ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT ENVIRONMENTAL IMPACT REPORT

PROPOSED BLACKWOOD SOLAR ENERGY FACILITY, FREE STATE PROVINCE

DEA REF NO.: 14/12/16/3/3/2/281

DRAFT FOR PUBLIC REVIEW
11 September 2014 - 13 October 2014

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/281
Title	:	Environmental Impact Assessment Process Draft EIA Report for the Proposed Blackwood Solar Energy Facility near Boshof, Free State Province
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Sub-consultants	:	Savannah Environmental McGregor Museum Paleo Field Services Karen Hansen Landscape Architect) Environmental Consulting and Research Johan Lanz Consulting Dough Harebottle Consulting
Client	:	Blackwood Solar Energy Facility (Pty) Ltd
Report Status	:	Draft Environmental Impact Assessment Report for public review
Review Period	:	11 September 2014 – 13 October 2014

When used as a reference this report should be cited as: Savannah Environmental (2014) Draft Environmental Impact Assessment Report: Proposed Blackwood Solar Energy Facility near Boshof, Free State Province.

PURPOSE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Blackwood Solar Energy Facility (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility with a maximum contracted capacity of up to 75MW, as well as associated infrastructure on a site located in the Free State approximately 25km south-east of Kimberley and 45km south-west of Boshof (refer to Figure 1). This project is to be known as the Blackwood Solar Energy Facility. Based on a pre-feasibility analysis, site identification process undertaken by Blackwood Solar Energy Facility (Pty) Ltd, a favourable area has been identified for consideration and evaluation through an Environmental Impact Assessment (EIA).

Blackwood Solar Energy Facility (Pty) Ltd has appointed Savannah Environmental as the independent environmental consultant to undertake the Environmental Impact Assessment (EIA) for the proposed facility. The EIA process is being undertaken in accordance with the requirements of the EIA Regulations of June 2010 (of GNR543) promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

The Draft EIA Report consists of nine chapters, which include:

Chapter 1: Provides background to the proposed facility and the environmental impact assessment.
Chapter 2: Provides a description of the proposed project and infrastructure.
Chapter 3: Provides an overview of the regulatory and legal context for electricity generation projects and the EIA process.
Chapter 4: Outlines the process which was followed during the EIA Phase, including the consultation process that was undertaken and input received from interested and affected parties.
Chapter 5: Describes the existing biophysical and socio-economic environment.
Chapter 6: Presents the assessment of environmental impacts associated with the proposed facility and associated infrastructure
Chapter 7: Assesses the potential for cumulative impacts associated with the development of the proposed Blackwood Solar Facility.
Chapter 8: Presents the conclusions of the EIA, as well as an environmental impact statement for the proposed project.
Chapter 9: Provides a list of references and information sources used in undertaking the studies for this EIA Report.

The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the extent of the studies required within the EIA Phase. The EIA Phase addresses those identified potential environmental impacts and benefits associated with all phases of the project including design,

construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report aims to provide the environmental authorities with sufficient information 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 to date have been captured and adequately considered within the study. The Final EIA Report will incorporate all issues and responses prior to submission to the National Department of Environmental Affairs (DEA), the decision-making authority for the project.

INVITATION TO COMMENT ON THE DRAFT EIA REPORT

Members of the public, local communities and stakeholders are invited to comment on the draft EIA Report for the Blackwood Solar Energy Facility which has been made available for 30-day[1] public review and comment period at the following locations from **11 September 2014 – 13 October 2014**:

» Kimberley Public Library
» Boshof Public Library
» www.savannahSA.com

Please submit your comments to
Gabriele Wood of Savannah Environmental (Pty) Ltd PO Box 148, Sunninghill,2157, Gauteng Tel: 011 656 3237 Fax: 086 684 0547 E-mail: gabriele@savannahsa.com
The due date for comments on the Draft EIA Report is **13 October 2014**

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

[1] Please note that Organs of state have a 40-day review period.

EXECUTIVE SUMMARY

Blackwood Solar Energy Facility (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility with a maximum contracted capacity of up to 75MW, as well as associated infrastructure on a site located in the Free State approximately 25km south-east of Kimberley and 45km south-west of Boshof (refer to Figure 1). The project is proposed to be developed on the remainder of Portion 1 of the Farm Pandamsfontein 1593 which covers an area of approximately 1468ha. The proposed facility and associated infrastructure (i.e. the development footprint) would occupy an area of approximately 300ha of the 1468ha.

The solar energy facility proposes to generate up to 75 MW of electricity and will be comprised of the following infrastructure:

» Solar panels (fixed/tracking technology) with a maximum contracted capacity of 75MW.
» Mounting structures for the solar panels to be rammed steel piles, piles with pre-manufactured concrete footings or ground screw anchors to support the PV panels.
» Cabling between the structures, to be lain underground where practical.
» Central inverter/transformer stations to collect all energy generated from the PV panels. The inverter's role is to convert direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
» An on-site substation.
» Internal access roads.
» Associated buildings including a workshop area for maintenance, storage, and control facility with basic services such as water and electricity (approximate footprint.
» Area for workshop/maintenance, warehouse/storage, and offices.

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

In summary, the following conclusions have been drawn from the specialist studies undertaken (refer to **Figure 2** for the sensitivity map):

OVERALL CONCLUSION (IMPACT STATEMENT)

Global climate change is widely recognised as being one of the greatest environmental challenges facing the world today. How a country sources its energy plays a big part in tackling climate change. As a net off-setter of carbon, renewable energy technologies can assist in reducing carbon emissions, and can play a big part in ensuring security of energy supply, as other sources of energy are depleted or

become less accessible. South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result, South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer of carbon emissions. With the aim of reducing South Africa's dependency on coal generated energy, and to address climate change concerns, the South African Government has set a target, through the Integrated Resource Plan (IRP) for electricity to develop 17.8 GW of renewables (including 8,4GW solar) within the period 2010 – 2030.

The technical viability of establishing a solar energy facility with a maximum contracted capacity of up to 75MW on a site located on the remainder of Portion 1 of the Farm Pandamsfontein 1593 has been established by Blackwood Solar Energy Facility (Pty) Ltd. The positive implications of establishing a solar energy facility on the identified site within the Free State include the following:

» The potential to harness and utilise solar energy resources within the Free State Province
» The project will assist the South African government in reaching their set targets for renewable energy.
» The project will assist the South African government in the implementation of its green growth strategy and job creation targets.
» The project will assist the district and local municipalities in reducing level of unemployment through the creation of jobs and supporting local business
» The National electricity grid in the Free State and Northern Cape Province will benefit from the additional generated power.
» Promotion of clean, renewable energy in South Africa
» Creation of local employment, business opportunities and skills development for the area.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts are high and can only be reduced by not impacting on the surrounding areas unnecessarily. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMPr) included within **Appendix L**.

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** provided all measures are taken to **protect and preserve** surrounding environment.

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 developmental impacts of the Blackwood Solar Energy Facility project can be mitigated to an acceptable level. In terms of this conclusion, 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:

» » The draft Environmental Management Programme (EMPr) as contained within Appendix L of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed solar energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered to be the main key in achieving the appropriate environmental management standards as detailed for this project.

» There is little or no difference between the impacts associated with the two technologies alternatives assessed for the proposed Blackwood Solar Facility, either one the technology (i.e. fixed/tracking) could be authorised.

» An independent Environmental Control Officer (ECO) must be appointed by the project developer prior to the commencement of any authorised activities.

» A thorough ecological investigation of all footprint areas will be conducted to detect and relocate all plant species of conservation concern by a suitably qualified botanist prior to commencement of activity

» 500m buffer is proposed around reservoir and pan on Landau's Dam and 1500m around the nearby Kraalkop White-backed Vulture breeding colony.

» Remains of a colonial era (ruin and set of ash middens) next to Kimberley-Bloemfontein railway line should be avoided

» Following the final design of the facility, a final layout must be submitted to DEA for review and approval prior to commencing with construction.

» If any protected plant or tree species are required to be removed/destroyed as part of the construction of the development, a collection/destruction permit to be obtained from DAFF for the

protected trees and from the FS DETEA.

» It is recommended that weeds and invasives in the remaining natural veld on the eastern portion of the study area be eradicated and controlled, but that the area is excluded as much as possible from the development. All declared alien plants must be identified and managed in accordance with the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983), the implementation of a monitoring programme in this regard is recommended. A rigorous alien invasive plant monitoring and manageme100nt plan must therefore be implemented right up to the decommissioning phase.

» Access roads to the development should follow existing tracks as far as possible. Where new access routes will be necessary, suitable erosion control measures must be implemented.

» All infrastructures, including access roads and other on-site infrastructure be planned so that the clearing of vegetation is minimised.

» Site rehabilitation of temporary laydown and construction areas to be undertaken immediately after construction.

» Once the facility has exhausted its life span, the main facility and all associated infrastructure not required for the post rehabilitation use of the site should be removed and all disturbed areas appropriately rehabilitated. An ecologist should be consulted to give input into rehabilitation specifications.

» Develop emergency maintenance operational plan to deal with any event of contamination, pollution, or spillages.

» Compile a comprehensive stormwater management method statement, as part of the final design of the project and implement during construction and operation.

» All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.

» An independent Environmental Control Officer (ECO) must be appointed by the project developer prior to the commencement of any authorised activities.

» Applications for all other relevant and required permits required to be obtained by the developer and must be submitted to the relevant regulating authorities.

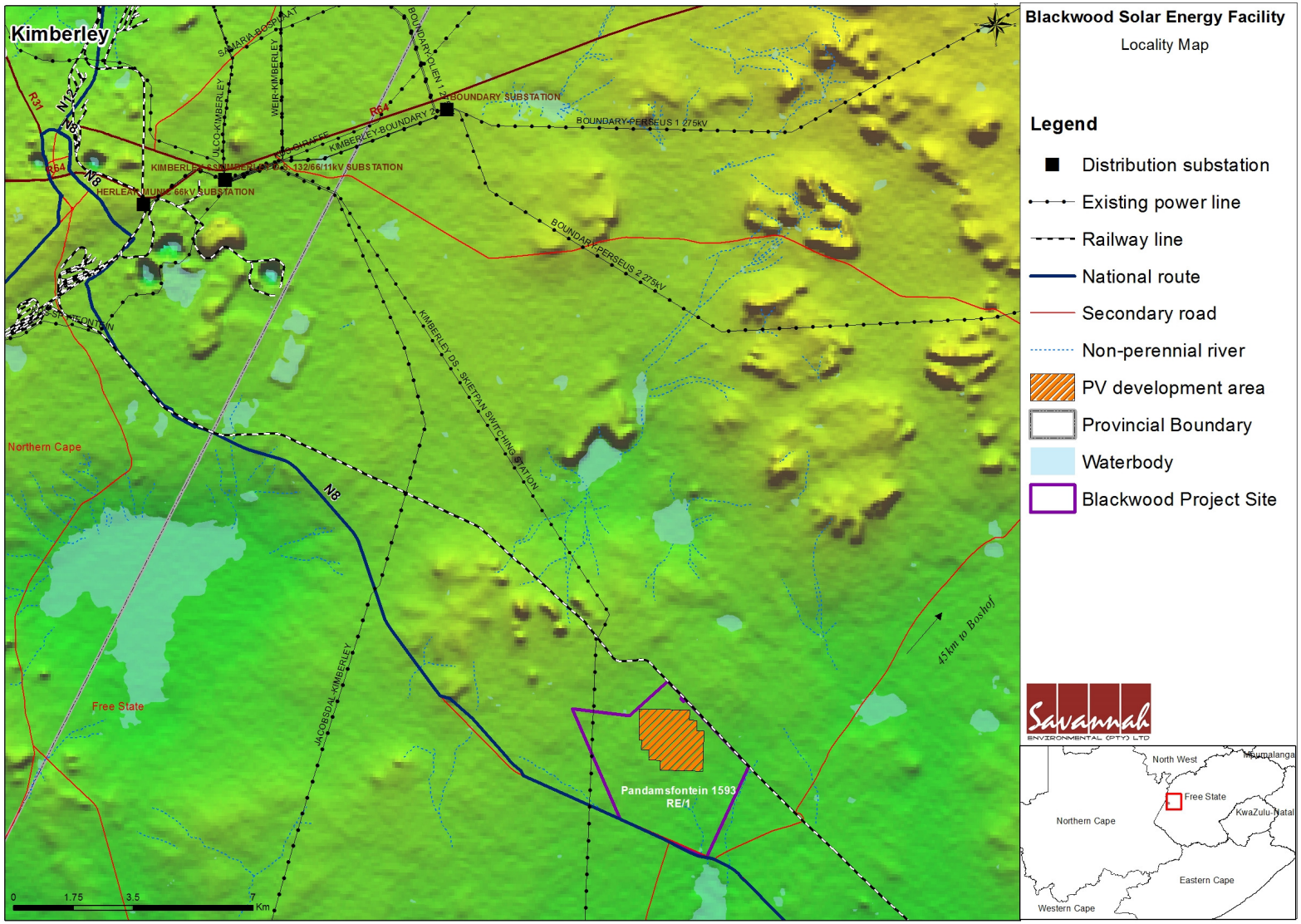

Figure 1: Locality Map of the proposed Blackwood Solar Energy Facility

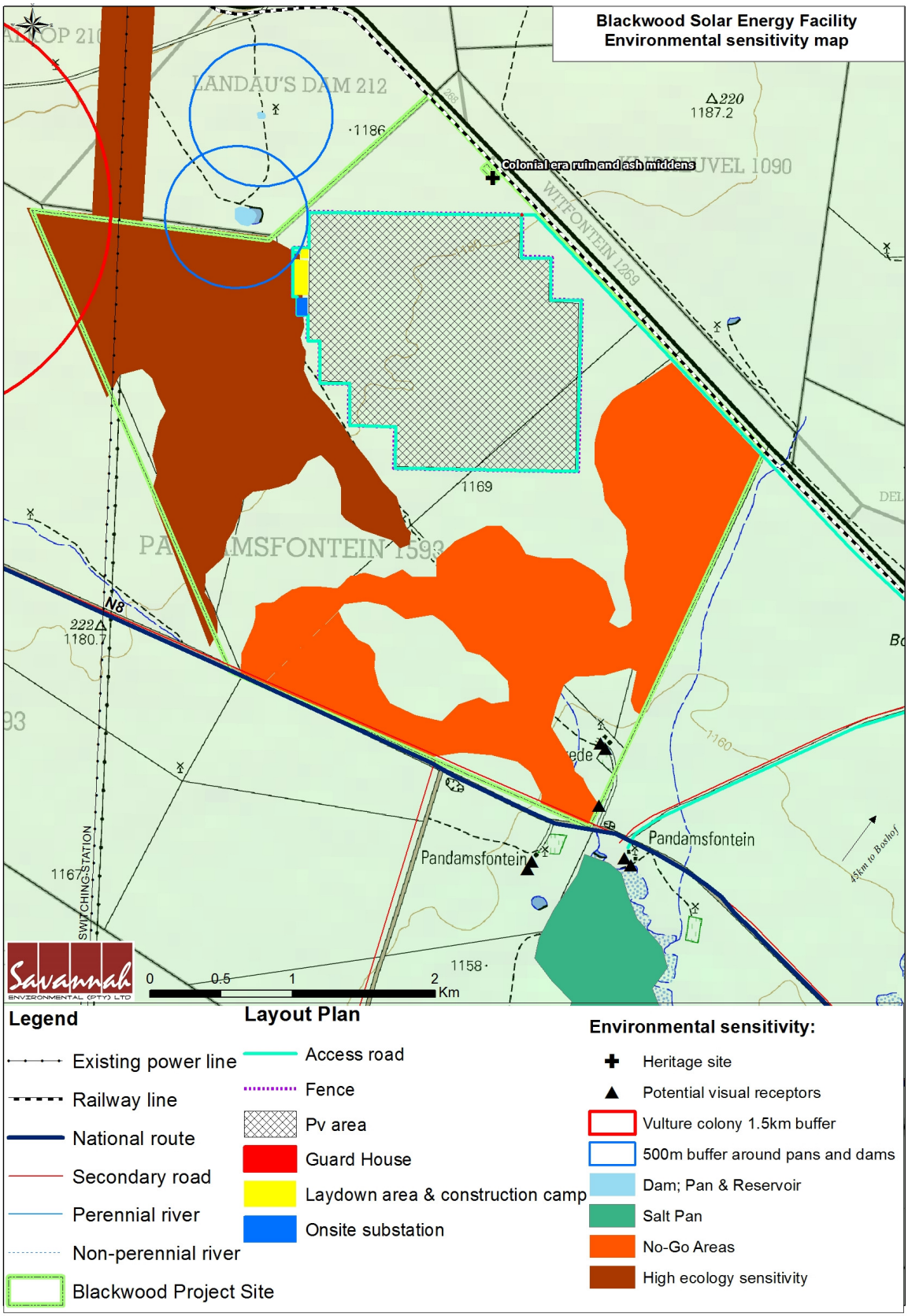

Figure 2: Environmental Sensitivity Map for the proposed Blackwood Solar Energy Facility

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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.

Archaeological material: Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

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

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.

Drainage: A drainage line is a lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial, and riparian vegetation may or may not be present

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

Fossil: Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

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.

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 general public.

Perennial and non-perennial: Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contains flows for short periods, such as a few hours or days in the case of drainage lines.

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

Photovoltaic effect: Electricity can be generated using photovoltaic solar panels which are comprised of individual photovoltaic cells that absorb solar energy to directly 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).

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.

Watercourse: as per the National Water Act means -
(a) a river or spring;

(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and
(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks

Wetlands: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CO_2	Carbon dioxide
DEA	National Department of Environmental Affairs
DEADP	Department of Environment Affairs and Development Planning
DoE	Department of Energy
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FSP	Free State Province
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
MAR	Mean Annual Rainfall
MF	Monitoring Forum
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
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NGOs	Non-Governmental Organisations
NWA	National Water Act (Act No. 36 of 1998)
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SEF	Solar Energy Facility
SIA	Social Impact Assessment
SDF	Spatial Development Framework
TLM	Tokologo Local Municipality

INTRODUCTION CHAPTER 1

Blackwood Solar Energy Facility (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility with a maximum contracted capacity of up to 75MW, as well as associated infrastructure on a site located in the Free State approximately 25km south-east of Kimberley and 45km south-west of Boshof (refer to Figure 1.1). This project is to be known as the Blackwood Solar Energy Facility. Based on a pre-feasibility analysis, site identification process undertaken by Blackwood Solar Energy Facility (Pty) Ltd, a favourable area has been identified for consideration and evaluation through an Environmental Impact Assessment (EIA).

The proposed project development site is considered suitable and favourable by the developer from a technical perspective due to the following site characteristics:

» **Climatic conditions:** Climatic conditions determine the economic viability of a solar energy facility as it is directly dependent on the annual direct solar irradiation values for a particular area. Studies of solar irradiation worldwide indicate that the Northern Cape shows great potential for the generation of solar power. The region in the vicinity of Kimberley has particularly high solar irradiation levels and is considered amongst the most efficient locations in the country for a solar energy project, as shown by the solar irradiation model.
» **Topographic conditions:** The local site conditions of the proposed development area are optimum for a development of this nature. A level surface area (i.e. with a minimal gradient in the region of 1%) is preferred for the installation of PV panels. The site slope and aspect of the proposed development area is predominantly flat.
» **Extent and availability of the site:** Significant land area (i.e. 300ha) is required for the proposed development. The available development site is larger than the area required for development which allows for the avoidance of any identified environmental and/or technical constraints.
» **Grid connection:** This site is located in close proximity to an existing electricity grid connection (i.e. the Kimberley DS - Skietpan Switching Station 132kV power line which traverses the site, 132kV Jacobsdal/Kimberlery; the Boundary and KDS Substations are located 20km north of the site) which minimises the need for a long power line connection. This is preferred from an environmental and technical perspective.

The nature and extent of the Blackwood Solar Energy Facility, as well as the potential environmental impacts associated with the construction, operation and

decommissioning phases are explored in more detail in this Draft EIA Report. The Draft EIA Report consists of nine chapters, which include:

Chapter 1: Provides background to the proposed facility and the environmental impact assessment.
Chapter 2: Provides a description of the proposed project and infrastructure.
Chapter 3: Provides an overview of the regulatory and legal context for electricity generation projects and the EIA process.
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Chapter 7: Assesses the potential for cumulative impacts associated with the development of the proposed Blackwood Solar Facility.
Chapter 8: Presents the conclusions of the EIA, as well as an environmental impact statement for the proposed project.
Chapter 9: Provides a list of references and information sources used in undertaking the studies for this EIA Report.

1.1. Summary of the Proposed Development

The Blackwood Solar Facility project falls within the jurisdiction of the Tokologo Local Municipality which in turn falls under the jurisdiction of the Lejweleputswa District Municipality of the Free State Province. The site is proposed on the remainder of Portion 1 of the Farm Pandamsfontein 1593 covering an area of 1468 ha. The location of the proposed Blackwood Solar Facility site is shown in **Figure 1.1**.

The scope of the EIA applies to the development footprint and associated infrastructure for the Blackwood Solar Energy project, including access roads, on-site substation/s, cables, offices, etc. The facility is proposed to include the following infrastructure:

» Solar panels (fixed/tracking technology) with a maximum contracted capacity of 75MW
» Mounting structures for the solar panels to be rammed steel piles, piles with pre-manufactured concrete footings or ground screw anchors to support the PV panels.
» Cabling between the structures, to be lain underground where practical.
» Central invertor/transformer stations to collect all energy generated from the PV panels. The inverter's role is to convert direct current (DC) electricity to alternating current (AC) electricity at grid frequency.

» Internal access roads
» Associated buildings including a workshop area for maintenance, storage, and control facility with basic services such as water and electricity
» Area for workshop/maintenance, warehouse/storage, and offices.
» Security fencing around the complete proposed facility

The construction of a substation (switching station) and overhead distribution power line to connect the facility to the Eskom grid is also being assessed as part of the larger project. In addition to a loop in/loop out alternative on site (alternative 1), three (3) alternative power line corridors are being considered for evacuation of power generated by the solar facility (alternatives 2 to 4). These alternatives, which are range between 1 and 20 km in length, include:

» Alternative 1: Loop in/loop out into existing transmission line which traverses the site (approx. 0.5 km x 2)
» Alternative 2a: New line to be constructed parallel to the existing transmission line - Connecting to KDS Substation (approx. 20 km)
» Alternative 2b: New line to be constructed parallel to the existing transmission line - Connecting to Boundary Substation (approx. 20 km)
» Alternative 3: Loop in/loop out from Blackwood SEF Substation to Jacobsdal/Kimberley 132kV line following the train track (approx. 10 km x 2)
» Alternative 4: A direct line loop in/loop out from Blackwood SEF Substation to Jacobsdal/Kimberley 132kV line (approx. 9 km x 2)

The above-mentioned proposed power line corridor alternatives are being **assessed within a separate Basic Assessment process** and are not further discussed or evaluated in this EIA Report. An impact assessment and public participation process will be conducted for the power line alternatives as part of the separate Basic Assessment process. Reference to the power line alternatives connecting the facility to the grid is provided in the interest of fully describing all infrastructures associated with the project, such that a holistic picture of the project is provided.

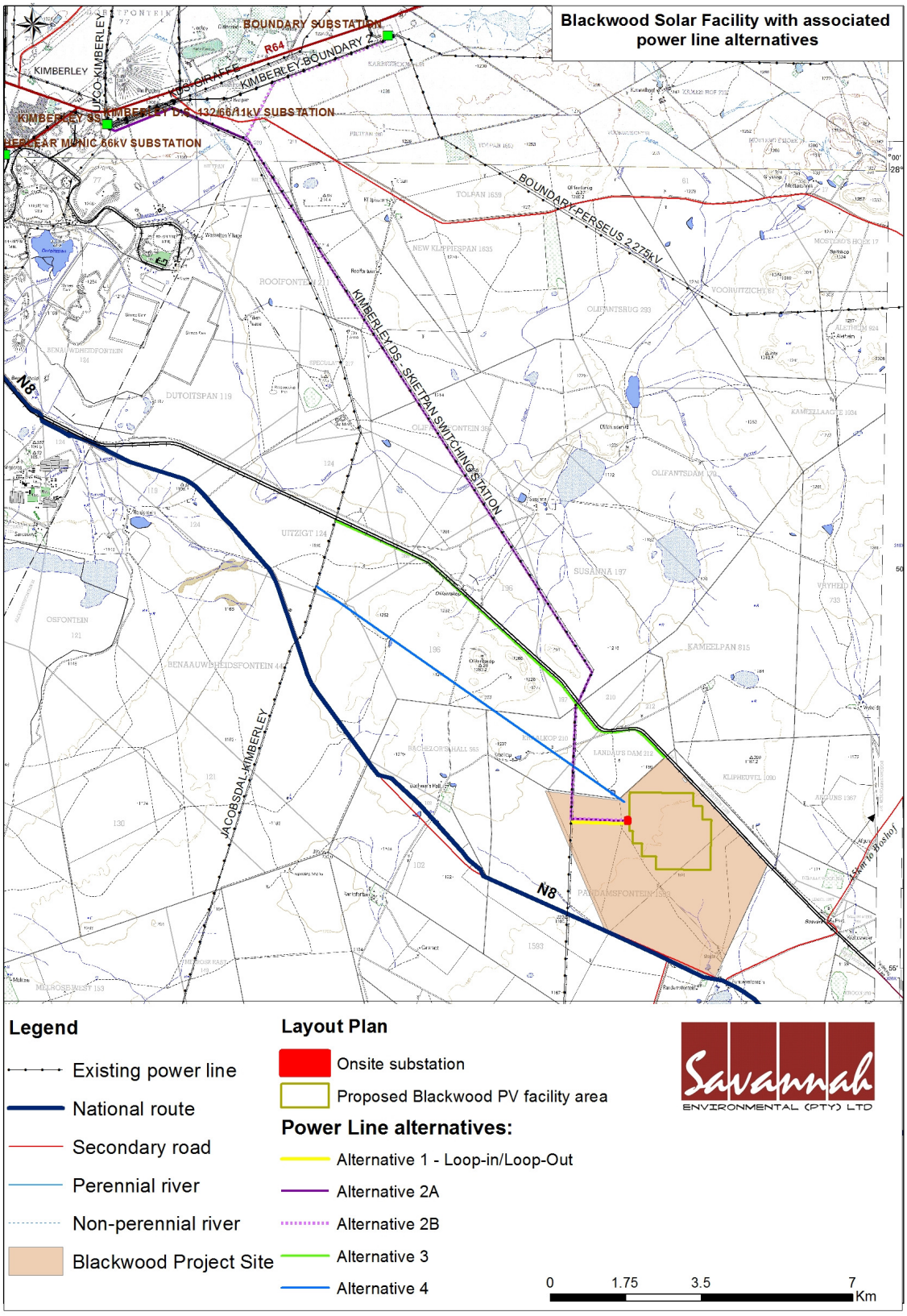

Figure 1.1: Locality map for the proposed site for the Blackwood Solar Energy Facility proposed on the remainder of Portion 1 of the Farm Pandamsfontein 1593 also showing the corridor for the proposed power line alternatives

The scope of the proposed Blackwood Solar Facility, including details of all elements of the project (for the design/planning, construction, operation and decommissioning phases) is discussed in more detail in **Chapter 2.**

1.2. Requirement for an Environmental Impact Assessment Process

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

EIA Regulations overview: NEMA is the national legislation that provides for the authorisation of 'listed activities'. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project and thereby considered to be of national importance, the National Department of Environmental Affairs (DEA) is the competent authority[2] and Free State Department of Economic Development, Tourism and Environmental Affairs (DETEA) will act as a commenting authority. An application for authorisation has been accepted by DEA for the proposed project under application reference number **14/12/16/3/3/2/281.**

Compliance with the requirements of the EIA Regulations ensures that decision-makers are provided with an opportunity to consider the potential environmental impacts of a project early in the project development process and to assess if potential environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision.

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the developer with the opportunity of being fore-warned of potential environmental issues. Subsequently it may assist with the resolution of issues reported on in the Scoping and EIA Phases as well as promoting dialogue with interested and affected parties (I&APs) and stakeholders. In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations R543, an EIA is required to be undertaken for this proposed project as the proposed project

[2] In terms of the Energy Response Plan, the DEA is the competent authority for all energy related applications.

includes several "listed activities" in terms of GN R544, R545 and R546 (GG No 33306 of 18 June 2010 as amended).

Listed activities: The list of relevant listed activities requiring Environmental Authorisation for the proposed Blackwood Solar Facility has been revised during the EIA Phase due to a clearer understanding of the project scope, its potential impacts and refinement of the layout plan in the EIA Phase. This is made possible through the availability of detailed designs provided by the applicant in response to the identified environmental sensitivities.

A copy of the latest amended application form with all the applicable listed activities is included in **Appendix N**. A full description of the impacts associated with the listed activities is provided in the impact assessment chapter (Chapter 6 and 7). The Conclusions chapter (Chapter 8) provides a concluding statement for each of the listed activities applied for and concludes whether the listed activity should be authorised, based on the outcome of the evaluation, impact assessment and relationship of the project footprint to the environment.

1.3. Objectives of the EIA Process

The Scoping Phase was completed in **November 2013** with the submission of a Final Scoping Report to the DEA, and the acceptance of scoping was received from DEA on **08 April 2014**. The scoping phase included desk-top studies and served to identify potential impacts associated with the proposed project and to define the extent of studies required within the EIA Phase. The Scoping Phase included input from the project proponent, specialists with experience in the study area and 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 (i.e. the current phase) assesses identified environmental impacts (direct, indirect, and cumulative as well as positive and negative) associated with the different project development phases (i.e. design, construction, operation, and decommissioning). The EIA Phase also recommends appropriate mitigation measures for potentially significant environmental impacts. The release of a 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 phase prior to submission to DEA.

1.4. Details of the Environmental Assessment Practitioner (EAP) and Specialist Team

Savannah Environmental was appointed by Blackwood Solar Energy Facility (Pty) Ltd as the independent EAP to undertake the EIA process for the proposed project. Neither Savannah Environmental nor any of its specialist sub-consultants are subsidiaries of or are affiliated to Blackwood Solar Energy Facility (Pty) Ltd. 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 consultancy which provides a holistic environmental management service, including environmental assessment and planning to ensure compliance with relevant environmental legislation. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has 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.

The EAPs from Savannah Environmental who are responsible for this project are:

» *Sheila Muniongo* - the principle author of this report holds an Honours Bachelor degree in Environmental Management and 3 and half years' experience in the environmental field. Her key focus is on environmental impact assessments, public participation, environmental management programmes, and mapping through ArcGIS for variety of environmental projects. She is currently involved in several EIAs for renewable energy projects EIAs across the country.
» *Karen Jodas* - a registered Professional Natural Scientist and holds a Master of Science degree. She has 17 years' experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country and the EAP on this project.
» *Gabriele Wood***:** the public participation consultant for this project, holds an Honours Bachelor degree in Anthropology and has 7 years' experience in Public Participation and Social consulting, including professional execution of public participation processes for a variety of projects, as well as managing

and co-ordinating public participation processes for Environmental Impact Assessments (EIA).

Savannah Environmental has developed a detailed understanding of impacts associated with the construction and operation of renewable energy facilities through their involvement in numerous EIA processes for these projects. In order to adequately identify and assess potential environmental impacts associated with the proposed project, Savannah Environmental has appointed the following specialists to conduct specialist impact assessments:

» Ecology – Marianne Strohbach (Savannah Environmental)
» Soils and Agricultural Potential – Johann Lanz (Johann Lanz Soil Scientist)
» Heritage - David Morris (McGregor Museum)
» Palaeontology– Lloyd Rossouw (Palaeo Field Services)
» Visual – Karen Hansen (Karen Hansen Landscape Architect)
» Social – Tony Barbour (Environmental Consulting and Research)
» Avifauna - Doug Harebottle (Doug Harebottle Consulting)

Curricula vitae for the Savannah Environmental project team and its specialist sub-consultants are included in **Appendix A**.

DESCRIPTION OF THE PROPOSED PROJECT CHAPTER 2

This chapter provides an overview of the proposed Blackwood Solar Energy Facility near Boshof, Free State Province. The project scope includes the planning and design, construction, operation and decommissioning phases during which potential impacts will vary in terms of their nature and significance. This chapter also describes the project alternatives considered, including the "Do-Nothing" alternative - that is the alternative of not establishing the solar energy facility.

2.1. Need and desirability of the proposed project

According to the DEA Draft Guideline on Need and Desirability (October 2012) in terms of the Environmental Impact Assessment (EIA) Regulations, 2010, the need and desirability of a development must be measured against the contents of the Integrated Development Plan (IDP), Spatial Development Framework (SDF) and Environmental Management Framework (EMF) for an area, and the sustainable development vision, goals and objectives formulated in, and the desired spatial form and pattern of land use reflected in, the area's IDP and SDF.

2.1.1 The Need for Renewable Energy Projects at a National Scale

The need for harnessing renewable energy resources (such as solar energy for electricity generation) is linked to increasing pressure on countries to increase their share of renewable energy generation due to concerns such as exploitation of non-renewable resources and the rising cost of fossil fuels. In order to meet the long-term goal of a sustainable renewable energy industry, a target of 17.8 GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010[3] and incorporated in the Renewable Energy Independent Power Producer Procurement (REIPPP) Programme initiated by the DoE. This programme has been designed so as to contribute towards a target of 3725 MW to be generated from renewable energy sources, required to ensure the continued uninterrupted supply of electricity, towards socio-economic and environmentally sustainable growth, and to start and stimulate the renewable industry in South Africa. The energy procured through this programme will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This 17.8 GW of power from renewable energy amounts to ~42% of all new power generation being derived from renewable energy forms by 2030.

[3] Note that an update of the IRP has been drafted and is currently under review. According to the DoE, this IRP is still the

2.1.2 Strategic Integrated Projects (SIPs)

In 2010, a National Development Plan was drafted to address socio economic issues affecting development in South Africa. These issues were identified and placed under 18 different Strategic Integrated Projects (SIPs) to address the spatial imbalances of the past by addressing the needs of the poorer provinces and enabling socio-economic development. Amongst these is the green energy in support of South African Economy i.e. SIP 8. The SIP aims at supporting sustainable green energy initiatives on national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP, 2010).

In fulfilment of SIP 8 (green energy) and to meet the targets set in the Integrated Resource Plan (IRP 2010), the Department of Energy has introduced the REIPPP Programme, which is now in its fourth year. The proposed Blackwood Solar Energy Facility could potentially contribute towards SIP 8 by addition of clean energy to the grid (should the project become a preferred bidder) and the project will create significant socio-economic benefits at a local, regional and national scale.

2.1.3 Renewable Energy Development Zones (REDZ)

The DEA in discussion with the DoE has been mandated by MinMec to undertake a Strategic Environmental Assessment (SEA). The DEA has subsequently appointed CSIR to manage wind and solar PV SEA processes. The SEAs will be undertaken in order to identify geographical areas most suitable for the rollout of wind and solar PV energy projects and the supporting electricity grid network. The CSIR has released a map (Figure 2.1) with initial identification of focus areas best suited for the roll-out of wind and solar photovoltaic (PV) energy projects in South Africa. These results form part of the strategic environmental assessment (SEA) that the CSIR is conducting for wind and solar energy, on behalf of the national Department of Environmental Affairs (DEA). The aim of the assessment is to designate renewable energy development zones (REDZs) within which such development will be incentivised and streamlined.

The proposed Blackwood Solar Energy Facility falls within the identified focus areas most suitable for the rollout of the development of solar energy projects within the Free State Province as shown on Figure 2.1.

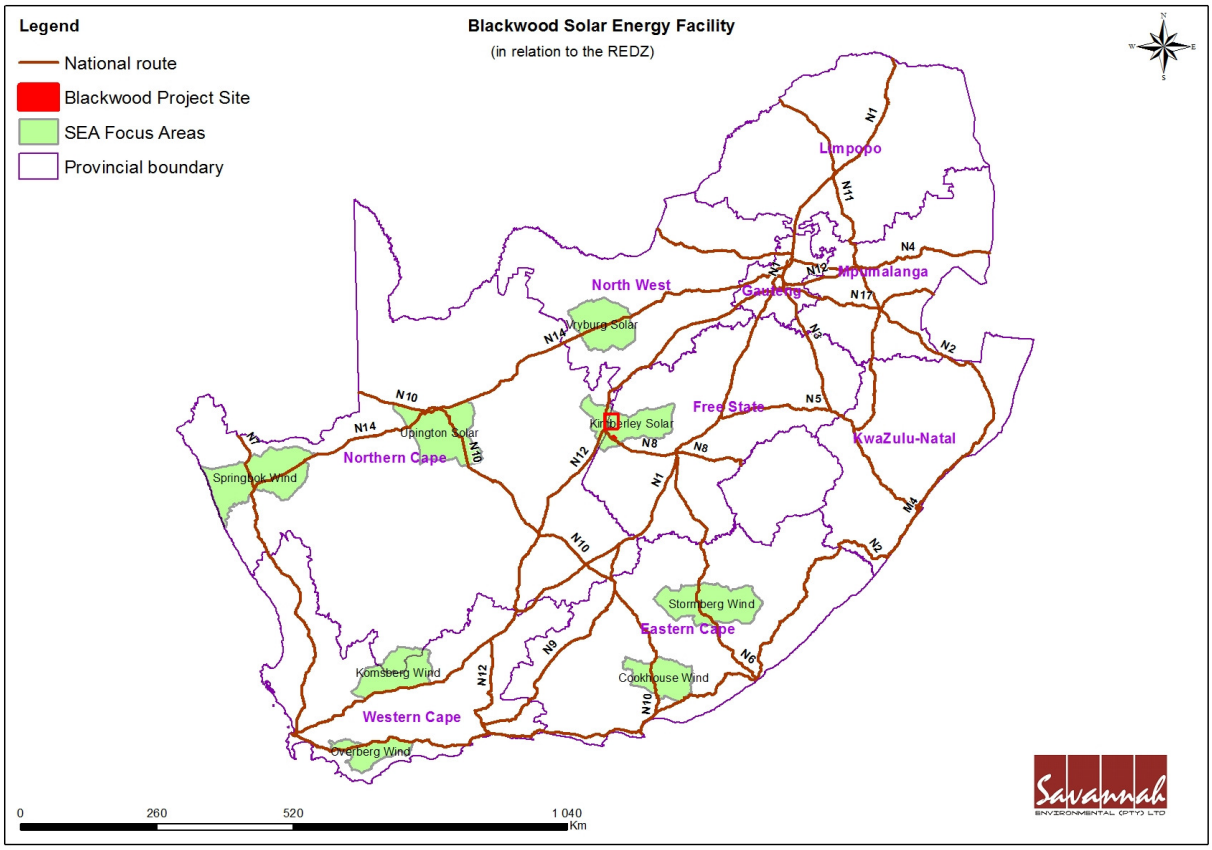

Figure 2.1: Renewable Energy Development Zones (REDZ) (CSIR 2014)

2.1.4 Free State Province Provincial Growth and Development Strategy (2004-2014)

The Free State Provincial Growth and Development Strategy (FSPGDS) is a nine-year strategy (2004-2014) which aims to achieve the objectives of Vision 2014. As a provincial policy framework, it sets the tone and pace for shared growth and development in the Province. It addresses the key social, economic, environmental and spatial imperatives in the Province. Underlying the FSGDS are the following imperatives:

- The need to effectively use scarce resources within the Province, while addressing the real causes of development challenges.
- The need to accelerate service delivery based on a common provincial development agenda as the basis for provincial strategic direction.
- The need to identify investment opportunities and provide an environment of certainty critical for private-sector investment.
- The need to promote intergovernmental coordination between the three spheres of government.
- The need to facilitate facilitates the implementation of the People's Contract within the Province.

» The need to provide a common vision as the basis for common action amongst all stakeholders, both inside and outside government.
» The need to provide a framework for budgets, implementation, performance management and spatial development.

Of specific relevance to the proposed Blackwood Solar Energy Facility, the FSPGDS also identifies a number of natural constraints to economic growth and development. These include, low rainfall coupled with the limited soil potential and the impact of this on agriculture, limited water availability and depletion of mineral resources. What is of interest is that none of the natural constraints impact on the renewable energy sector, specifically the solar energy sector. Solar energy, specifically PV solar energy, therefore provides the Free State with an opportunity to diversify its economy in a way that is not affected by natural constraints such as low rainfall and limited water supplies.

2.1.5 Lejweleputswa District Municipality Integrated Development Plan

The LDM IDP is informed by and aligned with the Free State Provincial Growth and Development Strategy (FSPGDS) and other governmental programmes and policies. In this regard the FSPGDS identified four key priority areas, two of which are relevant to the proposed project, namely:
» Economic development, employment and investment; and
» Social and Human Development.

The IDP identifies a number of priority areas, of which the following are regarded as relevant to the proposed project:
» Local Economic Development; and
» Basic Service Delivery and Infrastructure Investment.

The proposed solar energy facility will contribute towards the above-mentioned priority areas through local economic upliftment and job creation.

2.1.6 *Tokologo Local Municipality (TLM) Integrated Development Plan*

The vision for the TLM is "A progressive municipality, which through co-operative governance, creates conditions for economic growth, social development and meet the basic needs of the community and improve the quality of life of all residents". A Community Needs assessment undertaken as part of the IDP revision lists a number of needs that are relevant to the proposed project, including, job-creation, up-grading of community facilities and infrastructure, support for local economic development and SMMEs, and bursaries for learners. The need to protect the natural environment is also identified as a key objective in the IDP. The IDP also

notes that the bulk electrical network in the TLM is well established. However, development has been hampered by the quality/ stability of the supply.

The Blackwood Solar Energy project will be able to meet with some of these needs as identified by the TLM IDP through job-creation, infrastructural development and support for local economic development and SMMEs.

2.1.7 Rationale for the proposed Blackwood Solar Energy Facility

In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy as outlined above, Blackwood Solar Energy Facility (Pty) Ltd proposes the establishment of the Blackwood Solar Energy Facility project to add new capacity to the national electricity grid. The purpose of the proposed project is to supply renewable energy to the national grid (which is short of generation capacity to meet current and expected demand) and to aid in achieving the goal of a 30% share of all new power generation being derived from Independent Power Producers (IPPs), as targeted by the Department of Energy (DoE) by year 2025 (Strategic Plan, 2011/12 – 2015/16)

The development of the project would benefit the local, regional and national community by developing a renewable energy project with a maximum contracted capacity of 75MW. Surrounding communities would also benefit from the development through job creation and economic spin-offs. In addition, according to the Department of Energy's (DoE) bidding requirements, the developer will be required to plan for a percentage of the profit per annum from the solar energy facility operation to invest back into the community through a social beneficiation scheme.

2.1.8 The Desirability for the Blackwood Solar Energy Facility Project on the proposed project site

The use of solar irradiation for electricity generation is essentially a non-consumptive use of a natural resource. A solar energy facility also qualifies as a Clean Development Mechanism (CDM) project (i.e. a financial mechanism developed to encourage the development of renewable technologies) as it meets all international requirements in this regard. The proposed site located on the remainder of Portion 1 of the Farm Pandamsfontein 1593 was selected for the development of a solar energy facility based on its predicted climate (solar resource), suitable proximity in relation to the existing and available electricity grid, and minimum technical constraints from a construction and technical perspective. Blackwood Solar Energy Facility (Pty) Ltd considers this area, and specifically the demarcated site on the remainder of Portion 1 of the Farm Pandamsfontein 1593,

to be highly preferred for the development of a solar energy facility from a technical perspective. The reasons include:

» There are no arable lands in the studied area or directly adjacent to it, which could be impacted upon by the proposed development.
» The current land-use on the site is agriculture (cattle grazing). The development of the Blackwood Solar Energy Facility will allow current livestock grazing to continue on areas of the farm portions which will not be occupied by solar panels and associated infrastructure. Therefore the current land-use will be retained on much of the site (i.e. ~85% of the site), while also generating renewable energy from the sun. As the landowner will benefit from a portion of the revenue from the facility, the development of the project provides an alternative source of income, contributing towards the sustainability of the current farming operations. This presents a win-win situation for the landowner, the economical use of the site, and the developer.
» The power can be readily evacuated to strengthen the local Eskom grid. The Kimberley DS - Skietpan Switching Station 132kV power line which traverses the site and the Eskom Boundary Substation which is located 20km north of the proposed site present potential grid connection options. According to the Eskom planning office, Boundary Substation has sufficient excess capacity available to connect a solar facility development larger than the prescribed maximum of 75 MW to the grid.
» A number of essential service infrastructure elements are currently present in the vicinity of the site, including a number of existing Eskom power lines crossing the north-western corner of the proposed site and a railway line to Modderrivier and Petrusburg lies adjacent to the eastern boundary of the project site.

2.2. Description of the Proposed Solar Energy Facility

The solar energy facility is proposed to accommodate either static or tracking photovoltaic (PV) arrays, to harness the solar resource on the site. The facility is proposed to have a contracted maximum capacity of up to 75 MW. An area of approximately 300ha will be occupied by the PV panels and associated infrastructure. A layout of the proposed Blackwood Solar Energy Facility and associated infrastructure has been provided by the project developer, and is indicated in **Figure 2.2**. This is the layout which has been assessed within this EIA Report. **Table 2.1** summarises the dimensions of the project components.

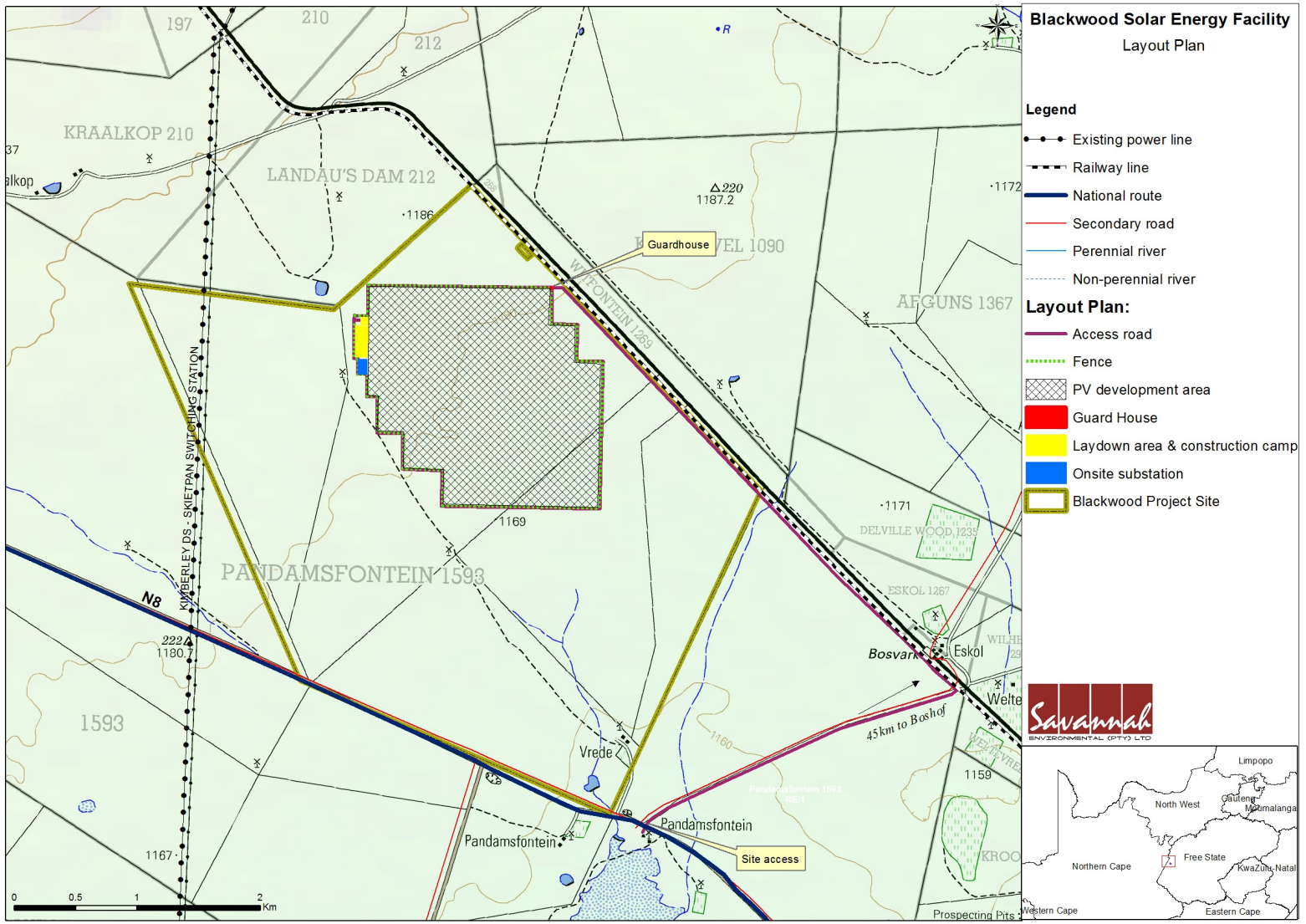

Figure 2.2: Layout for the proposed Blackwood Solar Park (PV) Facility indicating the project location on the remainder of Portion 1 of the Farm Pandamsfontein 1593

Table 2.1: Technical details for the proposed Blackwood Solar Energy Facility

Component	Description/ Dimensions
Location of the site	~25km south-east of Kimberley and 45km south-west of Boshof. Located in the Free State Province
Municipal Jurisdiction	» Tokologo Local Municipality » Lejweleputswa District Municipality
Extent of the proposed development footprint	~ 300ha (tracked or fixed panels) development area, with ~150ha[4] required for permanent infrastructure.
Extent of site available for development	~1468 ha
Site access	Site can be accessed directly off the N8. Access to the site will use existing roads where possible and where there are no existing roads, new access roads (dirt road) will be constructed (± 5000m in length and 5-8m wide).
Generating capacity	75 MW
Proposed technology	Ground-mounted photovoltaic panels utilising static or tracking technology
Cabling	Cabling between the projects components is to be lain underground between 2 – 4 meters deep where practical.
Panel Spec (installed capacity)	86.25 MW
Panel Dimensions	± 1m x 2m
Number of Panels	± 350 000
Number of inverters and Height	± 60 inverter stations/mini substations at a height of ± 3m
Main Transformer capacity	Varies according to detailed design and client requirement, 1 x 80 MVA transformation capacity is typical
Final Height of installed panels from ground level	3.5m
Width and length of internal roads	Width: ~5-8 m Length: 5000m
Construction camp & laydown area	± 200m x 150m
Substation	An on-site substation (120m X 70m in extent) to evacuate the power from the facility into the Eskom grid
Mounting Structure	Mounting structure (up to 3.5m in height) to be either rammed steel piles, piles with pre-manufactured concrete footings or ground screw anchors to support the PV panels
Services required	» Sewage and Refuse material disposal - all sewage and refuse material generated

[4] 150ha is ~10% of the total area used for the development, this is in line with requirement from DAFF

Component	Description/ Dimensions
	during the establishment of the proposed site and the operation of it will be collected by a contractor to be disposed of at a licensed waste disposal site » Water and electricity – water will be obtained from the municipality or a licence will be obtained from DWS for abstracting water from local boreholes. Electricity will be generated from generators for any electrical work on site.
Infilling or depositing material	Any infilling material that may be required for project development will be obtained from: » Option 1: Cut and fill material from construction activities on the site (i.e. from the remainder of Portion 1 of the farm Pandamsfontein 1593). » Option 2: Contractor to source suitable grade material from an approved/registered borrow pit in the broader Kimberley region. Any excess/spoil material will be disposed of to a licensed landfill site.

2.2.1. Water Requirements

An operational PV plant has no direct water requirement associated with the generation of electricity. Water is required primarily for the construction of the facility as well as for human consumption (sanitation) during operation. In many instances, water is used to clean off dust or dirt that builds up on the panels during operation.

During the construction period, water will be used for site preparation, compaction of building pads, road preparation, and dust control where necessary. A 75MW plant will require approximately 15 000 m^3 of water during the construction phase, although a higher volume could be required in the hotter periods of the year when dust suppression would be required on a more frequent basis. A volume of approximately 5 000 m^3 per annum would be required during the operational phase. Blackwood Solar Energy Facility (Pty) Ltd is considering three alternative sources to meet the water requirements for the proposed Blackwood Solar Energy Facility, namely:

1. Source water from the Local Water Services Provider (Tokologo Local Municipality).
2. During occasional thunderstorms, significant amounts of rainfall can be collected off rooftop of buildings in rainwater tanks. This water can be used to supplement existing water supplies, however may require adequate treatment to make it potable. Rainfall in the area is, however, unpredictable

and seasonal, and water sourced in this way will not be permanently available.

3. Source water from groundwater, i.e. borehole/s on the site (remainder of Portion 1 of the farm Pandamsfontein 1593). Please note that this option is the least preferred option, and subject to testing as required by the Department of Water and Sanitation, given water constraints in the region.

Blackwood Solar Energy Facility (Pty) Ltd will be required to obtain confirmation of water availability for the project from the Department of Water and Sanitation (DWS), Northern Cape Region. DWS is required to provide a non-binding indication of water availability to the project should water be obtained from a natural resource. This non-binding agreement would be required for the purposes of bidding the project to the DoE.

2.3. Solar Energy as a Power Generation Technology

The generation of electricity can be easily explained as the conversion of energy from one form to another. Solar energy facilities operate by harnessing solar energy and converting it into a useful form (i.e. electricity). Solar technologies can be divided into two categories, those that harness solar energy to create thermal energy, which in turn can be converted into electricity, and those that use the electromagnetic radiation of the sun and convert it directly into electricity. The latter is known as photovoltaic (PV) technology, which is proposed for this project, and is the direct conversion of sunlight into electricity without the use of water for power generation.

The use of solar energy for electricity generation is a non-consumptive use of a natural resource. Renewable energy is considered a 'clean source of energy' with the potential to contribute greatly to a more ecologically, socially, and economically sustainable future. The challenge now is ensuring solar energy projects are able to meet all economic, social, and environmental sustainability criteria in terms of NEMA.

2.3.1 How do Grid Connected Photovoltaic (PV) Facilities Function?

Solar energy facilities, such as those deploying PV technology, use the energy from the sun to generate electricity through a process known as the Photoelectric Effect. A PV cell or solar cell is the semiconductor device that converts sunlight into electricity. These cells are interconnected to form panels which, in turn, are combined with associated structural and electrical equipment to create PV arrays – the actual solar generation systems which connect to the energy grid. As sunlight hits the solar panel, photons can be reflected, absorbed, or pass through the panel. When photons are absorbed, they have the energy to knock electrons loose, which

flow in one direction within the panel and exit through connecting wires as solar electricity.

There are several types of semiconductor technologies currently in use for PV solar panels. Two however, have become the most widely adopted: crystalline silicon and thin film. The former is constructed by first putting a single slice of silicon through a series of processing steps, creating one solar cell. These cells are assembled together in multiples to make a solar panel. The latter is made by placing thin layers, hence the name thin-film, of semiconductor material onto various surfaces, usually glass. This project proposes using a thin-film PV technology which encloses the semiconductor between two sheets of glass.

A solar energy facility typically uses the following components:

The **Photovoltaic Panels**

Solar photovoltaic (PV) panels consist primarily of glass and various semiconductor materials and in a typical solar PV project, will be arranged in rows to form solar arrays, as shown in Figure 2.4 and Figure 2.5. The PV panels are designed to operate continuously for more than 25 years with minimal maintenance required.

Figure 2.4: Picture of a PV Panel

Figure 2.5: Picture of the installation of a typical PV array

The **Support Structure**

The photovoltaic (PV) modules will be mounted to steel support structures called tables. These can either be mounted at a fixed tilt angle, optimised to receive the maximum amount of solar radiation and dependent on the latitude of the proposed facility, or on a tracking mechanism where at a maximum tilt angle of 45° the lowest part of the panel is 30 cm from the ground.

2.4. Project Alternatives

In accordance with the requirements of the EIA Regulations[5], alternatives are required to be considered within any environmental impact assessment (EIA) process, and may refer to any of the following:

» Site alternatives
» Design or layout alternatives
» Technology alternatives
» The No-go alternative

2.4.1 Site Alternatives

Only one technically and economically feasible alternative site for the establishment of the proposed project has been identified by the developer for investigation in an EIA process, i.e. the remainder of Portion 1 of the farm Pandamsfontein 1593. This is based on an investigation by the developer of various sites within the area (refer to **Appendix N** for the full motivation on site selection). The following factors have been considered in determining a preferred site for solar PV development including:

Site Location
According to the Free State Provincial Spatial Development Framework (PSDF) (2013), the Southern Free State, especially the Xhariep region, is regarded as an ideal location to harness the natural solar energy for generating electricity. The Xhariep region has the second-best solar irradiation index after the Upington area, and therefore positions this region as an ideal location for the development of concentrated solar power (CSP) and photovoltaic (PV) solar power generation technologies. The proposed Blackwood PV site is situated 2km west of the Xhariep region, and it presents a superior opportunity to harness the natural sun power and to generate electricity.

City of Kimberley is the closest town to the proposed site, and is a town marked with high levels of unemployment and poverty. Other surrounding towns include Boshof which experiences similar levels of unemployment and poverty. As a consequence, local labour would be easy to source. This fits in well with the IPP Procurement Programme economic development criteria for socio-economic upliftment. Currently, a large proportion of local labour in the area is used in the agricultural industry. A few negatives related to agricultural employment are that it is very seasonal and it is not always in close proximity to employees' homes, forcing workers to travel large distances on a daily basis to reach their place of employment.

Properties to the north of the proposed site were considered by the developer as possible sites for investigation but landowners advised that a mining company has

[5] GNR543 27(e) calls for the applicant to identify feasible and reasonable alternatives for the proposed activity.

acquired the mineral prospecting rights to most of the neighbouring properties which render these sites unfeasible for development of a facility such as that proposed. The properties to the north east of the proposed site are considered more environmentally sensitive than the proposed site due to the large population of Camel Thorn trees in these areas. Also these north-eastern areas have dense bush cover and therefore tend to include more game and hunting farms than those areas close to the proposed development site, rendering these sites potentially more sensitive from a social perspective than the proposed development site.

Climatic Conditions

The economic viability of a photovoltaic plant is directly dependent on the annual direct solar irradiation values. The region where the Blackwood Solar PV project is proposed has the second-best solar radiation index after Upington (FS-PSDF, 2013).

Site Extent

Space is a restraining factor for the development of a solar energy facility. The proposed project site is approximately 1468 ha in extent, which exceeds ~300ha required area for the installation of the 75MW project. This will allow sufficient space for the avoidance of any identified environmental and/or technical constraints within the final design for the proposed solar facility.

Land availability

The land is available for lease by the developer. This specific farm is not commercially farmed by the current owner due to financial constraints.

Site access

Large volumes of material and components would need to be transported to the project site during the construction phase of the project. The accessibility of the site was therefore a key factor in determining the viability of the solar energy facility site, particularly taking transportation costs (direct and indirect) into consideration and the impact of this on project economics. The proposed development site is accessible directly off the N8. The site is therefore appropriately located for easy transport of components, materials and equipment as well as labour movement to and from the site.

Gradient of the site

A level surface area is preferred for the installation of PV panels and specifically for PV technologies (Fluri, 2009). This reduces the need for extensive earthworks associated with the levelling of a site, thereby minimising environmental impacts. The topography of the broader farm portion is generally characterised by very gently undulating terrain with typical gradients between 1% (1:100) and 8% (1:12). The altitude ranges from 830m in the northern parts of the farm to 795m in the south.

Grid Connection

A 132 kV Eskom distribution line traverses the area allowing for good access to the national grid. The site is in close proximity to an electrical load centre, i.e. Kimberley. Access to the Eskom grid is vital to the viability of the facility. The facility will require a new on-site substation (approximately 120 x 70m in extent) and associated power line (assessed in a separate BA Report) to evacuate the power from the facility into the Eskom grid.

Based on the above considerations, as well as discussions with Eskom, Blackwood Solar Energy Facility (Pty) Ltd considers the proposed site as a technically preferred site for the development of a PV Solar Energy Facility.

2.4.2 Layout Alternatives

Alternative sites within the proposed farm portions were considered during the scoping process (as shown in Figure 2.6), and were excluded based mainly on the ecological sensitivity of the site. The proposed location of the layout therefore aims to avoid the identified sensitivities. Based on the environmental sensitivities identified and the technical constraints of the development, no feasible alternative locations within the broader site or farm portion were identified for investigation.

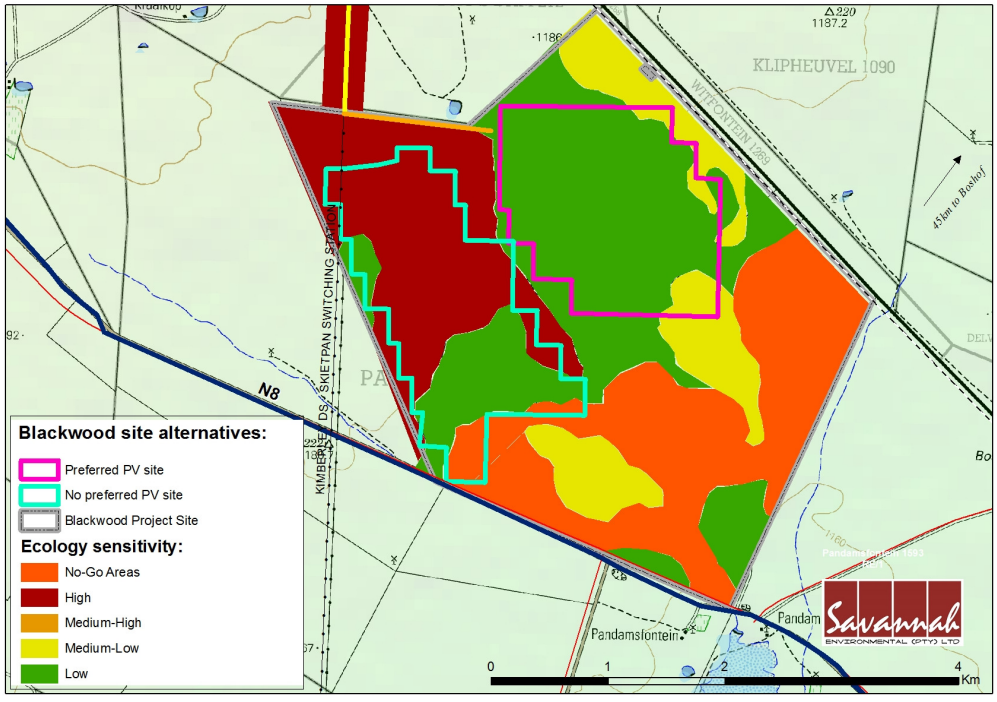

Figure 2.6: Alternative sites considered during the scoping processes for the proposed Blackwood solar energy project.

2.5.3 Technology Alternatives

As it is the intention of the developer to develop renewable energy projects as part of the DoE's REIPPP Programme, only renewable energy technologies are being considered. Solar energy is considered to be the most suitable renewable energy technology for this site, based on the site location, ambient conditions and energy resource availability. Solar PV technology was determined as the most suitable option for the proposed site as large volumes of water are not needed for power generation purposes compared to concentrated solar power technologies (CSP). PV is also preferred when compared to CSP technology because of the lower visual profile.

Two solar energy technology alternatives are being considered for the proposed project and include:

» Fixed Mounted PV systems (static/fixed-tilt panels);
» Tracking PV systems (with solar panels that rotate around a defined axis to follow the sun's movement);

Fixed Mounted PV System

In a fixed mounted PV system (fixed-tilt), PV panels are installed at 30° angle i.e. facing in the northerly direction from which they will not move during the lifetime of the plant's operation. The limitations imposed on this system due to its static placement are offset by the fact that the PV panels are able to absorb incident radiation reflected from surrounding objects. In addition, the misalignment of the angle of PV panels has been shown to only marginally affect the efficiency of energy collection. There are further advantages which are gained from fixed mounted systems, including:

» The maintenance and installation costs of a fixed mounted PV system are lower than that of a tracking system, which is mechanically more complex given that PV mountings include moving parts.
» Fixed mounted PV systems are an established technology with a proven track record in terms of reliable functioning. In addition, replacement parts are able to be sourced more economically and with greater ease than with alternative systems.
» Fixed mounted systems are robustly designed and able to withstand greater exposure to winds than tracking systems.
» Fixed mounted PV systems occupy less space than the tracking systems, thereby reducing impacts on the environment in this regard.

Tracking PV System

Tracking PV Systems (single axis or dual axis trackers) are fixed to mountings which track the sun's movement. There are various tracking systems. A 'single axis tracker' will track the sun from east to west, while a dual axis tracker will in

addition be equipped to account for the seasonal waning of the sun. These systems utilise moving parts and more complex technology, which may include solar irradiation sensors to optimise the exposure of PV panels to sunlight. Tracking PV panels follow the suns rotational path all day, every day of the year giving it the best solar panel orientation and thereby enabling it to generate the maximum possible output power.

Regardless of the technology selected, the PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

The technology to be used for the Blackwood Solar project is assessed further in Chapter 6 of this report.

2.5.4. Do Nothing Alternative

The no-go option would mean that the proposed development to install the Blackwood PV facility and associated infrastructure would not be implemented. Should this alternative be selected, there would be no impacts on the site due to the construction and operation activities of a solar energy facility. However, there will be impacts at a local and a broader scale.

At a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. Although the facility is only proposed to contribute 75 MW to the grid capacity, this would assist in meeting the growing electricity demand throughout the country and would also assist in meeting the government's goal for renewable energy.

At a broader scale, the benefits of this solar energy facility would not be realised. The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits 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 releases of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation. The use of solar radiation for power generation is considered a non-consumptive use of a natural resource which produces zero greenhouse gas emissions.
» ***Climate friendly development:*** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be responsible for approximately 1% of global GHG emissions and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions.
» ***Support for international agreements:*** 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.

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions. The No-Development option would represent a lost opportunity for South Africa to supplement its current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producers of carbon emissions in the world, this would represent a high negative social cost.

However, at a provincial and national level, it should be noted that the proposed Blackwood Solar Energy Facility is not unique. In this regard, a significant number

of other renewable energy developments are currently proposed in the FSP and other parts of South Africa. Foregoing the proposed Blackwood Solar Energy Facility would therefore not necessarily compromise the development of renewable energy facilities in South Africa. However, the socio-economic benefits for local communities in the TLM and economic benefits to the landowner would be forfeited.

2.5. Proposed Activities during the Project Development Stages

In order to construct the solar energy facility and its associated infrastructure, a series of activities will need to be undertaken during the design, pre-construction, construction, operation, and decommissioning phases which are discussed in more detail below.

2.5.1. Design and Pre-Construction Phase

Conduct Surveys

Prior to initiating construction, a number of surveys will be required including, but not limited to confirmation of the micro-siting footprint (i.e. the precise location of the PV panels, substation and the plant's associated infrastructure) and a geotechnical survey. 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.

2.5.2. Construction Phase

The construction the proposed project is expected to extend over a period of approximately 15-18 months and create at least 250-300 employment opportunities at peak. The majority of the employment opportunities, specifically the low and semi-skilled opportunities, are likely to be available to local residents in the area. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community, representing a significant positive social benefit in an area with limited employment opportunities. The construction phase will entail a series of activities including:

Undertake Site Preparation

Site preparation involves construction of new access roads and improvement of existing on-site construction access roads with compacted native soil, installation of drainage crossings, setup of construction staging areas, storm water management work, preparation of land areas for array installation, and other activities needed before installation of the solar arrays can begin. The work would involve trimming

of vegetation, selected compacting and grading, and setup of modular offices and other construction facilities.

The PV arrays require a relatively level and stable surface for safe and effective installation. Topographic, geotechnical, and hydrologic studies will be used to determine the necessary grading and compaction.

Trenching would occur within each array to bury the electrical cables. The trenches would be up to ~ 1.8m in width and 2m deep, for a total combined length of approximately 10 km. Minimal ground disturbance may occur within the trenched corridors to restore them after soil has been replaced in the trenches, so that the corridor can conform to the existing surface contours.

Transport of Components and Construction Equipment to Site

The components for the proposed facility will be transported to site by road. Some of the substation components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[6] by virtue of the dimensional limitations (i.e. size and weight). The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.), as well as the components required for the establishment of the on-site substation.

Establishment of Access Roads to the Site

The site can be accessed from the N8 national road which lies south of the through the proposed site connecting Kimberley to Bloemfontein. Within the site itself, access will be required to the individual facility components for construction purposes (and later limited access for maintenance). Upgrade of access roads within the site will be required and new access roads will be required (±5m wide). Access track construction would normally comprise of compacted rock-fill with a layer of higher quality surfacing stone on top. The strength and durability properties of the rock strata at the proposed site are not known at this stage; this will need to be assessed via a geotechnical study to be conducted by the project proponent. Depending on the results of these studies, it may be possible in some areas, to strip off the existing vegetation and ground surface and level the exposed formation to form an access track surface. The final layout of the access roads will be determined following the identification of site related sensitivities.

Installation PV Panels and Construct Substation & Invertors

[6] A permit will be required for the transportation of these abnormal loads on public roads.

The PV panels will be arranged in arrays (see typical example of a tracked system in Figure 2.7 below). The mounting structure will be preferably fixed onto the ground with the use of rammed or screw anchor foundations. Where the soil conditions do not lend themselves to these technologies, concrete or chemical anchors will be deployed. This approach reduces installation time, will make the installation of the plant less invasive for the territory and facilitate the decommissioning at the end of its production cycle. The height of the PV panel structure will be up to 3.5 m.

Figure 2.7: Frame, structural details (Courtesy of Igeam, 2011)

Inverters as illustrated in Figure 2.8 will be installed to facilitate the connection between the solar energy facility and the Eskom electricity grid via the 132kV power line. The position of the inverters within the footprint of the broader site will be informed by the final positioning of the PV components.

The construction of a substation would require a survey of the site, site clearing and levelling and construction of access road/s (where required), construction of a level terrace and foundations, assembly, erection, installation and connection of equipment, and rehabilitation of any disturbed areas and protection of erosion sensitive areas.

Figure 2.8: Image of a typical inverter to be used for this project

Establishment of Ancillary Infrastructure

Ancillary infrastructure will include; a workshop, laydown area and office. The laydown area will be a temporary structure. The establishment of these areas/facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required.

Construct on-site Substation

Substations are constructed in the following simplified sequence:

Step 1: Survey the area
Step 2: Final design of the substation and placement of the infrastructure
Step 3: Vegetation clearance and construction of access roads (where required)
Step 4: Construction of foundations
Step 5: Assembly and erection of infrastructure on site, connect conductors
Step 6: Rehabilitation of disturbed area and protection of erosion sensitive areas

The expected lifespan of the proposed on-site substation associated with the PV facility is 35 – 50 years with maintenance. During the life-span of the substation, on-going maintenance is performed.

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. Upon completion of 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.

2.5.3. Operational Phase

The solar energy facility is expected to be operational for a minimum of 20 years, with an opportunity for a lifetime of 50 years or more with equipment replacement and repowering. The project will operate continuously, 7 days a week, during daylight hours. While the project will be largely self-sufficient upon completion of construction, monitoring and periodic, as needed maintenance activities will be required. Key elements of the Operation and Maintenance plan include monitoring and reporting the performance of the project, conducting preventative and corrective maintenance, receiving visitors, and maintaining security of the project. The operational phase (for one solar energy facility) will create 7-15 full-time employment positions. No large scale energy storage mechanisms for the facility which would allow for continued generation at night or on cloudy days are proposed.

2.5.4. Decommissioning Phase

Depending on the continued economic viability of the facility following the initial 25-year operational period, the solar energy facility will either be decommissioned or the operational phase will be extended. If it is deemed financially viable to extend the operational phase, existing components would either continue to operate or be dissembled and replaced with new, more efficient 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.

When the project is ultimately decommissioned, the equipment to be removed will depend on the proposed land use for the site at that time. For example, depending on the power needs at the time of decommissioning, the on-site substations could remain for use by the utility or other industrial activity.

Below is a discussion of expected decommissioning activities.

Site Preparation

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

Disassemble and Remove Existing Components

All above ground facilities that are not intended for future use at the site will be removed. Underground equipment (e.g. foundation, wiring) will either be removed,

or cut off 1m below the ground surface, and the surface restored to the original contours. Much of the above ground wire, steel, and PV panels of which the system is comprised are recyclable materials and would be recycled to the extent feasible. The components of the plant would be deconstructed and recycled or disposed of in accordance with regulatory requirements. The site will be rehabilitated and can be returned to the agricultural or other beneficial land-use.

Future plans for the site and infrastructure after decommissioning

The plant capacity would have degraded by ±15% over 20 years, the plant will have the opportunity to generate power for a Merchant Market operation (i.e. the client would sell power on bid basis to the market. This system is not yet operational but would most likely emerge in the next 10 - 15 years). Another possibility is to replace panels with newer higher efficiency panels and negotiate a further Power Purchase Agreement with Eskom.

3.1 National Policy and Planning Context

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 hierarchy of policy and planning documentation that support the development of renewable energy projects such as solar energy Facility 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 development of Blackwood Solar Energy Facility on remainder of Portion 1 of the farm Pandamsfontein 1593, Free State, located near Kimberley.

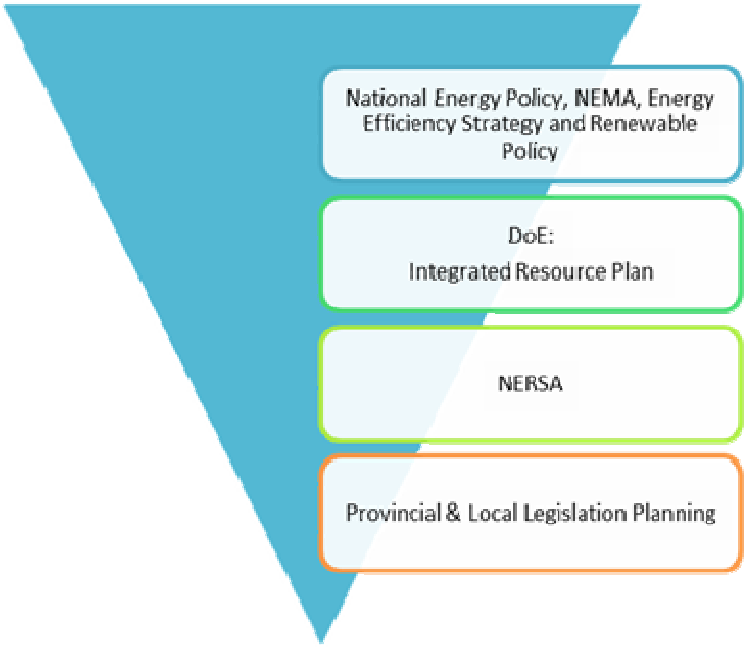

Figure 3.1: Hierarchy of electricity policy and planning documents

3.1.1 The National Energy Act (2008)

The National Energy Act was promulgated in 2008 (Act No 34 of 2008). One of the objectives of the Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar:

> *"To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements; to provide for increased generation and consumption of renewable energies (Preamble)"*

The National Energy Act aims to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors, as well as matters relating to renewable energy. The Act provides the legal framework which supports the development of renewable energy facilities for the greater environmental and social good.

3.1.2 White Paper on the Energy Policy of South Africa, 1998

Development within the South African energy sector is governed by the White Paper on a National Energy Policy (DME, 1998). The White Paper identifies key objectives for energy supply, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversity.

As such, investment in renewable energy initiatives is supported, 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.

3.1.3 White Paper on the Renewable Energy Policy of the Republic of South Africa (2003)

The White paper on renewable energy supplements the Governments overarching policy on energy as set out in its White Paper on the Energy Policy of the republic of South Africa (DME, 1998). The White Paper on Renewable Energy Policy recognizes the significance of the medium and long-term potential of renewable energy. The main aim of the policy is to create the conditions for the development and commercial implementation of renewable technologies. The White Paper on Energy Policy's position with respect to renewable energy is based on the integrated resource planning criterion of:

> *"Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options."*

This White Paper on Renewable Energy (November, 2003) sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. South Africa relies heavily on coal to meet its energy needs because it is well-endowed with coal resources; in particular. However South Africa is endowed with renewable energy resources that can be sustainable alternatives to fossil fuels, so far these have remained largely

untapped. The White Paper on Renewable Energy sets a target of generating 10 000GWh from renewable energy sources. Therefore the policy supports the investment in renewable energy facilities sources at ensuring energy security through the diversification of supply.

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) and more so when social and environmental costs are taken into account. In spite of this range of resources, the National Energy Policy acknowledges that the development and implementation of renewable energy applications has been neglected in South Africa.

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

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

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*."

3.1.4 Final Integrated Resource Plan, 2010 - 2030

The Energy Act of 2008 obligates the Minister of Energy to develop and publish an integrated resource plan for energy. Therefore, the Department of Energy (DoE), together with the National Energy Regulator of South Africa (NERSA) has compiled the Integrated Resource Plan (IRP) for the period 2010 to 2030. The objective of the IRP is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next twenty years. The IRP is intended to:

» Improve the long term reliability of electricity supply through meeting adequacy criteria over and above keeping pace with economic growth and development;
» Ascertain South Africa's capacity investment needs for the medium term business planning environment;
» Consider environmental and other externality impacts and the effect of renewable energy technologies; and

» Provide the framework for Ministerial determination of new generation capacity (inclusive of the required feasibility studies).

The objective of the IRP is to evaluate the security of supply, and determine the least-cost supply option by considering various demand side management and supply-side options. The IRP also aims to provide information on the opportunities for investment into new power generating projects.

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, and updated on 29 January 2010. The Department of Energy released the Final IRP in March 2011, which was accepted by Parliament at the end of the same month. This Policy-Adjusted IRP is recommended for adoption by Cabinet and subsequent promulgation as the final IRP. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9.6 GW of nuclear; 6.3 GW of coal; 17.8 GW of renewables (including 8,4GW solar); and 8.9 GW of other generation sources.

3.1.5 Electricity Regulation Act, 2006

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). NERSA has recently awarded electricity generation licences for new generation capacity projects under the IPP procurement programme.

3.2 Provincial and Local Policy and Planning Context

3.2.1. Free State Province Provincial Growth and Development Strategy

The Free State Provincial Growth and Development Strategy (FSPGDS) is a nine-year strategy (2004-2014) which aims to achieve the objectives of Vision 2014. As a provincial policy framework, it sets the tone and pace for shared growth and development in the Province. It addresses the key social, economic, environmental and spatial imperatives in the Province. Underlying the FSPGDS are the following imperatives:

» The need to effectively use scarce resources within the Province, whilst addressing the real causes of development challenges.
» The need to accelerate service delivery based on a common provincial development agenda as the basis for provincial strategic direction.

» The need to identify investment opportunities and provide an environment of certainty critical for private-sector investment.
» The need to promote intergovernmental coordination between the three spheres of government.
» The need to facilitate the implementation of the People's Contract within the Province.
» The need to provide a common vision as the basis for common action amongst all stakeholders, both inside and outside government.
» The need to provide a framework for budgets, implementation, performance management and spatial development.

The implementation of the FSPGDS is informed by the following vision, mission, and value statements.

Vision: A unified prosperous Free State that the fulfils the needs of all its people

Mission: Serving the people of the Province by working effectively with our social partners through:

» Economic growth, development, and employment.
» Human and social development.
» Justice and crime prevention.
» Efficient governance and administration.

The FSPGDS states the importance of applying the principles of sustainable development, specifically:

» Acknowledge the ecological limitation of the environment;
» Ensure integrated development planning and implementation;
» Actively address economic and social inequalities;
» Promote economic infrastructure investment and development spending in areas of potential and need according to the principles of the NSDP;
» Acknowledge the importance of BEE, as well as the need to broaden access to the economy; and
» Promote labour intensive approaches to development.

The FSPGDS identifies a number of key provincial priorities. The priorities that are relevant to the proposed solar energy facility include:

» Economic development, employment, and investment;
» Human and social development. Economic growth is underpinned by a good socio-economic environment.

The following key objectives are set for economic development, employment and investment:

» To achieve an economic growth rate of 6%-7% per annum;
» To reduce unemployment from 30% to 15%;
» To reduce the number of households living in poverty by 5% per annum;
» To provide adequate infrastructure for economic growth and development.

Regarding the above objectives and the discussion of development trajectories, trade-offs, and barriers, the key strategic approaches towards the economy are divided into economic driving and economic enabling strategies. The key economic drivers that are relevant to the renewable energy sector are:

» Expanding the manufacturing sector in key sub-sectors
» Developing tourism

To enhance these drivers, the following enabling strategies are followed:

» Emphasising SMME development;
» Providing economic infrastructure;
» Promoting human resource development;
» Creating an enabling environment.

SMME development: The FSPGDS acknowledges the key role played by SMMEs in terms of economic development and job creation. To bolster economic growth and create employment opportunities, SMME development is high on the agenda of government.

Tourism: The emphasis in respect of tourism is to optimise its benefits. More specifically, the weekend tourism market for the north and north-eastern parts of the Province should be explicitly marketed. Emphasis is on nature tourism and heritage tourism. Events tourism should be focused on in the larger urban areas of Bloemfontein and Welkom. Human resource development and economic growth: Providing the skills for a growing economy will be done by means of the learnerships, providing skills through the FET sector and internships.

The FSPGDS also identifies a number of barriers to economic growth and infrastructure that need urgent attention in order to foster economic growth. The barriers that are pertinent to the renewable energy sector include:

» The lack of appropriate skills.
» Access to capital;
» Poor institutional arrangements in respect of business support.
» Lack of basic infrastructure and the maintenance of basic infrastructure.

» Lack of appropriate R&D to foster the emphasis in the NSDP on innovation and economy, appropriate R&D is vital to the economic development of the Province. Not only should partnerships with local research institutions be fostered, but various national institutions also exist to assist in this regard;
» The HIV and AIDS pandemic.

The FSPGDS also identifies a number of natural constraints to economic growth and development. These include, low rainfall coupled with the limited soil potential and the impact of this on agriculture, limited water availability and depletion of mineral resources. What is of interest is that none of the natural constraints impact on the renewable energy sector, specifically the solar energy sector. Solar energy, specifically PV solar energy, therefore provides the Free State with an opportunity to diversify its economy in a way that is not affected by natural constraints such as low rainfall and limited water supplies.

Agriculture dominates the Free State landscape, with cultivated land covering 32 000 square kilometres, and natural veld and grazing a further 87 000 square kilometres of the province. Due to the climate change, Free State's agricultural potential has been declining and this has led to an increase in the level of unemployment. The proposed solar energy facility will create jobs during its construction and operation phase and this will decrease the level of unemployment currently being experienced in this province. Furthermore the proposed project will boost the local economy and attract tourists in the area..

3.2.2 Lejweleputswa District Municipality Integrated Development Plan

The LDM IDP is informed by and aligned with the Free State Provincial Growth and Development Strategy (FSPGDS) and other governmental programmes and policies. In this regard the FSPGDS identified four key priority areas, two of which are relevant to the proposed solar energy project, namely:

» Economic development, employment and investment;
» Social and Human Development.

The IDP identifies a number of priority areas, of which the following are regarded as relevant:

» Local Economic Development
» Basic Service Delivery and Infrastructure Investment
» The proposed solar energy facility will boost the local economy through job creation and supporting local business.

3.2.3 Tokologo Local Municipality IDP (2012-2017)

The vision for the TLM is "A progressive municipality, which through cooperative governance, creates conditions for economic growth, social development and meet the basic needs of the community and improve the quality of life of all residents". The Mission statement linked to the vision notes that the:

"Tokologo Local Municipality is committed to provide a better life for all residents within its area of jurisdiction through:

» Creating conditions for economic growth and sustainability;
» Improving access to basic services;
» Promoting social upliftment through improved education, skills development and job opportunities;
» Ensuring cooperative, transparent and democratic governance through community participation and involvement;
» Creating a healthy and safe environment; and
» Improving sport and recreation facilities".

The IDP notes that Local Economic Development within the municipal area will require strategic and focused efforts in those economic areas where TLM already shows stability and growth. An economic SWOT analysis was undertaken as part of the IDP revision. The key findings that are of relevance to the project include:

Strengths
» One of the most fertile agricultural regions of the Free state;
» Strong and versatile agricultural sector;
» Skilled and semi-skilled labour force;
» Well-developed infrastructure;
» Tourism destinations.

Weaknesses
» High rate of poverty, especially women and children;
» High unemployment and dependency rates;
» High levels of illiteracy;

Opportunities
» Development of skills;
» Transfer of skills
» Availability of labour;
» Development of a holistic LED Strategy for Tokologo

Threats/constraints
» Limited job opportunities

A Community Needs assessment undertaken as part of the IDP revision lists a number of needs that are relevant to the proposed project, including, job-creation, up-grading of community facilities and infrastructure, support for local economic development and SMME's, and bursaries for learners. The need to protect the natural environment is also identified as a key objective in the IDP.

The IDP also notes that the bulk electrical network in the TLM is well established. However, development has been hampered by the quality/ stability of the supply.

In terms of land uses the proposed site is located outside the area between Boshof and Dealsville identified as a Tourism Development Corridor identified in the TLM Spatial Development Framework. The proposed SEF is therefore unlikely to have a negative impact on tourism potential of the TLM.

3.3. Alignment of the Blackwood Solar Project with the Policies and Planning

From the above policies it can be said that the proposed Blackwood solar energy project is in line with both the local and the provincial policies. The proposed projects will contribute towards the promotion of SMMEs in order to strengthen the Local Economic Sector and bring job opportunities to the locals, who are some of the top priorities in these polices.

3.4. 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. As solar energy development is a multi-sectorial issue (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process for a solar energy facility project and the related statutory environmental assessment process.

3.4.1. Regulatory Hierarchy

At **National Level**, the main regulatory agencies are:

» *Department of Energy (DoE):* This Department is responsible for policy relating to all energy forms, including renewable energy, and is responsible for forming and approving the IRP (Integrated Resource Plan for Electricity).
» *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 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):* SAHRA is a statutory organisation established under the National Heritage Resources Act, No 25 of 1999, as the national administrative body responsible for the protection of South Africa's cultural heritage.
- *National Department of Agriculture, Forestry, and Fisheries (DAFF):* This Department is responsible for activities pertaining to subdivision and rezoning of agricultural land. The forestry section is responsible for the protection of tree species under the National Forests Act (Act No 84 of 1998).
- *South African National Roads Agency (SANRAL):* This Agency is responsible for the regulation and maintenance of all national routes.
- *National Department of Water and Sanitation:* This Department is responsible for water resource protection, water use licensing and permits. This area of the Northern Cape is not generally authorised, so applications go through the National Department.
- *Eskom:* Commenting authority regarding Eskom infrastructure and grid connection.

At the Provincial Level, the main regulatory agencies are:

- *Free State Department of Economic Development, Tourism and Environmental Affairs (DETEA):* This Department is the commenting authority for the project.
- *Department of Police, 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.
- *Provincial Department of Water Affairs:* This Department is responsible for water resource protection, water use licensing and permits.
- *Free State Department of Agriculture:* This Department is responsible for all matters which affect agricultural land.
- *Free State Department of Mineral Resources (DMR):* Approval from this department may be required to use land surface contrary to the objects of the Act in terms of Section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act, approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that might occur on site.

At **Local Level**, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Free State Province, both the local and district municipalities play a role. The local municipality is the Tokologo Local Municipality, which form part of the Lejweleputswa District Municipality. There are also numerous non-statutory bodies

such as environmental non-governmental organisations (NGOs) and community based organisation (CBO) working groups that play a role in various aspects of planning and environmental monitoring that will have some influence on proposed solar energy development in the area.

3.4.2 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 EIA Report:

- National Environmental Management Act (Act No. 107 of 1998)
- EIA Regulations, published under Chapter 5 of the NEMA (GNR R543 in Government Gazette 33306 of 18 June 2010)
- Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010)
  - Public Participation in the EIA Process (DEA, 2010)
  - Integrated Environmental Management Information Series (published by DEA)
- Tokologo Local Municipality Integrated Development Plan (2012-2017)
- Lejweleputswa District Municipality, Integrated Development Plan (2011/2012)
- International guidelines – the Equator Principles and the International Finance Corporation and World Bank Guidelines.

Several other Acts, standards or guidelines have also informed the project process and the scope of issues assessed in this report. A listing of relevant legislation is provided in **Table 3.1** and **Table 3.2.**

Table 3.1: Relevant legislative permitting requirements applicable to the proposed solar energy Facility

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. In terms of GN R543, R544, R545 and R546 of 18 June 2010, a Scoping and EIA Process is required to be undertaken for the proposed project.	Department of Environmental Affairs – competent authority Free State Department of Economic Development, Tourism and Environmental Affairs - (DETEA) commenting authority	The listed activities triggered by the proposed solar energy facility have been identified and assessed in the EIA process being undertaken (i.e. Scoping and EIA). This EIA Report will be submitted to the competent and commenting authority 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. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	Department of Environmental Affairs	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the EIA Phase through the consideration of potential impacts (cumulative, direct, and indirect). It 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)	National Noise Control Regulations (GN R154 dated 10 January 1992)	Department of Environmental Affairs Free State Department of Economic Development, Tourism and Environmental Affairs - (DETEA) - Local Authorities	Noise impacts are expected to be associated with the construction phase of the project and are not likely to present a significant intrusion to the local community. Therefore is no requirement for a noise permit in terms of the legislation. On-site activities should be limited to 6:00am - 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 DEA and the Local Municipality.
National Water Act (Act No 36 of 1998)	Water uses under S21 of the Act 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 (and then registration of the water use is required). Consumptive water uses may include the taking of	Department of Water and Sanitation Provincial Department of Water and Sanitation	A water use license (WUL) is required to be obtained if wetlands or drainage lines are impacted on, or if infrastructure lies within 500m of such features.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	water from a water resource and storage - Sections 21a and b. Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c; and altering of bed, banks or characteristics of a watercourse - Section 21i.		Should water be extracted from groundwater/ a borehole on site for use within the facility, a water use license will be required in terms of Section 21(a) and 21 (b) of the National Water Act. The storage of water in reservoirs may also require approval from DWA.
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. S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a	Department of Mineral Resources	A Section 53 application has been submitted the Free State DMR office.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	mineral resource that might occur on site.		
National Environmental Management: Air Quality Act (Act No 39 of 2004)	Measures in respect of dust control (S32)and National Dust Control Regulations of February 2014. Measures to control noise (S34) - no regulations promulgated yet.	Department of Environmental Affairs	No permitting or licensing requirements arise from this legislation. However, National, provincial and local ambient air quality standards (S9 - 10 & S11) to be considered. Measures in respect of dust control (S32) and the National Dust Control Regulations of February 2014. 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)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7). » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35). » Provides for the conservation and care of	South African Heritage Resources Agency	An HIA was undertaken for the proposed facility and a no go area have been highlighted. No development will take place in the no go areas. Should a heritage resource be impacted upon, a permit may be required from

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » Lists activities which require developers or any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38). » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44).		SAHRA.
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) » A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » Provides for listing threatened or protected ecosystems, in one of four categories: critically	Department of Environmental Affairs	Under this Act, a permit would be required for any activity that is of a nature that may negatively impact on the survival of a listed protected species. An ecological study has been undertaken as part of the EIA Phase. There is a pan and areas of protected trees and the potential for them to be affected has been considered. This report is contained in Appendix E.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011). » This Act also regulates alien and invader species. All category 1A and 1B alien invasive species must be eradicated and category 2 and 3 must be controlled.		
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur. » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048).	Department of Agriculture	This Act will find application 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.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			The permission of agricultural authorities will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas. There are none for the projects.
National Forests Act (Act No. 84 of 1998)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.	National Department of Forestry	A licence is required for the removal of protected trees. There were protected tree species recorded during the ecological survey within the broader study area. Few *Acacia* species and other small trees and geophytes scattered in on certain section of the site. Should protected trees need to be removed; a permit will be required to be obtained from DAFF.
National Veld and Forest Fire Act (Act 101 of 1998)	In terms of S12 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. In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.	Department of Agriculture, Forestry and Fisheries (DAFF)	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operational phase of the project.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
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 being in force.	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.	Local Municipality	The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	S(2-4) provide general principles for land development and conflict resolution.		development applicant who wishes to establish a land development area must comply with procedures set out in the Act.
National Environmental Management: Waste Act, 2008 (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 – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of this Act (GN 921), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:	National Department of Water and Environmental Affairs (hazardous waste) Provincial Department of Environmental Affairs (general waste)	As no waste disposal site is to be associated with the proposed project, and waste volumes stored on site would not exceed the specified volumes, a waste license will not be required for the project. General waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMPrs. The DWAF (1998) Waste Management Series. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste will also need to be considered.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» The containers in which any waste is stored, are intact and not corroded or in » any other way rendered unlit for the safe storage of waste; » Adequate measures are taken to prevent accidental spillage or leaking; » The waste cannot be blown away; » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented.		
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	Department of Agriculture	Subdivision will have to be in place prior to any subdivision approval in terms of S24 and S17 of the Act.
National Road Traffic Act (Act No 93 of 1996)	» The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on	» South African National Roads Agency Limited (national roads) » Provincial Department of Transport	An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of 22m. » Depending on the trailer

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	road pavements, bridges, and culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		configuration and height when loaded, some of the facility and substation components may not meet specified dimensional limitations (height and width).
Provincial Legislation			
Free State Provincial Spatial Development Framework (2013)	As a provincial policy framework, it sets the tone and pace for shared growth and development in the Province. It addresses the key social, economic, environmental and spatial imperatives in the Province. According to the FS (PSDF – 2013), the Free State renewable energy is a key focus area of the Free State Development Corporation, especially the solar energy sector.	Free State Department of Economic Development, Tourism and Environmental Affairs - (DETEA)	A permit is not required but this provincial legislation has been incorporated in this report and will remain applicable through the life cycle of the proposed project.

Table 3.2: Standards and guidelines applicable to the Blackwood Solar Energy Facility

Theme	» Standard/Guidelines	» Summary
Air	South African National Standard (SANS) 69	Framework for setting and implementing national ambient air quality standards.
	SANS 1929: Ambient Air Quality	Sets limits for common pollutants.

Noise	SANS 10328:2003: Methods for Environmental Noise Impact Assessments.	General procedure used to determine the noise impact.
	SANS 10103:2008: The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication.	Provides noise impact criteria.
	National Noise Control Regulations	Provides noise impact criteria.
	SANS 10210: Calculating and Predicting Road Traffic Noise	Provides guidelines for traffic noise levels.
Waste	DWAF (1998) Waste Management Series. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste.	DWAF Minimum Requirements
	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) – National norms and standard for the storage of waste.	» Provides uniform national approach relating the management of waste facilities. » Ensure best practice in management of waste storage Provides minimum standards for the design and operation of new and existing waste storage.
Water	Best Practise Guideline (G1) Stormwater Management DWA 2006	Provides guidelines to the management of storm water
Water	South African Water Quality Guidelines	Provides water quality guidelines
Others	Tokologo Local Municipality, Integrated Development Plan (2010/2011) and Lejweleputswa District Municipality, Integrated Development Plan (2011/2012.)	According to the Municipal Systems Act of 2000, all Municipalities have to undertake an Integrated Development Planning (IDP) process to produce Integrated Development Plans (IDPs). As the IDP is a legislative requirement it has a legal status and it supersedes all other plans that guide development at local government level.

APPROACH TO UNDERTAKING THE EIA PHASE CHAPTER 4

The EIA process for the proposed Blackwood PV facility is regulated by the EIA Regulations of June 2010 (as amended), which involves the identification of and assessment of direct, indirect, and cumulative environmental impacts (both positive and negative) associated with a proposed project. The EIA process forms part of the feasibility studies for a project, and comprises a Scoping Phase and EIA Phase which culminates in the submission of an EIA Report together with an Environmental Management Programme (EMPr) to the competent authority for decision-making.

The EIA process for proposed PV facility has been undertaken in accordance with the EIA Regulations in terms of Sections 24 and 24D of NEMA, as read with the EIA Regulations of GNR544; GNR545; and GNR546 of Section 24(5) of the National Environmental Management Act (NEMA Act No. 107 of 1998). In line with the EIA Regulations, an application for authorisation was lodged with the National DEA for the Blackwood Solar project.

4.1. Phase 1: Scoping Phase

The Scoping Study, which was completed in April 2014 with the acceptance of Scoping by the DEA, served to identify potential issues associated with the proposed project and define the extent of studies required within the EIA Phase, as detailed in the Plan of Study for EIA compiled as part of the Scoping Report. 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 interested and affected parties (I&APs).

I&APs were provided with the opportunity to receive information regarding the proposed project, to participate in the process and to raise issues or concerns. Furthermore, the Draft Scoping Report was made available at Kimberley and Boshof Public Library and on the Savannah Environmental website for I&AP review and comment for a 30-day period. All the comments, concerns, and suggestions received during the Scoping Phase and the review period were included in the Final Scoping Report.

A draft Scoping Report was released for public review in September 2013 for a 30-day comment period (40 days for Organs of State). Following the review of the draft scoping, a final scoping report was submitted to DEA in October 2013. The DEA however requested additional information prior to providing acceptance for the process. A revised Final Scoping Report was submitted in March 2014. This

together with the Plan of Study for the EIA was accepted by the DEA, as the competent authority, in April 2014. In terms of this acceptance, an EIA was required to be undertaken for the proposed project.

» **Circulation of the Draft and Final Scoping Report**
During the scoping phase, the following registered I&APs and State Departments were informed in writing of the availability of the Draft Scoping Report or provided with a copy of the report. They were also informed in writing of the availability of the Final Scoping Report and were requested to submit comments directly to the DEA, although some have submitted comments directly to Savanah Environmental.

- Free State Department of Economic Development, Tourism and Environmental Affairs (DETEA)
- Department of Police, Transport and Public Works
- Provincial Department of Water Affairs
- Free State Department of Agriculture
- South African Heritage Resources Agency
- Department of Agriculture, Forestry and Fisheries
- South African National Roads Agency Limited (SANRAL)
- Department of Energy
- Civil Aviation Authority
- Square Kilometre Array (SKA) Project
- Tokologo Local Municipality
- Lejweleputswa District Municipality
- Landowners, surrounding landowners
- Eskom Transmission and Distribution
- Wildlife Environment Society of South Africa
- BirdLife South Africa

4.2. Phase 2: Environmental Impact Assessment Phase

The EIA Phase for Blackwood Solar Energy Project aims to achieve the following:

» Provide a comprehensive assessment of the social and biophysical environments affected by the proposed project put forward as part of the project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Comparatively assess any 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&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA Report addresses potential direct, indirect, and cumulative[7] impacts (both positive and negative) associated with all phases of the project including design, construction, operation and decommissioning. In this regard the EIA Report aims to provide the relevant authorities with sufficient information to make an informed decision regarding the proposed project.

4.2.1. Tasks completed during the EIA Phase

The EIA Phase has been undertaken in accordance with the EIA Regulations published in GN 33306 of 18 June 2010, in terms of NEMA. 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 54 of GN R543 of 2010 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 57 of GN R543 of 2010).
» Undertaking of independent specialist studies in accordance with Regulation 32 of GN R543 of 2010.
» Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 31 of GN R543 of 2010.
» Prepare a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of GN R543 of 2010).
» Undertaking of independent specialist studies in accordance with Regulation 32 of GN R543 of 2010.
» Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 31 of GN R543 of 2010.

4.2.2 Authority Consultation

The National DEA is the competent authority for this application. A record of all authority consultations undertaken is included within this EIA report. Consultation

[7] "Cumulative environmental change or cumulative effects may result from the additive effect of individual actions of the same nature or the interactive effect of multiple actions of a different nature" (Spaling and Smit, 1993).

with the regulating authorities (i.e. DEA and Free State DETEA) has continued throughout the EIA process. On-going consultation included the submission of a final Scoping Report with a Plan of Study for the EIA phase, which was accepted by DEA in April 2014.

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

» Submission of a final EIA Report following the 30-day public review period and an additional 21 days public review period of the final EIA Report.
» If required, an opportunity for DEA and FS DETEA representatives to visit and inspect the proposed site, and the study area.
» Notification and 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, Department of Agriculture, etc.).
  * Government Structures (including the Department of Public Works, Roads and Transport, South African National Roads Agency Limited etc)

A record of the authority consultation in the EIA process is included within **Appendix B**.

4.3.1 Public Involvement and Consultation

The aim of the public participation process is 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.
» Comments received from stakeholders and I&APs were recorded and incorporated into the EIA process.

In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their inputs regarding the project, various opportunities for stakeholders and I&APs to be involved in the EIA Phase of the process will be provided, as follows:

» Focus group meetings and a public meeting (pre-arranged and stakeholders invited to attend - for example with directly affected and surrounding landowners).

» Telephonic consultation sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants).
» Written, faxed or e-mail correspondence.
» The Draft EIA Report was released for a 30-day public review period from 10 September 2014 – 10 October 2014: The comments received from I&APs will be captured within a Comments and Response Report, which will be included within the Final EIA Report, for submission to the authorities for decision-making.

In terms of the requirement of Chapter 6 of the EIA Regulations of June 2010, the following public participation tasks have been undertaken:

» Distribution of Letters of Notification to identified and registered I&APs to inform them on the changes in the project and planned EIA phase.
» Fixing a notice board at a place conspicuous to the public at the boundary or on the fence of—
    (i) the site where the activity to which the application relates is or is to be undertaken; and
    (ii) any alternative site mentioned in the application;
» Giving written notice to:
    (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
    (ii) Owners of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
    (iii) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
    (iv) the municipality which has jurisdiction in the area;
    (v) any organ of state having jurisdiction in respect of any aspect of the activity; and
    (vi) any other party as required by the competent authority.
» Placing an advertisement in:
    (i) one local newspaper (Diamond Fields Advertiser); and
    (ii) in at least one regional newspaper (Volksblad).
» Open and maintain a register/ database of interested and affected parties and organs of state
» Release of a Draft EIA Report for Public Review for a 30-day period.
» Hosting of a Public Meeting and Focus Group Meetings by the EAP to discuss and share information on the project.
» Preparation of a Comments and Responses Report which document all the comments received and responses from the project team.

Below is a summary of the key public participation activities conducted thus far.

» **Placement of Site Notices**
Site notices have been placed on-site and at relevant public places during the scoping phase of the project

» **Identification of I&APs and establishment of a database**
Identification of I&APs was undertaken by Savannah Environmental) through existing contacts and databases, recording responses to site notices and the newspaper advertisement, as well as through the process of networking. The key stakeholder groups identified include authorities, local and district municipalities, public stakeholders, Parastatals and Non-Governmental Organisations (refer to Table 4.1 below).

Table 4.1: Key stakeholder groups identified during the EIA Process

Stakeholder Group	Department
National and Provincial Authorities	» Free State Department of Economic Development, Tourism and Environmental Affairs (DETEA) » Department of Police, Transport and Public Works » Provincial Department of Water Affairs » Free State Department of Agriculture » South African Heritage Resources Agency » Department of Agriculture, Forestry and Fisheries » South African National Roads Agency Limited (SANRAL) » Department of Energy » Civil Aviation Authority
Municipalities	» Tokologo Local Municipality » Lejweleputswa District Municipality
Public stakeholders	» Landowners, surrounding landowners, occupiers of land, farmer's unions.
Parastatals & service providers	» Eskom Transmission and Distribution » Square Kilometre Array (SKA) Project
NGOs/Business forums	» Wildlife Environment Society of South Africa » BirdLife South Africa

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 undertaken by Savannah Environmental, the identification and registration of I&APs has been on-going for the duration of the EIA phase of the process.

» **Newspaper Advertisements**

In order to notify and inform the public of the proposed project and invite members of the public to register as interested and affected parties (I&APs), the project, and EIA process was advertised in the following newspapers

* The Volksblad (22 July 2013)
* Snuffelblad (19 July 2013)

During the scoping phase, a second round of newspaper adverts was placed to inform the public of the public meeting. These adverts were placed in the following newspapers:

* Volksblad – (06 September 2013)
* Snuffelblad – (06 September 2013)

A third advert was placed announcing the availability of the Draft Scoping report for public review. This advert appeared in the following newspapers:

* Volksblad – (27 September 2013)
* Diamond Fields Advertiser – (26 September 2013)

During the EIA phase, a fourth round of newspaper adverts has been placed in the following newspapers to inform the public of the availability of the Draft EIA report and the public meeting:

* Volksblad – (12 September 2014)
* Diamond Fields Advertiser – (12 September 2014)

» **Consultation**

In order to accommodate the varying needs of stakeholders and I&APs, the following opportunities have been provided for I&AP issues to be recorded and verified through the EIA phase, including:

Consultations in Scoping phase:	**Date**
Public meeting	18 September 2013
Focus Group Meeting with Lejweleputswa District Municipality	18 September 2013
Focus Group Meeting with Tokologo Local Municipality	18 September 2013
Focus Group Meeting with impacted and adjacent landowners	19 September 2013
Consultations in EIA phase:	**Date**
Public meeting	07 October 2014
Focus Group Meeting with landowners	06 & 07 October 2014

» In order to further facilitate comments on the Draft EIA report and to provide feedback on the findings of the specialist scoping studies, a **public feedback** meeting will be held on Tuesday, **07 October 2014** and interested and affected parties have been invited to attend the public meeting. Adverts informing the public on the availability of the draft EIA report for public comment and public meeting were advertised in the Volksblad and Diamond Fields Advertiser newspapers are as follows :

* **Date:** Tuesday, 07 October 2014
* **Time:** 18:00
* **Venue:** The Kimberley Library

4.3.2 Identification and Recording of Issues and Concerns

Issues and comments raised by I&APs over the duration of the EIA process will be synthesised into a Comments and Response Reports. The Comments and Response Report includes 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. This is included in **Appendix D**.

4.3.3 Assessment of Issues Identified through the Scoping Process

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

Table 4.2: Specialist studies undertaken within the EIA Phase

Specialist	Area of Expertise	Refer Appendix
Doug Harebottle (Doug Harebottle Consulting)	Avifaunal impact assessment	Appendix E
Marianne Strohbach (Savannah Environmental)	Ecological impact assessment	Appendix F
David Morris (McGregor Museum)	Heritage impact assessment	Appendix G
Lloyd Rossouw (Palaeo Field Services)	Palaeontology impact assessment	Appendix H
Tony Barbour (Environmental Consulting and Research)	Social impact assessment	Appendix I
Johann Lanz (Johan Lanz Consulting)	Soils and Agricultural Potential	Appendix J
Karen Hansen (Karen Hansen Landscape Architect)	Visual impact assessment	Appendix K

Specialist studies considered direct, indirect, cumulative, and residual environmental impacts associated with the development of the proposed Blackwood Solar Energy project. 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 the developer 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 EMPr is included as **Appendix L.**

4.3.4 Assumptions and Limitations

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

» All information provided by the developer 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 the developer represents a technically suitable site for the establishment of the proposed solar 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 specialist study specific limitations.

DESCRIPTION OF THE RECEIVING ENVIRONMENT CHAPTER 5

This section of the Draft EIA Report provides a description of the environment that may be affected by the proposed Blackwood Solar Energy Facility and associated infrastructure. This information is provided in order to assist the reader in understanding the receiving environment within which the proposed facility is situated. Features 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 E – L**.

5.1 Regional Setting: Location of the Study Area

The project falls within the jurisdiction of the Tokologo Local Municipality, which in turn falls under the jurisdiction of the Lejweleputswa District Municipality of the Free State Province. The remainder of Portion 1 of the farm Pandamsfontein 1593 is located in the Free State approximately 25km south-east of Kimberley and 45km south-west of Boshof. The farm portions cover an area of 1468 ha. The site is adjacent to the N8, an Eskom power line (Kimberley DS - Skietpan Switching Station 132kV) traverses the site in a south-west to north-east direction. The co-ordinate for the central point of the project area considered in this report is as follows:

* Latitude: 28°54'1.59"S
* Longitude: 24°57'2.61"E

5.2 Topography

The terrain consists of level to slightly undulating plains, sloping slightly in a south-westerly direction. The proposed site is on a level plain with a gentle slope of approximately 1% at a south-easterly aspect across the site. The site slopes from northwest, at about 1190m, down to south-east at about 1160m above sea level (asl). The highest point locally is about 3.5km to the north of the site, at 1230m, 'Olifantskop'.

5.3 Geology

The geology of the region has been described by Bosch (1993). The area in question is underlain by sediments of widely different geological ages (Figure 5.1, portion of 1: 250 000 scale geological map 2824 Kimberley, Council for Geoscience, Pretoria, 1991) (Cole 2005; Johnson *et al.* 2006; Partridge *et al*. 2006). From oldest to youngest, the geology in and around the affected area is made up of early Permian Ecca shales (Prince Albert Formation, *Ppr*), Jurassic dolerite intrusions (*Jd,* Karoo Dolerite Suite), Quaternary calcretes, surface limestones, calcified pan dunes (lunettes) (*Qc*) and aeolian sands (*Qs*). The wind-blown sands represent the latest geological phase and are made up of the characteristically red-brown Kalahari sands (Hutton sands). The geological map indicates that, except for dolerite intrusions, the affected area lies within an outcrop area of the Prince Albert Formation (Ecca Group) that is mainly covered by Quaternary-age surface deposits made up of surface calcretes and a thick mantle of aeolian sand.

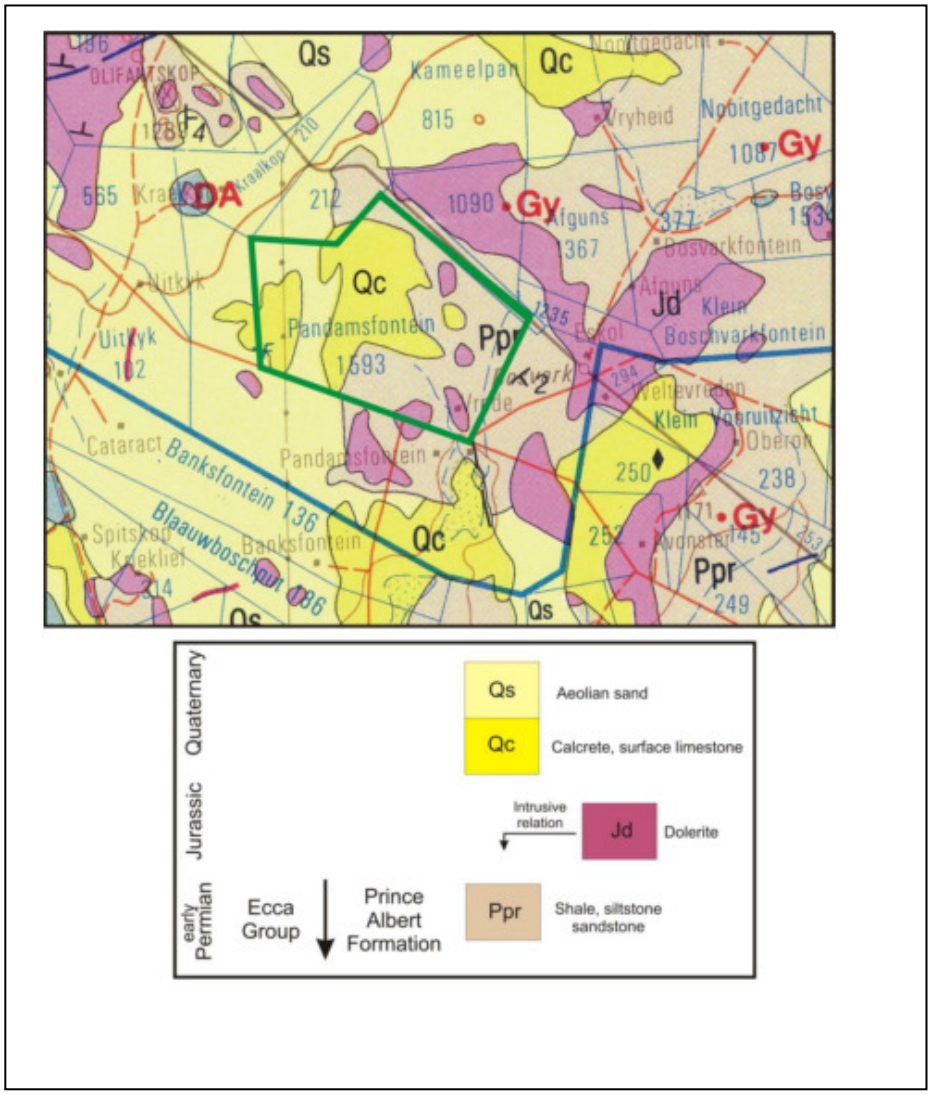

Figure 5.1: Map of the geology underlying the project area on the remainder of Portion 1 of the farm Pandamsfontein 1593 and its surroundings

5.4 Climate

The climate for the Blackwood Solar Energy Facility project site has been derived from the nearest available climatic data summarised for Kimberley located about 25 km north-west of the Project site. The area receives approximately 400 - 450 mm of rain on average per year. From May to September, rainfall is minimal with most rainfall occurring from November to April, peaking between January and March. Temperatures in summer peak during December and January at a daily average of 33°C to 37°C, with an average of 17C°to 20°C for June. During July, night temperatures are on average -4°C to 2°C, with frosts during winter common.

5.5 Land Cover / Land-Use

The main land uses in the vicinity of the Blackwood study area is commercial farming, with a focus on livestock (cattle, goat and sheep). A number of farms in the area also have irrigation-based operations along the Modder River (Paardeberg, Jacobsdal). Unlike the Boshof area further to the north along the R64 (Bonnievale, Amakulu, Tarentaalrand, etc.), the study area is not characterized by commercial game farming/ hunting operations. However, most of the farms in the area do contain some game, usually springbuck and blesbuck, with some migrant kudu. These farms also cater for hunting during the winter hunting season (May-August). While the study area settlement pattern is relatively sparse, most farms are inhabited. Operations typically provide limited permanent employment opportunities. Labourers typically reside on core farms and are transported to other farms on an as-needed basis. The farm portion proposed for the development is currently used for livestock farming with prospects of future small-scale game farming.

The Blackwood project site is bordered by the N8 (Petrusburg Road) to the south and the Kimberley-Jacobsdal railway line to the north. Access to the farm is from the N8 which according to the FS PSDF (2013) is referred to as an 'active tourist route'; this tourism corridor links Bloemfontein and Lesotho, passing Ladybrand, Thaba Nchu, and Botshabelo. From Bloemfontein westwards the N8 leads via Petrusburg to Kimberley. This route is also an alternative route for travellers from KwaZulu-Natal to the Eastern Cape and Cape Town via Bloemfontein. The activities on the farm were traditionally based on sheep farming. However, chronic stock theft has seen operations largely phased out and the current activities focus on cattle farming. In addition to the cattle farming, the Vrede Felidae Centre is based on a few hectares around Vrede farmstead. The centre accommodates lions and other large cats and generates an income mainly by catering to educational tours and tourists. Tourism activities are currently mainly limited to weekends. The owners plan to establish a cheetah breeding centre and

to expand the current lion-proofed facilities to provide the lions with more roaming space.

5.6 Access

A major national road found in the broader study area, the N8 links Kimberley and Bloemfontein via Petrusburg in a SE direction. Direct access to the site can be obtained from this road (N8).

5.7 Flora

Regional overview - The study area is situated in the Savanna Biome, Eastern Kalahari Bushveld. The vegetation unit covering the study area is Kimberley Thornveld (Figure 5.2). The majority of Kimberley Thornveld (SVk 4) landscapes consist of flat to slightly undulating plains with some smaller outcrops and occasional surface intrusions of dolerites and andesitic lavas. The Kimberly Thornveld vegetation is considered least threatened.

The tree and shrub layer is well developed, albeit occurring in a very patchy mosaic. Tree species dominating within this vegetation unit are *Boscia albitrunca, Acacia erioloba,* (both species protected by the NFA), *A. tortilis*, and *A. karroo*. Dominant shrubs include *Tarchonanthus camphoratus* and *A. mellifera* subsp. *detinens*. Both these shrub species may increase significantly once the herbaceous layer is weakened, with the possibility of forming impenetrable thickets. The grass layer can be patchy and open with large areas of uncovered soil during the dry season. *Eragrostis lehmanniana* is considered the most dominant grass species of this vegetation type, with *Digitaria eriantha* and *Themeda triandra* the most valuable grasses for grazing (Mucina & Rutherford 2006).

Local overview - Four vegetation associations could be identified on site as shown on Figure 5.3:

» Association 1: *Acacia tortilis – Eragrostis trichophora* sparse woodlands
» Association 2: *Pentzia lanata – Eriocephalus karroicus* dwarf shrublands
» Association 3: *Pentzia lanata – Tragus koelerioides* grass plains
» Association 4: *Zygophyllum incrustatum – Pentzia lanata* bands

There is a high potential of spread of succulent and herbaceous alien invasive species, especially *Opuntia, Argemone, Datura* and *Xanthium* species, from surrounding habitats (and outside the study area), which must be monitored and eradicated as soon as detected

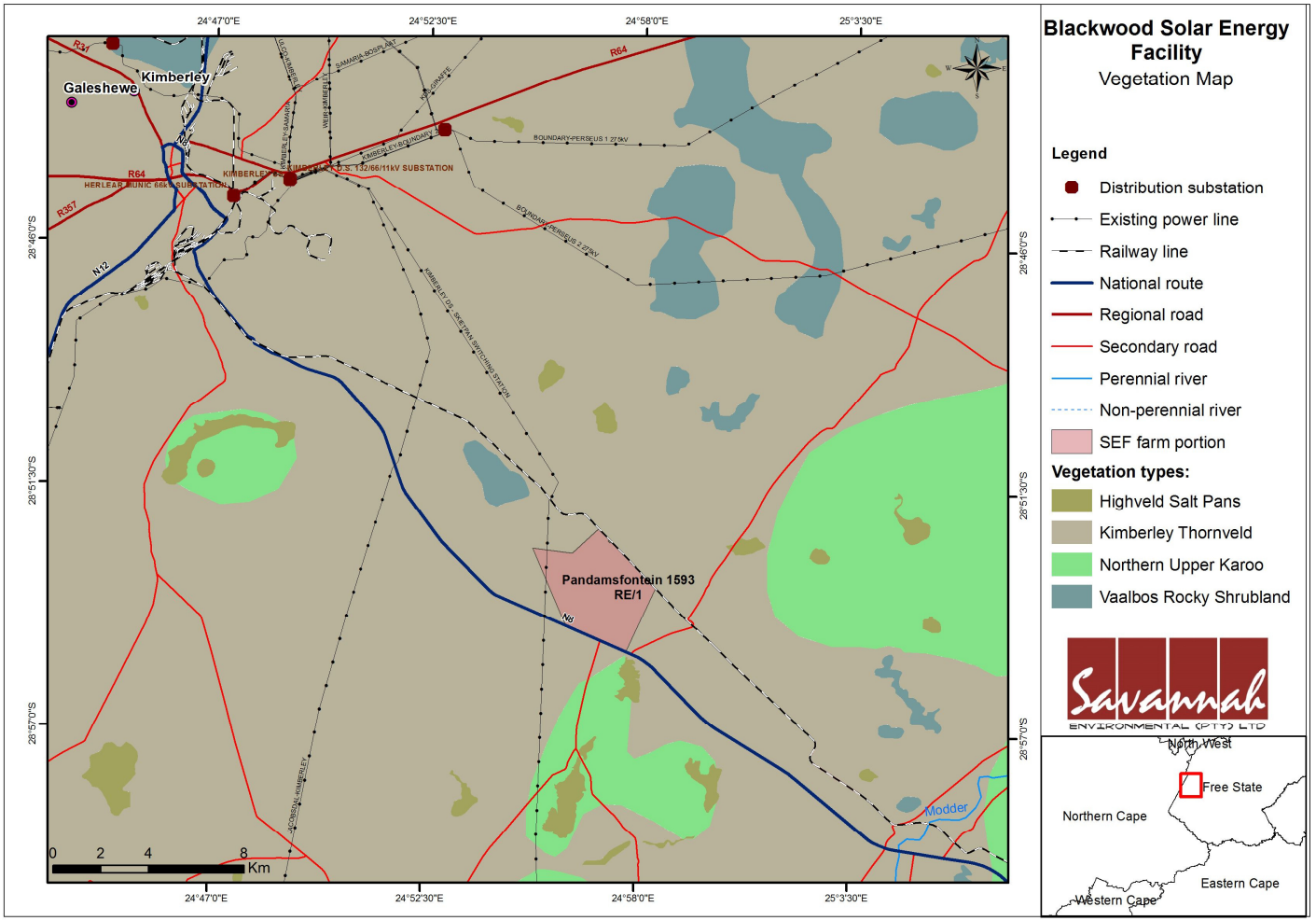

Figure 5.2: Regional overview map of the vegetation types as defined by Mucina and Rutherford (2006) on and around the proposed project area.

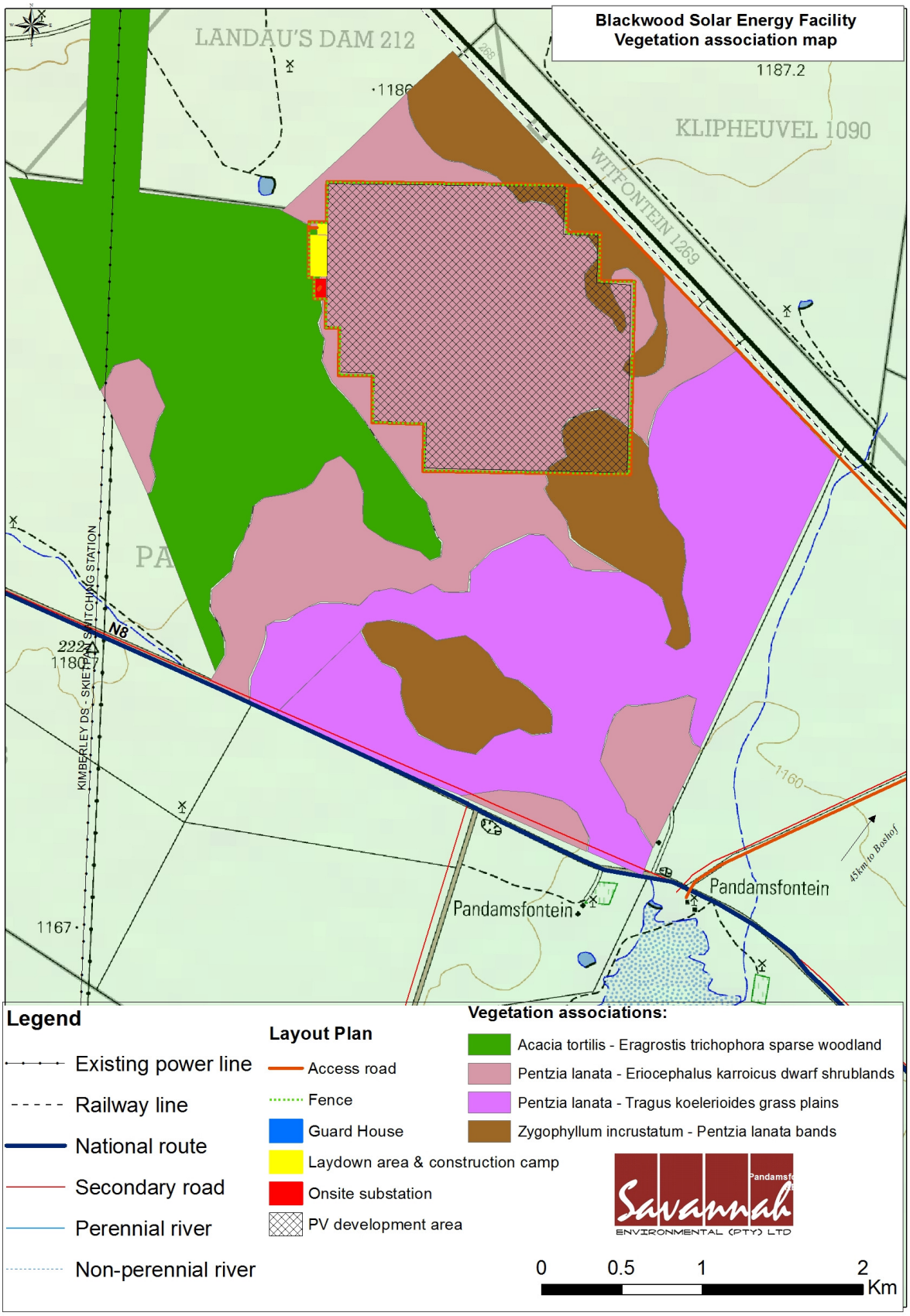

Figure 1.3: Vegetation associations of the study site as determined through the vegetation survey data.

Plant species of Conservation Concern - The following red data species have been recorded from the area (Grid 2824) according to the red data species list of SANBI and the ADU database:

Species	Red Data Status	Suitable Habitat	Likelihood of occurrence	Threat
Acacia erioloba	**Declining** (protected)	Sandy savannas	Confirmed	Habitat loss, wood harvesting
Aloinopsis rubrolineata	**Rare** (protected)	Low calcrete ridges	Confirmed	Collection, habitat loss
Boophone disticha	**Declining** (protected)	Savanna	Confirmed	Medicinal trade
Crinum bulbispermum	**Declining** (protected)	Plains with seasonally high moisture levels	Moderate	Medicinal trade Habitat loss
Drimia sanguinea	**Not threatened** (protected)	Sandy plains	Moderate	Medicinal trade
Lithops lesliei subsp. *lesliei*	**Not threatened** (protected)	Quartz ridges and quartz gravel plains	Unlikely	Collection, habitat loss
Nananthus vittatus	**Data Deficient** (Taxonomically Problematic)	Low calcrete ridges	Slight	Collection, habitat loss
Rennera stellata	**Vulnerable**	Pan edges	Slight	Habitat loss
Oxalis setosa	**Data Deficient** (Taxonomically Problematic)	Variable	Slight	Habitat loss

The following species observed on the study site during this survey are protected:

» The Nature Conservation Ordinance (NCO) 8 of 1969 and subsequent amendments -

Acacia erioloba
Aloinopsis rubrolineata
Ammocharis coranica
Boophane disticha
Chortolirion angolense (Aloe welwitschii)
Cynanchum orangeanum
Ledebouria crispa
Ledebouria revoluta
Ledebouria undulata
Nerine species
Stapelia species
Titanopsis calcarea
Helichrysum lucilioides

» National Environmental Management Act: Biodiversity Act (NEMA:BA) (Act No. 10 of 2004) and amendments –
Harpagophytum procumbens

5.9 Fauna

The study area was investigated during the ecological survey for signs or the presence (observations, no trapping due to time limitations) of amphibians, reptiles, and mammals. Species and signs of such sighted during the survey on and in the vicinity of the study area were the following:

» Aardvark (*Orycteropus afer*)
» Cape Ground Squirrel (*Xerus inauris*)
» Signs of Porcupine (*Hystrix africaeaustralis)*
» Signs of Aardwolf (*Proteles cristatus*)
» Bat-eared Fox (*Otocyon megalotis*)
» Blesbok (*Damaliscus pygargus s. phillipsi*)
» Common duiker (*Sylvicapra grimmia*)
» Steenbok (*Raphicerus campestris*)

The site is home to the Felidae Centre and plans are to expand the camps of the large predators (lions, cheetah, and leopards) to the more tree-rich section of the farm. This would primarily be the *Acacia tortilis – Eragrostis trichophora* sparse woodland, which will be excluded from the development.

Species of conservation concern - The following red data species have been recorded from the area (Grid 2824) according to the red data species list of SANBI and the ADU database:

» *Brown Hyena (Hyaena brunnea) – Near Threatened:* This species occupies a wide range of habitats, although due to its shy and secretive behaviour, its presence in an area is not always recognised (Apps, 2012).
» *Honey Badger (Mellivora capensis) – Near Threatened:* This species is one of the widest spread species of small carnivores, occurring across a diverse range of habitats, albeit uncommon throughout most of its range.
» *South African Hedgehog (Atelerix frontalis) – Near Threatened:* This species occurs in a wide range of habitats, favouring semi-arid and sub-temperate areas. They are predominantly nocturnal, becoming active after sundown, foraging for invertebrate prey.

The following species observed on the study site during this survey are protected by the Nature Conservation Ordinance (NCO) 8 of 1969 and subsequent amendments:

» Aardvark (*Orycteropus afer)*
» Aardwolf (*Proteles cristatus*)
» Bat-eared Fox (*Otocyon megalotis*)

5.10 Soils

There are two land types across the site, namely Fb1 and Ae45 (refer to Figure 5.4). Land type Fb1 occupies the majority of the site, with Ae45 occurring only on a smaller portion of the site of the north-west margin of the site. Soils across the site are generally extremely shallow to moderately deep, red, loamy sands on underlying rock or calcrete. The field data shows that the predominant depth limitation across the site is a hardpan carbonate horizon, and according to the current South African soil classification system, the soils are classified predominantly as Coega and Plooysburg forms. Land capability is the combination of soil suitability and climate factors. The entire site has a land capability classification, on the 8 category scale, of Class 5 – non-arable, moderate potential grazing land. The land on the site has a low to moderate susceptibility to water erosion, and is classified as class 5 water erosion hazard (on 8 class scale). It is classified as susceptible to wind erosion, with sands sub-dominant or present.

5.11 Agricultural Potential

The farm is located within a cattle farming agricultural region. There has never been any cultivation or irrigation on the site due to the poor potential of the soils, as detailed above. It is leased out by the current owner for grazing of cattle. The only agricultural infrastructure at the solar site is fencing into camps. There are stock watering points and a farmstead with a predator rehabilitation centre elsewhere on the farm.

As an indication of agricultural potential on the site, the land is classified on AGIS as having a grazing capacity of 14-21 hectares per animal unit. The major limitations to agriculture are the aridity and the shallow soils limited in depth by rock and calcrete.

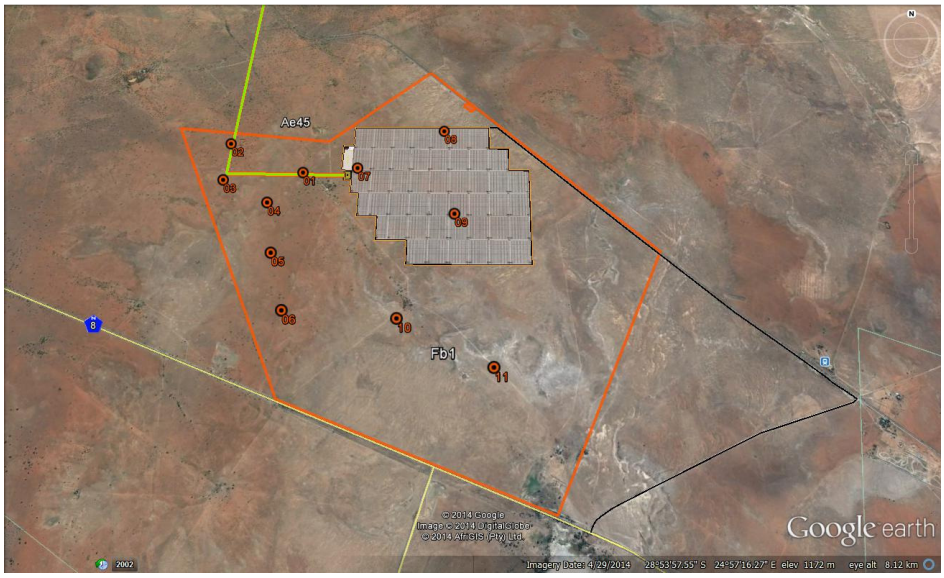

Figure 5.4: The distribution of the different land types across the proposed site

5.12 Water Resources

No clear drainage lines are present within the farm portion where the PV array is proposed, but there are larger valley floor areas on the southern edge of the farm portion, where moisture will accumulate during rainfall seasons. Seepage from these valley floors drain into larger salt pans just south of the farm.

5.13 Heritage Resources

Observations derived from previous experience of the area indicate that:

» The terrain on which the proposed Blackwood Solar Energy Facility would be located is likely to include traces of Stone Age utilization of the landscape with palimpsests of material spanning Pleistocene and Holocene times.
» Where there are dolerite outcrops or hills, rock engravings may occur.
» Nineteenth- and twentieth-century cultural history may occur in the form of stone kraals, ruins of dwellings, extant dwellings and infrastructure (those over 60 years old are explicitly protected by the Act), and graves. Intangible heritage values attached to places may be recoverable from current or former inhabitants (farmers, farm-workers).
» Generally sparse heritage traces were found over almost all of the proposed development area, on archaeological grounds, these occurrences can be said to be of low significance. Remains of a colonial era (post-1907) railway-associated feature alongside the Kimberley-Bloemfontein line lies next to the project.

5.14 Palaeontology

'Paleontological' means any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

The project area is completely underlain by the Quaternary-age aeolian deposits, surface calcretes, dolerite outcrop, as well as older Ecca sediments of the Prince Albert Formation. Visibility of Ecca Group outcrop are for the most part hampered by a capping of Quaternary-aged residual soils. There is no evidence of potentially fossil-bearing erosional features such as pans and alluvial dongas within development footprint of the proposed infrastructure. There is no indication for the accumulation and preservation of intact fossil material within the Quaternary sediments (unconsolidated topsoils). Impact on Quaternary sediments within the footprint will be extensive, but impact on potential *in situ* Quaternary fossils, within the confines of the affected area is considered unlikely

5.15 Visual Quality of the Study Area

The character of the landscape is defined as open, undulating, sparsely populated land, extensively agricultural. Vertical elements in the immediate landscape are some individual trees, a line of transmission pylons across the site and telegraph poles. There are no formally protected areas in the immediate vicinity of the site. The visual signposts to signal the exact location of the development site are not very evident, but are from the proximity of the N8 to the south and the railway line to the north and east. The site would be held in view by users of the N8, by users of other local roads and by rail users as shown on Figure 5.5. People living in some farmsteads locally may become visually aware of the solar facility. The landscape character of the local area is open savanna with few centres of habitation, few transmission lines, and gravel roads; it has value for agriculture. Views seem to be long and open to all compass points. The simplicity of the forms and the long open views bring visual clarity to the landscape. The visual clutter introduced by the semi-industrial proposals would alter the existing landscape character.

Figure 5.5: View from the N8 travelling towards Kimberley and about 1km from the site

5.16 Socio-Economic Environment

Administrative and Social profile:

Lejweleputswa District Municipality

According to the FSPGDS (2006-14), the Lejweleputswa DM is the major contributor to the Free State Gross Geographic Product (GGP) and is also an important agricultural area. The district is predominantly known as the Free State Goldfields which forms a part of the larger Witwatersrand basin. The economy of the region is dominated by the gold mining industry and agriculture sectors, in particular maize production.

Tokologo Local Municipality (TLM)

The TLM covers an area of 9 326 km^2 and is located in the western part of the Free State Province within Lejweleputswa District Municipality (LDM). The TLM consists of three former Transitional Local Councils, namely Boshof, Dealesville and Hertzogville, as well as a portion of a former Transitional Rural Council (Moddervaal) which contained approximately 1480 farms.

Boshof is the administrative seat of the TLM and is located approximately 124km west of Bloemfontein and 53km east of Kimberley, along the R64 (old Bloemfontein/Kimberley Road). The majority of the commercial and industrial activities in the TLM are based in Boshof. The associated townships of Kareehof and Seretse are predominantly dormitory towns dominated by low income households with limited economic activities, save for corner shops and informal traders.

Population: Socio-economic data from Census 2011 indicates that the population in the TLM decreased marginally from 32 455 in 2001 to 28 986 in 2011. The dependency ratio improved from 62.4% to 58.9%.

Unemployment and Level of education: Unemployment increased from 26.8% in 2001 to 27.5% in 2011. The main contributor was the increase in youth unemployment from 33.1% to 35.8%. In terms of employment, there was improvement in the education levels, with the number of people with no schooling decreasing from 31.5% to 20.8%. This does, however, still represent a high level of people over the age of 20 with no schooling. For example the figure for the Free State Province as a whole was 7.1% in 2011. While the percentage of the population over the age of 20 with matric also increased from 12% in 2001 to 17.8% in 2011, this is still well below the provincial average of 26.7%. The levels education in the TLM is therefore low. This can be attributed to the rural nature of the area.

Municipal basic service: The level of services provided by government also improved, with households supplied with flush toilets linked to sewage increasing from 13.9% to 18.5%, households with piped water within the house increasing from 19% to 22.7% and households provided with electricity growing from 73.1% to 84.2%. It is therefore reasonable to say that the quality of life of the residents of the TLM has improved since 2001. However, having said this, the services levels in the TLM are substantially lower than those for the Free State Province as a whole. The percentages for flush toilets, piped water and household with electricity for the Free State Province as a whole in 2011 were 64.9%, 44.8% and 89.9% respectively. The level of household services in the TLM is therefore low.

5.17 Description of the Environment - Summary of the Environmental & Social characteristics of the project

Table 5.1 below provides a summary of the environmental and social characteristics of Blackwood Solar Energy facility site on the remainder of Portion 1 of the farm Pandamsfontein 1593.

Table 5.1: Summary of the Environmental and Social characteristics of the site earmarked for the Blackwood Solar Energy facility on the remainder of Portion 1 of the farm Pandamsfontein 1593

Environmental Characteristics	Blackwood Solar Energy Facility and associated infrastructure
1. Land Use	» Zoned Agriculture » Currently utilised as grazing land (livestock)
2. Land Capability	» There is no cultivation or irrigation, or any evidence of past cultivation on the site. » The grazing capacity on most of the site is classified as 14-21 hectares per animal unit. » The major limitations to cultivation are the aridity and the shallow soils limited in depth by rock and calcrete
3. Climate	» Semi-arid
4. Topography	» Gentle slope of approximately 1% at a south-easterly aspect across the site » The site slopes from northwest, at about 1190m, down to south-east at about 1160m above sea level (asl). » The highest point locally is about 3.5km away to the north, at 1230m, 'Olifantskop'.
5. Hydrology, Riparian Zones and Watercourses	» No clear drainage lines are present within the site » There are larger valley floor areas on the southern area of the property, where moisture will accumulate during rainfall seasons into a larger salt pan just south of the farm.
6. Land Types	» Fb1 and Ae45
7. Vegetation types	» Kimberley Thornveld (regarded as Least Threatened) » Protected tree and plant species present on the site » A number of fauna were sighted on and in the vicinity of the study area, 3 of which are protected species.
8. Heritage and Palaeontology	» Heritage materials from Colonial frontier, i.e. the railway and middle stone age, are notable feature near the site (none impacted by the project footprint). » The project area is completely underlain by the Quaternary-age aeolian deposits, surface calcretes, dolerite outcrop, as well as older Ecca sediments of the Prince Albert Formation. Impact on Quaternary sediments within the footprint will be extensive, but impact on potential in situ Quaternary fossils, within the confines of the affected area is considered unlikely
9. Social	» Population: Census 2011 indicates that the population in the TLM

Environmental Characteristics	Blackwood Solar Energy Facility and associated infrastructure
Characteristics	decreased marginally from 32 455 in 2001 to 28 986 in 2011 » Unemployment and Level of education: Unemployment increased from 26.8% in 2001 to 27.5% in 2011. The levels education in the TLM is therefore low » The level of services provided by government also improved from 13.9% to 18.5%. Free State Province as a whole in 2011 was 64.9%, 44.8% and 89.9% respectively. Therefore level of household services in the TLM is therefore low.

ASSESSMENT OF POTENTIAL IMPACTS: PV FACILITY & ASSOCIATED INFRASTRUCTURE CHAPTER 6

This chapter serves to assess the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) potentially associated with the development of the proposed Blackwood Solar Energy Facility (refer to **Figure 6.1**). This assessment has considered the construction of a 75 MW facility and all related and ancillary infrastructure, including:

» Solar panels (fixed/tracking technology) with a maximum contracted capacity of 75MW
» Mounting structures for the solar panels to be rammed steel piles, piles with pre-manufactured concrete footings or ground screw anchors to support the PV panels.
» Cabling between the structures, to be lain underground where practical.
» Central inverter/transformer stations to collect all energy generated from the PV panels. The inverter's role is to convert direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
» Internal access roads
» Associated buildings including a workshop area for maintenance, storage, and control facility with basic services such as water and electricity
» Area for workshop/maintenance, warehouse/storage, and offices.
» Security fencing around the complete proposed facility

The construction of a substation (switching station) and overhead distribution power line to connect the facility to the Eskom grid is also being assessed **within a separate Basic Assessment process** and is not discussed in this report.

The proposed Blackwood Solar Energy Facility and associated infrastructure will have a development footprint of approximately 300ha. The development of the Blackwood Solar Energy Facility will comprise the following phases:

» *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of the access road, electricity generation infrastructure, establishment of power line within servitude, construction camps, laydown areas, transportation of components/construction equipment to site; and undertaking site rehabilitation and establishment and implementation of a storm water management plan. The construction phase for the Blackwood Solar Energy Facility is expected to take approximately 16 months.
» *Operation* – will include operation and maintenance of the facility and the generation of electricity. The operational phase is expected to extend for 20 - 25 years.

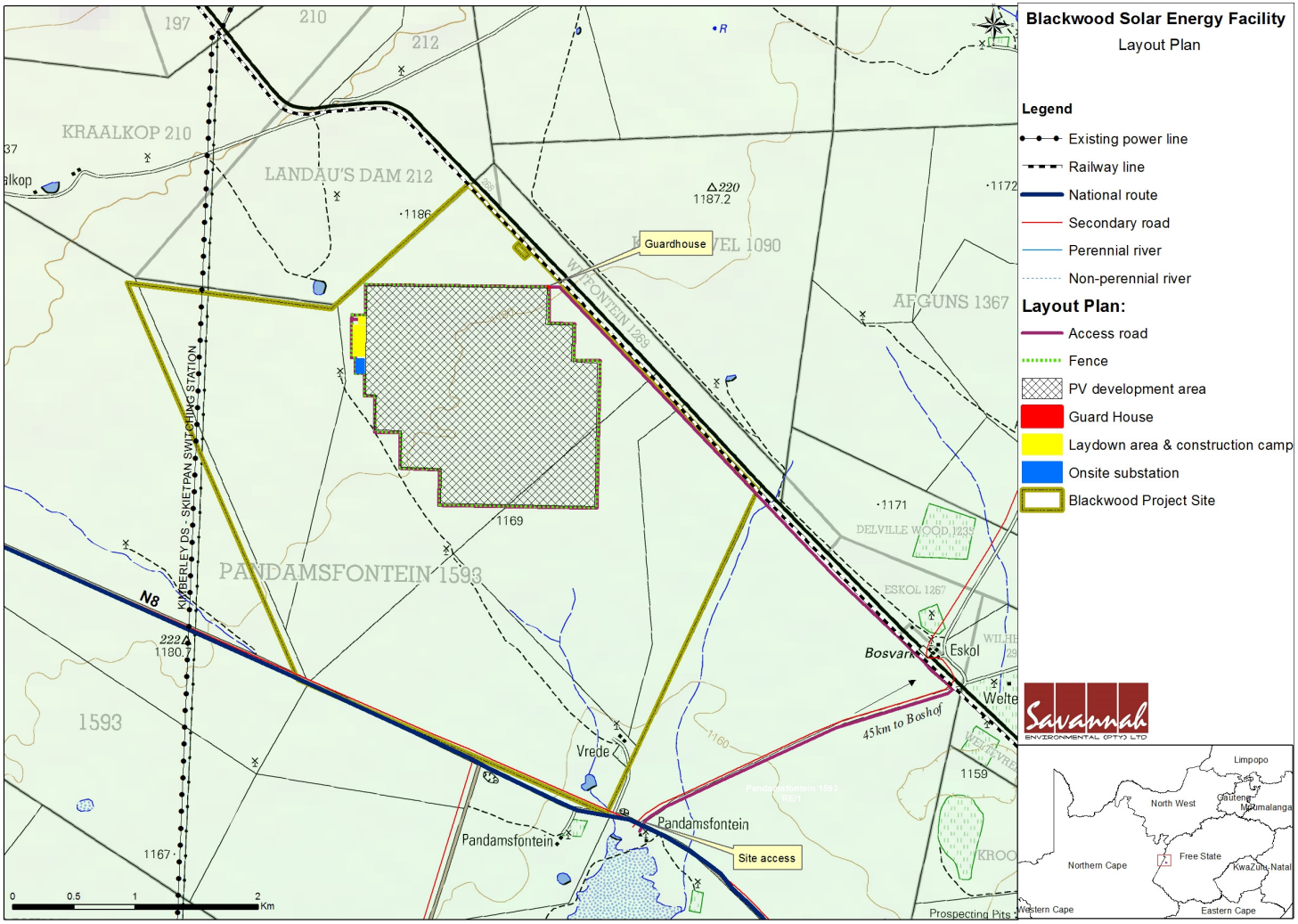

Figure 6.1: Layout map showing Blackwood Solar Energy Facility and associated infrastructure on the remainder of Portion 1 of the Farm Pandamsfontein 1593

» *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately within this chapter.

Conclusions from the Scoping Phase

The full extent of the project development site (i.e. remainder of Portion 1 of the Farm Pandamsfontein 1593) was evaluated within the scoping phase of the EIA process. The purpose of this was to provide an indication of any potentially high sensitivity or no-go areas from an environmental perspective, thereby informing the location of the development footprint. The following sensitive environmental features were identified (shown in **Figure 6.2**):

» **Ecologically sensitive areas on the site -** As depicted in Figure 1.2, areas assumed to have higher sensitivity are depressions and wetlands such as larger drainage lines, dams and pans. Areas with deeper sandy soils are expected to have a higher density of tree species and were mapped within the farm portion. Furthermore, potentially sensitive areas included those that are expected to be prone to bare patch formation (indicated by distinct banded patterning of vegetation) and more rocky areas with assumed higher species diversity. Depending on their location within the general landscape, these could have a rating of medium-low sensitivity.
» **Drainage within the site -** Smaller ephemeral drainage lines were visible from available Google-earth imagery within the farm portion. Most of these drain into larger salt pans just south of the farm, indicating that the drainage lines carry only small amounts of very localised, short-lived surface floods during the rainfall season. Higher volumes of water may move into the pans from below-ground seepage off surrounding plains, especially where soils may be shallow.
» **Visual / Social Receptors:** Preliminary viewshed analyses showed that the proposed facility would have a fairly contained area of potential visibility (i.e. within a 3.5km radius of the site), especially to the south-east of the site. This area of exposure is generally restricted to vacant natural land, but may contain some potentially sensitive visual receptors such as dwellings and travellers on both the N8 and the railway line.
» **Agricultural Potential:** From an agricultural impact point of view, no sensitive areas that should be avoided (other than a 2 hectare cultivated area within the farm boundary) were identified during scoping. Agricultural potential is fairly uniform across the site and there are therefore no preferred locations for the development within the site.

These areas of potential environmental sensitivity identified in the scoping phase relate mostly to the ecological aspects of the site and are illustrated in the preliminary sensitivity map (refer to **Figure 6.2**). It was recommended that infrastructure should be placed so as to consider the identified sensitive areas to minimise impacts. Subsequently, the sensitive environmental features that were identified during the scoping phase have been refined through the detailed EIA studies and have been taken into consideration through the layout design of the solar energy facility by the developer. The proposed layout of infrastructure is discussed further in Chapter 2.

From the conclusions of the Scoping Phase of the EIA, the potentially significant issues identified as being related to the **construction** of the Blackwood Solar Energy Facility include, *inter alia*:

» Loss of or disturbance to protected flora and fauna (including avifauna) and associated habitats (local and site specific).
» Loss of soil and impacts on agricultural potential.
» Soil erosion during construction activities.
» Socio-economic impacts, both positive and negative (including job creation and business opportunities, impacts associated with construction workers in the area).

The potentially significant issues related to the **operation** of the Blackwood Solar Energy Facility include, *inter alia*:

» Visual impacts and impacts on "sense of place" on nearby residential areas and observers travelling on main roads and rail.
» Positive socio-economic impacts.
» Generation of clean, renewable energy (positive).

The potentially significant issues related to the decommissioning of the Blackwood Solar Energy Facility will include, inter alia:

» Loss of or disturbance to protected flora and fauna and associated habitats (local and site specific).
» Soil erosion during decommissioning activities.
» Socio-economic impacts, both positive and negative (including job creation, nuisance).

These issues are assessed within this EIA Report in line with the Plan of Study for EIA approved by the DEA though their acceptance of the Scoping Report.

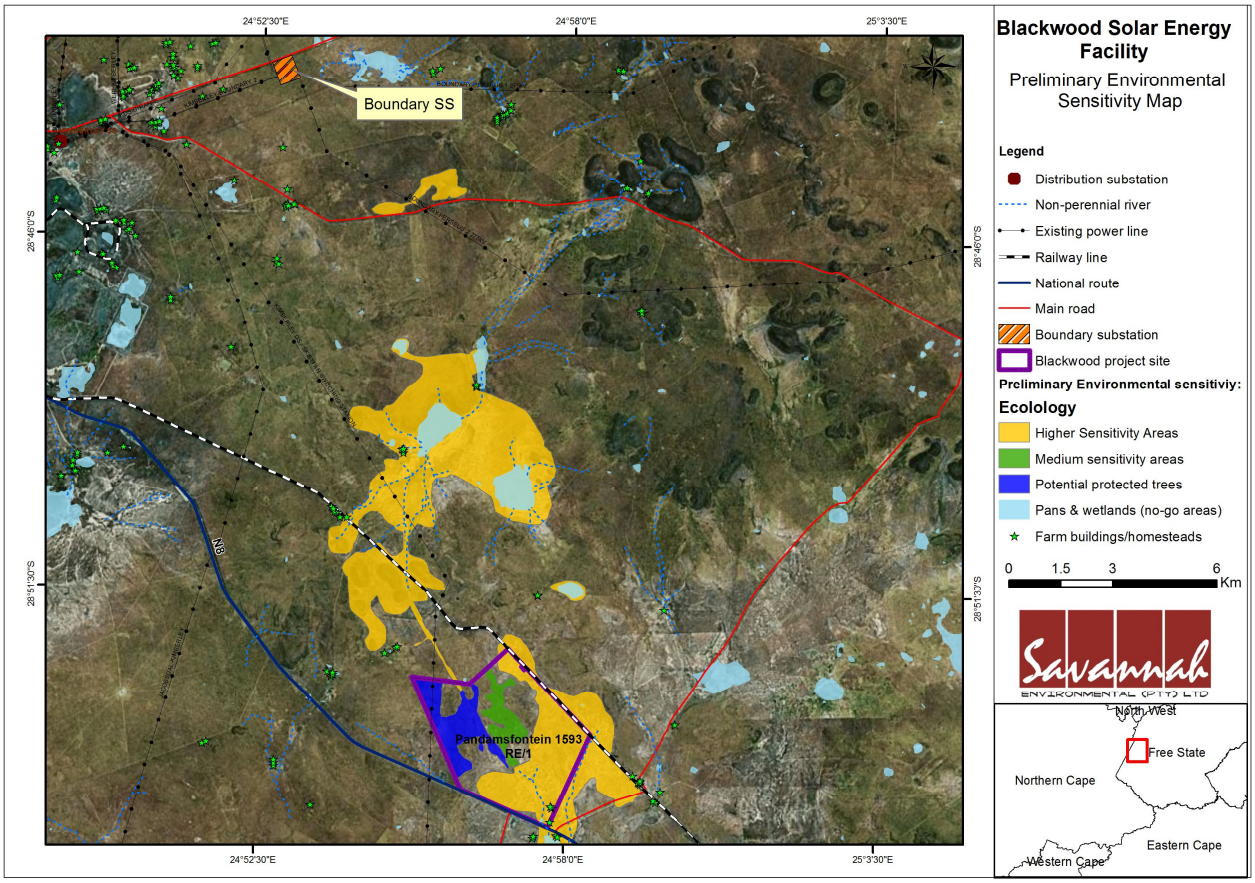

Figure 6.2: Desktop Environmental Sensitivity Map for the proposed Blackwood Solar Energy Facility site illustrating areas of higher sensitivity at the scoping phase level

6.1. Alternatives Assessment

Technology Alternatives

Impacts on the environment associated with the project will be influenced by the type of PV panel array to be used. The PV technologies being considered for the proposed project is fixed or single axis tracking. As the panels will not differ in height with the two technologies under consideration, the most important differences in impact between the technologies relate to the ecological environment (Tsoutsos *et al*. 2005, Turney and Fthenakis 2011, Strohbach 2012) and are summarised in the table below:

Each of the impacts assessed below provides a comparative assessment of the two technology alternatives.

6.2. Methodology for the Assessment of Potentially Significant Impacts

The sections which follow provide a summary of the findings of the assessment of potential impacts associated with the construction and operation of the proposed identified site remainder of Portion 1 of the Farm Pandamsfontein 1593 (covering an area of 1468 ha in extent). The assessment of potential issues presented in this chapter includes key input from specialist consultants, the public and the project developer. Issues were assessed in terms of the criteria detailed in Chapter 4 (section 4.3.3). 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/enhancement and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted. Cumulative impacts are assessed in further detail in Chapter 7.

6.2.1 Potential Impacts on Ecology

The study area is situated in the Savanna Biome, Eastern Kalahari Bushveld. The vegetation unit covering the study area is Kimberley Thornveld (SVk 4). The majority of Kimberley Thornveld (SVk 4) landscapes consist of flat to slightly undulating plains with some smaller outcrops and occasional surface intrusions of dolerites and andesitic lavas. The Kimberley Thornveld vegetation is considered least threatened. A target of 16% has been earmarked for conservation, of which 2% are already protected in the Vaalbos National Park, Sandveld, Bloemhof Dam, and S.A. Lombard Nature Reserves. Eighteen percent of the vegetation unit is already transformed, mostly to cultivated lands and urban areas. No clear drainage lines are present within the farm portion where the PV array is proposed, but there are larger valley floor areas on the southern edge of the farm, where moisture will accumulate during rainfall seasons. Seepage from these valley floors drains into larger salt pans just south of the farm.

During a detailed vegetation survey of the study area, four vegetation associations were identified, namely:

- Association 1: *Acacia tortilis – Eragrostis trichophora* sparse woodlands
  - Sensitivity High
  - Avoid areas for developments that would completely TRANSFORM the landscape, avoid larger trees within power line servitudes
- Association 2: *Pentzia lanata – Eriocephalus karroicus* dwarf shrublands
  - Sensitivity Low
- Association 3: *Pentzia lanata – Tragus koelerioides* grass plains
  - NO-GO Area
  - No expansion of road network through these areas
- Association 4: *Zygophyllum incrustatum – Pentzia lanata* bands
  - Sensitivity Medium-Low

Ecological sensitivity has been found to be mainly influenced by vegetation and soil surface criteria, not by the type of terrestrial fauna present. However, the presence of terrestrial fauna is influenced by the state of the vegetation. Of the vegetation associations within the study area, not all are suitable for the proposed development. This is mainly due to either ecosystem functionality of species present, nature of the system or the presence of unique and sensitive species. Figure 6.3 presents the sensitivity of vegetation on the site.

Solar energy facilities require relatively large areas of land for placement of infrastructure. The proposed Blackwood Solar Energy Facility and associated infrastructure requires ~300ha for the establishment of the proposed panels and associated infrastructure. The main expected negative impact from an ecological perspective will be due to loss of vegetation, loss of species of conservation concern, and loss of habitat which may have direct or indirect impacts on individual species. Potential impacts and the relative significance of the impacts are summarised in the tables which follow (refer to **Appendix E - Ecology Report** for more details).

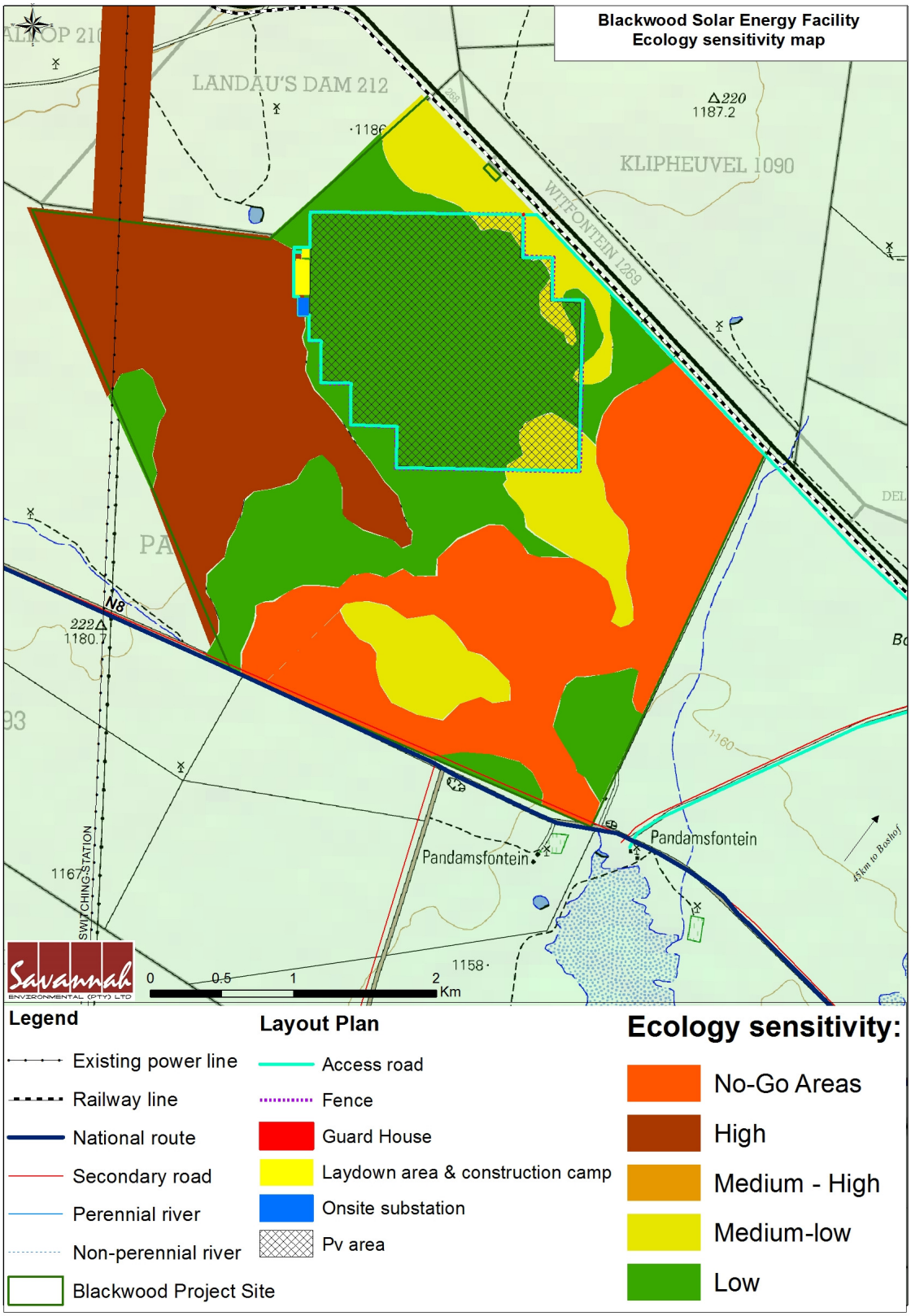

Figure 6.3: Sensitivity map indicating sensitive ecological areas within the proposed Blackwood Solar Energy Facility

a) Summary of impacts associated with the proposed solar energy facility

Nature: Loss of vegetation, increase in runoff and erosion, possible distribution and increased establishment of alien invasive species, possible disturbance and reduction of habitat or injury to burrowing vertebrates, possible change of natural runoff and drainage patterns, possible loss of protected species, possible permanent loss of revegetation potential of soil surface, increase in dust levels

Activity: Upgrading and/or creation of site access and internal maintenance roads

Environmental Aspect: Removal of vegetation, movement, compaction and disturbance of topsoil and subsoils, creation of runoff zone, destruction of animal burrows, possible traversing of drainage areas, impact on protected species, alteration of soil surface properties, possible introduction of pollutants and regenerative material of undesirable species.

Note: relatively large access roads already exist to the land portion

Listed activities:
GN **544** activity **11**(iii) (x) (xi), **18**(i) & **22** (ii);
GN **545** activity **15**;
GN **546** activity **14**(i).

	Without mitigation	**With mitigation**
Extent (E)	Local (2)	Local (1)
Duration (D)	Long-term (4)	Long-term (4)
Magnitude (M)	Low (4)	Minor (2)
Probability (P)	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (35)**
Status	Negative	Negative Notes: reduced impact on existing roads and tracks
Reversibility	Not reversible	Relatively reversible
Irreplaceable loss of resources?	Probable	Not likely
Can impacts be mitigated?	Reasonably well	

Mitigation:

» No new access roads must be permitted in *Acacia tortilis – Eragrostis trichophora* sparse woodland or *Pentzia lanata – Tragus koelerioides* grass plains
  - Use existing tracks where movement across such vegetation is necessary

» Keep main access route as planned along existing gravel road next to the railway line, with only small sections on natural veld, where existing track routes should be followed where feasible

» After the final layout has been approved, conduct a thorough footprint investigation to detect any protected plant species and animal burrows
  - Map (by GPS) as far as possible *larger* concentrations of large trees and protected species that could be avoided or must be relocated
  - Protected plant species: must be relocated
  - Animal burrows: must be monitored by EO/ECO prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor

- During construction: create designated turning areas and strictly prohibit any off-road driving or parking of vehicles and machinery outside designated areas
- Keep the clearing of natural veld to a minimum
    - All cleared shrubs and trees must be shredded and used as mulch
    - Wood may not be sold as firewood and removed from the farm
- Dust levels must be controlled and minimised
- If filling material is to be used, this should be sourced from areas free of invasive species
    - The project company will have to determine as soon as possible if borrow pits will be needed for construction, and the location of these.
- Topsoil (the upper 25 cm of soil) is an important natural resource; where it must (and can) be stripped, never mix it with subsoil or any other material, store and protect it separately until it can be re-applied, minimise handling of topsoil
- Reinforce portions of existing access routes that are prone to erosion, create structures or low banks to drain the access road rapidly during rainfall events, yet preventing erosion of the track and surrounding areas
- Ensure that runoff from compacted or sealed surfaces is slowed down and dispersed sufficiently to prevent accelerated erosion from being initiated (erosion management plan required)
- Prevent leakage of oil or other chemicals or any other form of pollution, as this may infiltrate local groundwater reserves
- Monitor the establishment of (alien) invasive species and remove as soon as detected, whenever possible before flowers or other regenerative material can be produced
- After decommissioning, if access roads or portions thereof will not be of further use to the landowner, remove all foreign material and rip area to facilitate the establishment of vegetation, followed by a suitable revegetation program

Cumulative impacts:

- Possible erosion of areas lower than the access road, possible contamination of groundwater reserves due to oil or other spillage
- Possible spread and establishment of alien invasive species
- Increased transformed areas (together with surrounding developments) that will affect local fauna and flora population dynamics and runoff patterns

Residual impacts:

- Localised loss of vegetation, some loss of large indigenous trees
- Altered topsoil conditions
- Potential barren areas remaining after decommissioning
- Potential for erosion and invasion by weeds or alien species
- Potential for increased dust and its impact on surrounding environments and biodiversity

Nature: Loss of vegetation and specifically protected or red data species, window of opportunity for the establishment of alien invasive species, altered topsoil characteristics prone to capping and sheet erosion, increased runoff and storm water volumes, temporary disturbance of burrowing fauna, possible reduction of habitat and forage availability to terrestrial vertebrates and livestock

Activity: Fencing area – may also serve as fire-break and assumed to run alongside maintenance track.

Environmental Aspect: Removal of vegetation, compaction of soils, creation of runoff zone, impact on protected species, impact on terrestrial vertebrates by restricting movement

Listed activities:
GN **544** activity **11**(iii) (x) (xi) & **18**(i)
GN **546** activity **14**(i).

	Without mitigation	**With mitigation**
Extent (E)	Local (2)	Local (1)
Duration (D)	Long-term (4)	Long term (4)
Magnitude (M)	Low (4)	Minor (1)
Probability (P)	Definite (5)	Highly Probable (4)
Significance	**Medium (50)**	**Low (24)**
Status	Negative	Negative
Reversibility	Partially reversible	Reversible
Irreplaceable loss of resources?	Probable	Not likely
Can impacts be mitigated?	Reasonably well	

Mitigation:

» Minimal fencing must be permitted in *Acacia tortilis – Eragrostis trichophora* sparse woodland, no fences allowed in *Pentzia lanata – Tragus koelerioides* grass plains
» Limit cutting of large trees where possible
» After the final layout has been approved, conduct a thorough footprint investigation to detect any protected plant species and animal burrows
  - Map (by GPS) as far as possible *larger* concentrations of protected species that could be avoided or must be relocated
  - Protected plant species: must be relocated
  - Animal burrows: must be monitored by EO/ECO prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor
» During the design phase, the possible impact of burrowing vertebrates and rodents on the development must be determined, and fencing must be designed to either exclude such fauna if it will be detrimental or enable occasional migration of smaller vertebrates onto and across the site (which could be beneficial to small vertebrate populations)
» Minimise area affected, especially during construction
» During construction: strictly prohibit any off-road driving or parking of vehicles and machinery outside the footprint areas
» Prevent leakage of oil or other chemicals, strictly prohibit littering of any kind
» Monitor the establishment of (alien) invasive species and remove as soon as detected, whenever possible before flowers or other regenerative material can be produced

» If the area will be used as fire-break as well, maintain a suitably low grass layer by regular mowing or appropriate plant species selection, but do not leave soil bare. Alternatively, ensure that the soil has a covering of gravel or small rock that prevents erosion.
Cumulative impacts: » Possible erosion of cleared areas and associated accelerated erosion from surrounding areas » Possible new accumulation area for wind-blown seeds of alien invasive herbaceous species, causing more invasions if mitigation measures are not implemented » Possible loss of ecosystem functioning due to increase in invasive species » Increased habitat fragmentation and displacement of terrestrial vertebrates in the region
Residual impacts: » Altered vegetation composition » Compacted topsoils » Possibility for erosion and invasion by alien invasives

Nature: Loss of vegetation and/or species of conservation concern, loss of and alteration of many niche microhabitats, altered vegetation cover, site-specific altered distribution of rainfall and resultant runoff patterns, increase in runoff from PV panels and/or bare areas and accelerated erosion, loss of habitat and resource availability for terrestrial fauna, possible increase of storm water and dust effects during periods of extreme weather events, e.g. increased erosion or dust due to lower buffering capacity of sparser vegetation

Activity: Construction and operation of PV panels on natural vegetation (tracking panel option)

Environmental Aspect: Removal of or excessive damage to vegetation, compaction of soils, alteration of soil surface and microhabitats, creation of runoff zone, redistribution and concentration of runoff from panel surfaces, artificial shading of vegetation, displacement of terrestrial vertebrates, reduced buffering capacities of the landscapes during extreme weather events

Listed activity:
GN **544** activity **11**(iii) (x) (xi), & **18**(i)
GN **545** activity **1** & **15**;
GN **546** activity **14**(i).

	Without mitigation	**With mitigation**
Extent (E)	Local (4)	Local (2)
Duration (D)	Long-term (4)	Long-term (4)
Magnitude (M)	High (8)	High (7)
Probability (P)	Definite (5)	Definite (5)
Significance	**High (80)**	**High (65)**
Status	Negative	Negative
Reversibility	Low reversibility	Partially reversible
Irreplaceable loss of resources?	Highly Probable	Moderate Probability
Can impacts be	Reasonably but with limited	

mitigated?	full restoration potential	

Mitigation:

» No PV arrays should be permitted in *Acacia tortilis – Eragrostis trichophora* sparse woodland or *Pentzia lanata – Tragus koelerioides* grass plains
» Conduct a thorough footprint investigation after the final layout has been approved, to determine the full extent of protected fauna and flora that will be affected and compile a suitable photo record that can be used by ECO/construction staff to identify the relevant species and take the following actions:
  - Protected plant species: must be relocated
  - Animal burrows: must be monitored by EO/ECO prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor
» Keep areas affected to a minimum, strictly prohibit any disturbance outside the demarcated footprint area
» Clear as little vegetation as possible, aim to maintain vegetation where it will not interfere with the construction or operation of the development
  - Shred all trees and shrubs cleared and use the chips as mulch for dust and erosion control
  - This material may not be used as firewood
» After construction, rehabilitate an acceptable vegetation layer according to rehabilitation recommendations of the relevant EMP
  - Use only species that were part of the original indigenous species composition as listed in the specialist report, aim to obtain at least the original cover percentages of desirable species
  - It is expected that where topsoils were not excessively disturbed, revegetation should occur naturally
  - The higher level of shading anticipated from the PV panels may prevent or slow the re-establishment of desirable species, thus re-establishment must be monitored and species composition adapted with indigenous species if a desirable vegetation cover fails to establish within 24 months after construction.
  - Should an excessive re-establishment of grasses pose a fire risk to the PV array, such grasses must be controlled by regular mowing, NOT by application of herbicides
» Remove all invasive vegetation, completely uproot potentially resprouting high shrubs, e.g. *Rhigozum trichotomum, Lycium* and *Asparagus* species
» Continuously monitor (monthly during construction) the establishment of new invasive species and remove as soon as detected, whenever possible before regenerative material can be formed, up to decommissioning
» If filling material is to be used, this should be sourced from areas free of invasive species
» Topsoil (the upper 25 cm of soil) is an important natural resource; where it must and can be stripped, never mix it with subsoil or any other material, store and protect it separately until it can be re-applied, minimise handling of topsoil
» Temporarily stored topsoil must be re-applied within 6 months, topsoils stored for longer need to be managed according to a detailed topsoil management plan
» Monitor the area below the PV panels regularly after larger rainfall events to determine where erosion may be initiated and then mitigate by modifying the soil micro topography and revegetation efforts accordingly
» Prevent leakage of oil or other chemicals, strictly prohibit littering of any kind

Cumulative impacts:

» If mitigation measures are not strictly implemented the following could occur:
  - Considerable loss of biodiversity and keystone trees
  - Erosion of areas around the panels and continued erosion of the development area
  - Spread and establishment of invasive species

» Increased habitat fragmentation and displacement of terrestrial vertebrates in the region

» Increased transformed areas (together with surrounding developments) that will affect local fauna and flora population dynamics and runoff patterns that may affect lower-lying ecosystems

Residual impacts:

» Altered topsoil characteristics

» Loss of and alteration of microhabitats

» Altered vegetation composition, small loss of large trees, lower vegetative cover and possible loss of species diversity

» Increased habitat fragmentation and displacement of terrestrial vertebrates

» Higher risk of invasion by alien plant species

Nature: Loss of vegetation and/or species of conservation concern, loss of and alteration of microhabitats, altered vegetation cover, altered distribution of rainfall and resultant runoff patterns as a result of presence of PV panels, increase in *concentrated* runoff from PV panels and higher volumes of storm water and accelerated erosion, reduction of habitat and resource availability for terrestrial fauna, possible increase of detrimental effects during periods of extreme weather events, e.g. increased erosion or dust due to lower buffering capacity of sparser vegetation.

Activity: Construction and operation of PV panels on natural vegetation (fixed panel option)

Environmental Aspect: Removal of or excessive damage to vegetation, alteration of soil surface and microhabitats, compaction of soils, creation of runoff zone, redistribution and concentration of runoff from panel surfaces, excessive shading of vegetation, displacement of terrestrial vertebrates, reduced buffering capacities of the landscapes during extreme weather events

Listed activity:
GN **544** activity **11**(iii) (x) (xi), & **18**(i)
GN **545** activity **1** &**15**;
GN **546** activity **14**(i).

	Without mitigation	**With mitigation**
Extent (E)	Local (4)	Local (2)
Duration (D)	Long-term (4)	Long-term (4)
Magnitude (M)	High (9)	High (8)
Probability (P)	Definite (5)	Definite (5)
Significance	**High (85)**	**High (70)**
Status	Negative	Negative
Reversibility	Low reversibility	Partially reversible

Irreplaceable loss of resources?	Highly Probable	Medium Probability
Can impacts be mitigated?	Reasonably but with limited full restoration potential	

Mitigation:

» No PV arrays should be permitted in *Acacia tortilis – Eragrostis trichophora* sparse woodland or *Pentzia lanata – Tragus koelerioides* grass plain
» Limit the destruction of large trees to the footprint of the development
» Conduct a thorough footprint investigation after the final layout has been approved, to determine the full extent of protected fauna and flora that will be affected and compile a suitable photo record that can be used by ECO/construction staff to identify the relevant species and take the following actions:
  - Protected plant species: must be relocated
  - Animal burrows: must be monitored by ECO prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor
» Keep areas affected to a minimum, and strictly prohibit any disturbance outside the demarcated footprint area
» Clear as little vegetation as possible, aim to maintain all indigenous vegetation where it will not interfere with the construction or operation of the development
  - Shred all trees and shrubs cleared and use the chips for dust and erosion control
» After construction, rehabilitate an acceptable vegetation layer according to rehabilitation recommendations of the relevant EMPr
  - Use only species that were part of the original indigenous species composition as listed in the specialist report, aim to obtain at least the original cover percentages of desirable species
  - Revegetation should occur naturally where topsoils were not severely altered
  - The higher level of shading anticipated from fixed panels may prevent or slow the re-establishment of desirable species, thus re-establishment must be monitored and species composition adapted if vegetation fails to establish sufficiently.
  - Alternatively, soil surfaces where no revegetation seems possible will have to be covered with gravel or small rock fragments to increase porosity of the soil surface, slow down runoff and prevent wind- and water erosion
  - Should an excessive re-establishment of grasses pose a fire risk to the PV array, such grasses must be controlled by regular mowing, NOT by application of herbicides
» Remove all invasive vegetation, completely uproot potentially resprouting high shrubs, e.g. *Rhigozum trichotomum, Lycium* and *Asparagus* species
» Continuously monitor (monthly during construction) the establishment of new invasive species and remove as soon as detected, whenever possible before regenerative material can be formed, up to decommissioning
» If filling material is to be used, this should be sourced from areas free of invasive species
» Topsoil (the upper 25 cm of soil) is an important natural resource; where it must and can be stripped, never mix it with subsoil or any other material, store and protect it separately until it can be re-applied, minimise handling of topsoil
» Temporarily stored topsoil must be re-applied within 6 months. Topsoils stored for

longer need to be managed according to a detailed topsoil management plan
» Monitor the area below and around the PV panels regularly after larger rainfall events to determine where erosion may be initiated and then mitigate if required by modifying the soil micro-topography and revegetation efforts accordingly
  - Due to the fixed nature and larger runoff surfaces of the PV panels, the development area should be adequately landscaped and rehabilitated to contain expected accelerated erosion
  - Runoff may have to be specifically channelled or storm water adequately controlled to prevent localised rill and gully erosion
» Prevent leakage of oil or other chemicals, strictly prohibit littering of any kind

Cumulative impacts:

» If mitigation measures are not strictly implemented the following could occur:
  - Considerable loss of biodiversity and keystone trees
  - Possible accelerated erosion of areas around the panels and continued erosion of the development area
  - possible spread and establishment of invasive species
» Increased habitat fragmentation and displacement of terrestrial vertebrates in the region
» Increased transformed areas (together with surrounding developments) that will affect local fauna and flora population dynamics and runoff patterns

Residual impacts:

» Altered topsoil characteristics
» Loss of and alteration of microhabitats
» Altered vegetation composition, small loss of large trees, lower vegetative cover and possible loss of species diversity
» Potential for increased dust and its impact on surrounding environments and biodiversity
» Higher risk of invasion by alien plant species

Nature: Loss of vegetation and/or species of conservation concern, loss of microhabitats, reduced vegetation cover, altered distribution of rainfall and resultant runoff patterns, increase in *concentrated* runoff from sealed surfaces and possibly higher accelerated erosion, reduction of habitat and resource availability for terrestrial fauna

Activity: Construction of PV-related buildings, workshops, offices, guardhouses and onsite substation, etc.

Environmental Aspect: Removal of vegetation, compaction and alteration of topsoils, creation of runoff zone, redistribution and concentration of runoff from new sealed surfaces, displacement of terrestrial vertebrates

Listed activities:
GN **544** activity **10** (i),**11**(iii) (x) (xi), **18**(i)
GN **545** activity **15**;
GN **546** activity **14**(i).

	Without mitigation	**With mitigation**
Extent (E)	Local (2)	Local (1)
Duration (D)	Long-term (4)	Long-term (4)

Magnitude (M)	Moderate (6)	Low (3)
Probability (P)	Definite (5)	Definite (5)
Significance	**Medium (60)**	**Medium (40)**
Status	Negative	Negative
Reversibility	Partially reversible	Reversible
Irreplaceable loss of resources?	Probable	Not likely
Can impacts be mitigated?	Reasonably	

Mitigation:

» No buildings or cleared hard surface areas should be permitted in *Acacia tortilis – Eragrostis trichophora* sparse woodland or *Pentzia lanata – Tragus koelerioides* grass plains
» Aim to minimise the destruction of indigenous large shrubs and trees
  - Shred all trees and shrubs cleared and use the chips for dust and erosion control
  - Not for firewood…
» Conduct a thorough footprint investigation after the final layout has been approved, to determine the full extent of protected fauna and flora that will be affected and compile a suitable photo record that can be used by ECO/construction staff to identify the relevant species and take the following actions:
  - Protected plant species: must be relocated
  - Animal burrows: must be monitored by ECO prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor
» Limit disturbance to footprint area as far as practically possible
» During construction: stay within demarcated footprint areas and strictly prohibit any off-road driving or parking of vehicles and machinery outside designated areas
» Prevent spillage of construction material and other pollutants, contain and treat any spillages immediately and dispose of contaminated material at suited sites
» Topsoil (the upper 25 cm of soil) is an important natural resource; where it must and can be stripped, never mix it with subsoil or any other material, store and protect it separately until it can be re-applied, minimise handling of topsoil
» Temporarily stored topsoil must be re-applied within 6 months, topsoils stored for longer need to be managed according to a detailed topsoil management plan
» Rehabilitate and revegetate all areas outside footprint area that have been disturbed as a result of construction activities
» After decommissioning remove all foreign material prior to starting the rehabilitation
» The rehabilitation plan for all temporarily affected areas and for the development area after decommissioning must aim to re-introduce all non-weed indigenous species listed in the specialist report as a minimum, taking the observed original cover percentages as a guideline of acceptable vegetation cover
» Monitor (monthly during construction) the establishment of invasive species and remove as soon as detected, whenever possible before regenerative material can be formed

Cumulative impacts:

» If mitigation measures are not strictly implemented the following could occur:
  - Erosion of areas around sealed surfaces and continued erosion of the development area
  - Contamination of ground water resources

○ Spread and establishment of invasive species » Increased habitat fragmentation and displacement of terrestrial vertebrates in the region » Increased transformed areas (together with surrounding developments) that will affect local fauna and flora population dynamics
Residual impacts: » Altered topsoil characteristics » Loss of microhabitats » Reduced vegetation cover and loss of species diversity » Potential for increased dust and its impact on surrounding environments and biodiversity

Nature: Loss of vegetation and/or species of conservation concern, alteration and loss of microhabitats, altered vegetation cover, altered distribution of rainfall and resultant runoff patterns, increase in *concentrated* runoff from sealed or compacted surfaces and possibly higher accelerated erosion, reduction of habitat and resource availability for terrestrial fauna, possible contaminated topsoil, possible contaminated ground water or wetlands, possible increased dust levels.

Activity: Temporary construction camps and sites where machinery is kept during construction

Environmental Aspect: Removal of vegetation, compaction of soils, creation of runoff zone, displacement of terrestrial vertebrates, possible contamination of topsoil and groundwater by chemicals or oils

Listed activities:
GN **544** activity **11**(iii) (x) (xi), **18**(i)
GN **545** activity **15**;
GN **546** activity **14**(i).

	Without mitigation	**With mitigation**
Extent (E)	Regional (5)	Local (1)
Duration (D)	Moderate-term (3)	Short-term (2)
Magnitude (M)	Moderate (6)	Low (3)
Probability (P)	Definite (5)	Definite (5)
Significance	**High (70)**	**Medium (30)**
Status	Negative	Negative
Reversibility	Partially reversible	Reversible
Irreplaceable loss of resources?	Probable	Not likely
Can impacts be mitigated?	Reasonably	

Mitigation:
» No temporary construction camps or other temporary storage activity allowed in *Acacia tortilis – Eragrostis trichophora* sparse woodland or *Pentzia lanata – Tragus koelerioides* grass plains
» Aim to minimise the destruction of indigenous large shrubs, *no* indigenous trees with a stem diameter over 15 cm may be removed for temporary construction camps

- Shred all trees and shrubs cleared and use the chips for dust and erosion control

» Conduct a thorough footprint investigation after the final layout has been approved, to determine the full extent of protected fauna and flora that will be affected and compile a suitable photo record that can be used by ECO/construction staff to identify the relevant species and take the following actions:
  - Protected plant species: must be relocated
  - Animal burrows: must be monitored by ECO prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor
» Place infrastructure as far as possible on sites that have been disturbed by past farming activities already
» Stay within demarcated temporary construction areas and strictly prohibit any off-road driving or parking of vehicles and machinery outside designated areas
» Prevent spillage of construction material and other pollutants, contain and treat any spillages immediately, strictly prohibit any pollution/littering according to the relevant EMPr
» No fires may be lit for cooking or any other purposes
» Facilities may not be used as staff accommodation
» No vehicles may be washed, serviced or repaired on the property
» Topsoil (the upper 25 cm of soil) is an important natural resource; where it must and can be stripped, never mix it with subsoil or any other material, store and protect it separately until it can be re-applied, minimise handling of topsoil
» Temporarily stored topsoil must be re-applied within 6 months. Topsoils stored for longer need to be managed according to a detailed topsoil management plan
» After construction remove all foreign material prior to starting the rehabilitation
» The rehabilitation plan for all temporarily affected areas must aim to re-introduce all non-weed indigenous species listed in the specialist report as a minimum, taking the observed original cover percentages as a guideline of acceptable vegetation cover
» Monitor the establishment of invasive species and remove as soon as detected, whenever possible before regenerative material can be formed

Cumulative impacts:

If mitigation measures are not strictly implemented the following could occur:

» Considerable loss of biodiversity and keystone trees
» Erosion of the development area
» Contamination of ground water
» Spread and establishment of invasive species
» Increased transformed areas (together with surrounding developments) that will affect local fauna and flora population dynamics and runoff patterns

Residual impacts:

» Altered topsoil characteristics
» Loss of and alteration of microhabitats
» Altered vegetation composition
» Higher risk of invasion by alien plant species
» Potential for increased dust and its impact on surrounding environments and biodiversity

Nature: Loss of vegetation and/or species of conservation concern, loss of microhabitats, altered vegetation cover, altered distribution of rainfall and resultant runoff patterns, possibly higher accelerated erosion, possible loss of topsoil resources, reduction of habitat and resource availability for terrestrial fauna, possible source of dust.

Activity: Borrow-pits and/or topsoil stockpiles and spoils that may be required during or after construction

Environmental Aspect: Removal of vegetation, compaction of soils, creation of runoff zone, displacement of terrestrial vertebrates

Listed activities:
GN **546** activity **14**(i).

	Without mitigation	**With mitigation**
Extent (E)	Local (2)	Local (1)
Duration (D)	Long-term (4)	Short-term (2)
Magnitude (M)	Moderate (6)	Low (4)
Probability (P)	Highly Probable (4)	Probable (3)
Significance	**Medium (48)**	**Low (21)**
Status	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Probable	Not likely
Can impacts be mitigated?	Reasonably	

Mitigation:

» No borrow pits or stockpiles will be allowed in *Acacia tortilis – Eragrostis trichophora* sparse woodland or *Pentzia lanata – Tragus koelerioides* grass plains
» After the final layout has been approved, conduct a thorough footprint investigation to detect and map (by GPS) any protected plant species and animal burrows
  - Protected plant species: must be relocated
  - Animal burrows: must be monitored by ECO prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor
» Aim to remain on previously transformed or disturbed areas
  - Shred all shrubs cleared and use the chips for dust and erosion control
» Stay within demarcated areas and access routes for extraction and/or movement of materials
» Strictly prohibit any off-road driving or parking of vehicles and machinery outside designated areas
» Prevent spillage of pollutants, contain and treat any spillages immediately, strictly prohibit any pollution
» Topsoil (the upper 25 cm of soil) is an important natural resource; where it must and can be stripped, never mix it with subsoil or any other material, store and protect it separately until it can be re-applied, minimise handling of topsoil, manage stored topsoil according to a dedicated topsoil management plan
» Temporarily stored topsoil must be re-applied within 6 months, topsoils stored for longer need to be managed according to a detailed topsoil management plan

» Monitor erosion of areas and control where necessary » After construction remove all foreign material and spoil material not required for rehabilitation purposes prior to starting the rehabilitation » Fill up borrow pits that may be created first with overburden or subsoils, covered with topsoils, following a detailed rehabilitation plan. Where insufficient material is available for this purpose, appropriately contour the borrow pit and implement appropriate mitigation measures to prevent erosion. » The rehabilitation plan for all temporarily affected areas must aim to re-introduce indigenous species, taking the observed original cover percentages as a guideline of acceptable vegetation cover » Monitor the establishment of invasive species and remove as soon as detected, whenever possible before regenerative material can be formed
Cumulative impacts: » If mitigation measures are not strictly followed the following could occur: o Continued erosion of the altered surfaces with associated degradation of the site and surrounding areas o Spread and establishment of invasive species » Increased habitat fragmentation and displacement of terrestrial vertebrates in the region » Increased transformed areas (together with surrounding developments) that will affect local fauna and flora population dynamics and runoff patterns
Residual impacts: » Altered topsoil characteristics » Loss of and alteration of microhabitats » Altered vegetation composition, lower vegetative cover and loss of species diversity » Potential for increased dust and its impact on surrounding environments and biodiversity » Higher risk of invasion by alien plant species

Nature: Loss of vegetation, increase in runoff and erosion, disturbance or possible mortality incidents of terrestrial fauna, possible contamination of soil and groundwater by oil- or fuel spillages, possible establishment and spread of undesirable weeds and alien invasive species that could further damage ecosystem functionality.

Activity: Transport of materials to site, movement of vehicles on site during construction and maintenance

Environmental Aspect: Compaction of soils, possible contamination by oils or fuels, possible introduction and spread of weeds and alien invasives, temporary disturbance of terrestrial fauna

Listed activities: None

	Without mitigation	**With mitigation**
Extent (E)	Regional (4)	Local (1)
Duration (D)	Long-term (4)	Long-term (4)
Magnitude (M)	Low (4)	Small (0)
Probability (P)	Definite (5)	Highly Probable (4)
Significance	**Medium (60)**	**Low (20)**

Status	Negative	Neutral
Reversibility	Partially reversible	Reversible
Irreplaceable loss of resources?	Probable	Not likely
Can impacts be mitigated?	Reasonably	

Mitigation:

» No transport or construction should be permitted in *Acacia tortilis – Eragrostis trichophora* sparse woodland, none allowed on *Pentzia lanata – Tragus koelerioides* grass plains
» Strictly restrict all movement of vehicles and heavy machinery to permissible areas, these being designated access roads, maintenance roads, turning points and parking areas. No off-road driving beyond designated areas may be allowed
» Parking areas should be regularly inspected during the construction phase for oil spills and covered with an impermeable or absorbent layer (with the necessary storm water control) if oil and fuel spillages are highly likely to occur
» Wheels of large machinery should be checked prior to entering the site and cleared of seed material of alien invasive plants if transport routes go through infested areas (especially of species with spiny or bur-like seeds). Such seed must be destroyed.
» Strict speed limits must be set and adhered to
  - Animals accidentally injured by moving vehicles or machinery must be taken to a local veterinarian to be treated or put down in a humane manner
» Dust levels must be controlled and minimised through the implementation of appropriate measures
» Driving on site between dusk and dawn is only permissible during emergency situations, and not for general construction
» Prevent spillage of any fuels, oils or other chemicals, strictly prohibit other pollution
» Monitor the establishment of invasive species and remove as soon as detected, whenever possible before regenerative material can be formed, destroy all material to prevent re-establishment

Cumulative impacts:

» Possible pollution of surrounding areas if no mitigation is implemented
» Possible spread of alien invasive species beyond the site if no mitigation is implemented
» Possible increased road collisions and road kill of fauna

Residual impacts:

» Related to access roads and internal maintenance tracks

Potential impact of decommissioning a PV plant on vegetation and soil

Nature: localised increase in runoff and accelerated erosion, possible release of toxic substances and/or heavy metals and associated contamination of soil and groundwater, possible contamination and damage to terrestrial fauna by broken glass

Activity: PV array *components* and their continued maintenance and eventual decommissioning: regular washing and possible breakage of panels

Environmental Aspect: altered runoff and associated vegetation and erosion patterns, contamination of the environment by possible toxic substances and glass		
Listed activities: GN **544** activity **11**(iii) (x) (xi), **18**(i) & **22** (ii); GN **545** activity **15**; GN **546** activity **14**(i).		
	Without mitigation	**With mitigation**
Extent (E)	Regional (4)	Local (1)
Duration (D)	Long-term (4)	Long-term (4)
Magnitude (M)	Low (4)	Small (0)
Probability (P)	Definite (5)	Probable (3)
Significance	**Medium (60)**	**Low (15)**
Status	Negative	Neutral
Reversibility	Partially reversible	Reversible
Irreplaceable loss of resources?	Probable	Not likely
Can impacts be mitigated?	Reasonably	
Mitigation: » Where panels need to be washed, no polluting chemicals may be used, and the use of water should be minimal as well » Where water is used for washing, monitor areas around the PV arrays for signs of accelerated erosion and establishment of weeds or alien invasive species and manage according to the erosion- and invasive species management plan » Prior to construction and up to decommissioning, clear instructions must be drafted and at all times be available on site on how any breakages or burning of PV panels will be dealt with, including: o A list of possible toxic substances, heavy metals or other potentially harmful substances that could be released during breakage or burning o How to contain and mitigate the release of such substances o Correct salvage, disposal and preferably also recycling methods (or possibilities) for any broken materials		
Cumulative impacts: » Possible pollution of surrounding areas if no mitigation is implemented » Possible increase in and spread of alien invasive species beyond the site if no mitigation is implemented		
Residual impacts: » None expected if mitigation measures are implemented		

b) Comparative Assessment of PV Panel technology (Fixed vs Tracking):

The table below provides a comparison of the potential ecological impacts associated with the two technologies under investigation.

Table 6.1: Fixed panel technology vs tracking panel (single axis)

Aspect influenced	Fixed panel	Tracking panel (single axis)
Size of land needed	approx. 2ha per MW	approx. 3ha per MW
Foundation	Easier deployment of rammed of screw anchor foundations having to withstand less forces	Stronger foundations required due to structural design, sometimes leading to increased use of concrete
Shading and associated change of vegetation	More continuous and intense shading. Less stable and dense vegetation expected; reduced buffering capacity of extreme weather events by vegetation expected.	More variable and less intense overall shading. More stable and denser vegetation cover expected; smaller reduction of buffering capacity of extreme weather events expected.
Effect on runoff and accelerated erosion	Larger continuous panel area, more concentrated runoff, constant runoff edges potentially create more erosion, especially where vegetation is weakened.	Smaller continuous panel areas, runoff more dissipated, moderate variation of runoff edges that are expected to create less erosion where vegetation is weakened.
Mounting height of panel	PV panels may be as low as 30 cm above ground to reduce total height, increasing the limits of permissible vegetation due to maintenance and fire risks.	Expected to be more than 1 m off the ground, increasing the possibility of low vegetation establishment and small fauna movement without compromising safety.
Height of top of panel	3.5m	3.5 -4m

Single axis tracking PV technology is ecologically the preferred alternative. Considering the aridity of the area and the difficulty of new vegetation establishment, the impact of tracking systems appears to be lower than that of a fixed panel array, even if the latter may occupy less space because the vegetation below the panels will receive more sunlight with the tracking technology option. This effect will become especially pronounced after decommissioning, when it is expected that seedbanks under a fixed panel system will have vanished as there will be little new inputs of seeds and old seeds will die over time. Topsoil quality most likely will have deteriorated to such an extent due the low cover of vegetation that re-establishment of vegetation will be very difficult, as most of the microbiota on which many of these species depend for survival will no longer be present in the soil. The difference in the potential impacts on ecology associated with the two technology alternatives. Therefore, **tracking PV technology** is nominated as the preferred alternative (refer to Table 6.1)

c) Implications for Project Implementation

» By excluding sensitive vegetation from the development, the overall impact can be significantly reduced and agricultural potential, which is restricted to livestock and game in the area, maintained.
» By excluding all vegetation around natural drainage lines and maintaining a 50 m buffer around them, important ecosystem services of these areas can be maintained.
» The impact on fauna is expected to be low for the development.

6.2.2 Potential Impacts on Avifauna

a) Summary of avifaunal impacts associated with the proposed solar energy facility

Considering the preliminary layout proposed for the Blackwood Solar Energy Facility development (refer to Figure 6.4) together with the associated available bird and habitat data, no highly sensitive species or processes (e.g. raptor breeding sites) are expected to be severely impacted by the proposed development. Consequently no 'no-go' areas were identified within the Project Development Area (PDA). However, taking into consideration some of the sensitive habitats close to the PDA and the likely impact they may have on some development aspects related to the PDA, it is suggested that 'buffer areas' be considered.

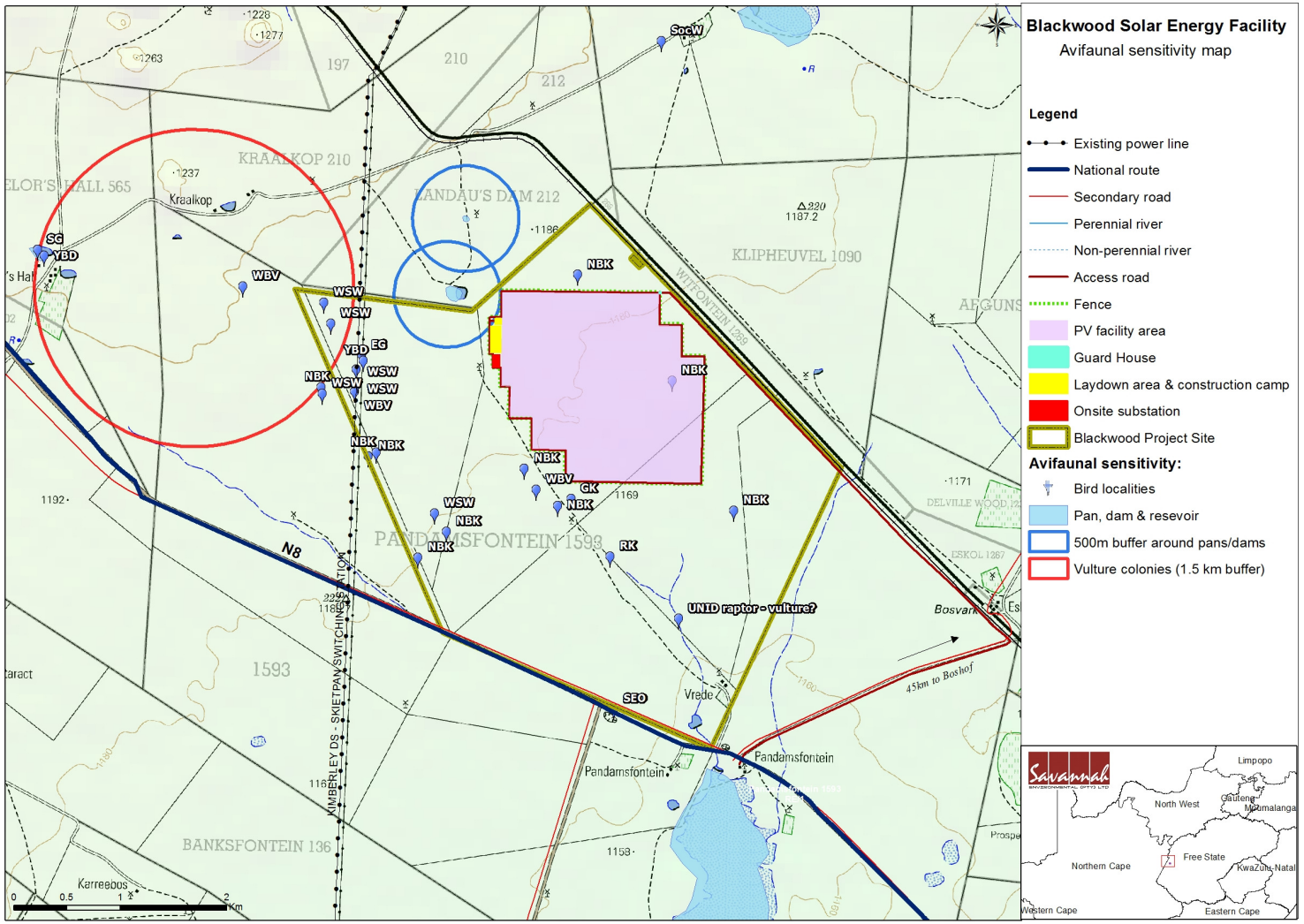

Figure 6.4: Avifaunal sensitive areas (i.e. 1.5 km buffer around vulture colonies and 500m buffer around dams & pans) within the proposed Blackwood Solar Energy Facility

Construction impacts

Nature: **Habitat loss** as a result of construction activities		
Listed activities: GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).		
	Without mitigation	**With mitigation**
Extent:	Local (2)	Local (1)
Duration	Very short (1)	Very short (1)
Magnitude	Moderate (4)	Moderate (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Low (28)**	**Low (24)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation » Restrict the construction footprint to a minimum, including keeping access roads to a minimum		
Cumulative impacts Although the magnitude of the impact is moderate-low, and taking into account the possibility of the construction of other similar facilities around the area and associated power lines there is likely to be the loss of additional habitat from the area in general. This could therefore have further impacts on the occurrence of avifauna in the area.		
Residual impacts No residual impacts are envisaged.		

Nature: **Disturbance** to bird communities as a result of **construction activities**		
Listed activities: GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).		
	Without mitigation	**With mitigation**
Extent:	Local (3)	Local (2)
Duration	Very short (1)	Very short (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (28)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation

» Reducing and maintaining noise disturbance to a minimum particularly with regards to any drilling for foundations. Drilling should, wherever possible, be limited to periods outside of the breeding seasons of the resident avifaunal community and in particular for priority species.

» Excluding development or disturbance from sensitive areas. Although no sensitive areas or species occur on site, disturbance should, where possible, be limited during the breeding period (July - October) of the nearby Kraalkop White-backed Vulture breeding colony. This should take precedence over the breeding seasons of the on-site resident breeding avifauna, i.e. from Oct/Nov – Feb/Mar.

Cumulative impacts

Although the magnitude of the impact is moderate-low, and taking into account the possibility of the construction of other similar facilities around the area and associated power lines there is likely to be the loss of additional habitat from the area in general. This would therefore have further impacts on the occurrence of avifauna in the area.

Residual impacts

No residual impacts are envisaged.

Operational impacts

Nature: **Disturbance and displacement** as a result of **operational activities**. There will be little maintenance activity on the site during operation.

Listed activities:

GN **544** activity **10**(i), **22** (ii)
GN **545** activity **1** & **15**;
GN **546** activity **14**(i).

	Without mitigation	**With mitigation**
Extent:	Site (1)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Probable (3)
Significance	**Low (21)**	**Low (15)**
Status	Negative	Neutral
Reversibility	Low	Low
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation

» Minimizing the disturbance associated with the operation of the facility (e.g. vehicular traffic), by scheduling maintenance activities to avoid and/or reduce disturbance in sensitive areas at sensitive times (e.g. White-backed Vulture breeding season(July - October)

» Following the construction phase the extent of access roads within the facility should be kept to a minimum.

Cumulative impacts

No major cumulative impacts are envisaged.

Residual impacts

No residual impacts are envisaged.

b) Comparative Assessment of PV Panel technology (Fixed vs Tracking):

The two alternative PV technologies do not differ in any significant way as far as avifaunal habitat which they will affect, or the interaction between birds and the infrastructure is concerned. In terms of impacts arising from disturbance and displacement as a result of construction activities, there is **no significance difference** in the potential impacts associated with the two technology alternatives. Therefore, there is no preference between the alternative technologies.

c) Implications for Project Implementation

» A buffer of 1.5 km is suggested around the *Kraalkop White-backed Vulture colony* so that any impacts/activities do not impinge on the breeding productivity of the colony. This would mainly include activities related to changes in access roads and associated infrastructure. Currently, the buffer does not impinge on the revised PV layout, as far as possible; impacts from the SEF should not result in the vulture abandoning the breeding site.
» It is recommended to move the PV array to fall outside of the 500 m buffer area around the r*eservoir and pan on Landau's Dam.*
» Although no White-browed Sparrow-weaver colonies were located in the revised PV array layout it is suggested that if any additional colonies are found close to the boundary of the new PV array that a buffer of 100 m is created.

6.2.3 Potential Impacts on Soils and Agricultural Potential

There are two land types across the site (i.e. Ae45 & Fb1). Soils across the site are generally extremely shallow to moderately deep, red, loamy sands on underlying rock or calcrete. As an indication of agricultural potential on the site, the grazing capacity on most of the site is classified as 14-21 hectares per animal unit*. Agricultural potential is uniform across the farm and the choice of placement of the facility on the farm therefore has no influence on the significance of agricultural impacts*. No agriculturally sensitive areas occur within the proposed development footprint.

Activities that may have an impact on soils include:

» Placement of the solar facility footprint (i.e. an array of PV panels, mounting structures, underground cabling between project components and fencing);
» Construction and positioning of internal access roads;
» Use of potential sources of contaminants on the site (i.e. oil, petrol, diesel and other substances used by the vehicles and equipment);
» Construction and operation of the on-site substation; and

» Construction and positioning of the on-site workshop area for maintenance, storage, and offices and temporary construction/ laydown areas.

The potential impacts on soil include:

» Soil loss and erosion;
» Loss of agricultural land use;
» Generation of alternative land use income; and
» Degradation of veld vegetation.

a) Summary of impacts associated with the proposed solar energy facility during the construction and operational phase

Nature*:* Loss of agricultural Land use caused by the direct occupation of land by footprint of energy facility infrastructure; and having the effect of taking affected portions of land out of agricultural production.		
Listed activities: GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).		
	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Small (1)	Small (1)
Probability	Definite (5)	Highly probable (4)
Significance	**Medium (30)**	**Low (24)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Cumulative impacts: The overall loss of agricultural land in the region due to other developments. The significance is low due to the limited agricultural potential of the area.		
Residual impacts: No residual impacts are envisaged.		

Nature*:* Generation of alternative land use income By the alternative land use of energy facility, rental on low productivity agricultural land, in combination with continued farming on the rest of the farmland having the effect of: providing land owners with increased cash flow and rural livelihood.		
Listed activities: N/A		
	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (3)	Minor (3)

Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (32)**
Status	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can *impacts be mitigated?*	No, not required	
Cumulative *impacts:* None required		
Residual *impacts:* None		

Nature*:* Soil Erosion Caused by the alteration of run-off characteristics due to hard surfaces and access roads; and having the effect of: loss and deterioration of soil resources.		
Listed activities: GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).		
	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor (3)
Probability	Probable (3)	Very improbable (1)
Significance	**Low (27)**	**Low (8)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can* impacts *be mitigated?	Yes	
Mitigation*:* Implement an effective system of run-off control, where it is required this plan must ensure the collection and dissemination of run-off water from hardened surfaces and prevents potential down slope erosion. This should be in place and maintained during all phases of the development.		
Cumulative *impacts:* None		
Residual *impacts:* Soil erosion issues in the area if impacts are not mitigated		

Impacts associated only with the construction phase of the development

Nature*:* Loss of topsoil Caused by: poor topsoil management (burial, erosion, etc.) during construction related soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.). And having the effect of: loss of soil fertility on disturbed areas after rehabilitation.
Listed activities:

GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).		
	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (3)	Minor (2)
Probability	Probable (3)	Very improbable (1)
Significance	**Low (24)**	**Low (7)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can* impacts *be mitigated?	Yes	
Mitigation*:* » Strip and stockpile topsoil from all areas where soil will be disturbed. » After cessation of disturbance, re-spread topsoil over the surface. » Dispose of any sub-surface spoils from excavations where they will not impact on agricultural land, or where they can be effectively covered with topsoil.		
Cumulative* impacts*: None		
Residual* impacts*: Loss of topsoil		

b) Comparative Assessment of PV Panel technology (Fixed vs Tracking):

In terms of impact arising from soils and agricultural potential, there is **no significance** difference in the potential impacts associated with the two technology alternatives tracking panels can occupy more land than fixed panel technology. However a total of 300ha would be available for the proposed Blackwood SEF on the remainder of Portion 1 of the Farm Pandamsfontein 1593, regardless of the type of technology used. The agricultural potential for this site is low. In terms of impact arising from soils and agricultural potential, there is no significant difference in the potential impacts associated with the two technology alternatives. Therefore, there is **no preference** between the alternative technologies.

c) Implications for Project Implementation

» Agricultural potential is uniform across the farm and the choice of placement of the facility on the farm therefore has minimal influence on the significance of agricultural impacts.
» No agriculturally sensitive areas occur within the proposed development footprint and have no implications on project development.
» Impact on agriculture will be minimised through limiting the extent of

permanent infrastructure to approximately 10% of the total area.

6.2.4 Assessment of Potential Impacts on Heritage & Palaeontology

a) Heritage impacts associated with the construction and operation phases of the proposed facility

» Generally sparse heritage traces were found over almost all of the proposed development area, on archaeological grounds, these occurrences can be said to be of low significance. Remains of a colonial era (post-1907) railway-associated feature alongside the Kimberley-Bloemfontein line lies next to the project site and should be avoided if possible.
» No graves were found during the survey.

Colonial era ruin (foundations only) and ash middens (in vicinity of -28.878429° 24.954201°)

Nature: Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological material or object (what affected).		
Listed activities: GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	Very High (10)	Very High (10)
Probability	Definite (5)	Probable (3)
Significance	**High (90)**	**Medium (54)**
Status	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes, materials trace reflecting part of the bygone age of steam, a feature of the history of railways in South Africa.	Other similar sites probably exist.
Can impacts be mitigated?	Yes – Recommend exclusion of this small site, if possible, which in any case lies outside of the indicated PV array layout.	
Mitigation: Avoid disturbing this site if possible, beyond the indicated PV array layout; manage as part of EMP.		
Cumulative impacts:		

Where any archaeological contexts occur the impacts are once-off permanent destructive events. Infrastructure development may lead to spatially extended impacts in the vicinity, hence the need to demarcate areas for zero impact.
Residual Impacts: Depleted archaeological record.

Across the remainder of the proposed development footprint on Pandamsfontein (Blackwood Solar Energy Facility PV array facility & associated infrastructure).

Nature: Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological material or object (what affected) for the remainder of the proposed development footprint.		
Listed activities: GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).		
	Without mitigation	**With mitigation**
Extent	Local(1)	-
Duration	Permanent (5)	-
Magnitude	Minor (2)	-
Probability	Improbable (2)	-
Significance	**Low (16)**	**-**
Status (positive or negative)		-
Reversibility	No	-
Irreplaceable loss of resources?	Yes, where present – but occurrence is generally extremely low density and of low significance.	
Can impacts be mitigated?	Yes – but not considered necessary.	
Mitigation: Artefact densities are low over the development footprint area in question. Unlike biological processes, heritage destruction generally has a once-off permanent impact and in view of this the figures given in the "Without mitigation" column err on the side of caution. Even so, the criteria for significance indicated in this matrix give a Low significance weighting (<30 points). Mitigation measures are not considered necessary.		
Cumulative impacts: Where any archaeological contexts occur the impacts are once-off permanent destructive events.		
Residual Impacts: Depleted archaeological record.		

b) Palaeontology impacts associated with the construction and operation phases of the proposed facility

The project area is completely underlain by the Quaternary-age aeolian deposits, surface calcretes, dolerite outcrop, as well as older Ecca sediments of the Prince Albert Formation. Visibility of Ecca Group outcrop is for the most part hampered by a capping of Quaternary-aged residual soils. There is no evidence of potentially fossil-bearing erosional features such as pans and alluvial dongas within development footprint of the proposed infrastructure. There is no indication for the accumulation and preservation of intact fossil material within the Quaternary sediments (unconsolidated topsoils). Impact on Quaternary sediments within the footprint will be extensive, but impact on potential *in situ* Quaternary fossils, within the confines of the affected area is considered unlikely. Impact on Quaternary sediments within the footprint will be extensive, but impact on potential in situ Quaternary fossils, within the confines of the affected area is considered unlikely

Nature: Possible loss of Quaternary soils (topsoil resources), disturbance of intact sediments during the construction of the solar facility and its infrastructure		
Listed activities: GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Moderate (6)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (60)**	**Medium (52)**
Status (positive or negative)	Negative	Positive (the discovery of otherwise unobservable fossil material discovered as a result of the proposed development, can be seen as beneficial to the scientific community).
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Probable	Probable
Can impacts be mitigated?	Reasonably	
Mitigation: The recorded features are located on the periphery of the study area and can be preserved in situ.		
Cumulative impacts: Possible impact on palaeontological resources if construction activities go beyond area demarcated for development. Possible impact on basement rocks, generally considered to be of moderate to high palaeontological sensitivity.		
Residual impacts: Disturbance of *in situ* Quaternary soils.		

Nature: Possible loss of Quaternary soils (topsoil resources), disturbance of intact sediments during the construction of access roads.		
Listed activities: GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (4)	Improbable (2)
Significance	**Medium (52)**	**Low (22)**
Status (positive or negative)	Negative	Neutral
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Probable	Not likely
Can impacts be mitigated?	Reasonably	
Mitigation: It is recommended that thorough examination of the planned access roads be made by a palaeontologist prior to the commencement of the project.		
Cumulative impacts: Possible impact on palaeontological resources if road construction activities go beyond area demarcated for development.		
Residual impacts: Disturbance of in situ Quaternary soils.		

c) Comparative Assessment of PV Panel technology (Fixed vs Tracking):

In terms of impacts on Heritage and Palaeontological sites, there is **no significant** difference in the potential impacts associated with the two technology alternatives. Therefore, there is **no preference** between the alternative technologies.

d) Implications for Project Implementation

» The HIA findings recommend avoidance of a colonial era ruin and set of ash middens close to the railway next to the PV facility.
» The terrain is not considered paleontological vulnerable and there are no major paleontological grounds to suspend the proposed development

6.2.5 Assessment of Potential Visual Impacts

The site for the proposed Blackwood Solar Energy Facility is about 25km to the south east of Kimberley, along the N8 national road, which lies close to the south

site boundary. Part of the north site boundary runs close to and parallel with a freight rail line; there is railway station close by, 'Bosvark'. The landscape setting is rural, located along a transport corridor; the terrain is gently undulating, but open with long views.

The following potentially sensitive visual receptors exist in the study area:

» Farmsteads located adjacent to the site;
» Road users travelling northeast - southwest along the N8;

Visual envelope calculated at a radius of 5km from the proposed *Preferred* layout the height of 3.5 m and showing the locations of farmsteads, (red circles), the N8 and the rail-line. The two farmsteads affected are K: Kraalkop, and E: a large farm beside Bosvark. The area potentially impacted from a visual perspective is coloured cyan.

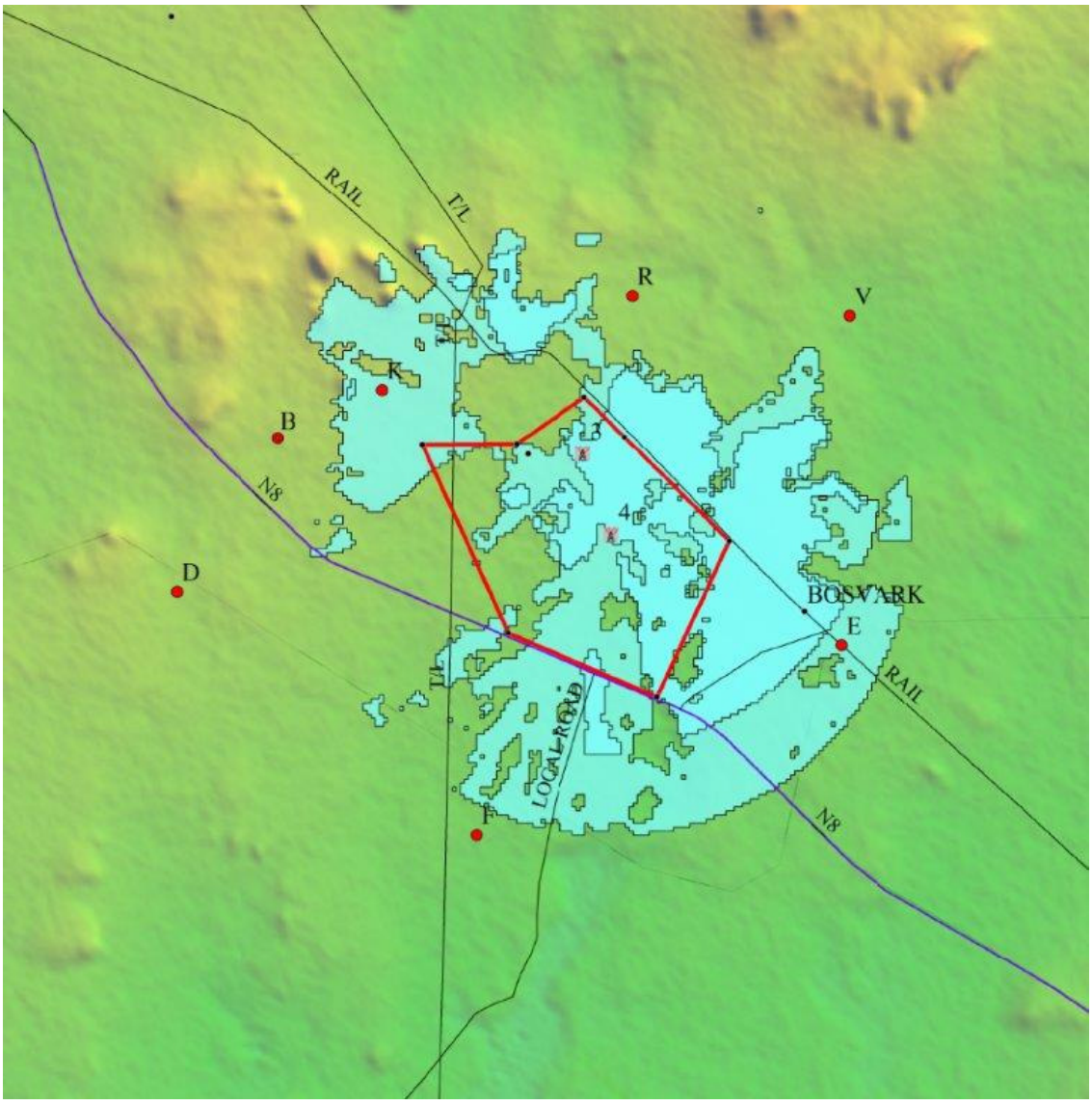

Figure 6.5: Visual envelope calculated at a radius of 5km from the proposed layout and showing the locations of farmsteads, (red circles), the N8 and the rail-line.

a) Impact tables summarising the significance of visual impacts of the PV facility

Construction phase impacts:

Nature: Visual impact of construction activities on sensitive receptors such as local homesteads and road users of the N8 road within 5km (this includes the impacts from initial site works, construction camp, site set up, setting out, laying services and ground works)

Listed activities:
GN **544** activity **10**(i), **22** (ii)
GN **545** activity **1** & **15**;
GN **546** activity **14**(i).

	Without mitigation	***With mitigation***
Extent	Local (2)	Local (1)
Duration	Short -term (2)	Short-term (2)
Magnitude	Moderate (5)	Moderate-Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (36)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:
» Establish screening structures to shield construction works from sensitive receptors where possible;
» Keep disturbed areas to a minimum.
» No clearing of land to take place outside the demarcated footprint.
» Utilise existing roads and tracks if possible. Where new roads are required, they should be two-track gravel roads, maintained to prevent dust plumes and erosion.

Cumulative impacts:
Industrial-type infrastructure such as electrical transmission lines and pylons and a railway line already exist in the immediate surroundings. Therefore, the cumulative impact would be increased with the establishment of a new industrial infrastructure.

Residual Impacts:
The proposed infrastructure is such that the status quo could be regained after decommissioning. If the site is rehabilitated to its current state, the visual impact will also be removed.

Operational phase impacts:

Nature: Visual impact on the sense of place for people living and working locally, using the N8, change of local site character from agriculture to industrial within 5km

Listed activities:
GN **544** activity **10**(i), **22** (ii)
GN **545** activity **1** & **15**;
GN **546** activity **14**(i).

	Without mitigation	***With mitigation***
Extent	Local (2)	Local (2)
Duration	Long - term (4)	Long – term (4)
Magnitude	Moderate (5)	Moderate-Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (44)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

» Retain and maintain natural vegetation in all areas outside of the development footprint.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the facility.
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Cumulative impacts:

» Industrial-type infrastructure such as electrical transmission lines and pylons and a railway line already exist in the immediate surroundings. Therefore, the cumulative impact would be increased with the establishment of a new industrial infrastructure.

Residual Impacts:

The proposed infrastructure is such that the status quo could be regained after decommissioning. If the site is rehabilitated to its current state, the visual impact will also be removed.

Nature: Visual impact of the fixed or single axis tracker panels on visual receptors in the area

Listed activities:
GN **544** activity **10**(i), **22** (ii)
GN **545** activity **1** & **15**;
GN **546** activity **14**(i).

	Without mitigation	***With mitigation***
Extent	Local (2)	Local (2)
Duration	Long - term (4)	Long - term (4)
Magnitude	Moderate (5)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (30)**

Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	
Mitigation: » Use of fixed rather than single axis tracker panels to reduce visual impact derived from slow movement while tracking the sun during the day » Use of single axis tracker panels to reduce in the area affected by possible reflections		
Cumulative impacts: Industrial-type infrastructure such as electrical transmission lines and pylons and a railway line already exist in the immediate surroundings. Therefore, the cumulative impact would be increased with the establishment of a new industrial infrastructure.		
Residual Impacts: The proposed infrastructure is such that the status quo could be regained after decommissioning. If the site is rehabilitated to its current state, the visual impact will also be removed.		

Potential visual impact of decommissioning a PV plant

Nature of Impact: Potential visual impact on visual receptors in close proximity to proposed facility		
	No mitigation	***Mitigation considered***
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	High (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	Moderate (48)	Low (32)
Status	Positive	Positive
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
General mitigation/management: » None		
Cumulative impacts: » Reduction in potential cumulative impact		
Residual impacts: » None. The visual impact will be removed after decommissioning.		

b) Comparative Assessment of PV Panel technology (Fixed vs Tracking):

Sensitive receptors on the roads or in close by homesteads will be able to see either fixed or tracking panels on the site due to the flat topography of the project. Tracking panels can result in a higher visual intrusion than fixed panels due to the more mechanically complex structure. For this particular site there is **very little difference in the significance** in the potential impacts associated

with the two technology alternatives, however the fixed panel PV technology would be nominated as the preferred alternative.

c) Implications for Project Implementation

» There is little in the local landscape that can shield this development as views are long and open to most compass points; the trees in the surrounding of the site vary in density and frequency.
» Visual impacts associated with the PV facility and associated infrastructure are expected to be of moderate significance largely due to the scale of the development, the numbers and types of receptors directly affected and its compatibility with the local landscape.
» Visual Impacts are difficult to mitigate, however, possible mitigation measures are recommended to minimse impacts as far as possible.
» In order to limit scarring of the landscape, rehabilitate disturbed construction areas and re-vegetate using appropriate indigenous grasses

6.2.6 Assessment of Potential Social Impacts

Impacts associated with the construction phase of a project are usually of a short duration, temporary in nature, but could have long term effects on the surrounding environment. The operational life of a PV facility is between 20 - 25 years, after which the facility would possibly be upgraded to continue its lifespan if feasible, or decommissioned. The impacts usually associated with the operational phase are therefore perceived by affected parties to be more severe.

The key social issues associated with the *construction phase* are the following:

Potential positive impacts
» Creation of employment and business opportunities, and opportunity for skills development and on-site training.

Potential negative impacts
» Impacts associated with the presence of construction workers on local communities;
» Impacts related to the potential influx of job-seekers;
» Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site;
» Increased risk of grass fires associated with construction related activities; and
» Noise, dust and safety impacts of construction related activities and vehicles.

The two alternative PV technologies do not differ in any significant way as far as the impacts on the social environment is concerned. Therefore, there is **no significant difference** in the potential impacts associated with the alternatives, and the impacts for the two alternatives are not comparatively assessed in the assessment tables below.

The following listed activities are applicable to all the social impacts in the construction phase:
GN 544 activity 10(i)
GN 545 activity 1 & 15
GN 546 activity 14(a)(i)

a) Impact tables summarising the significance of Social impacts of the PV facility

Nature: Creation of employment and business opportunities during the construction phase		
	Without Enhancement	**With Enhancement**
Extent	Local – Regional (3)	Local – Regional (4)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (44)**	**Medium (56)**
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement :

Employment

» Where reasonable and practical the contractors appointed by the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skill levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
» Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.
» Before the construction phase commences the proponent and its contractors should meet with representatives from the Tokologo Local Municipality to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.

» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. **Business** » The proponent should seek to develop a database of local companies, specifically Broad Based Black Economic Empowerment (BBBEE) companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work. » The proponent, in consultation with the Tokologo Local Municipality and the local Chamber of Commerce, should identify strategies aimed at maximising the potential benefits associated with the project.
Cumulative impacts: Opportunity to up-grade and improve skills levels in the area.
Residual impacts: Improved pool of skills and experience in the local area.

Nature: Potential impacts on family structures and social networks associated with the presence of construction workers		
	Without Mitigation	**With Mitigation**
Extent	Local (2) (Rated as 2 due to potential severity of impact on local communities)	Local (1) (Rated as 1 due to potential severity of impact on local communities)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STDs etc. (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STDs etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low** for the community as a whole **(24)** **Moderate-High** for specific individuals who may be affected by STDs etc. **(51)**	**Low** for the community as a whole **(21)** **Moderate-High** for specific individuals who may be affected by STDs etc. **(48)**
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in	

	communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

» Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically semi and low-skilled job categories. This will reduce the potential impact that this category of worker could have on local family and social networks;
» The proponent and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
» The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis;
» The contractor should make necessary arrangements to enable workers from outside the area to return home on a regular basis during the 18 month construction phase. This would reduce the risk posed by non-local construction workers to local family structures and social networks;
» The contractor should make the necessary arrangements for ensuring that all non-local construction workers are transported back to their place of residence once the construction Blackwood Solar Energy Facility is completed. This would reduce the risk posed by non-local construction workers to local family structures and social networks; and
» As per the agreement with the local farmers in the area, no construction workers, will be permitted to stay overnight on the site. Security personnel will be housed in the vicinity of the site.

Cumulative impacts:

Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.

Residual impacts:

Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.

Nature: Potential risk to safety of scholars, farmers and farm workers, livestock and damage to farm infrastructure associated with the presence of construction workers on site

	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (2)
Duration	Short term (2)	Short term (2)

Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock losses and damage to farm infrastructure etc.	Yes, compensation paid for stock losses and damage to farm infrastructure etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes

Mitigation:

- The construction area should be fenced off prior to the commencement of the construction phase. The movement of construction workers on the site should be confined to the fenced off area;
- The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;
- Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties;
- The proponent should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;
- The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities
- The Environmental Management Plan (EMP) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
- Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
- Contractors appointed by the proponent must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
- The housing of construction workers on the site should be strictly limited to security personnel.

Cumulative impacts:

No**,** provided losses are compensated for.

Residual impacts:

No**,** provided losses are compensated for.

Nature: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires		
	Without Mitigation	**With Mitigation**
Extent	Local (4) (Rated as 4 due to potential severity of impact on local farmers)	Local (2)
Duration	Short term (2)	short term (2)
Magnitude	Moderate due to reliance on agriculture for maintaining livelihoods (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock and crop losses etc.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	

Mitigation:

- The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;
- A fire-break should be constructed around the perimeter of the site prior to the commencement of the construction phase;
- Contractor should ensure that open fires on the site for cooking or heating are not allowed at all, or at worst only in designated areas;
- Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;
- Contractor to provide adequate firefighting equipment on-site, including a fire fighting vehicle;
- Contractor to provide fire-fighting training to selected construction staff;
- No construction staff, with the exception of security staff, to be accommodated on site over night; and
- As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the firefighting costs borne by farmers and local authorities.

Cumulative impacts:

No, provided losses are compensated for.

Residual impacts:

None anticipated

Nature: Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short Term (2)	Short Term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (15)**
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation: » Site clearing activities should be phased so as to minimise the total area cleared at any given time. Progressive rehabilitation should also be carried out during the construction phase; » The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends and holiday periods; » The contractor must ensure that damage caused by construction related traffic to the internal access roads is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor; » Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers; and » All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.		
Cumulative impacts: Once construction is completed, this will cease to take place, hence will not have any cumulative impacts		
Residual impacts: Once construction is completed, this will not be an impact.		

Nature: The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the soar energy facility and power lines will damage farmlands and result in a loss of farmlands for grazing.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term-permanent if disturbed areas are not effectively rehabilitated (5)	Short term if damaged areas are rehabilitated (2)

Magnitude	Medium (6)	Minor (2)
Probability	Probable (3)	Highly Probable (4)
Significance	**Moderate (36)**	**Low (20)**
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided

Mitigation:

» The site for the proposed SEF should be fenced off prior to commencement of construction activities;
» The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised;
» An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
» All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase;
» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA;
» The implementation of the Rehabilitation Programme should be monitored by the ECO.

Cumulative impacts:

Overall loss of farmland due to numerous developments in the area could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

Residual impacts:

Overall loss of farmland due to numerous developments in the area could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

The following key social issues are of relevance to the *operational phase*:

Potential positive impacts

» Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
» Benefits associated with the establishment of a Community Trust; and
» The establishment of renewable energy infrastructure.

Potential negative impacts

» Impact on adjacent hunting operations;
» The visual impacts and associated impact on sense of place;
» Potential impact on tourism; and
» Potential impact on groundwater supplies.

Nature: Creation of employment and business opportunities associated with the operational phase		
	Without Enhancement	**With Enhancement**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	**Medium (30)**	**High (65)**
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: » As part of the Social Economic Development programme the proponent is committed to implement a training and skills development programme for the duration of the 20 year operating period. The programme should seek to maximise the number of locals that benefit from the programme. » The proponent, in consultation with the Tokologo Local Municipality, should investigate the options for the establishment of a Community Development Trust.		
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area		
Residual impacts: Improved pool of skills and experience in the local area.		

Nature: Establishment of a community trust funded by revenue generated from the sale of energy. The revenue can be used to fund local community development		
	Without Enhancement	**With Enhancement**[8]
Extent	Local (2)	Local and Regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	**Medium (30)**	**High (70)**
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	

[8] Enhancement assumes effective management of the Community Trust

Can impact be enhanced?	Yes	
Enhancement: » Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community; » Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the Solar Energy Facility plant.		
Cumulative impacts: Promotion of social and economic development and improvement in the overall well-being of the community		
Residual impacts: Improve development within the community and better infrastructure		

Nature: Promotion of clean, renewable energy		
	Without Mitigation	**With Mitigation** (The provision of renewable energy infrastructure is in itself a mitigation measure)
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (48)**	**Medium (48)**
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be mitigated?	Yes	
Enhancement: » Use the project to promote and increase the contribution of renewable energy to the national energy supply; » Maximise the public's exposure to the project via an extensive communication and advertising programme; » Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project.		
Cumulative impacts: Reduced carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: Reduced carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		

Nature: Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (4)	Highly Probable (4)
Significance	**Medium (32)**	**Low (28)**
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: Existing vegetation between the site and the N8 should be retained as far as possible, and where necessary additional vegetation screening should be established where required. The recommendations contained in the VIA should also be implemented.		
Cumulative impacts: Potential impact on current rural sense of place as a result of numerous developments in the area		
Residual impacts: None anticipated if the visual impact will be removed after decommissioning, provided the solar facility infrastructure is removed and the site is rehabilitated to its original (current) status.		

Nature: Potential impact of the Solar Energy Facility on local tourism		
	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)** (Applies to both – and +)	**Low (24)** (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement:		

» PV panels should be placed on the site in such a manner to ensure that visual impacts are minimised as far as possible; and » Buffer of natural vegetation should be maintained along the boundary of the property where possible to screen the PV panels from the adjacent affected properties.
Cumulative impacts: Due to size and height of PV Solar Energy Facility and the fact that there are power lines all across the surrounding areas where the project is proposed, the potential cumulative impacts are not rated significant.
Residual impacts: The impact on sense of place can be reversed after decommissioning, provided that rehabilitation is done to a satisfactory level.

Potential social impact of decommissioning a PV plant

Nature of Impact: Social impacts associated with retrenchment including loss of jobs, and source of income		
	No mitigation	***Mitigation considered***
Extent	Local and regional (3)	Local and regional (2)
Duration	Medium Term (2)	Very Short Term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium44)	Low 16
Status (positive, neutral or negative)	Negative	Negative-Neutral
Reversibility	Yes, assumes retrenchment packages are paid to all affected employees	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
General mitigation/management: » The proponent should ensure that retrenchment packages are provided for all staff retrenched when the plant is decommissioned. » All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning; » Revenue generated from the sale of scrap metal during decommissioning should be allocated to funding closure and rehabilitation of disturbed areas.		
Cumulative impacts: » Loss of jobs and associated loss of income etc. can impact on the local economy and other businesses. However, decommissioning can also create short term, temporary employment opportunities associated with dismantling etc.		
Residual impacts: » Loss of income.		

b) Comparative Assessment of PV Panel technology (Fixed vs Tracking):

There is **no difference** in terms of social or economic impacts from either technology alternatives. Therefore there is no preference from a social perspective on the implementation of either technology.

c) Implication for project implementation

» The findings of the SIA undertaken for the proposed Blackwood Solar Energy Facility indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project.
» The establishment of a Community Trust will create an opportunity to support local economic development in the area.
» The development of renewable energy has been identified as a key growth sector by the TLM and also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.
» It is recommended that the Blackwood Solar Energy Facility as proposed be supported, subject to the implementation of the recommended enhancement and mitigation measures contained in the SIA report.

6.3. Assessment of the Do Nothing Alternative

The 'do-nothing' alternative is the option of not constructing the proposed Blackwood Solar Energy Facility. Should this alternative be selected, there would be no environmental impacts on the site due to the construction and operation activities of a solar energy facility. Currently, the proposed site is used for cattle farming by the owner. Moderate veld degradation is visible and can be attributed to moderately heavy grazing and possible drought conditions currently and in the past. Should the current land use activities continue, degradation of the site vegetation could continue without proper management strategy to improve or eradicate the degradation of vegetation on site.

In addition, within the project site there are a number of tracks as well as Eskom power lines, consequently parts of the vegetation cover for the site has been disturbed. Hence, the developer of the proposed Blackwood Solar Facility finds this site suitable for this development (among other reasons as explained in chapter 2).

At a local level, the do nothing option would result in the level of unemployment remaining the same and no transfer of skills to people in terms of the construction and operation of the solar energy facility. The landowner would lose an opportunity of an alternative income source to maintain his property and use his land in a sustainable manner. Furthermore, the community would lose the

opportunity to improve and uplift their infrastructure through the community trust.

At a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. Although the facility is only proposed to contribute 75 MW to the grid capacity, this would assist in meeting the growing electricity demand throughout the country and would also assist in meeting the government's goal for renewable energy. The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits 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 releases of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation. The use of solar radiation for power generation is considered a non-consumptive use of a natural resource which produces zero greenhouse gas emissions.

» ***Climate friendly development:*** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions.

South Africa is estimated to be responsible for approximately 1% of global GHG emissions and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions.

» ***Support for international agreements:*** 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.

Based on the above motivations, it is considered that it would be beneficial to pursue projects such as the Blackwood Solar PV Facility that may assist in electricity supply and contribute towards more sustainable and renewable energy. The 'do nothing' alternative will not assist the South African government in addressing climate change, in reaching the set targets for renewable energy, nor will it assist in supplying the increasing electricity demand within the country. In addition the Free State Province power grid will lose an opportunity to benefit from the additional generated power being evacuated directly into the Province's grid at the Boundary and KDS Substation. The 'do nothing alternative is, therefore, not a preferred alternative.

6.4. Assessment of Summary of Impacts

Table 6.2 summarises all potential impacts associated with the proposed Blackwood Solar Energy Facility and its relevant EIA regulation listed activities.

Table 6.2: Summary of impacts associated with the proposed Blackwood Solar Energy and applicable EIA Regulation Listed activity assessed.

Construction / Decommissioning Impacts	Significance of Impact			EIA Regulation Listed activity assessed
	Without mitigation	With mitigation	Status	
Ecology				
Loss of vegetation, increase in runoff and erosion, possible distribution and increased establishment of alien invasive species - *Upgrading and/or creation of site access and internal maintenance roads*	M (50)	M (35)	Negative	GN **544** activity **11**(iii) (x) (xi), **18**(1) & **22** (ii); GN **545** activity **15**; GN **546** activity **14**(i).
Loss of vegetation and specifically protected or red data species, window of opportunity for the establishment of alien invasive species - *Fencing area*	M (50)	L (24)	Negative	GN **544** activity **11**(iii) (x) (xi) & **18**(1) GN **546** activity **14**(i).
Loss of vegetation and/or species of conservation concern, loss of and alteration of many niche microhabitats, altered vegetation cover, site-specific altered distribution of rainfall and resultant runoff patterns, increase in runoff from PV panels and/or bare areas and accelerated erosion - *Construction and operation of PV panels*	H (80) – tracking H (85) – tracking	H (65) – tracking H (70) – tracking	Negative	GN **544** activity **11**(iii) (x) (xi), & **18**(1) GN **545** activity **1** &**15**; GN **546** activity **14**(i).
Loss of vegetation and/or species of conservation concern, loss of microhabitats, reduced vegetation cover, altered distribution of rainfall and resultant runoff patterns, increase in concentrated runoff from sealed surfaces and possibly higher accelerated erosion, reduction of habitat and resource availability for terrestrial fauna - *Construction of PV-related buildings, workshops, offices, guardhouses, etc*.	M (60)	M (40)	Negative	GN **544** activity **10** (i),**11**(iii) (x) (xi), **18**(1) GN **545** activity **15**; GN **546** activity **14**(i).
Loss of vegetation and/or species of conservation concern, loss of microhabitats, reduced vegetation cover, altered distribution of rainfall and resultant runoff patterns, increase in concentrated runoff from sealed surfaces and possibly higher accelerated erosion, reduction of habitat and resource availability for terrestrial fauna - *Temporary construction camps and sites where machinery is kept during construction*	M (70)	M (30)	Negative	GN **544** activity **11**(iii) (x) (xi), **18**(1) & GN **545** activity **15**; GN **546** activity **14**(i).
Loss of vegetation and/or species of conservation concern, loss of microhabitats, altered vegetation cover, altered distribution of rainfall and resultant runoff patterns, possibly higher accelerated erosion, possible loss of topsoil resources,	M (48)	L (21)	Negative	N/A

Construction / Decommissioning Impacts	Significance of Impact			EIA Regulation Listed activity assessed
	Without mitigation	With mitigation	Status	
reduction of habitat and resource availability for terrestrial fauna, possible source of dust - *Borrow-pits and/or topsoil stockpiles that may be required during construction*				
Loss of vegetation, increase in runoff and erosion, disturbance or possible mortality incidents of terrestrial fauna, possible contamination of soil and groundwater by oil- or fuel spillages, possible establishment and spread of undesirable weeds and alien invasive species that could further damage ecosystem functionality - *Transport of materials to site, movement of vehicles on site during construction*	M (60)	L (20)	Negative	N/A
Avifauna				
Avifaunal habitats loss	L (28)	L (24)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Disturbance and displacement of avifauna	M (44)	L (28)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Soil & agriculture potential				
Loss of agricultural land use	M (30)	L (24)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Generation of alternative land use income	M (32)	M (32)	Positive	none
Soil erosion	L (27)	L (8)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Loss of topsoil	L (24)	L (7)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Heritage & palaeontology				
The destruction, damage, excavation, alteration, removal or collection of any	H (90)	M(54)	Negative	GN **544** activity **10**(i), **22** (ii)

Construction / Decommissioning Impacts	Significance of Impact			EIA Regulation Listed activity assessed
	Without mitigation	With mitigation	Status	
archaeological material(areas of heritage sensitive materials)				GN **545** activity **1** & **15**; GN **546** activity **14**(i).
The destruction, damage, excavation, alteration, removal or collection of any archaeological material (remainder of the of the site)	L(16)	n/a	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Possible loss of Quaternary soils (topsoil resources), disturbance of intact sediments during the construction of the solar facility & it associated infrastructure	M (60)	L (52)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Possible loss of Quaternary soils (topsoil resources), disturbance of intact sediments during the construction of access roads.	M (52)	L (22)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Visual				
Visual impact of construction activities on sensitive receptors such as local homesteads and road users of the N8 road within 5km	M (36)	M (32)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Social				
Creation of employment and business opportunities	M (44)	L(56)	Positive	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Potential impacts on family structures and social networks associated with the presence of construction workers	L (24)	L (21)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires	M (36)	L (24)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site	L (24)	L(15)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Operational Impacts	**Significance of Impact**			**EIA Regulation Listed activity**

	Without mitigation	With mitigation	Status	assessed
Ecology				
Loss of vegetation and/or species of conservation concern, loss of microhabitats, altered vegetation cover, altered distribution of rainfall and resultant runoff patterns, possibly higher accelerated erosion, possible loss of topsoil resources, reduction of habitat and resource availability for terrestrial fauna, possible source of dust - *Borrow-pits and/or topsoil stockpiles and spoil that may be required after construction*	M (48)	L (21)	Negative	N/A
Loss of vegetation, increase in runoff and erosion, disturbance or possible mortality incidents of terrestrial fauna, possible contamination of soil and groundwater by oil- or fuel spillages, possible establishment and spread of undesirable weeds and alien invasive species that could further damage ecosystem functionality - *Transport of materials to site, movement of vehicles on site during maintenance*	M (60)	L (20)	Negative	N/A
Avifauna				
Disturbance and displacement of avifauna	L (21)	L (15)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Soil & agriculture potential				
Loss of agricultural land use	M (30)	L(24)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Generation of alternative land use income	M (32)	M (32)	Positive	n/a
Soil erosion	L (27)	L (8)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Visual				
Visual impact on the sense of place for people living and working locally, using the N8, change of local site character from agriculture to industrial within 5km	M (44)	M (40)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Visual impact of the operation of PV panels (fixed panel option)	M (33)	L (20)	Negative	GN **544** activity **10**(i), **22** (ii)

Operational Impacts	Significance of Impact			EIA Regulation Listed activity assessed
	Without mitigation	With mitigation	Status	
				GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Visual impact of the operation of PV panels (tracking panel option)	M (44)	L (30)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Social				
Creation of employment and business opportunities	M (30)	H (65)	Positive	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Establishment of a community trust funded by revenue generated from the sale of energy. The revenue can be used to fund local community development	M (30)	H (70)	Positive	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Promotion of clean, renewable energy	M (48)	M (48)	Positive	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Potential visual impacts associated with the Solar Energy Facility may impact on the experience of hunters on adjacent farms	L (24)	L (15)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place.	M (32)	L (28)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Potential impact of the Solar Energy Facility on local tourism	L (24)	L (24)	Positive & Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).
Potential visual impact and impact on sense of place associated with power lines	L (24)	L (21)	Negative	GN **544** activity **10**(i), **22** (ii) GN **545** activity **1** & **15**; GN **546** activity **14**(i).

L **Low** M **Medium** H **High**

ASSESSMENT OF CUMULATIVE IMPACTS CHAPTER 7

Cumulative impacts in relation to an activity are defined in the Environmental Impact Assessment Regulations (Government Notice R543) as meaning "the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area".

There has recently been a substantial increase in renewable energy developments in South Africa as legislation is evolving to facilitate the introduction of Independent Power Producers (IPPs) and renewable energy into the electricity generation mix. Due to the recent substantial increase in interest in renewable energy developments in South Africa, it is important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts are considered and avoided where possible.

The Department of Energy has, under the REIPPP Programme, released a request for proposals (RfP) to contribute towards Government's renewable energy target of 3725 MW (1450 MW of which has been allocated to solar PV energy) and to stimulate the industry in South Africa. The bid selection process will consider the suggested tariff as well as socio-economic development opportunities provided by the project and the bidder.

There is a legislated requirement to assess cumulative impacts associated with a proposed development. This chapter looks at whether the proposed project's potential impacts become more significant when considered in combination with the other known or proposed solar farm projects within the area.

7.1 Approach Taken to Assess Cumulative Impacts

Significant cumulative impacts that could occur due to the development of the solar energy facility and its associated infrastructure in proximity to other similar developments include impacts such as:

» Loss of vegetation and impacts on ecology;
» Impacts on avifauna;
» Soil and agricultural potential impacts;
» Heritage impacts;
» Visual impacts; and
» Social impacts.

Figure 7.1 indicates the proposed location of the Blackwood Solar Energy Facility in relation to other known renewable energy applications in the area. These projects were identified by CSIR using the Department of Environmental Affairs Geographic Information System digital data (CSIR, 2014), as well as by Savannah Environmental from known projects in the area. In the case of the proposed Blackwood Solar Energy Facility, there are nine (9) renewable projects (all solar PV) proposed within a 20 km radius of the Blackwood site (refer to Figure 7.1 and Table 7.1 below). At the time of writing this EIA report, Pulida Solar Park is a Round 3 preferred bidder project and ACSA PV installation at Kimberley Airport is a Round 1 selected project under the small projects. Cumulative impacts discussed within this section have been considered within the detailed specialist studies, where applicable (refer to Appendices E-K).

The combined effect of the solar energy facilities and associated infrastructure within this area will have a cumulative visual impact, impact on the landscape character, social impact, and impacts on ecology and soil erosion.

As there is uncertainty as to whether all the above-mentioned developments will be implemented, it is also difficult to quantitatively assess the potential cumulative impacts. It is, however, important to explore the potential cumulative impacts qualitatively as this will lead to a better understanding of these impacts and the possible mitigation that may be required. As these cumulative impacts are explored in more detail the trade-offs between promoting renewable energy (and the associated benefits in terms of reduction in CO_2 emissions – a national interest) versus the local and regional environmental and social impacts and benefits (i.e. landscape, ecology, tourism, , employment etc.) will become evident. It is only when these trade-offs are fully understood, that the true benefits of renewable energy can be assessed.

In the sections below the potential cumulative impacts of eight solar facilities within the immediate vicinity of the proposed Blackwood Solar Energy Facility are explored. The discussion and associated conclusions must be understood in the context of the uncertainty associated with the proposed developments and the qualitative nature of the assessment.

Table 7.1: Proposed solar developments in the vicinity of the Blackwood Solar Energy Facility

Project	Applicant/ Developer	DEA Ref. No	Location	Status
Pulida Solar Park	Pulida Energy (Pty) Ltd	14/12/16/3/3/2/391	On the remainder of the farm Klipdrift 20, Letsemeng local municipality	Environmental Authorisation issued. Preferred bidder REIPPP Round 3

Project	Applicant/ Developer	DEA Ref. No	Location	Status
Kabi Kimberly PV Solar Energy Facility and associated infrastructure	Kabi Solar	12/12/20/2124	Kennilworth Estate no 71, east of Kimberly	Environmental Authorisation issued
Proposed construction of a 100MW photovoltaic solar power generation plant on the farm Kenilworth Estate No 71	BioTherm Energy (Pty) Ltd	12/12/20/2440	Kennilworth Estate no 71, east of Kimberly	Environmental Authorisation issued
Proposed ACSA PV installation at Kimberley Airport	ACSA PV	12/12/20/2148	Kimberley Airport	Environmental Authorisation issued. Reached selected bidder status in the Small IPP Program for projects less than 5MW
Proposed Boundary Solar Energy Facility on a site near Boshof	Rodicon Trading and Investments (Pty) Ltd	14/12/16/3/3/2/555	Farm Karreeboom 1716, 15 km south east of Kimberley.	Environmental Authorisation issued
Renewable energy generation project on farm Melrose East 149	Dioflash (Pty) Ltd	14/12/16/3/3/392	Farm Melrose East 149, Letsemeng Local Municipality,	EIA in progress
Proposed Olam Energy Project 10	Transalloys (Pty) Ltd	14/12/16/3/3/1/438	Remaining extent of the farm Boschkop 202, Free State	Environmental Authorisation issued
Proposed Inyanga Energy Project 8	Islandsite Investment	12/12/20/2582	Remaining extent of the farm Boschkop 202, Northern Cape Province	EIA in progress

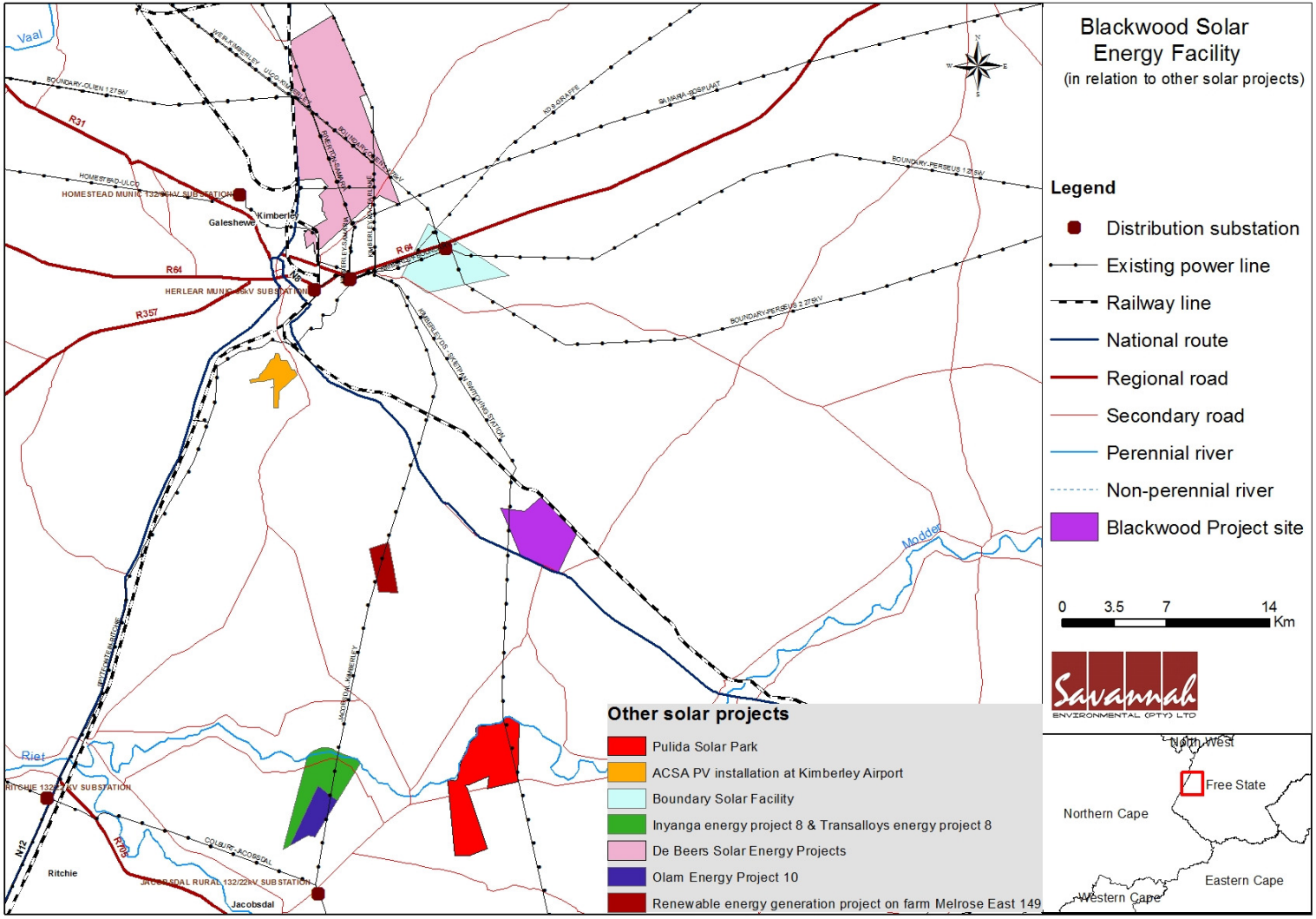

Figure 7.1: Map showing the proximity of other renewable energy facility projects to the proposed Blackwood Solar Energy Facility in order to understand the potential or cumulative impacts

7.2 Cumulative Impacts on Ecology

Large-scale destruction of large specimens of *Acacia erioloba* trees has been attributed to past mining activities in the wider Kimberley area. This has already impacted local population dynamics as well as microhabitats and resources associated with these species available to other fauna and flora species and should not be further exacerbated. Cumulative impacts of developments on population viability of species can be reduced significantly if new developments are kept as close as possible to existing developed and/or transformed areas or, where such is not possible, different parts of a development should be kept as close together as possible. New power lines should follow routes of existing servitudes if such exist. Renewable energy facilities should be constructed as close as possible to existing infrastructure or substations, and if several developments are planned within close proximity, these developments should be situated as close together as possible, and not scattered throughout the landscape. Generally, cumulative impacts on ecology as a result of the proposed project will be of **low to moderate significance** since the impact has been minimised for this project as the areas of protected trees have been avoided?

7.3 Cumulative Impacts on Avifauna

Cumulative impacts on avifauna are expected to be as a result of habitat loss, and impacts associated with power lines (i.e. collisions and electrocutions). Impacts associated with the proposed project are expected to be **low to moderate**, subject to implementation of mitigation measures at the site, considering the proposed construction of similar developments in the area and the number of existing Eskom power lines and the railway line infrastructure that are present close to the project site. The existing infrastructure has already impacted on the environment used by birds, and they would have adjusted to these changes to some extent. The project presents a consolidation of impacts in one area to some extent. However, the development of the project would contribute to the cumulative loss of habtat for birds in the area.

7.4 Cumulative impacts on soil and agricultural potential

The broader remainder of Portion 1 of the Farm Pandamsfontein 1593 is 1468ha and the development of the proposed Blackwood PV facility (ie permanent area) will result in the loss of a maximum of 10% of agricultural potential. The remainder of the farm portion can be continued to be utilised for agricultural activities. The impacts are expected to be low as a result of the low agricultural potential of the farm. The overall loss of agricultural land in the region due to other similar developments is expected to be of **low** significance due to the limited agricultural potential of the area. Due to the limited crop production in the wider study area,

the development of multiple solar energy facilities within the Tokologo Local Municipality will not affect food security in the region.

7.5 Cumulative impacts on heritage and palaeontological sites

Cumulative impacts in terms of archaeological contexts are once-off permanent destructive events. Infrastructure development may lead to spatially extended impacts in the vicinity, hence the need to demarcate areas for zero impact. Cumulative negative impacts on heritage resources (including archaeological and palaeontological sites) are expected to be of **low significance** provided such sites are avoided by development. Positive impacts could result as the potential for the discovery of heritage artefacts in the region will increase with the increased numbers of developments in the area.

7.6 Cumulative Visual Impacts

The visual integrity of the area has already been impacted to some extent by the existing power lines within and around the site. In addition, at a broader level the visual integrity of the area has been negatively impacted by mining activities and mining related infrastructure. The potential for cumulative impacts associated with combined visibility (whether two or more solar facilities will be visible from one location) is likely to be low. In terms of sequential visibility (e.g. the effect of seeing two or more solar facilities along a single journey, e.g. road or walking trail), the potential does exist given the development of solar energy facilities in and around Kimberley. However, given that the potential visual impact associated with solar energy facilities is low the significance of the cumulative impacts is also likely to be **low**.

7.7 Cumulative Impacts on Social and Economic Environment

In addition to the potential negative impacts (i.e. Impacts associated with the presence of construction workers on local communities; Impacts related to the potential influx of job-seekers; Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site; Increased risk of grass fires associated with construction related activities; Noise, dust and safety impacts of construction related activities and vehicles; Impact on productive farmland.), the proposed Blackwood Solar Energy Facility also has the potential to result in significant positive cumulative impacts; specifically the establishment of a number of solar energy facilities in the vicinity of Kimberly will create a number of socio-economic opportunities for the Tokologo LM, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities.

7.7 Conclusion regarding Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The degree of significance of these cumulative impacts is difficult to predict without detailed studies based on more comprehensive data/information on each of the receptors and the site specific developments. This however, is beyond the scope of this study.

The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional and national level have the potential to be significant.

The CSIR has released an initial identification of geographical areas best suited for the roll-out of wind and solar photovoltaic (PV) energy projects in South Africa. The aim of the assessment is to designate renewable energy development zones (REDZs) within which such development will be incentivised and streamlined. The Blackwood Solar Energy Facility falls within the identified geographical areas most suitable for the rollout of the development of solar energy projects within the Free State Province. This implies that projects of the same nature will be consolidated in one area creating a node, and ultimately aiming to reduce the potential for cumulative impacts associated with such developments when spatially fragmented.

It is also important to note that it is unlikely that all proposed renewable energy facilities located in the 20km radius will be built due to capacity constraints on the Eskom grid and the limits placed on renewable energy targets. Considering the findings of the specialist assessments undertaken for the project, as summarised within the sections above, the cumulative impacts for the proposed Blackwood Solar Energy Facility will be of **low to moderate significance.**

CONCLUSIONS AND RECOMMENDATIONS CHAPTER 8

Blackwood Solar Energy Facility (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility with a maximum contracted capacity of up to 75MW, as well as associated infrastructure on a site located in the Free State approximately 25km south-east of Kimberley and 45km south-west of Boshof (refer to Figure 8.1). The site is located within the Tokologo Local Municipality. The purpose of the proposed facility is to add new capacity for generation of power from renewable energy to the national electricity supply (which is short of generation capacity to meet current and expected demand), and to aid in achieving the goal of a 30% share of all new power generation being derived from independent power producers (IPPs), as targeted by the Department of Energy (DoE).

Globally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of non-renewable resources. In order to meet the long-term goal of a sustainable renewable energy industry, a goal of 17, 8 GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~42% of all new power generation being derived from renewable energy forms by 2030.

In response to the need, Blackwood Solar Energy Facility (Pty) Ltd, as an IPP, is proposing the establishment of the proposed project. The proposed facility will require a development footprint area of approximately 300ha (within a larger farm portion which is 1468ha in extent), and will be comprised of the following primary elements (Figure 8.1):

» Solar panels (fixed/tracking technology) with a maximum contracted capacity of 75MW.
» Mounting structures for the solar panels to be rammed steel piles, piles with pre-manufactured concrete footings or ground screw anchors to support the PV panels.
» Cabling between the structures, to be lain underground where practical.
» Central inverter/transformer stations to collect all energy generated from the PV panels. The inverter's role is to convert direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
» An on-site substation.
» Internal access roads.

» Associated buildings including a workshop area for maintenance, storage, and control facility with basic services such as water and electricity (approximate footprint.
» Area for workshop/maintenance, warehouse/storage, and offices.

The construction of a substation (switching station) and an overhead distribution power line to connect the facility to the Eskom grid is also being assessed **within a separate Basic Assessment process** and are not discussed in this report

An EIA process, as defined in the NEMA EIA Regulations, is a systematic process of identifying, assessing, and reporting environmental impacts associated with an activity. The EIA process forms part of the planning of a project and informs the final design of a development. In terms of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), Blackwood Solar Energy Facility (Pty) Ltd requires authorisation from the National Department of Environmental Affairs (DEA) (in consultation with the Free State Department of Economic Development, Tourism and Environmental Affairs (DEDTEA)) for the establishment of the Blackwood Solar Energy Facility. In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations of GNR543, GNR544, GNR545; and GNR546, a Scoping and an EIA Phase have been undertaken for the proposed project. As part of this EIA process comprehensive, independent environmental studies have been undertaken in accordance with the EIA Regulations. The following key phases have been undertaken to date in the EIA Process.

» *Notification Phase* - organs of state, stakeholders, and interested and affected parties (I&APs) were identified and notified of the proposed project using adverts, site notices, and stakeholder letters. Details of registered parties have been included within an I&AP database for the project (Appendix C).
» *Scoping Phase* – identification of potential issues associated with the proposed project and environmental sensitivities (i.e. over the broader project development site - entire extent of the remainder of Portion 1 of the Farm Pandamsfontein 1593), as well as the extent of studies required within the EIA Phase were defined. Public consultation was ongoing throughout this process.
» *EIA Phase* – potentially significant biophysical and social impacts[1] and identified feasible alternatives put forward as part of the project have been comprehensively assessed through specialist investigations. Appropriate mitigation measures have been recommended as part of a draft Environmental Management Programme (EMPr) (refer to Appendix L). Public consultation was ongoing throughout this process.

[1] Direct, indirect, cumulative that may be either positive or negative.

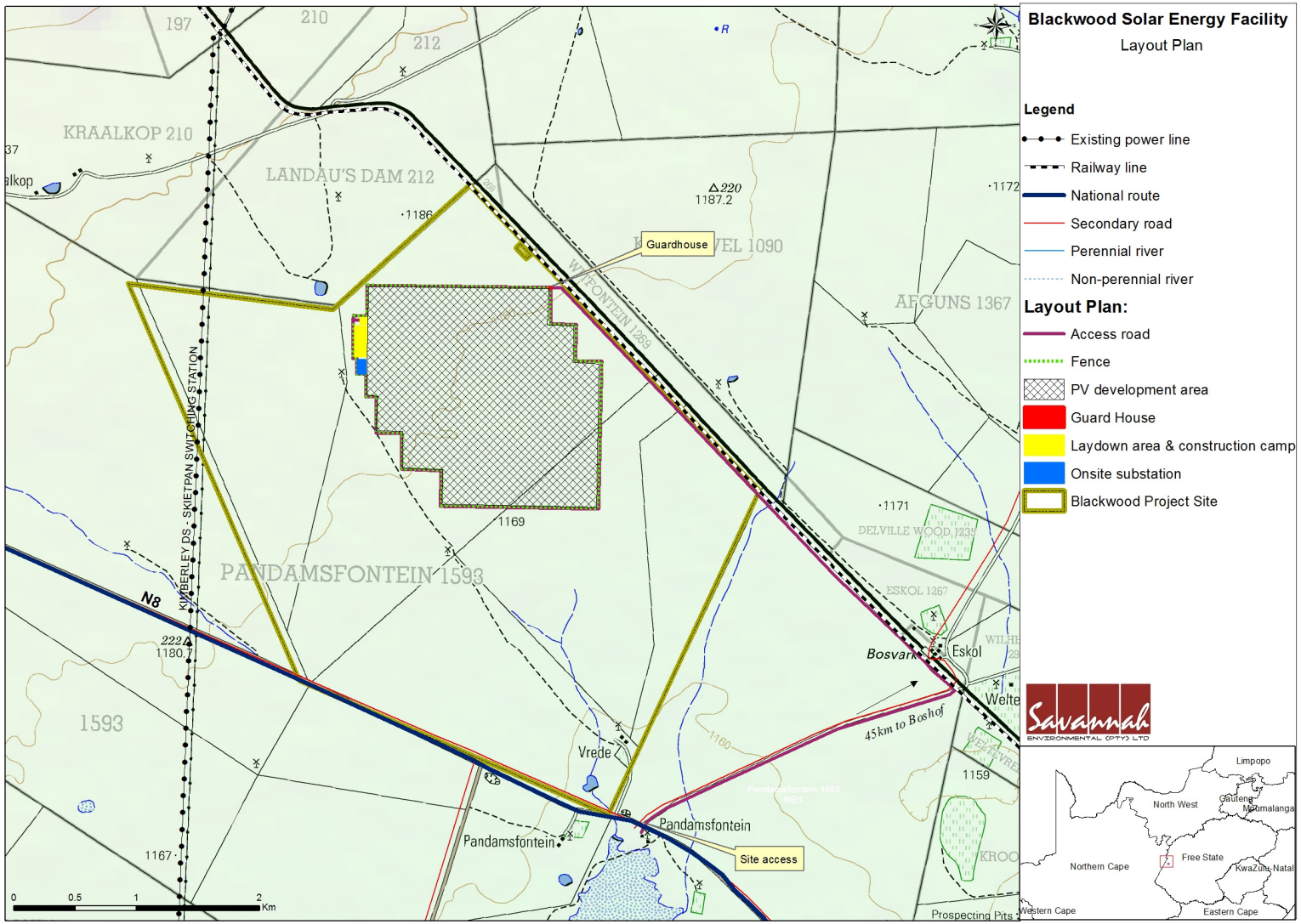

Figure 8.1: Map illustrating the location of the development footprint for Blackwood Solar Energy Facility and the location of the associated infrastructure on the remainder of Portion 1 of the Farm Pandamsfontein 1593.

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. A summary of the recommendations and conclusions for the proposed Blackwood Solar Energy Facility project is provided in this Chapter.

8.1. Summary of Blackwood Solar Energy Facility and Associated Infrastructure

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 EIA Report for Blackwood Solar Energy Facility by providing a summary of the conclusions of the assessment of the proposed site for the development of the PV solar energy facility. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental specialist consultants and presents an informed opinion of the environmental impacts associated with the proposed project.

From the conclusions of the detailed EIA studies undertaken, sensitive areas within the development footprint area were identified and flagged for consideration and avoidance by the facility layout (refer to Figure 8.2). Potential impacts which could occur as a result of the proposed project are summarised in the sections which follow.

The most significant environmental impacts identified and assessed to be associated with the proposed Blackwood project include:

» Impacts on ecology occurring on the site; and
» Impacts on heritage

Other impacts which could have an impact on the environment include:

» Impacts on the local soils, land capability and agricultural potential of the site;
» Visual impacts mainly due to the solar panels and partly due to other associated infrastructure (power line, access road etc.);
» Impacts on paleontological resources;
» Social and economic impacts; and
» Avifaunal impacts.

8.1.1. Impacts on Ecology

The vegetation unit within which the study area is located is mostly Kimberley Thornveld. Vegetation overall is considered as being of least conservation concern, but within the vegetation types more sensitive plant associations, habitats and species of conservation concern, including protected trees and geophytes occur. Most of the protected trees are concentrated within limited vegetation associations. These have been excluded from the development as far as possible. Several protected geophytic and succulent species occur within the study area. Smaller patches of distinct sub-populations of these species should be excluded from the development footprint. In general, it is **not expected** that the PV array and associated infrastructure will compromise the survival of any specific flora or terrestrial vertebrate species in the study area or beyond if mitigation measures as recommended are fully implemented. The most significant impacts are expected to be on ecosystem health and functionality, which should remain relatively intact if all mitigation recommendations are implemented.

8.1.2. Impact on avifauna

There are no known nationally critical populations of impact susceptible species within or close to the development area; however the White-backed Vulture breeding colonies are regionally significant and any impact on these breeding populations should be avoided at all costs. The proposed site is not known to impinge on any major migration routes or avian fly-ways but the data from the site visit does suggest that flight paths of numerous medium-large waterbirds (e.g. Yellow-billed Duck, Egyptian Goose), raptors (e.g. White-backed Vulture) and migrant passerines (e.g. Barn Swallow) could be affected or impacted. The PV arrays are likely to have a **negligible** impact on flight paths or patterns.

Overall, development and construction of the solar energy facility is predicted to have an impact on the avifauna present on site. The predicted disturbances will vary between the construction and operational phases. It is difficult to predict at this stage how detrimental the impacts will be on bird populations in the short or long-term but based on the relatively small footprint of the solar energy facility, bird species present and flight path analyses, **low to moderate** impacts are probable.

8.1.3. Impact on Soils, Land Capability and Agricultural Potential

The site is currently used only for the grazing of cattle. Agricultural potential is fairly uniformly low across the farm and the choice of placement of the facility on the farm therefore has minimal influence on the significance of agricultural impacts. There are no agriculturally sensitive areas that occur within the proposed development footprint. The major limitations to agriculture are the aridity and lack of access to water, as well as the shallow soils. The development will have **low**

negative impacts on agricultural resources and productivity. The conclusion of this assessment is that from an agricultural impact perspective the development can proceed as proposed, subject to the recommended mitigation measures being implemented.

8.1.4. Visual Impacts

Due to the flat topography and terrain of the area, there is little in the surrounding landscape (such as trees and buildings) that can shield the development from view. The landscape character of the site, and surrounds, is open grassland with few homesteads, the visual exposure of the facility is therefore rated high for the immediate vicinity of the site. Industrial-type infrastructure such as electrical transmission lines and pylons and a railway line already exist in the immediate surroundings and therefore the overall visual environment has already been impacted upon to some extent. The study concluded that the significance of the visual impact of the proposed development would be **moderate-low** due to its extent, long-term duration and medium magnitude. A number of mitigation measures are proposed which could minimise the visual impact to some extent.

8.1.5. Impacts on Heritage and Paleontological Resources

Generally sparse **heritage** traces were found over almost all of the proposed development area. Remains of a colonial era (post-1907) railway-associated feature alongside the Kimberley-Bloemfontein line located close to the proposed development area should be avoided as far as possible. From an archaeological perspective the observed heritage resources over the indicated footprint of the Blackwood Solar Energy Facility were found to be mainly of low density and **low significance**.

In terms of the **palaeontology**, it is expected that infrastructure development will involve installation of multiple photovoltaic panels, underground cables and new buildings, resulting in construction activities extending over a relatively large surface area. The field assessment indicates that the construction of the photovoltaic panels and associated infrastructure at the remainder of Portion 1 of the Farm Pandamsfontein 1593 will primarily impact on Quaternary-age surface deposits (Qs). There is a **low probability** that Quaternary fossil remains will be adversely impacted during the construction phase of the proposed project.

8.1.6. Social and Economic Impacts

The findings of the SIA indicate that the development of the proposed Blackwood SEF SEF will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a

Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximse the potential benefits. In addition, the proposed establishment of a number of renewable energy facilities in the area will create socio-economic opportunities, which, in turn, will result in a positive social benefit. The significance of this impact is rated as **high Positive**. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The establishment of the proposed Blackwood SEF is therefore supported by the findings of the SIA.

However, the potential impacts associated with large, solar energy facilities on an areas' sense of place and landscape cannot be ignored. These impacts are an issue that will need to be addressed by the relevant environmental authorities, specifically given the large number of applications for solar facilities in the FSP.

8.2 Assessment of Potential Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The degree of significance of these cumulative impacts is difficult to predict without detailed studies based on more comprehensive data/information on each of the receptors and the site specific developments. This however, is beyond the scope of this study. The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional and national level have the potential to be significant.

The Blackwood Solar Energy Facility falls within the identified geographical areas most suitable for the rollout of the development of solar energy projects within the Free State Province, as identified by the renewable energy SEA study currently underway by the DEA. This implies that projects of the same nature will be consolidated in one area creating a node, and ultimately aiming to reduce the potential for cumulative impacts associated with such developments when spatially fragmented. It is also important to note that it is unlikely that all proposed renewable energy facilities located in the 20km radius will be built due to capacity constraints on the Eskom grid and the limits placed on renewable energy targets.

The cumulative impacts for the proposed Blackwood Solar Energy are expected to be associated with visual impact, impact on the landscape character, social impact,

and impacts on ecology and soil erosion. Impacts in this regard have been assessed to be of low to moderate significance.

8.3 Comparison of Technology Alternatives

Impacts on the environment associated with the project will be influenced by the type of PV panel array to be implemented. PV technologies being considered for the proposed project are fixed and single axis tracking, to be developed with a ~280ha development footprint. For the majority of impacts, the two alternative PV technologies do not differ in any significant way. Therefore, there is **no significant difference** in the potential impacts associated with the alternatives. In terms of the specialist studies undertaken, the following conclusions were made regarding the preferred PV technology alternatives:

	Fixed	**Tracking**
Ecology	Less preferred	Preferred
Soils and agricultural potential	No preference	No preference
Visual	No preference	Less preferred
Heritage & palaeontology	No preference	No preference
Social	No preference	No preference

- ***Ecology*** – Depending on the specific habitat configuration affected, tracking PV technology may be the preferential technological option. This is due to lesser concentration of runoff from sealed surfaces as well as less permanently shaded areas where plant re-establishment is expected to be relatively low, exposing soils to an increased erosion potential.
- **Soils and agricultural potential -** The agricultural potential for the proposed development site is low, in terms of impact arising from soils and agricultural potential. There is no significance difference in the potential impacts associated with the two technology alternatives.
- **Visual -** Fixed technology is preferred being that it is less intrusive to sensitive receptors. However, for this particular site there is very little difference in the significance in the potential impacts associated with the two technology alternatives.
- **Heritage and palaeontology -** There is no significance difference in the potential impacts associated with the two technology alternatives as the footprint remains unchanged.
- **Social** - There is no difference in social / economic impacts from either technology alternatives.

There are no impacts of unacceptably high significance associated with either technology alternative assessed for the proposed Blackwood Solar Energy Facility.

In addition, there is little or no difference between the impacts associated with the two technology alternatives, apart from the expected difference in impact expected to be associated with ecology. From an environmental perspective both technologies are considered to be environmentally acceptable for implementation at the Blackwood Solar Energy Facility. The technology preference should therefore be determined on the basis of technical considerations.

8.4 Environmental Costs of the Project versus Benefits of the Project

Environmental (natural environment, economic and social) costs can be expected to arise from the project proceeding. This could include:

» Direct loss of biodiversity, flora, fauna and soils due to the clearing of land for the construction and utilisation of land for the PV project (which is limited to the development footprint of 300ha). The cost of loss of biodiversity has been minimised on the Blackwood PV site through the careful location of the development footprint to avoid key areas supporting biodiversity of particularly high conservation importance.
» Visual impacts associated with the PV panels. The cost of loss of visual quality to the area is reduced to some extent due to the area already being visually impacted by power lines, a railway line and surrounding mines.
» Change in land-use and loss of land available for grazing on the development footprint.

These costs are expected to occur at a local and site level and are considered acceptable provided the mitigation measures as outlined in the EMPr are implemented.

Benefits of the project include the following:

» The project would result in important economic benefit at the local and regional scale through job creation, procurement of materials and provision of services and other associated downstream economic development. These will occur during the preconstruction/ construction and operational phases.
» The project will contribute towards diversifyng the electricity generation mix of South Africa by addition of solar energy to the mix.
» South Africa's per capita greenhouse gas emission is amongst the highest in the world due to reliance on fossil fuels (South Africa Low Carbon Report). The proposed project will contribute to South Africa achieving goals for implementation of 'green' energy. Greenhouse gas emission load is estimated to reduce by 0.86% for a 500MW coal-fired power station compared to a similar MW in renewable energy project, on a like for like basis[10]

[10] NB: SA CO2 emissions are taken from the US Energy Information Administration, The data is for 2009. Internet Website: http://www.eia.gov

The benefits of the project are expected to occur at a national, regional and local level. These benefits partially offset the localised environmental costs of the project.

8.5. Overall Conclusion (Impact Statement)

The technical viability of establishing a solar energy facility with a maximum contracted capacity of up to 75MW on a site located on the remainder of Portion 1 of the Farm Pandamsfontein 1593 has been established by Blackwood Solar Energy Facility (Pty) Ltd. The positive implications of establishing the Blackwood Solar Energy Facility on the identified site include the following:

» The potential to harness and utilise solar energy resources within the Free State Province
» The project will assist the South African government in reaching their set targets for renewable energy.
» The project will assist the South African government in the implementation of its green growth strategy and job creation targets.
» The project will assist the district and local municipalities in reducing level of unemployment through the creation of jobs and supporting local business.
» The National electricity grid in the Free State will benefit from the additional generated power.
» Promotion of clean, renewable energy in South Africa
» Creation of local employment, business opportunities and skills development for the area.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts have been reduced by implementing the mitigation measures recommended by the specialist team during the EIA process, and this specifically included the consideration of the facility layout in relation to sensitivities identified. The avoidance of areas of sensitivity (ie sensitive plant associations' habitats, species of conservation concern, including protected trees and geophytes, vulture breeding colonies and sensitive heritage features) is illustrated by the facility layout drawing included as Figure 8.2.

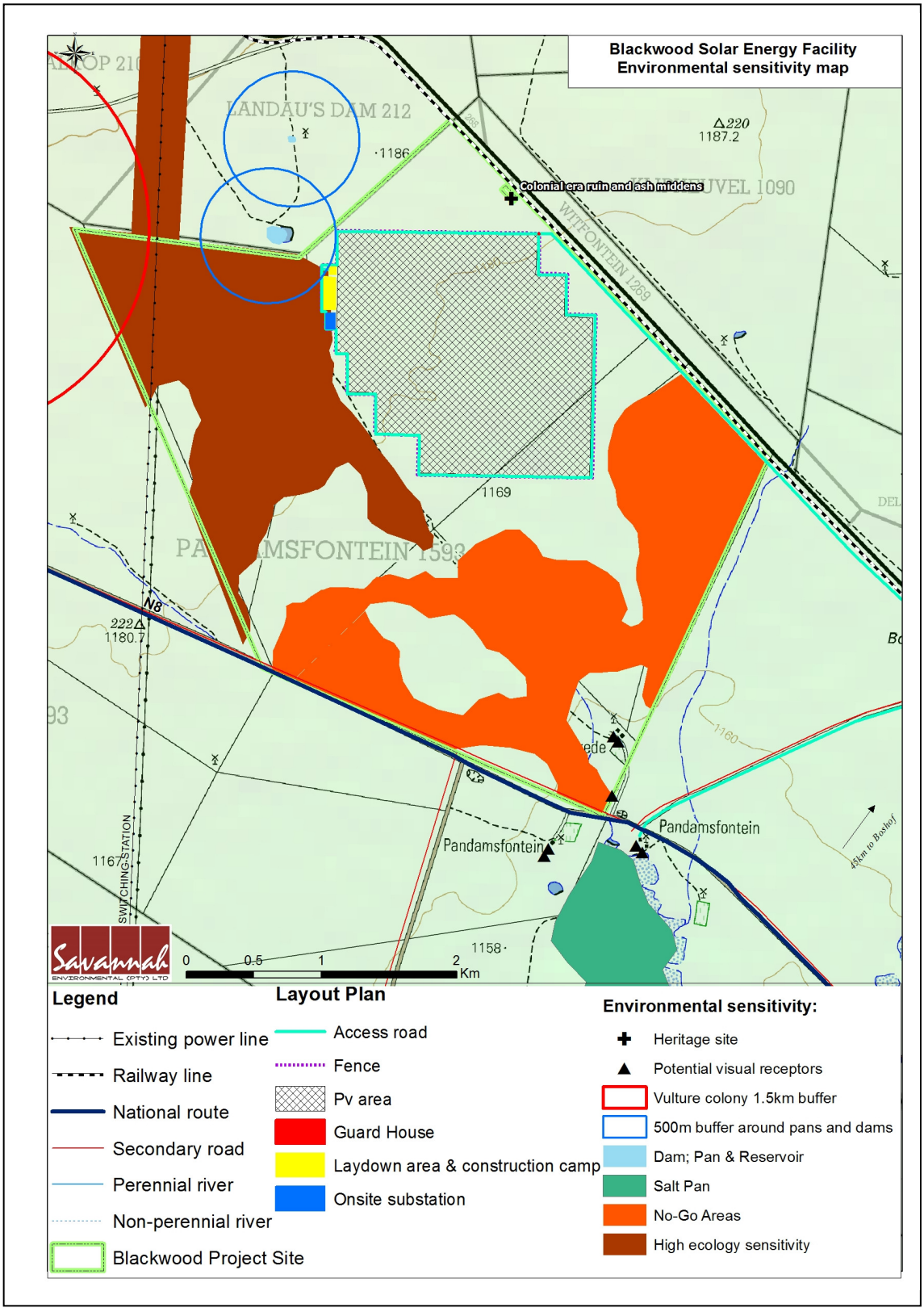

Figure 8.2: Sensitivity map of the proposed Blackwood Solar Energy Facility

The layout plan as presented in Figure 8.2 has been designed to avoid the majority of the sensitive environments on the site:

» Remains of a colonial era (ruin and set of ash middens) next to Kimberley-Bloemfontein railway line should be avoided
» Riparian and fluvial areas are no-go areas
» Areas with higher density of protected and other large tree species are mostly avoided;
» 1.5 km buffer for the White-backed Vulture colony and, a 500m buffer around dams and pans are proposed for the avifauna in the project site.

Therefore this layout as presented is acceptable.

The project has considered constraints, and is considered to meet the requirements of sustainable development. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMPr) for the Blackwood Solar Energy Facility included within **Appendix L**.

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** provided all measures are taken to protect and preserve surrounding environment.

8.6. Overall Recommendation

Global climate change is widely recognised as being one of the greatest environmental challenges facing the world today. How a country sources its energy plays a big part in tackling climate change. As a net off-setter of carbon, renewable energy technologies can assist in reducing carbon emissions, and can play a big part in ensuring security of energy supply, as other sources of energy are depleted or become less accessible. South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result, South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer of carbon emissions. With the aim of reducing South Africa's dependency on coal generated energy, and to address climate change concerns, the South African Government has set a target, through the Integrated Resource Plan (IRP) for electricity to develop 17.8 GW of renewables (including 8,4GW solar) within the period 2010 – 2030.

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 impacts associated with the development of the Blackwood Solar Energy Facility project can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

The following conditions should be included within an authorisation issued for the project:

» The draft Environmental Management Programme (EMPr) as contained within Appendix L of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed solar energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered to be the main key in achieving the appropriate environmental management standards as detailed for this project.
» There is little or no difference between the impacts associated with the two technologies alternatives assessed for the proposed Blackwood Solar Facility, either one of the technology (i.e. fixed/tracking) could be authorised.
» An independent Environmental Control Officer (ECO) must be appointed by the project developer prior to the commencement of any authorised activities.
» A thorough ecological investigation of all footprint areas will be conducted to detect and relocate all plant species of conservation concern by a suitably qualified botanist prior to commencement of activity
» 500m buffer is proposed around reservoir and pan on Landau's Dam and 1500m around the nearby Kraalkop White-backed Vulture breeding colony.
» Remains of a colonial era (ruin and set of ash middens) next to Kimberley-Bloemfontein railway line should be avoided
» If any protected plant or tree species are required to be removed/destroyed as part of the construction of the development, a collection/destruction permit to be obtained from DAFF for the protected trees and FS DETEA for other protected plants. Clearing of large indigenous trees with a stem diameter exceeding 15 cm should be kept to a minimum. Several protected geophytic and succulent species occur within the study area and should be excluded from the development footprint.
» It is recommended that weeds and invasives in the remaining natural veld on the eastern portion of the study area be eradicated and controlled, but that the area is excluded as much as possible from the development. All declared alien plants must be identified and managed in accordance with relevant legislative requirements, the implementation of a monitoring programme in this regard is

recommended. A rigorous alien invasive plant monitoring and management plan must therefore be implemented right up to the decommissioning phase.

» Following the final design of the facility, a final layout must be submitted to DEA for review and approval prior to commencing with construction.
» A water use license must be obtained should water be abstracted for the project from the groundwater resource. The viability and sustainability of this resource should however first be investigated in consultation with DWA.
» Permits must be obtained from the relevant authority for impacting on protected plant species
» Access roads to the development should follow existing tracks as far as possible. Where new access routes will be necessary, suitable erosion control measures must be implemented and maintained throughout the project life-cycle.
» All infrastructures, including access roads and other on-site infrastructure must be planned so that the clearing of vegetation is minimised.
» Site rehabilitation of temporary laydown and construction areas to be undertaken immediately after construction.
» Once the facility has exhausted its life span, the main facility and all associated infrastructure not required for the post rehabilitation use of the site should be removed and all disturbed areas appropriately rehabilitated. An ecologist should be consulted to give input into rehabilitation specifications.
» Develop emergency maintenance operational plan to deal with any event of contamination, pollution, or spillages.
» Compile a comprehensive storm-water management method statement, as part of the final design of the project and implement during construction and operation.
» All rehabilitated areas should be monitored every 2-3 months for at least a year following decommissioning, and remedial actions implemented as and when required.
» Applications for all other relevant and required permits must be obtained by the developer and submitted to the relevant regulating authorities.

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