and visitor's access to the site along with behaviour on the site and in surrounding areas.

» The proponent should keep communication channels with neighbouring farmers open and consider the establishment of a local land owners' forum in which concerns and issues associated with the plant can be raised and dealt with pro-actively.

Cumulative Impacts:

No cumulative impacts are expected.

Residual Impacts:

No residual impacts are expected.

Nature: Impacts on property values in the areas surrounding the site

Impacts on property values in the wider local area and region have been given a very low negative to neutral impact significance rating with mitigation based on a consolidated consideration of impacts outlined above and those discussed in the section on the impacts on tourism and the impacts on agriculture on farms surrounding the site.

Risks to specific neighbouring properties are considered higher than for the wider region, but manageable. With mitigation, it is predicted that the net property value impacts (i.e. positive and negative) associated with the project would be very low negative for the Sterkstroom 103 and Schoongezicht 107 farming unit and very low to low negative for Sterkstroom 105/4. As with impacts on tourism, it should be noted that this finding assumes particularly diligent mitigation of visual impacts and high levels of management and control of worker, sub-contractors, and visitor's access to the PV plant site along with behaviour on the site and in surrounding areas.

	Without mitigation	***With mitigation***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Medium (6)	Low - neutral (2)
Probability	Probable (3)	Probable (3)

Significance	Medium **(39)**	Low – neutral **(27)**
Status	Negative	Negative to neutral
Reversibility	High	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Mitigation: » The measures recommended in other specialist reports to minimise impacts (primarily the minimisation of visual impacts) would also minimise impacts on property values.		
Cumulative Impacts: No cumulative impacts are expected.		
Residual Impacts: No residual impacts are expected.		

Nature: Positive economic impacts associated with project expenditure during the construction phase		
	Without mitigation	***With mitigation***
Extent	Regional (3)	Regional (3)
Duration	Very short term (1)	Very short term (1)
Magnitude	Low (4)	Low to moderate (5)
Probability	Probable (3)	Highly probable (4)
Significance	Low **(24)**	Medium **(36)**
Status	Positive	
Reversibility	High	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Mitigation: » Set reasonable targets for use of local labour and maximise opportunities for the training of unskilled and skilled workers. » Use local sub-contractors where possible » Explore ways to enhance local community benefits with a focus on broad-based BEE through mechanisms such as community shareholding schemes and trusts		
Cumulative Impacts: No cumulative impacts are expected.		
Residual Impacts: No residual impacts are expected.		

Nature: Positive economic impacts associated with project expenditure during the operational phase		
	Without mitigation	***With mitigation***
Extent	Regional (3)	Regional (3)

Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate - high (7)
Probability	Probable (3)	Highly probable (4)
Significance	Medium **(39)**	Medium **(56)**
Status	Positive	
Reversibility	High	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Mitigation: As per the construction phase		
Cumulative Impacts: No cumulative impacts are expected.		
Residual Impacts: No residual impacts are expected.		

Implications for Project Implementation

» The achievement of a net benefit at a local scale surrounding the site would be particularly dependent on extensive mitigation as the key risks of the project would be felt at this scale.
» The balance between positives and negatives as well as the significance of tourism impacts are difficult to predict as they are primarily reliant on the perceptions of tourists some of whom may find that the project detracts from their experience and others who may not.

6.3. Summary of All Impacts

As a summary of the potential impacts identified and assessed through the EIA process, the following table provides a summary of the impact rating.

Nature	**Without mitigation**	**With mitigation**
Impacts on Geology, soil, and erosion potential		
Soil degradation - Removal of vegetation and topsoil under footprint of structures and access roads affecting soil formation processes on the site	Moderate	N/A
Soil degradation - Pollution, salinisation, acidification, or water-logging of natural soil in construction areas affecting soil formation processes.	Moderate	Low
Soil degradation - Mixing, stockpiling and	Moderate	Low

compaction of topsoil affecting soil formation processes		
Soil degradation – Increased sheet, rill or gulley erosion and deposition down-slope due to the removal of vegetation and other activity in construction areas	Moderate	Moderate
Degradation of parent rock - Excavations and or blasting causing degradation to local geology and instability	Low	Low
Impacts on Agricultural Potential		
Loss of agricultural land	Moderate	Moderate
Potential Visual Impacts		
Potential visual impact on users of secondary roads in close proximity of the PV plant	Moderate	Moderate
Potential visual impact on residents of settlements within the region	Moderate	Low
Potential visual impact on protected areas in close proximity of the PV plant	Low	Low
Potential visual impact on tourist routes and destinations within the region	Moderate	Low
Potential visual impact of ancillary infrastructure on visual receptors in close proximity of the PV plant	Low	Low
Potential visual impact of lighting on visual receptors in close proximity of the PV plant	Low	Low
Potential Road Related Impacts		
Impact of the Construction vehicles will be to add to the wear and tear to the gravel roads	Low	Low
Potential Social Impacts		
Employment creation, skills inequities, capacity building and skills training during the construction phase	Moderate	High
Employment creation, skills inequities, capacity building and skills training during the operational phase	Moderate	High
Influx of outside workforce & influx of job seekers during the construction phase	Moderate	Low
Impacts on agricultural practices from a biophysical perspective	Moderate	Moderate
Impacts on tourism from a social perspective	Moderate	Moderate

Impacts on safety and security	Moderate	Moderate
Health related impacts	Low	Low
Impacts of rezoning	Moderate	Moderate
Impacts on traffic	Moderate	Moderate
Potential Socio-Economic Impacts		
Impacts on the tourism potential of the wider area	Moderate	Low
Impacts on agricultural activities on surrounding farms	Low	Neutral
Impacts on property values in the areas surrounding the site	Moderate	Neutral
Positive economic impacts associated with project expenditure during the construction phase	Low	Moderate
Positive economic impacts associated with project expenditure during the operational phase	Moderate	Moderate

6.4. Assessment of Potential Cumulative Impacts Associated with the proposed Photovoltaic Plant

A cumulative impact, in relation to an activity, refers to 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 undertaking in the area[12]. The cumulative impacts associated with the proposed PV plant primarily refer to those impacts associated with social and socio-economic related impacts and include the following:

» Through the generation of **additional electricity**, power can be fed back into the system to individual consumers through the VS (i.e. Vaalwater/Sterkstroom) or VG (Vaalwater/Garona) lines, as well as to the Vaalwater substation. This would cumulatively be beneficial to the larger Waterberg area with a subsequent improvement in quality of life of various individuals benefiting through the improvement of the local electricity supply and possible positive economic spin-offs due to the improved and stable electricity supply.

Cumulative effects have been considered within the detailed specialist studies, where applicable and are low as there are not any other similar projects in the area and therefore there are no cumulative negative impacts.

[12] Definition as provided by DEA in the EIA Regulations.

CONCLUSIONS AND RECOMMENDATIONS CHAPTER 7

Thupela Energy is proposing the establishment of a commercial solar energy facility and associated infrastructure on Portion 2 of the Farm Goedgevonden KR 104, near Vaalwater in the Limpopo Province. The facility is expected to have a developmental footprint of approximately 20 ha (but not larger than 30 ha), which will be sited within the broader 50 ha site.

The primary components of the project (i.e. areas of activity) include several 'strings' of **PV panels**; a **switching station**; and **ancillary infrastructure** (i.e. an extraction point and low volume water supply pipeline; access roads; workshop, laydown and storage areas; a Visitors Centre, crèche and kitchen/dining facilities

The EIA for the proposed facility has been undertaken in accordance with the EIA Regulations published in Government Notice 28753 of 21 April 2006, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the potential impacts (i.e. both positive and negative) that may occur as a result of the establishment of the proposed facility.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.
» Assess the potential socio-economic impacts as well as the potential impacts on the existing access roads to the facility, which was not originally part of the project scope. These studies were commissioned following input from the public participation process.

The conclusions and recommendations of this EIA are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all stakeholders in the study area.

7.1. Evaluation of the Proposed Project

The preceding chapters of this report together with the specialist studies contained within Appendices E - K provide a detailed assessment of the potential impacts that may result from the proposed project. This chapter concludes the Draft EIA Report by providing a summary of the conclusions of the assessment of the proposed site for the solar energy facility and the associated infrastructure. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental consultants during the course of the EIA and presents an informed opinion of the environmental impacts associated with the proposed project. In summary, the following conclusions have been drawn from the specialist studies undertaken:

» The overall impact on the **geology, soils, erosion potential** is likely to be of a **low - moderate** significance given the implementation of mitigation measures. The site is underlain by transported silty sands and the soil erosion potential for the site is moderate. However, the topography is favourable and the vegetation aids the stability of the soil. As a result there is no sign of significant erosion on the site. The envisaged geological and soil related impacts will carry a moderate significance during the construction phase however these can be mitigated to a resultant low significance through effective implementation of the EMP. Furthermore an assessment of the potential geotechnical constraints on the project indicates no insurmountable problems or "fatal flaws" which may have an impact on the design and construction processes.

» The overall impact on the **agricultural potential** of the site will be of **moderate** significance for the lifetime of the proposed facility. However the infrastructure will not involve any significant earth-moving processes or large-scale topsoil removal. Furthermore the site should be able to be returned to its natural state at a future stage without significant problems.

» The overall impact on the **heritage resources** is likely to be **neutral** as no known heritage sites occur in the study area.

» The overall **visual** impact is likely to be of a **medium** - **low significance**. The potential visual impact on users of secondary roads in close proximity to the proposed PV plant will be of medium significance after VAC and mitigation have been taken into account. The potential visual impact on residents, tourist routes and destinations will be of low significance after VAC and mitigation have been taken into account. The significance of the potential visual impact on protected areas in close proximity to the facility will also be low. This anticipated visual impact is not, however, considered to be a fatal flaw from a visual perspective,

considering the relatively low incidence of visual receptors in the region, and the contained area of potential visual exposure.

» The overall **social-economic** impact is likely to be of a **moderate** significance in terms of negative and positive impacts.

» The overall **social** impact in terms of positive and negative impacts is likely to be of a **moderate** significance during both the construction and operational phases with the implementation of enhancement/mitigation measures.

No environmental fatal flaws were identified with the establishment of the proposed Waterberg Photovoltaic Plant. However a number of issues requiring mitigation have been highlighted. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Plan (EMP) included within Appendix L.

The most significant environmental impacts associated with the proposed project, as identified through the EIA, include:

Visual impacts

The construction and operation of the proposed facility will have a visual impact on the natural scenic resources of this region. However, it is not likely to detract from the regional tourism appeal, numbers of tourists or tourism potential of the existing centers and destinations. The facility may, in fact add to the plethora of attractions within the region. Within natural areas, the nature of recreational activities (game viewing, quad biking, arts and crafts viewing etc) undertaken in the region is not likely to be influenced. The facility further has a novel and futuristic design that invokes a curiosity factor not generally present with other conventional power generating plants. The advantage being that the solar facility can become an attraction or a landmark within the region that people would actually want to come and see. Despite the high visual absorption capacity of the surrounding vegetation and the potential for screening (i.e. at the sensitive receptor itself), it is generally difficult to hide a facility of this nature as the panels cannot be shaded. As it is impossible to hide the facility and therefore the only option would be to promote it.

Social impacts

The potential negative impacts associated with the construction phase are typical of construction related projects and are expected to respond to the mitigation measures proposed. The possible job creation and skills development are regarded as a significant positive injection into the area, especially for the majority of poor households in the study area with low skills levels and low household income profiles. The 'sense of place' is difficult to quantify as the intensity would depend on each individual's perception and experience of the area. It is, not anticipated that the

project would alter the host community's standard of living or quality of life or directly negatively affect the activities undertaken on these properties, even though it would have a negative impact on the sense of place.

Socio-economic impacts

The project would result in significant positive economic spin-offs for the local area and region primarily because of the labour intensive operational practices that would be associated with it. While risks to tourism and property value are present, they are considered acceptably low with mitigation particularly when compared with the potential benefits associated with the project. The plant actually has the potential to contribute to the tourism packages on offer through its potential to enhance the 'sustainable tourism' or 'eco-friendly' brand of the area. Therefore considered as a whole, the key potential drivers of negative tourism impacts (i.e. primarily visual impacts) do not seem to be significant enough to provide any clear basis to conclude that the project would entail more than a low level of risk for tourism.

7.2. Overall Conclusion (Impact Statement)

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources. The South African Government has set a 10-year cumulative target for renewable energy of 10 000 GWh renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. This amounts to approximately 4% (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013.

The key documents that provide guidance regarding planning in the area are the 2010/2011 Waterberg IDP, the 2010/2011 Modimolle IDP, the 2009 Modimolle Local Economic Development Strategy, the 2010 Modimolle Spatial Development Framework, and the 2009 Draft Waterberg Environmental Management Framework. Although the latter cautions that the rural environment should be protected from development that is not in line with the rural character of the area, the proposed location of the PV plant is not out of line with international trends.

The viability of establishing a solar plant on a site near Vaalwater has been established by Thupela Energy. The positive implications of establishing a solar energy facility on the identified site within the Limpopo Province include:

» The injection of electricity into the grid, at the proposed point, would serve to strengthen the power supply in the area.
» The proposed facility could become a major tourist attraction in its own right and could complement the existing tourism attractions in the area, thereby resulting

in promoting a positive image of the area with resultant positive impact on the local tourism industry, economy, and environment.

» The project is anticipated to have positive social and health related impacts through the "greener" technology that will be used (limited noise / no emissions and so forth).
» On a global scale the project has the potential to assist in reducing carbon dioxide emissions which would thus have an ameliorating impact on global climate change.
» The project will have numerous benefits during both the construction and the operation phase by way of employment opportunities, skills development, and capacity building within the local communities.

The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

7.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the application for the proposed Waterberg Photovoltaic Plant can be mitigated to an acceptable level. With this in mind the EIA project team support the decision for environmental authorisation.

The following conditions would be required to be included within an authorisation issued for the project:

» All mitigation measures detailed within this report and the specialist reports contained within Appendices E to K should be implemented to limit the negative impacts and enhance the positives.
» The draft Environmental Management Plan (EMP) as contained within Appendix L of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.

- As the area could experience an inflow of outside jobseekers, the project proponent, local leaders and the MLM should jointly develop a strategy to minimise the influx of jobseekers to the area
- During construction, unnecessary disturbance to surrounding habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
- The project proponent should not just use the possible employment opportunities to obtain support from the local communities, but should be committed to creating long term employment and capacity building, thereby ensuring long-term sustainable development in the area.
- Although the functional design of the structures cannot be changed in order to reduce visual impacts, it is proposed that the standard height of the units be set at 3 – 4 m and that a 6 m height should only be used on exception where necessary. This will reduce the facility's visual intrusion and increase the vegetations' ability to mask the facility.
- Receptor sites exposed to visual impact may mitigate this impact by planting a vegetation screen similar in form and density to the natural vegetation of the receiving environment. It should be noted, however, that this measure will only be effective if the screen is planted *in close proximity to the receptor*. This means that the visual impact must be screened at the property which is experiencing the impact, rather than at the development site itself. It is recommended that the visual screen be planned and specified by a planning professional in order to maximise the screening benefit. In addition, it is imperative that the species of plants utilised be ecologically appropriate for the natural environment.
- Ancillary infrastructure (i.e. the switching station, the internal access roads, the pipeline, the workshop/storage area, and the visitor's centre) must be properly planned with due cognisance of the topography, that all disturbed areas be properly rehabilitated, and that all infrastructure and the general surrounds be maintained in a neat and appealing way.
- The water supply pipeline should be placed underground with proper re-instatement and re-vegetation to avoid additional visual clutter.
- The proponent should keep communication channels with neighbouring farmers open and consider the establishment of a local land owners' forum in which concerns and issues associated with the plant can be raised and dealt with pro-actively.

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