ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
FINAL ENVIRONMENTAL IMPACT REPORT

PROPOSED KLIP GAT SOLAR ENERGY FACILITY (75MW) NEAR NOUPOORT, NORTHERN CAPE PROVINCE
DEA Ref. No: 14/12/16/3/3/2/354

FINAL EIA REPORT
FOR SUBMISSION TO DEPARTMENT OF ENVIRONMENTAL AFFAIRS

Prepared for:

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EIA INFORMATION LIST – DEA & LEGAL REQUIREMENTS

According to the requirements of the DEA, site, technical and environmental information on the proposed project is to be included in scoping / EIA reports or to be appended to these reports.

1. General Site

No.	Information	Provided / Reference
1.1	Descriptions of all affected farm portions	Refer to Chapter 1 of this report.
1.2	21 digit Surveyor General codes of all affected farm portions	Refer to Chapter 1 of this report.
1.3	Copies of deeds of all affected farm portions	N/A
1.4	Photos of areas that give a visual perspective of all parts of the site	Various within the report (Chapter 5)
1.5	Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)	
1.6	Solar plant design specifications including: * Type of technology * Structure height * Surface area to be covered (including associated infrastructure such as roads) * Structure orientation * Laydown area dimensions (construction period and thereafter) * Generation capacity of the facility as a whole at delivery points	Refer to Chapter 2 of this report.

2. Site maps and GIS information

No.	Information	Provided
2.1	All maps/information layers must also be provided in ESRI Shapefile format	Contained in the CD version of this report
2.2	All affected farm portions must be indicated	Refer to Figure 1.1 of this report – locality map
2.3	The exact site of the application must be indicated (the areas that will be occupied by the application)	Refer to Figure 1.1 of this report – locality map
2.4	A status quo map/layer must be provided that includes the following: Current use of the land on site including:	See Figure 5.4 for land cover/land use map
	2.4.1 Buildings and other structures	Also shown on Figure 5.4
	2.4.2 Agricultural fields	Also shown on Figure 5.4
	2.4.3 Grazing areas	The entire farm portion is used for grazing, and not

No.	Information	Provided
		limited to one area
	2.4.4 Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support areas	See Figure 5.6
	2.4.5 Critically endangered and endangered vegetation areas that occur on the site	Not Applicable
	2.4.6 Bare areas which may be susceptible to soil erosion	Appendix Soil Report
	2.4.7 Cultural historical sites and elements	Figure 5.12
	2.4.8 Rivers, streams and water courses	See Figure 5.2
	2.4.9 Ridgelines and 20m continuous contours with height references in the GIS database	See Figure 5.2
	2.4.10 Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs	Not Applicable to this site
	2.4.11 High potential agricultural areas as defined by the Department of Agriculture, Forestry & Fisheries	Not Applicable to this site
	2.4.12 Buffer zones (also where it is dictated by elements outside the site): 500m from any irrigated agricultural land 1km from residential areas Indicate isolated residential, tourism facilities on or within 1km of the site	The site does not occur within these areas
	2.4.13 A slope analysis map / layer that include the following slope ranges: less than 8% slope between 8% and 12% slope between 12%and 14% slope steeper than 18 %slope	See Appendix K of this report
	2.4.14 A map/layer that indicate locations of birds and' bats including roosting and foraging areas (specialist input required)	***These areas do not occur within the site***
2.5	A site development proposal map(s)/layer(s) that indicate:	***Refer to Appendix K***
	2.5.1 Position of solar facility	
	2.5.2 Foundation footprint	
	2.5.3 Permanent laydown area footprint	
	2.5.3 Construction period laydown footprint	
	2.5.4 Internal road indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible)	

No.	Information	Provided
	2.5.5 River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used	
	Substation (s) and/ transformer (s) sites including their entire footprint	
	2.5.6 Cable routes and trench dimensions (where they are not long internal roads)	
	2.5.7 Connection routes to the distribution / transmission network	
	2.5.8 Cut and fill areas along roads and at substation /transformer sites indicating the expected volume of each cut and fill	
	2.5.9 Borrow pits	
	2.5.10 Spoil heaps (temporary for topsoil & subsoil and permanently for excess material)	
	2.5.11 Buildings including accomodation	

3. Regional map and GIS information

No.	Information	Provided
3.1	All maps/information layers must also be provided in ESRI Shapefile format	Maps contained in the CD version of this report & Appendix K
3.2	The map/layer must cover an area of 20km around the site	Contained in the CD version of this report
3.3	Indicate the following: * roads including their types (tarred or gravel) and category (national, provincial, local or private) * Railway lines and stations * Industrial areas * Harbours and airports * Electricity transmission and distribution lines and substations * Pipelines * Water sources to be utilizes during the construction and operational phases * Critical Biodiversity Areas and Ecological Support Areas * Critically Endangered and Endangered vegetation areas * Agricultural fields * Irrigated areas * An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut	Refer to Appendix K – Project maps

No.	Information	Provided
	and fill areas and crossings of rivers and streams	

NEMA REGULATIONS 543, SECTION 31 REQUIREMENTS FOR THE CONTENT OF ENVIRONMENTAL IMPACT ASSESSMENT REPORTS	CROSS REFERENCE IN THIS EIA REPORT
(a) details of— (i) the EAP who prepared the report; and (ii) the expertise of the EAP to carry out an environmental impact assessment;	Section 1.5
(b) a detailed description of the proposed activity	Chapter 1
(c) a description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is— (i) a linear activity, a description of the route of the activity; or (ii) an ocean-based activity, the coordinates where the activity is to be undertaken	Chapter 1
(d) a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity	Chapter 5
(e) details of the public participation process conducted in terms of subregulation (1), including— (i) steps undertaken in accordance with the plan of study; (ii) a list of persons, organisations and organs of state that were registered as interested and affected parties; (iii) a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and (iv) copies of any representations and comments received from registered interested and affected parties	Chapter 4 Section 4.1
(f) a description of the need and desirability of the proposed activity;	Section 2.2
(g) a description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	Section 2.4

NEMA REGULATIONS 543, SECTION 31 REQUIREMENTS FOR THE CONTENT OF ENVIRONMENTAL IMPACT ASSESSMENT REPORTS	CROSS REFERENCE IN THIS EIA REPORT
(h) an indication of the methodology used in determining the significance of potential environmental impacts	Section 6.1
(i) a description and comparative assessment of all alternatives identified during the environmental impact assessment process	Section 2.4, Chapter 6, Section 7.1.5
(j) a summary of the findings and recommendations of any specialist report or report on a specialised process	Section 7.3
(k) a summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues	Appendix D
(i) a description of the need and desirability of the proposed activity	Section 2.1
(j) a description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	Section 2.4, Chapter 6, Section 7.1.5
(k) a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures	Chapter 6
(l) an assessment of each identified potentially significant impact, including— (i) cumulative impacts; (ii) the nature of the impact; (iii) the extent and duration of the impact; (iv) the probability of the impact occurring; (v) the degree to which the impact can be reversed; (vi) the degree to which the impact may cause irreplaceable loss of resources; and (vii) the degree to which the impact can be mitigated	Chapter 6
(m) a description of any assumptions, uncertainties and gaps in knowledge	Section 4.3.4
(n) a reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	Section 7.3
(o) an environmental impact statement which contains—	Section 7.2 & 7.3

NEMA REGULATIONS 543, SECTION 31 REQUIREMENTS FOR THE CONTENT OF ENVIRONMENTAL IMPACT ASSESSMENT REPORTS	CROSS REFERENCE IN THIS EIA REPORT
(i) a summary of the key findings of the environmental impact assessment; and (ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;	
(p) a draft environmental management programme containing the aspects contemplated in regulation 33	Appendix J
(q) copies of any specialist reports and reports on specialised processes complying with regulation 32	Appendix E-I
(r). any specific information that may be required by the competent authority.	Section 7.3

PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/354
Title	:	Environmental Impact Assessment Process Final Environmental Impact Assessment Report: Proposed Klip Gat Solar Energy Facility Near Noupoort, Northern Cape Province
Authors	:	Savannah Environmental (Pty) Ltd Umeshree Naicker Ravisha Ajodhapersadh Karen Jodas
Sub-consultants	:	Dr. Helga van der Merwe Louis George du Pisani of Edu Plan cc Job M. Kibii from the University of the Witwatersrand Nkosinathi Tomose of Zone Land Solutions Jacques Louis Volschenk of Zone Land Solutions Tony Barbour of Tony Barbour Consulting
Client	:	Klip Gat Solar Energy (Pty) Ltd
Report Status	:	Final EIA Report For Submission to Department of Environmental Affairs

When used as a reference this report should be cited as: Savannah Environmental (2013) Final Environmental Impact Assessment Report: Proposed Klip Gat Solar Energy Facility near Noupoort, Northern Cape Province.

PURPOSE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Klip Gat Solar Energy (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility (with a generating capacity of 75 MW) on Portion 2 of Farm Klip Gat 80 located within the Emthangeni Local Municipality, Northern Cape Province. The proposed site is located approximately 20 km north-west of Noupoort.

Klip Gat Solar Energy (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).

This Final EIA Report consists of eight sections:

Chapter 1: Provides background to the proposed facility and the environmental impact assessment.
Chapter 2: Provides a description of the proposed project.
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 program that was undertaken and input received from interested parties.
Chapter 5: Describes the existing biophysical and socio-economic environment.
Chapter 6: Presents the assessment of environmental impacts associated with the proposed facility.
Chapter 7: Presents the conclusions of the EIA, as well as an impact statement on the proposed project.
Chapter 8: 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 provided stakeholders with an opportunity to verify that the issues they have raised to date have been captured and adequately considered within the study. This Final EIA Report incorporated 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 were invited to comment on the draft EIA Report which was made available for public review and comment for an extended review period during **03 December 2012 to 21 January 2013** at the following locations**.**

» Noupoort Public Library
» Hanover
» www.savannahsa.com

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 was held in November 2012. All interested and affected parties were invited to attend a public meeting held on:

* **Date:** 29 November 2012
* **Time:** 16h30
* **Venue:** Kwezi Community Hall, Kwezi, Hanover

EXECUTIVE SUMMARY

Klip Gat Solar Energy (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility (75 MW) on a site located approximately 20 km north-west of Noupoort, Northern Cape Province. The project is known as the **Klip Gat Solar Energy Facility (75MW).**

The facility is proposed on Portion 2 of Farm Klip Gat 80 which is within the Emthangeni Local Municipality, Northern Cape Province (refer to Figure 1).

The proposed facility, which will be entirely contained within the identified farm portion, will have a developmental footprint of ~ 300ha in extent . The solar energy facility can generate up to 75 MW of electricity and will comprise of the following infrastructure:

» An array of photovoltaic (PV) panels (either static or tracking)and up to 4m in height.
» Mounting structure to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
» Cabling (1-2 m deep) between the project components, to be lain underground where practical.
» Invertors (transformers) between the arrays.
» A new on-site substation (200m x 200m in extent) to evacuate the power from the facility into the Eskom grid via the Linde Carolus 132 kV power line which traverses the site.
» The substation is proposed to be connected to a loop-in loop-out power line to the existing Linde Carolus 132 kV power line. The power line will be up to500m in length with a servitude of ~36m.
» Internal access roads (up to 5m wide) and fencing (up to 3m in height).
» Offices (200m X 200m) area for maintenance, storage, and offices (two locational alternatives are considered and assessed).
» During construction (temporary infrastructure) such as a laydown area will also be required. The temporary construction laydown area will occupy an area of ~157ha.

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 environmental specialist studies undertaken:

» In terms of ecology, the potential impact significance was rated as having a medium significance.
» In terms of geology, soil, and erosion potential, the potential significance was rated as having a high to low significance.

» In terms of heritage resources, the potential significance was rated as having a predominately low significance.
» In terms of visual impacts, the potential significance was rated as having a medium to low significance.
» In terms of social impacts, the potential significance was rated as having a medium to low significance.

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

OVERALL CONCLUSION (IMPACT STATEMENT)

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

The positive implications of establishing a solar energy facility on the identified site within the Northern include:

» The injection of electricity into the grid, at the proposed point, would serve to strengthen the power supply in the area.
» Solar facilities utilise a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a positive light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers.
» The facility could become a major tourist attraction in its own right and could complement the existing tourism attractions in the area, thereby resulting in promoting a positive image of the area with resultant positive impact on the local tourism industry, economy, and environment.
» The project is anticipated to have positive social and health related impacts through the “greener” technology that will be used (limited noise, no emissions etc.).
» On a global scale the project has the potential to assist in reducing carbon dioxide emissions which would thus have an ameliorating impact on global climate change.

» The project will have numerous benefits during both the construction and the operation phase by way of employment opportunities, skills development, and capacity building within the local communities.

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

OVERALL RECOMMENDATION

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the application for the proposed **Klip Gat Solar Energy Facility (75MW)** can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

Potential sensitive areas have been identified through the environmental scoping study and are listed below. In order to reduce the potential for on-site environmental impacts, these areas should be avoided as far as reasonably possible.

» A collection/destruction permit be obtained from Northern Cape Department of Environment and Nature Conservation for the species found on site and for the species that could potentially occur on the site. Thus, the specially protected and protected familiesAizoaceae/Mesembryanthemaceae, Amaryllidaceae, Apocynaceae, Asphodelaceae, Crassulaceae, Iridaceae and Orchidiaceae and genera Androcymbium, Euphorbia, Diascia, Jamesbrittenia, Ornithogalum, Oxalis, Lachenalia, Lessertia, Manulea, Nemesia, Ornithogalum, Sutherlandia and Pelargonium should be applied for since the development will in all probability disturb or destroy individuals belonging to these families and genera. Additionally, a permit for the disturbance or destruction of indigenous species should be applied for.
» Only one identified visual receptorsare located in the background. In addition, no receptors are located in the foreground to the project site. The sensitive receptors in the background of the generated viewshed represent mostly private farmsteads and limited users of the farm access road, some 2.5km north of the project site.

» The preliminary survey of the study area, broader proposed development area (PDA) during the Scoping Phase, yielded 3 heritage resources sites – 2 located within the PDA (Klipgat-1 & Klipgat-2), the other a farmstead referred to as Klipgat farmstead is located just outside the PDA. These sites, however, fall outside the project development foot print.

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

» All mitigation measures detailed within this report and the specialist reports contained within Appendices E to I should be implemented to limit the negative impacts and enhance the positives.
» The draft Environmental Management Programme (EMP) as contained within Appendix J of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
» Alien invasive plants should be controlled on site. Currently, the site contains very little alien vegetation. It is important to maintain this situation and not allow alien species to become established on site.
» A collection/destruction permit be obtained from Northern Cape Nature Conservation for the species found on site and for the species that could potentially occur on the site
» A detailed geotechnical investigation should be undertaken before the engineering design phase to provide more detail. Specialist geotechnical input is recommended during the construction of foundations.
» Earthwork related mitigation measures should be included in the EMP and implemented during the construction phase to limit impacts on geology and soil.
» The management plan primarily focuses on the mitigation and management of potential secondary visual impacts, because the primary visual impact has very low mitigation potential. In this regard proper planning should be undertaken regarding the placement of lighting structures.

In summary, the most significant environmental impacts associated with the Klip Gat Solar Energy Facility, as identified through the EIA, include:

» Local site-specific biophysical (flora, fauna and soils) impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
» Visual impacts.
» Heritage impacts.
» Impacts on the social environment.

The construction of the Klip Gat Solar Energy Facility will lead to permanent disturbance of an area of < 325ha (the development footprint is 37% of the farm portion) in extent. Permanently affected areas include the area for the PV panels and associated infrastructure, as well as the internal power line route. From the specialist investigations undertaken for the proposed solar energy facility development site, it was determined that the majority of the site is in a natural state, but degraded. Areas of sensitivity within the proposed development site were identified through the EIA process. These relate to the local ecology (soil) and heritage artefacts (refer to the sensitivity map – Figure 2).

Each impact is summarised below.

» ***Visual Impacts***

All but one of the identified (Farm road - at the entrance to the farm Holvlakte) receptors is located in the *background*. In addition, no receptors are located in the *foreground* to the project site. The sensitive receptors in the *background* of the generated viewshed represent mostly private farmsteads and limited users of the farm access road, some 2.5km north of the project site.

In the case of cumulative visual impacts there approximately 20 Solar Energy Facilities proposed between Hanover and Noupoort. Klip Gat is the only solar energy facility one in Emthangeni Local Municipality east of the N1. The potential cumulative impacts associated with sequential visibility (e.g. the effect of seeing two or more wind farms (solar facilities) along a single journey, e.g. road or walking trail) is therefore likely to be medium. The Northern Cape is earmarked as a potential solar energy hub for South Africa, considering the vast amounts land available, cumulative impacts will be of acceptable levels within the Pixley Ka Seme District Municipality.

» ***Heritage Impacts***

The survey of the study area yielded 3 heritage resources sites – 2 located within the PDA (Klipgat-1 & Klipgat-2), the other a farmstead referred to as Klipgat farmstead is located just outside the proposed development area. These sites, however, fall outside the project development footprint. The identified sites are further categorised into 2 categories - 2 archaeological sites (i.e. Klipgat-1 & Klipgat-2) and a built environment and landscape site (i.e. Klipgat farmstead). The grading of the heritage sites are generally protected, therefore the impact will

be low. The yellow area indicates the area that needs to be surveyed prior to construction (walk down by an archaeologist before the project construction phase).

» ***Impacts on the Social Environment***

Impacts on the social environment are expected during both the construction phase and the operational phases of the Klip Gat solar energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the solar energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region. Construction crew camps may be established on the site, and if required construction workers may also be housed in the nearest towns or other available/existing accommodation. Construction activities on the site will be largely restricted to daylight hours, and the construction phase is anticipated to extend for a minimum period of 8-months.

Negative impacts during construction relate mainly to impacts due to the presence of construction workers and visual impact imposed by the facility on the local environment. The findings of the SIA undertaken for the proposed project indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project. This will be a positive impact due to the high unemployment levels in the area. The positive impact due to employment creation will be lower during operation as there will be a limited number of staff required compared to the construction phase.

» ***Comparative Assessment of Location Alternatives for Workshop / Office***

Two options for the location of the office have been provided by the developer. Chapter 6 contains the full comparative assessment of the office alternatives. In summary the assessment indicated that from an environmental (ecology, soil and heritage) and social (including visual) perspective, both the options are considered to be acceptable and there is no preference between the options. Therefore, it is supported that the technically preferred option to be implemented.

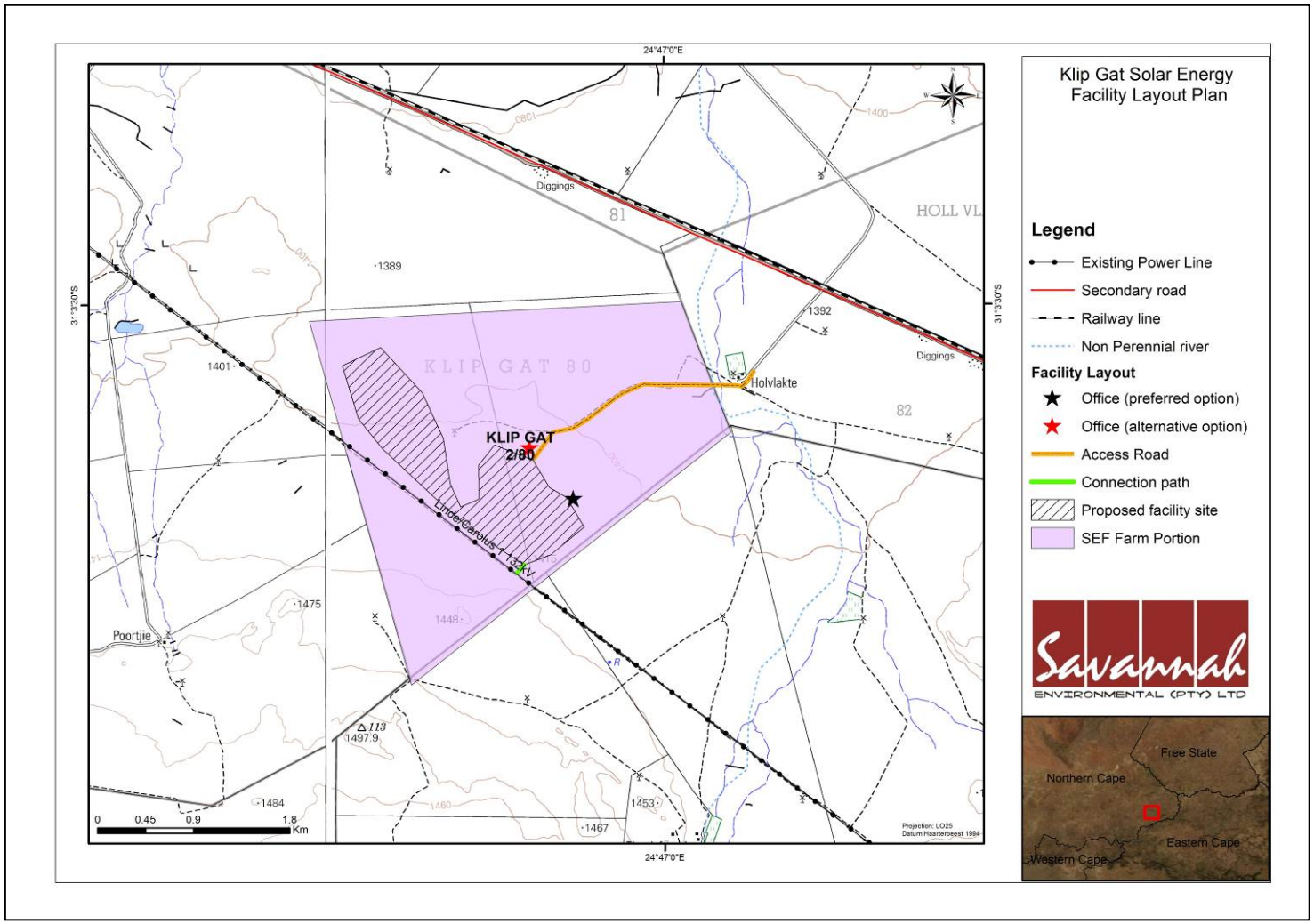

Figure 1: Locality Map

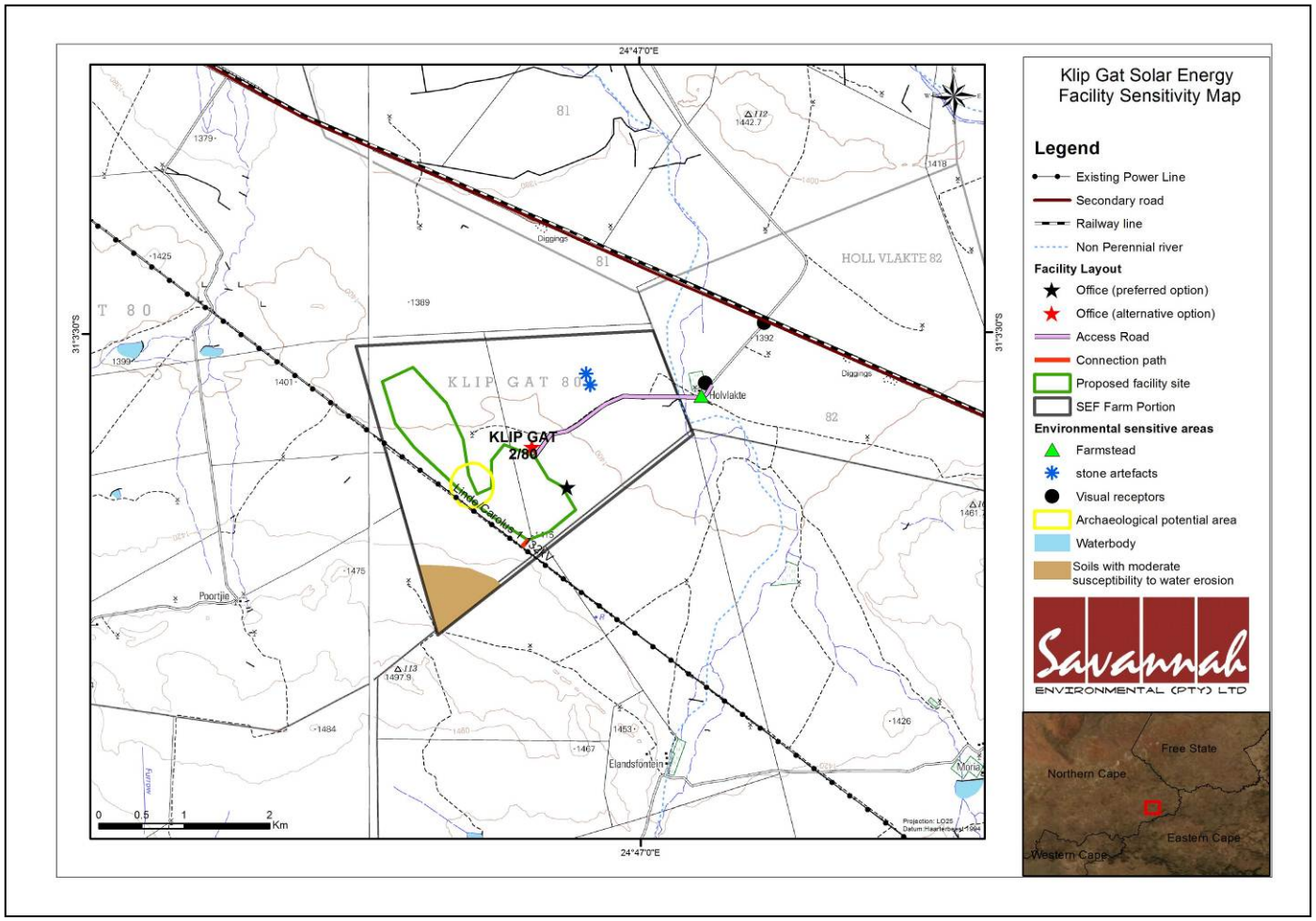

Figure 2: Environmental Sensitivity Map

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APPENDICES

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.

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 ongoing 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.

Photovoltaic effect: Electricity can be generated using photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells that absorb solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

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

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

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.

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 Programme
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
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
SDF	Spatial Development Framework

INTRODUCTION CHAPTER 1

Klip Gat Solar Energy (Pty) Ltd is proposing to establish a commercial photovoltaic solar energy facility on Portion 2 of Farm Klip Gat 80(Surveryor General Code: C03000000000008000002), which is located within the Emthangeni Local Municipality, Northern Cape Province. The proposed site is located approximately 20 km north-west of Noupoort. The farm portion covers an area of approximately 845 ha. The proposed facility and associated infrastructure (i.e. the development footprint) would occupy an area of approximately 325 hectares (ha) of the 845 ha. The site is shown in **Figure 1.1**.

The proposed project development site is considered suitable and favourable 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;
» **Orographic conditions:** The site conditions are optimum for a development of this nature. For instance the site slope and aspect for the proposed site is predominantly flat. A level surface area (i.e. with a minimal gradient in the region of 1%) is preferred for the installation of PV panels.
» **Extent of the site:** Significant land area is required for the proposed development. The site is larger than the area required for development; and
» **Proximity:** This site is in close proximity to an existing electricity grid connection, which minimises the need for a long connection power line.

The nature and extent of the Klip Gat 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 Final EIA Report. The Final EIA Report consists of eight 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 parties.
Chapter 5: Describes the existing biophysical and socio-economic environment.

Chapter 6: Presents the assessment of environmental impacts associated with the proposed facility.

Chapter 7: Presents the conclusions of the EIA, as well as an environmental impact statement on the proposed project.

Chapter 8: 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 Klip Gat Solar Energy Facility is proposed to accommodate several arrays of photovoltaic (PV) panels with associated infrastructure in order to generate up to **75 MW** of electricity. The facility will comprise of PV panels and associated infrastructural requirements which will include:

» An array of photovoltaic (PV) panels either static or tracking and up to 4m in height.
» Mounting structure to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
» Cabling (1-2 m deep) between the project components, to be lain underground where practical.
» Invertors (transformers) between the arrays.
» A new on-site substation (200m x 200m in extent) to evacuate the power from the facility into the Eskom grid via the Linde Carolus 132 kV power line which traverses the site.
» The substation is proposed to be connected to a loop-in loop-out power line to the existing Linde Carolus 132 kV power line. The power line will be up to 500m in length with a servitude of ~36m.
» Internal access roads (up to 5m wide) and fencing (up to 3m in height).
» Offices (200m X 200m) area for maintenance, storage, and offices (two locational alternatives are considered and assessed).
» During construction (temporary infrastructure) such as a laydown area will also be required. The temporary construction laydown area will occupy an area of ~157ha.

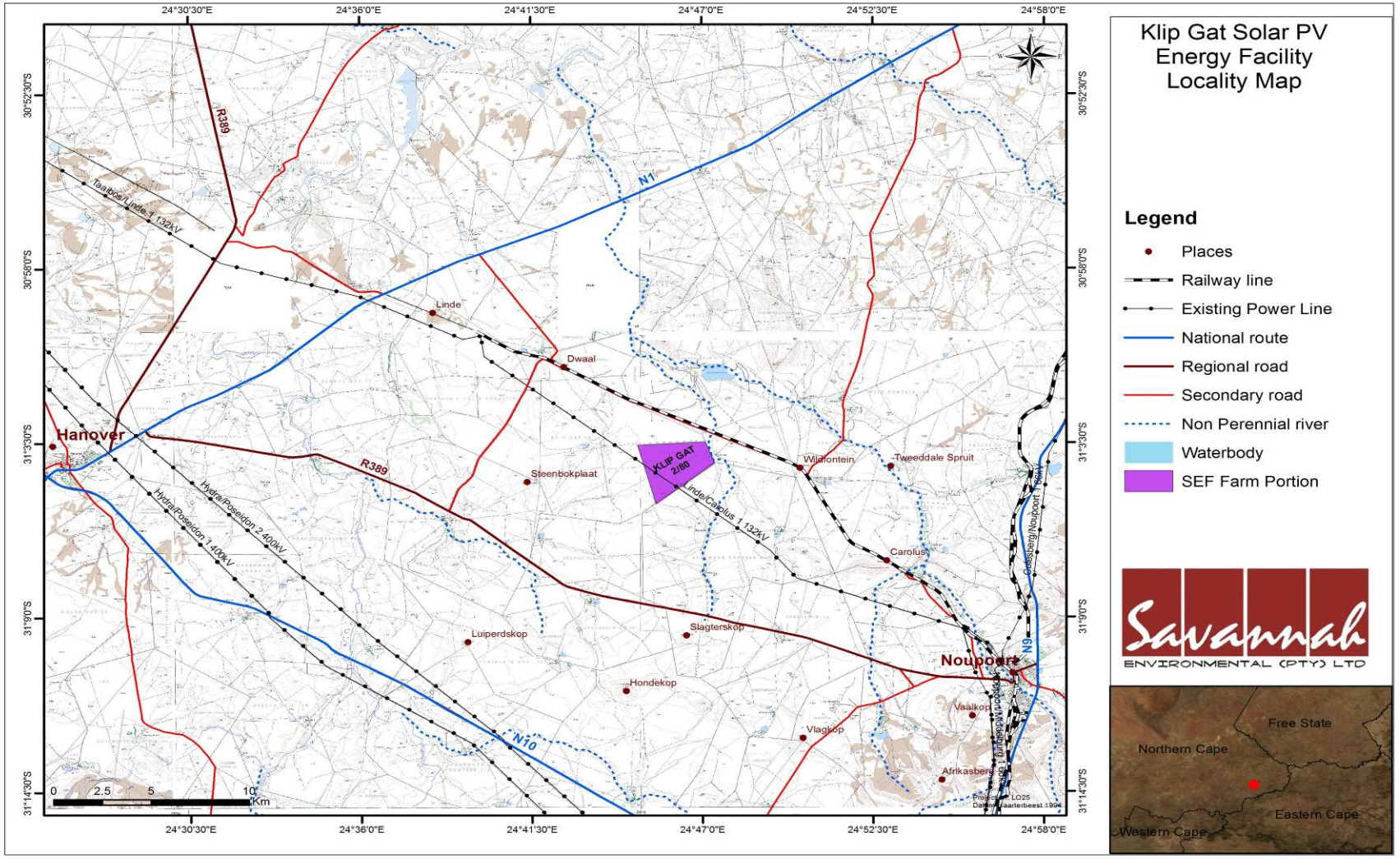

Figure 1.1: Locality map illustrating the location of the assessed development site for the proposed Klip Gat Solar Energy Facility

The overarching objective for the Klip Gat solar energy facility is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. In order to meet these objectives local level environmental and planning issues will be assessed through site-specific studies in order to delineate areas of sensitivity within the broader site of which will serve to inform the design of the facility.

The scope of the proposed Klip Gat Solar Energy 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. Conclusions from the Scoping Phase

The full extent of the project development site (i.e. the entire extent of the farm portion) was evaluated within the Scoping phase of the EIA. The following sensitive environmental features were determined during the Scoping Phase of the EIA (shown in Figure 1.2):

» **Erosion sensitivity of the soils on the site**

There is a difference of soil susceptibility on the proposed site. The majority of the site consists of a low susceptibility to water erosion while a portion of the site (the south-western edge of the site) is of moderate susceptibility to water erosion. The area that is of moderate erosion susceptibility consists of gentle slopes/ ridges.

» **Heritage Artefacts**

Two archaeological sites (stone artefacts) were identified (and are referred to as Klip Gat 1 and Klip Gat 2; refer to Figure 1.2). These areas are considered to be sensitive from an archaeological point of view, however of low heritage significance.

» **Visual receptors**

There are four dominant view corridors that were identified in the region, namely: N1 (the main movement corridor between Cape Town and Johannesburg), N9 (the main movement corridor that run across the spine of the country from Port Elizabeth to Upington, via Cradock, Middelburg, Hanover, De Aar and Groblershoop.), N10 (a main movement route between Colesberg in the Northern Cape and Graaff-Reinett in the Eastern Cape), R389 (a secondary road linking the N9 in the east with the N1 in the west).

The only relevant view corridor is that of a minor farm road, which runs parallel to the De Aar – Noupoort railway line, north of the project site.

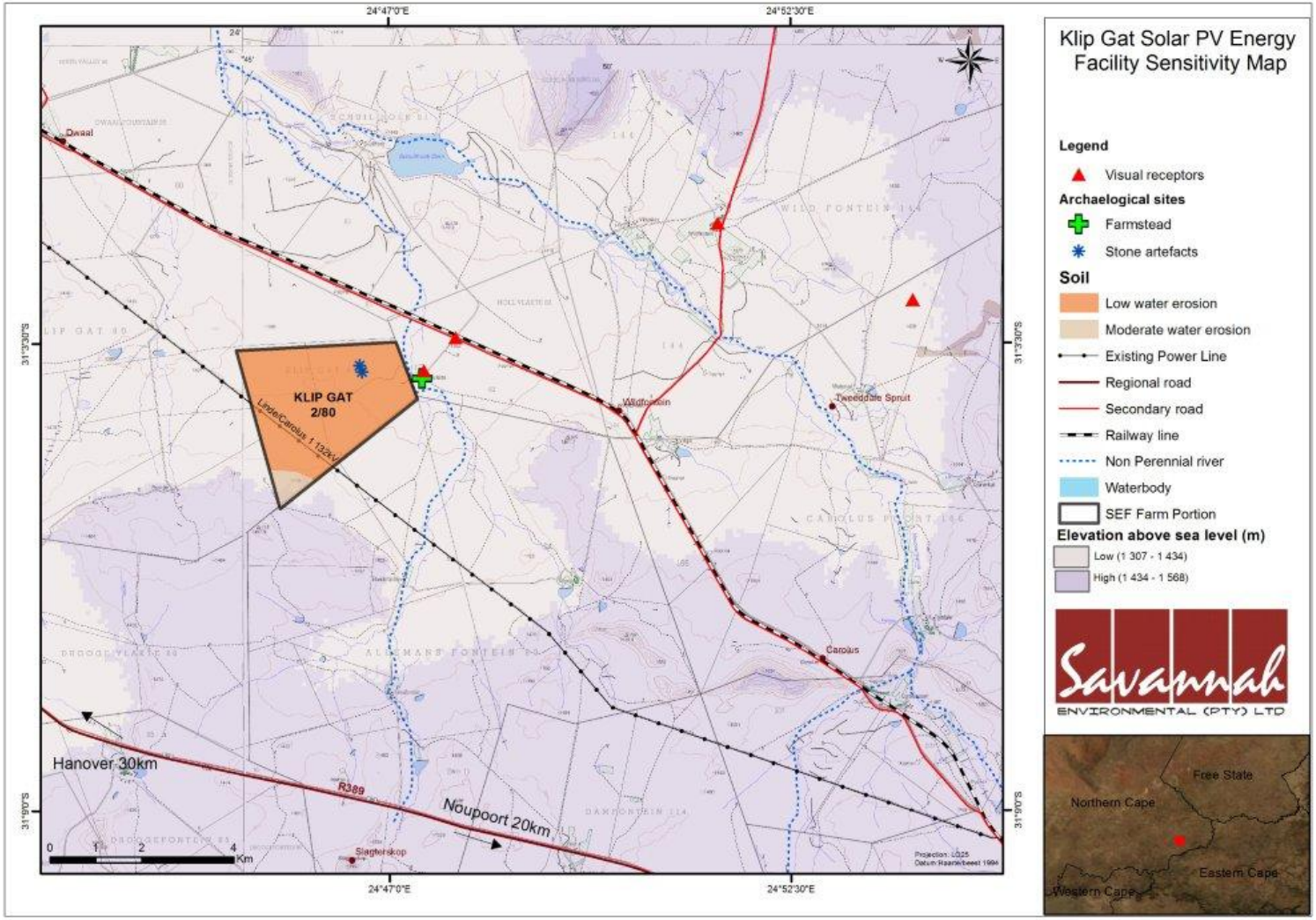

Figure 1.2: Scoping Phase Environmental Sensitivity Map for the proposed Klip Gat Solar Energy Facility

No environmental fatal flaws were identified to be associated with the site during the scoping phase of the EIA. It was recommended that infrastructure should be placed considering the implementation of mitigation measures to minimise impacts to identified sensitive areas. These areas of sensitivity relate only to the ecological aspects of the site and are illustrated in the sensitivity map (refer to Figure 1.2). Subsequently, the layout/ design of the solar energy facility was undertaken by the developer. The 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 Klip Gat Solar Energy Facility include, *inter alia*:

» Loss of / disturbance to protected flora and fauna (local and site specific).
» 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 Klip Gat Solar Energy Facility include, *inter alia*:

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

1.3. 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.

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 and the Northern Cape Department of Environment and Nature Conservation (DENC) will act as a commenting authority for the application. An

application for authorisation has been accepted by DEA under application reference number **14/12/16/3/3/2/354.**

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. Klip Gat Solar Energy Facility (Pty) Ltd appointed Savannah Environmental (Pty) Ltd as the independent Environmental Assessment Practitioner (EAP) to conduct the EIA process for the proposed project.

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, a Scoping Phase and an EIA are required to be undertaken for this proposed project as the proposed project includes the following "listed activities" in terms of GN R544, R545 and R546 (GG No 33306 of 18 June 2010).

Table 1: Activities applied for to be authorised

Relevant Notice	Activity No	Description of listed activity	Description of relevance
GN 544, 18 June 2010	10	The construction of facilities or infrastructure for the transmission and distribution of electricity – i. Outside urban areas or industrial complexes with a capacity of more than 33kv but less than 275kv; or	***The facility will require the construction of an 132kV overhead distribution power line to connect into the existing Linde/Carolus power line.***
GN545, 18 June 2010	1	The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more.	***The PV facility will have a generation capacity of up to 75MW.***

Relevant Notice	Activity No	Description of listed activity	Description of relevance
GN545, 18 June 2010	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; Except where such physical alteration takes place for: (i) Linear development activities. (ii) Agriculture or afforestation where activity 16 in this schedule will apply.	***The PV facility and associated infrastructure will occupy an area of ~325 hectares for commercial electricity generation which will be sold to Eskom.***
GN 546, 18 June 2010	13(c)ii	In the Northern Cape: The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.	***An area of 1 ha or more of indigenous vegetation cover will need to be cleared for the PV panels.***

The EIA phase was conducted in accordance with the requirements of the EIA Regulations of June 2010 and in terms of Section 24(5) of NEMA.

1.4. Objectives of the EIA Process

The Scoping Phase was completed in November 2012 with the receipt of the acceptance of the scoping report from DEA on 06 November 2012. The scoping phase 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) addressed 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 provided stakeholders with an opportunity to verify that issues they have raised through the EIA Process have been captured and adequately considered. This final EIA Report incorporated all issues and responses raised during the public review phase prior to submission to DEA.

1.5. Details of the Environmental Assessment Practitioner

Savannah Environmental was contracted by to Klip Gat 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 Klip Gat 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:

» Karen Jodas - a registered Professional Natural Scientist and holds a Master of Science degree. She has 15 years of 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.

» Ravisha Ajodhapersadh holds an Honours Bachelor of Science degree in Environmental Management and has 5 years' experience in environmental management and has undertaken EIAs for other proposed solar energy facilities in South Africa.

» Umeshree Naicker – The principle author of this report, holds an Honours Bachelor of Science degree in Environmental Science and has 4 years experience in environmental management.

In order to adequately identify and assess potential environmental impacts associated with the proposed project, Savannah Environmental has appointed the following specialist sub-consultants to conduct specialist studies:

» Ecology – Dr. Helga van der Merwe
» Geology, soils, and erosion and agricultural potential – Dr L G du Pisani
» Heritage and Paleontological Assessment– Zone Land Solutions (Pty) Ltd
» Visual – Zone Land Solutions (Pty) Ltd
» Social – Tony Barbour Environmental Consultancy

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, Savannah Environmental has appointed specialist consultants as required. Curricula vitae for the Savannah Environmental project team and its specialist sub-consultants are included in Appendix A.

DECSRIPTION OF THE PROPOSED PROJECT CHAPTER 2

This chapter provides an overview of the proposed Klip Gat Solar Energy Facility near Noupoort, Northern Cape Province. The project scope includes the planning/design, construction, operation and decommissioning phases during which potential impacts will vary in terms of their nature and significance. This chapter also explores the "Do-Nothing" alternative - that is the alternative of not establishing the solar energy facility.

2.1. Purpose of the Proposed Project

The Klip Gat Solar Energy Facility is proposed to be developed as a commercial energy facility. The purpose of the proposed facility is to add new capacity for generation of 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 17,8GW 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. This is however dependent on the assumed learning rates and associated cost reductions for renewable options.

In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy, Klip Gat Solar Energy Facility (Pty) Ltd is proposing the establishment of the Klip Gat Solar Energy Facility to add new capacity to the national electricity grid. Klip Gat Solar Energy Facility (Pty) Ltd will be required to apply for a generation license from the National Energy Regulator of South Africa (NERSA), as well as a power purchase agreement from Eskom (typically for a period of 20 years) in order to build and operate the proposed facility. As part of the agreement, the Klip Gat Solar Energy Facility (Pty) Ltd will be remunerated per kWh by Eskom who will be financially backed by government. Depending on the economic conditions following the lapse of this period, the facility can either be decommissioned or the power purchase agreement may be renegotiated and extended.

It is considered viable that long-term benefits for the community and/or society in general can be realised should the site identified prove to be acceptable from a technical and environmental perspective for the establishment of the proposed PV facility. The Klip Gat Solar Energy Facility has the potential to contribute to national electricity supply and to increase the security of supply to consumers. In addition, it may provide both economic stimulus to the local economy through the construction process and long term employment (i.e. management and maintenance) during the operation phase.

2.2. Description of the Proposed Solar Energy Facility

The facility is proposed to accommodate either static or tracking l photovoltaic (PV) arrays, to harness the solar resource on the site. The facility is proposed to have a generating capacity of up to 75 MW. An area of approximately 325 ha in extent will be occupied by the PV panels & associated infrastructure. A layout of the proposed Klip Gat Solar Energy Facility and associated infrastructure has been provided by the project developer, and is indicated in Figure 2.1 and 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.

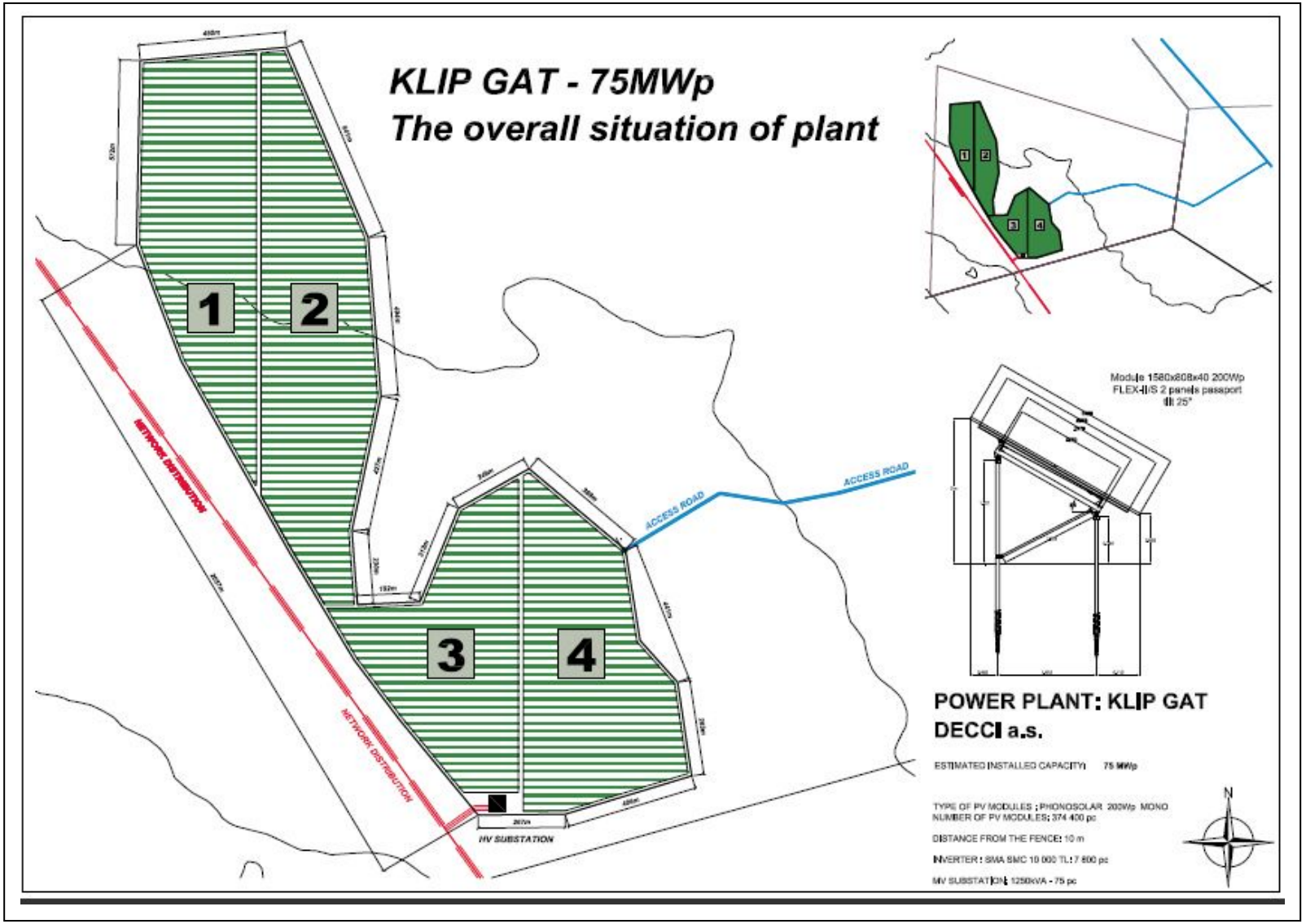

Figure 2.1: Layout for the proposed Klip Gat Solar Energy Facility.

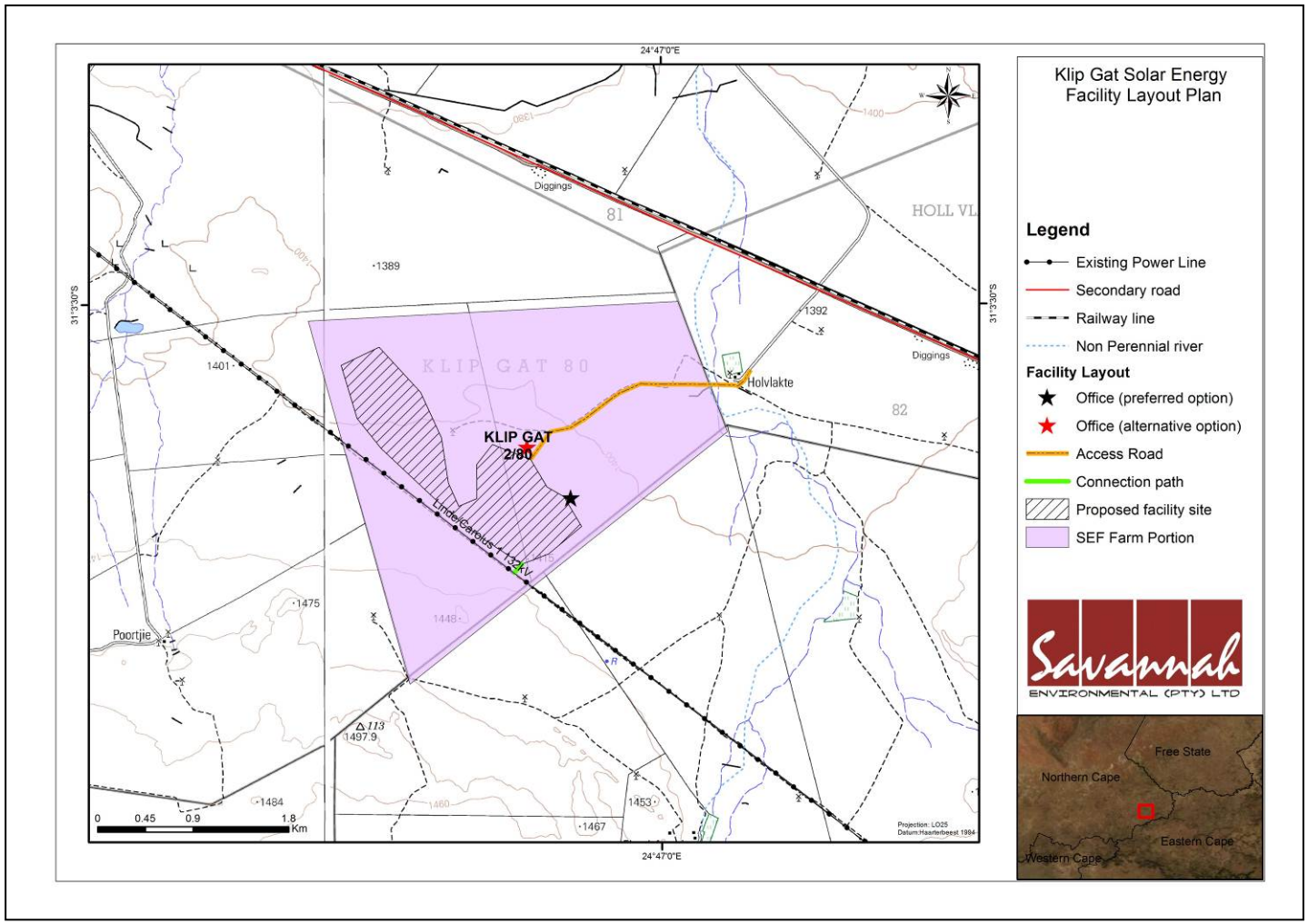

Figure 2.2: Map showing location of the PV panels and associated infrastructure for the Klip Gat project

Table 2.1: Showing the size and technical details

Component	Description / Dimensions
Location of the site	~ 20 km north west of Noupoort ~ 30 km west of Hanover
Municipal Jurisdiction	» Emthanjeni Local Municipality » Pixley ka Seme District Municipality
Extent of the proposed development footprint	~ 325ha
Extent of broader site available for development	~845 ha
Site access	Use of existing access road to the Farm Holvlakte. A new access road to the PV panel "site" will be developed.
Generating capacity	75 MW
Proposed technology	Photovoltaic panels (200Wp) static/ tracking Number of Panels - 372 096ks
Invertors	Number of inverters - 7752ks
Cabling	» Cabling between the project components is between 1 – 2 meters deep, to be lain underground where practical.
Water use	» Water will be sourced/ purchased from the Local Municipality or from existing boreholes – to be determined. » ~12 000m^3 required during the construction phase for general use and 7000m^3 for annual operations for cleaning the PV panels. » No effluent will be produced except for the normal sewage from site and operations staff. This will be treated as per normal standards with a septic tank and disposed of at a facility off-site.
Panel Spec (installed capacity)	200Wp
Panel Dimensions	1580x808
Number of Panels	372 096ks
Number of inverters	7752ks
Main Transformer capacity	2x40MVA

Component	Description / Dimensions
Final Height of installed panels from ground level	4m
Height of inverters	0.6m
Height of Transformers	2.4m
Height of Buildings	2.7m
Width and length of internal roads	5 m width and 5km Length
Height of Fencing	2.2m
Office / workshop (size)	Workshop area for maintenance, storage, and offices is 200m X 200m
Substation	A new on-site substation (132 kV and 200m x 200m) to evacuate the power from the facility into the Eskom grid via the Linde Carolus 132 kV power line which traverses the site
Power line connection	The substation is proposed to be connected via a loop-in loop-out connection to the existing Linde Carolus 132 kV power line or there will be an upgrade or construction of a new power line. The length of the power line is up to 500 m in length and servitude of up to 36 m wide.
Mounting Structure	Mounting structure (up to 4m) to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.

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 converting solar energy into a useful form (i.e. electricity). Solar technologies can be divided into two categories, those that use thermal energy from the sun and those that use the light energy. The former uses water (i.e. solar thermal) whereas the latter does not (i.e. photovoltaic technology which is proposed for this project).

The use of solar energy for electricity generation is a non-consumptive use of a natural resource and consumes no fuel for continuing operation. 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.

2.3.1 How do Grid Connected Photovoltaic Facilities Function?

Solar energy facilities, such as those using PV technology use the energy from the sun to generate electricity through a process known as the Photovoltaic Effect. This effect refers to photons of light colliding with electrons, and therefore placing the electrons into a higher state of energy to create electricity. This is achieved using the following components:

The **Photovoltaic Cell**
Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel. Other technologies that can be used include thin film.

Figure 2.3: Picture of a PV Panel (Courtesy of Decchi)

The **Inverter**
The photovoltaic effect produces electricity in direct current. Therefore an inverter must be used to change it to alternating current.

Figure 2.4: Conceptual drawing showing an invertor cabins (Courtesy of Acciona)

The **Support Structure**

The photovoltaic (PV) panels will be attached to a **support structure approximately 4 meters off the ground** set at an angle so to receive the maximum amount of solar radiation. The angle of the panel is dependent on the latitude of the proposed facility and the angles may be adjusted to optimise for summer or winter solar radiation characteristics. The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

Figure 2.5: Illustration of a photovoltaic solar facility (Courtesy of Decchi)

Grid Connection

Energy generated by the Klip Gat Solar Energy Facility will be evacuated to the national grid via a new on-site substation; a power line will be constructed from the new substation to loop in and loop out of the existing Linde Carolus 132kV power line. The power line will be 500m in length.

2.4. Project Alternatives

Due to the nature of the development (i.e. a PV solar energy facility), the location of the project is largely dependent on technical factors such as solar irradiation (i.e. the fuel source), climatic conditions, available extent and the relief/topography of the site, and available grid connection. The proposed site was identified by the proposed developer as being technically feasible.

The following characteristics were considered in determining the feasibility of the proposed site. Based on these considerations, Klip Gat Solar Energy Facility (Pty) Ltd considers the proposed site as their highly preferred site for the development of the Klip Gat Solar Energy Facility.

Site extent: Space is a restraining factor for a PV solar facility installation. The PV solar facility of 75 MW will require an area ~ 300 ha. There is sufficient space for the proposed project within the area under consideration.

Site access: Access to the Klipgat site is via the Holvlakte main access road off the Dwaal-Noupoort road. Holvlakte is located approximately equidistant (~20 km) from the Dwaal turnoff on the N1 22 km north of Hanover, and Noupoort to the south-east.

Climatic conditions: The economic viability of a PV facility is directly dependent on the annual direct solar irradiation values. The Northern Cape receives the highest average daily direct normal irradiation in South Africa which indicates that the regional location of the project is appropriate to a solar energy facility.

Site slope and aspect: A level surface area (i.e. with a minimal gradient in the region of 1%) is preferred for the installation of PV panels (Fluri, 2009) (refer to Figure 2.3).

Project alternatives: The location of the alternatives for the office is assessed in the EIA phase. Two options for the location of the office have been provided by the developer. The preferred location for the office is located 31 04 29.82 S 24 46 28.07 E. The Alternative option is located 31 04 14.14 S 24 46 12.38 S. The office will occupy an area of 200m x 200m. The preferred location site is assessed in the

Impact Chapter (Chapter 6), as shown in Figure 2.1. The location of the PV site was based on the outcome of the scoping.

Technology Alternatives: Static or Tracking PV technology is being considered for the project. Photovoltaic Solar Panels point directly due south or due north depending upon their location. In order to increase efficiency the photovoltaic panel needs to produce the maximum amount of solar energy for the maximum amount of time during sunlight hours. Static PV panels are fixed at an angle and do not "track" the sun. However, tracking PV panels follow the suns rotational path all day, every day of the year giving it the best solar panel orientation and generating the maximum possible output power

2.5. Proposed Activities during the Project Development Stages

In order to construct the proposed 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. Construction Phase

The construction of the facility is unlikely to be phased, with the full 75 MW (most likely being installed in one phase (75 MW is the current limit for solar projects set by the Department of Energy). The construction phase is expected to extend over a period of 18-24 months and create approximately 291 employment opportunities, depending on the final design. Of this total ~ 68% (198) will be available to low-skilled workers (construction labourers, security staff etc.) and semi-skilled workers (drivers, equipment operators etc.) and 32% (93) to skilled personnel (engineers, land surveyors, project managers etc.). 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. This would represent a significant positive social benefit in an area with limited employment opportunities

The construction phase will entail a series of activities including:

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.

A power line servitude survey will also be conducted for the proposed Linde Carolus 132kV power line. If necessary, a walk through survey will be undertaken for ecological/heritage resources.

Establishment of Access Roads

Access to the Klipgat site is via the Holvlakte main access road off the Dwaal-Noupoort road. The farm Holvlakte is located approximately ~20 km from the Dwaal turnoff on the N1. Within the site itself, an access road will be constructed to the individual facility components for construction purposes (and later limited access for maintenance). Access track construction would normally comprise of compacted rock-fill with a layer of higher quality surfacing stone on top. The roads will be up to 5 metres wide.

Undertake Site Preparation

Site preparation activities will include clearance of vegetation for most of the proposed area. In addition, site preparation will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site. If the terrain is undulating, then the ground may have to be levelled to one slope. Rocks may also be removed.

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)[1] 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 substation and power line.

Establishment of Construction Equipment Camp

Once the required equipment has been transported to site, a construction equipment camp will need to be established. The purpose of this camp is to confine activities and storage of equipment to one designated area to limit the potential

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

ecological impacts associated with this phase of the project. The laydown area(s) will be used for assembly purposes and the general placement/storage of construction equipment. The storage of fuel for the on-site construction vehicles and equipment will need to be secured in a temporary bunded facility so as to prevent the possibility of leakages and soil contamination.

Establishment of the PV Panels

The PV panels will be mounted via steel structures which will be attached to uprights which are stabilised by concrete foundations where necessary. The foundation holes will be mechanically excavated to a depth of approximately 100 - 150 cm. The concrete foundations where necessary will be poured and then left for up to a week to cure. The installation of underground cables will require the excavation of trenches of approximately 50 cm – 200 cm deep within which they can then be laid.

Establishment of Ancillary Infrastructure

Ancillary infrastructure for the proposed development includes; a workshop, laydown area and office. 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 and Power line

An on-site 132 kV substation of approximately 200m x 200m will be required to be established on the site. The construction of the substation would include the construction of the foundations, erection and installation of equipment (including the transformer and feeder bays, HV yard) and connection of the necessary conductors. A loop-in, loop-out power line connection on the Linde Carolus 132kV power line which is immediately east of the proposed site, will evacuate the power generated from the facility to the Eskom grid. The power line will be up to 500m in length.

Undertake Site Rehabilitation

As construction is completed in an area, and as all construction equipment is removed from the site, the site must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operation phase will be closed and prepared for rehabilitation.

2.5.2. Operational Phase

A small number of people employed during the operational phase (~ 60). The following maintenance activities; trimming vegetation, washing panels and security systems are to be used during the operational phase.

The proposed operational phase is expected to extend for a period of approximately 20 years with plant maintenance. It is anticipated that during this time, full time security, maintenance, supervision and monitoring teams will be required on site. Maintenance activities will include *inter alia*, replacement and cleaning of the panels (using water and/or pressurised air). The photovoltaic plant will be operational during daylight hours only. However, it will not be operational under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities. No energy storage mechanisms (i.e. batteries) which would allow for continued generation at night or on cloudy days are proposed.

2.5.3. Decommissioning Phase

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

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

The components of the plant will be disassembled and removed. Thereafter they will be reused and recycled (where possible) or disposed of in accordance with regulatory requirements. The site will be rehabilitated and can be returned to the agricultural land-use.

REGULATORY AND LEGAL CONTEXT CHAPTER 3

3.1 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 facilities is illustrated in **Figure 3.1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed Klip Gat solar energy facility.

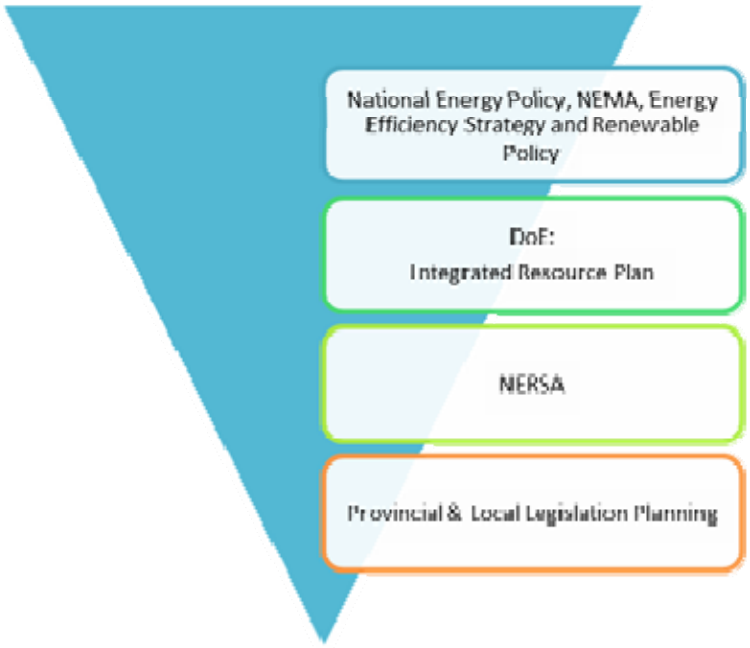

Figure 3.1: Hierarchy of electricity policy and planning documents

3.1.1 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.

3.1.2 Renewable Energy Policy in South Africa, 1998

Internationally there is increasing development of the use of renewable technologies for the generation of electricity due to concerns such as climate change and exploitation of resources. In response, the South African government ratified the United Nations Framework Convention on Climate Change (UNFCCC) in August 1997 and acceded to the Kyoto Protocol, the enabling mechanism for the convention, in August 2002. In addition, national response strategies have been developed for both climate change and renewable energy.

Investment in renewable energy initiatives, such as the proposed solar energy facility, is supported by the National Energy Policy (DME, 1998). This policy recognises that renewable energy applications have specific characteristics which need to be considered. The Energy Policy is "*based on the understanding that renewables are energy sources in their own right, and are not limited to small-scale and remote applications, and have significant medium- and long-term commercial potential*." In addition, the National Energy Policy states that "*Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future*".

The White Paper on Renewable Energy (DME, 2003) supplements the Energy Policy, and sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. It also informs the public and the international community of the Government's vision, and how the Government intends to achieve these objectives; and informs Government agencies and organs of their roles in achieving the objectives.

The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology); more so when social and environmental costs are taken into account. 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.

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

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

3.1.3 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.

3.1.4 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.

3.1.5 Northern Cape Provincial Spatial Development Framework (2011)

Dennis Moss Partnership is currently preparing a Provincial Spatial Development Framework (PDSF) for the Northern Cape Province (NCP) The PSDF is a legal requirement in terms of Chapter 4 of the Northern Cape Planning and Development Act 7 of 1998.

Volumes 1 and 2 were finalised in December 2011. Volumes 1 and 2 are essentially introductory, status quo reports. Volume 2 provides a situation analysis of the NCP, mainly with the view of identifying key aspects for policy focus/ intervention. Volumes 3 (Spatial Directives) and 4 (Strategies) are currently in preparation, and no Draft documents are available at this stage.

Volume 2 (Situation Analysis and Key Aspects) indicates that the envisaged Spatial Directives and Strategies reports would be closely aligned to the 2004-2014 Northern Cape Provincial Growth and Development Strategy (PGDS) (currently in Draft 4)[2]. Volume 2 includes an overview of some key relevant aspects of the PGDS Draft 4, including with regard to the roles of renewable energy and tourism in the provincial economy.

The PSDF (Vol 2) notes that, at present, the Eskom Vanderkloof hydro station on the Orange River (240 MW) represents the only large renewable energy-generating facility in the NCP. The PSDF therefore notes that the NCP's major energy

[2] Draft 4 (2011) of the PGDS does not seem to have been made public yet.

challenges include securing energy supply to meet growing demand, providing everybody with access to energy services and tackling the causes and impacts of climate change (as per PGDS). In this regard, the development of large-scale solar energy supply schemes is strategically important for increasing the diversity of domestic energy supplies for the NCP, and avoiding energy imports while minimizing the environmental impacts.

The PSDF further notes that renewable energy has been identified in the Draft 4 PGDS (2011) as a mechanism to diversify the economy and thereby promote a green economy in the province. According to the PGDS, greening the economy is characterized by substantially increased investments in economic sectors (NCPG; 2011: F.1.4.1). Vol. 2 of the PSDF indicates that the promotion of job creation in the green jobs industries (e.g. manufacturing of solar water heaters, maintenance of wind generators and solar energy infrastructure) would be promoted in the forthcoming spatial directives and strategies reports (Volumes 3-4). The PSDF notes that, according to the PGDS the NCP has considerable potential for renewable energy generation, including solar energy.

Tourism

The PSDF notes that the tourism sector is identified in the Draft 4 PGDS as one of the key sectors with the capacity to 'grow, transform and diversify the provincial economy'. According to the PGDS, the vision for tourism is underpinned by a number of broad, essential and specific drivers. The 'broad drivers' consider the 'big picture' focusing on tourism's contribution to a larger development purpose, including overall economic growth, addressing social up-liftment and poverty alleviation through facilitating job creation, and striving for more equitable ownership and participation in tourism through transformation.

Comparative advantages of the NCP are identified as mainly eco-tourism opportunities, including unique sectoral or nature-based routes; National parks, nature reserves and game reserves, Natural and cultural manifestations, as well as festivals and cultural events (PGNC; 2011b).

3.1.6. Pixley ka Seme District Municipality Integrated Development Plan (2007-2011)

The vision for the Pixley ka Seme District Municipality(PSKDM) as set out in the IDP is to "commit ourselves to be a developmental municipality where the quality of life of all people in the district will be improved".

In terms of the mission statement, the PKSDM sets out to achieve -

- » Efficient service delivery;
- » Optimal human and natural resource development;

- » Local economic growth and development, job creation and poverty alleviation;
- » A vibrant tourism industry and;
- » A safe, secure and community friendly environment.

Key developmental challenges identified for the PKSDM most likely to have a fundamental effect on the long-term economic viability of the district include:

- » Optimizing on the opportunities presented by the region's geo-political location between Cape Town, Bloemfontein, Johannesburg and Pretoria, which are among the most important cities in South Africa;
- » Optimizing on the opportunities presented by the N1, N12, N9 and N10 corridors, which already transport many tourists, goods and services throughout the year through the region;
- » The potential opportunities of the proposed renewable energy hub in the region;
- » The HIV/AIDS pandemic and its impact on regional demographics;
- » Management of investor risk, and where necessary, direct intervention in order to attract international capital;
- » The maintenance and preservation of pristine environment; and
- » High levels of unemployment and poverty (PKSDM; 2012: 110).

Key objectives and strategies of relevance to the proposed Klip Gat solar energy facility development include:

» **LED, Tourism and Poverty Alleviation:**

Key identified challenges include high levels of poverty and low skills levels; and a relatively undiversified economy, relying mainly on primary sector activities.

Key interventions would include promoting SMMEs; attracting and retaining investors in the region; development of identified development corridors; value-adding to/ beneficiation of local produce; and the promotion of tourism development. Policies/ targets aimed at addressing these challenges include:

- » LED1: Promote Local Economic Development in the region;
- » LED 2: Increase SMME promotion;
- » LED 4: Increased tourism promotion – a Tourism Market Strategy should be compiled to attract investments and tourists;
- » LED 6: Reduce employment and poverty by 50% each, respectively in the region by 2014.

» **HIV/ AIDS:**

- Key identified challenges include low awareness levels, inadequate health care facilities, including a lack of trained professionals, mobile clinics, a hospice, etc.

Policy HIV 1 focuses on reducing the level HIV/AIDS infections amongst young men and women in the District.

» **Education, Youth and development:**
Key identified challenges include limited or no access to higher learner institutions; lack of IT skills in the region; poor qualification and skills of the community limiting their entry to institutions of higher learning; very few training facilities in the region; and a lack of funds available to the majority of learners. Policy Y1 focuses on improving the well-being of young men and women, including improving access to vocational training (Y1.2).

» **Safety and security:**
Key identified challenges include high endemic levels of family and child abuse; and high levels of alcohol abuse. Policy SS1 provides for the promotion of a safe and secure environment in the District.

» **Renewable Energy Hub**

The Pixley ka Seme District Municipality convened a conference on investment and renewable energy which was held from the 14th to the 16th of September 2010. The intention of the conference was to provide insight around virgin opportunities that could be exploited in key sectors of the district economy, namely: mining, tourism, manufacturing, retail, agriculture and agro-processing and also in the renewable energy sector, namely: solar, wind, hydro, bio-mass, bio-digestion and geo-thermal development. The investment and renewable conference took resolutions on matters including Infrastructure development and Rural industrialization and development zones (PKSDM; 2012: 176).

The PKSDM Local Economic Development (LED) has indicated The DM is currently actively promoting itself as renewable energy hub, and hopes to become the national solar hub. It is hoped that the development of multiple solar projects in the DM would create sufficient critical mass to support the development of local solar-related manufacturing and servicing industry, and potentially even the establishment of a renewables related vocational training centre/ FET in De Aar. As such, the PKSDM has identified renewables development - and solar in particular – as a key local economic growth and development strategy, with potential spinoffs in terms of direct long term employment creation, and major potential cumulative downstream benefits in terms of local investment, manufacturing and spending, as well as local tertiary vocational training. Spatially, concentration of facilities is envisaged in the De Aar area, but also including Prieska, Hannover and Noupoort. Unlike the Gariep/ Orange River valley located to the north, the relevant area is not considered visually sensitive (Madyo – pers. comm).

3.1.7 Emthanjeni Local Municipality Integrated Development Plan 2012-2013

The ELM IDP (2012) identifies a number of key performance areas (KPAs) in line with National guidelines. These KPAs address the outcome of an analysis of the status quo across numerous sectors within the ELM and include the following:

- Basic Service Delivery;
- Local Economic Development;
- Environmental Management;
- Social Development;
- Good Governance and Public Participation;
- Safety and Security;
- Cross-Cutting Issues;
- Municipal Financial Viability and Management; and
- Municipal Institutional Transformation.

These KPAs aim to utilize existing economic strengths and opportunities by transferring these into workable programmes and projects. These programmes and projects tend to reduce the current threats, and strengthen the weaknesses in the local economic environment. The IDP KPAs that are relevant to the proposed PVSEF include:

- Basic Service Delivery: Energy is highlighted as one of the priority issues for the ELM with respect to basic services; and,
- Local Economic Development (LED): Micro and macro-economic development and land use management are highlighted as one of the priority issues for the ELM with respect to LED.

The Municipality identified a number of industrial and manufacturing projects that form part of their strategy for the economic development of the ELM. These include amongst others:

- The development of N10 Corridor;
- Revitalization of the rail infrastructure;
- Development of industrial sites (Hanover / Britstown);
- Urban Renewal Programme (Renewal of Townships);
- A Logistics hub (De Aar); and
- A Renewable Energy hub (De Aar).

3.3. 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 solar energy facility project and the related statutory environmental assessment process.

3.3.1. Regulatory Hierarchy

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

» *Department of Energy:* This Department is responsible for policy relating to all energy forms, including renewable energy, and are 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):* The National Heritage Resources Act (Act No 25 of 1999) and the associated provincial regulations provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes.
» *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 department is responsible for all national routes.

At the Provincial Level, the main regulatory agencies are:

» *Provincial Government of the Northern Cape – Department of Environmental and Nature Conservation (DENC):* This department is the commenting authority for this project.
» *Department of Transport and Public Works:* This department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
» *Provincial Department of Water Affairs:* This department is responsible for water use licensing and permits.
» *Ngwao Boswa ya Kapa Bokone (Northern Cape Heritage Authority):* This body is responsible for all heritage related issues in the Northern Cape Province.

» *The Department of Agriculture:* This Department is responsible for all matters which affect agricultural land.

At the local level, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape, both the local and district municipalities play a role. The local municipality is the Emthanjeni Local Municipality which forms part of the Pixley ka Seme District Municipality. There are also numerous non-statutory bodies such as environmental non-governmental organisations (NGOs) and community based organisations (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.

3.3.2 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 (GNR543, GNR544, GNR545, and GNR546 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).
» International guidelines – the Equator Principles

Several other acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the EIA Report. A review of legislative requirements applicable to the proposed project is provided in the **Table 3.1.**

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 Department of Environmental and Nature Conservation (DENC)- 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 Department of Environmental and Nature Conservation (DENC)- 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 water from a water resource - Sections 21a and b. Non-consumptive water uses may include impeding	Department of Water Affairs Provincial Department of Water Affairs	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. No drainage lines occur within the development foot print. Should water be abstracted from a

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	or diverting of flow in a water course - Section 21c; and altering of bed, banks or characteristics of a watercourse - Section 21i.		borehole, then a water use licence may also be triggered. Should water be abstracted from ground water/ a borehole on site for use within the facility, a water use license may be required.
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 mineral resources that might occur on site.	Department of Mineral Resources	As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained. A Section 53 application will be submitted the Northern Cape DMR office.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	Measures in respect of dust control (S32) – no regulations promulgated yet. Measures to control noise (S34) - no regulations	Department of Environmental Affairs	No permitting or licensing requirements arise from this legislation.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	promulgated yet.		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 cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » Lists activities which require developers 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).	South African Heritage Resources Agency	An HIA and PIA has been undertaken as part of the EIA Process to identify heritage sites.(See Appendix G). Should and heritage resource be removed, a permit may be required from SAHRA.
National Environmental	» Provides for the MEC/Minister to identify any	Department of	As the applicant will not carry out

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Management: Biodiversity Act (Act No 10 of 2004)	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 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.	Environmental Affairs	any restricted activity, as is defined in S1 of the Act, no permit is required to be obtained in this regard. Specialist flora and fauna studies have been undertaken as part of the EIA Phase. As such the potentially occurrence of critically endangered, endangered, vulnerable, and protected species 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
	» Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.		
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. 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 project.
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	National Department of Forestry	A licence is required for the removal of protected Trees. There are no protected tree species recorded on the site during the ecological survey,

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Minister'.		
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.
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	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.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	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.		
Development Facilitation Act (Act No 67 of 1995)	Provides for the overall framework and administrative structures for planning throughout the Republic. S (2 - 4) provide general principles for land development and conflict resolution.	Local Municipality	The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act.
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 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.	National Department of Water and Environmental Affairs Provincial Department of Environmental Affairs (general waste)	As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. 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 EMP (refer to

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Making other changes to the particulars on the list. In terms of the Regulations published in terms of this Act (GN 718), 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: » 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.		Appendix K). The volumes of waste to be generated and stored on the site during construction and operation of the facility will not require a waste license (provided these remain below the prescribed thresholds).
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	» South African National Roads Agency Limited (national roads) » Provincial Department of	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

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	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 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.	Transport	abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).
Promotion of Access to Information Act (Act No 2 of 2000)	All requests for access to information held by state or private body are provided for in the Act under S11.	Department of Environmental Affairs	No permitting or licensing requirements.
Promotion of Administrative Justice Act (Act No 3 of 2000)	In terms of S3 the government is required to act lawfully and take procedurally fair, reasonable, and rational decisions. Interested and affected parties have a right to be heard.	Department of Environmental Affairs	No permitting or licensing requirements.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Provincial Legislation			
Northern Cape Nature Conservation Act, Act No. 9 of 2009	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. » The Act provides lists of protected species for the Province.	Provincial Department of Environmental Affairs	A collection/destruction permit be obtained from Northern Cape Nature Conservation for the species found on site as for the species that could potentially occur on the site. The specially protected and protected families that should be applied for include: Aizoaceae/Mesembryanthemaceae, Amaryllidaceae, Apocynaceae, Asphodelaceae, Crassulaceae, Iridaceae and Orchidiaceae. Additionally, the genera *Androcymbium*, *Euphorbia*, *Diascia*, *Jamesbrittenia*, *Lachenalia*, *Lessertia*, *Manulea*, *Nemesia*, *Ornithogalum*, *Oxalis*, *Pelargonium* and *Sutherlandia* should be applied for since the development will most likely disturb or destroy individuals belonging to these families and genera. Additionally, a permit for the disturbance or destruction of indigenous species must be applied for.

APPROACH TO UNDERTAKING THE EIA PHASE CHAPTER 4

An EIA process is regulated by the EIA Regulations 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 (EMP) to the competent authority for decision-making.

The EIA Process for the proposed 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 NEMA (Act No. 107 of 1998). The environmental studies for this proposed project were undertaken in two phases, in accordance with the EIA Regulations.

4.1. Phase 1: Scoping Phase

The Scoping Study, which was completed in November 2012 with the acceptance of Scoping by the DEA, the scoping phase served to identify potential issues associated with the proposed project, and define the extent of studies required within the EIA Phase. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and 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 the Noupoort and Hanover 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.

The Scoping Report was submitted to the National Department of Environmental Affairs in August 2012. The Final Scoping Report and Plan of Study for the EIA were accepted by the DEA, as the competent authority, in November 2012. In terms of this acceptance, an EIA was required to be undertaken for the proposed project.

4.2. Phase 2: Environmental Impact Assessment Phase

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

within the EIA Phase of the process (refer to Chapter 6). The EIA Phase aimed to achieve the following:

» Provide a comprehensive assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Comparatively assess any alternatives put forward as part of the project (i.e. in this case the options of storage versus no storage were assessed).
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA Report addresses potential direct, indirect, and cumulative[3] 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 to be 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.

[3] "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).

» 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 consultation undertaken prior to the commencement of the EIA Phase is included within the Scoping Report and this EIA report. Consultation with the regulating authorities (i.e. DEA and NC DENC) has continued throughout the EIA process. On-going consultation included the following:

» Submission of a final Scoping Report following a 30-day public review period and consideration of stakeholder comments received
» Ad hoc discussions with DEA in order to clarify the findings of the Scoping Report and the issues identified for consideration in the EIA Phase.

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.
» Provision of an opportunity for DEA and NC DENC representatives to visit and inspect the proposed site, and the study area.
» Consultation with Organs of State that may have jurisdiction over the project, including:
    * Provincial and local government departments (including South African Heritage Resources Agency, Department of Water Affairs, South African National Roads Agency Limited, Department of Agriculture, etc.).
    * Government Structures (including the Department of Public Works, Roads and Transport, etc)

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

4.3.1 Public Involvement and Consultation

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

» Information containing all relevant facts in respect of the proposed project was made available to potential stakeholders and I&APs.

» Participation by potential I&APs was facilitated in such a manner that all potential stakeholders and I&APs were provided with a reasonable opportunity to comment on the proposed project.
» Comment received from stakeholders and I&APs was recorded and incorporated into the EIA process.

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

» **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	» Northern Cape – Department of Environmental and Nature Conservation (DENC) » Northern Cape - Agriculture and Rural Development » Northern Cape - Public Works, Roads and Transport » Northern Cape - Water Affairs » South African Heritage Resources Agency National » Department of Agriculture, Forestry and Fisheries » South African National Roads Agency » Department of Energy
Municipalities	» Emthangeni Local Municipality » Pixley ka Seme District Municipality
Public stakeholders	» Advertisement placed to inform the public of the availability of the report and public meeting
Parastatals & service providers	» Eskom Transmission and Distribution » South African Heritage Resources Agency – » Ngwao Boswa ya Kapa Bokone (Northern Cape Heritage Authority):
NGOs/Business forums	» Wildlife Environment Society of South Africa

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

» **Newspaper Advertisements**

During the scoping phase, in order to notify and inform the public of the proposed project and notify the public on the availability of the Draft Scoping report for public review and public meeting, a first round of adverts were placed as follows:

* The Volksblad (27 July 2012)
* De Aar Echo (23 July 2012)

During the EIA phase, a second round of newspaper adverts was placed to inform the public on the details of the public meeting in the following newspapers:

* Volksblad (22 November 2012)

During the EIA phase, a third round of newspaper adverts was placed to inform the public of the availability of the Draft EIA report in the following newspapers:

* The Volksblad (6 December 2012)
* De Aar Echo (6 December 2012)

» **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:

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

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 was held in November 2012. All interested and affected parties were invited to attend a public meeting held on:

* **Date:** 29 November 2012
* **Time:** 16h30
* **Venue:** Kwezi Community Hall, Kwezi, Hanover

Records of all consultation undertaken are included within **Appendix D**.

4.3.2 Identification and Recording of Issues and Concerns

Issues and comments raised by I&APs over the duration of the EIA process have been synthesised into Comments and Response Reports and included in this Final EIA report.

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.

4.3.3 Assessment of Issues Identified through the Scoping Process

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

Table 4.1: Specialist studies undertaken within the EIA Phase

Specialist	Area of Expertise	Refer Appendix
Dr. Helga van der Merwe	Ecological impact assessment	Appendix E
Dr L G du Pisani	Geology, soils, and erosion potential	Appendix F
Zone Land Solutions (Pty) Ltd	Visual impact assessment	Appendix G
Tony Barbour of Tony Barbour Environmental Consulting and Research	Social impact assessment	Appendix H
Zone Land Solutions (Pty) Ltd	Heritage & Palaeontology resources	Appendix I

Specialist studies considered direct, indirect, cumulative, and residual environmental impacts associated with the development of the proposed Klip Gat Solar Energy Facility. 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 EMP is included as **Appendix J**.

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 – I** for specialist study specific limitations.

DESCRIPTION OF THE RECEIVING ENVIRONMENT CHAPTER 5

This section of the Final EIA Report provides a description of the environment that may be affected by the proposed Klip Gat 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 environmental and social specialist reports contained within **Appendices E – I**.

5.1 Regional Setting: Location of the Study Area

The project site is located in the Emthanjeni Local Municipality (NC073) in the Northern Cape Province. The site is located ~30 km of the town of Hanover. Noupoort is the other town in the region. The site is accessible via an unnamed gravel road which is linked to the N1. The major transportation routes in the area are the N1, N9 and N10. All of these roads are situated between 17km and 20km from the project site. The R389 runs between Hanover in the east and Noupoort in the west. This road is ~8km to the south of the project site. In addition, a railway line crosses ~2.5km north-east of the project site en route to De Aar.

An Eskom power line (the Linde/Carolus 1 132 kV power line) crosses the site in a south-east-to north-west direction. The electricity generated from the Klip Gat facility is planned to be evacuated into the electrical grid via the existing Linde/Carolus 1 132 kV power line.

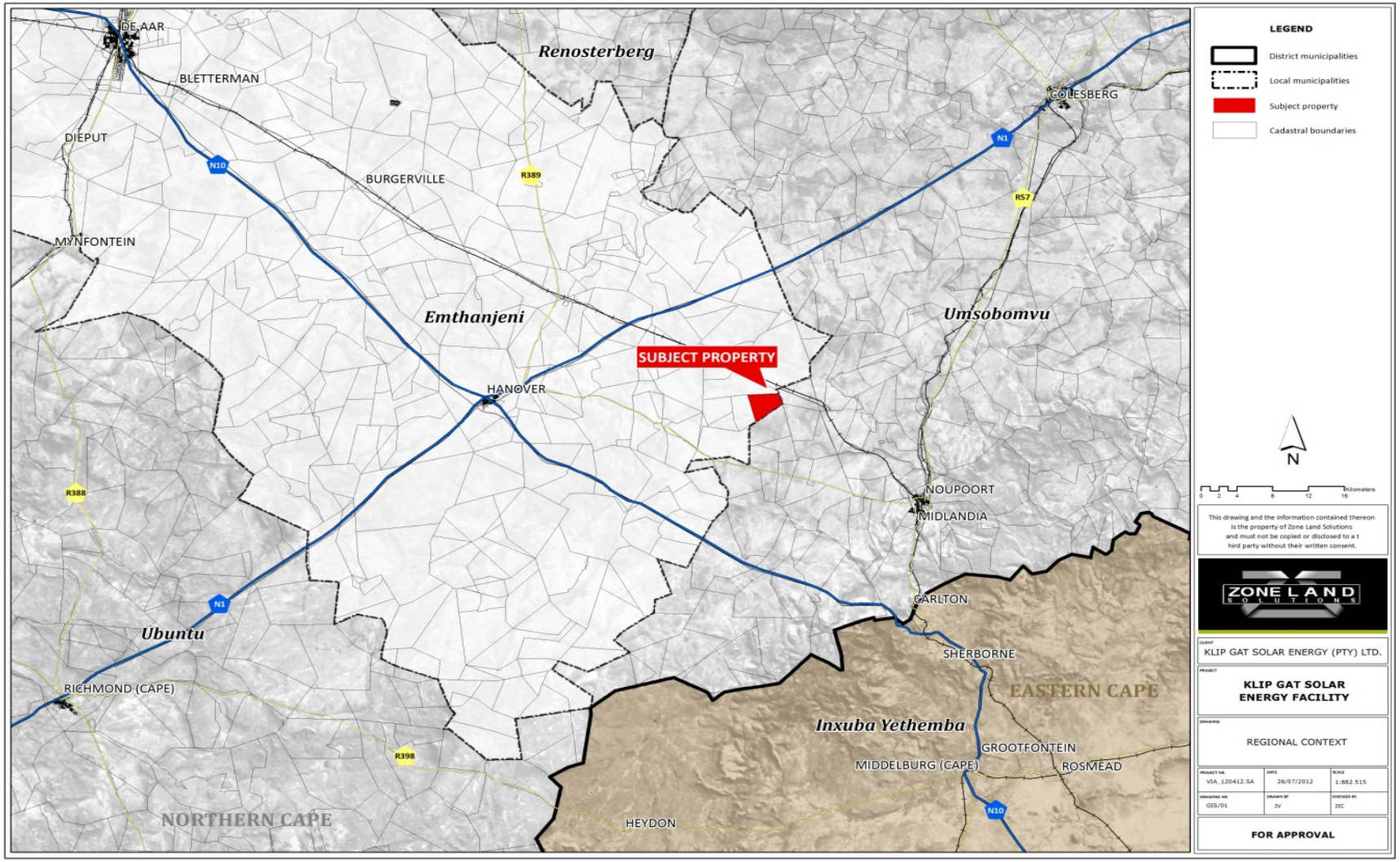

Figure 5.1: Regional context of the project site

5.2 Climatic Conditions

The proposed Klip Gat Solar Energy Facility site falls within a summer rainfall region, i.e. rain falls mainly in summer and autumn with rainfall peaks in February and March. The mean annual precipitation ranges from 297 mm at Andriesfontein to 438 mm at the Gariep Dam. Grootfontein Agricultural Station's maximum rainfall recorded in a 24 hour-period was for March (93 mm). The highest monthly maximum rainfall recorded for the station was 178 mm recorded in January.

The mean maximum temperature for the Grootfontein Agricultural Station is for January (30.4°C), the warmest month, and a mean minimum temperature for July (0.1°C), the coldest month. An extreme maximum of 38.8°C (recorded in January) and an extreme minimum of -10.3°C (recorded in July) has been recorded for the station.

5.3 Access and Transport Routes in the region

The site is accessible a gravel road off the N1 national road between Colesburg and Hanover via gravel roads. The N10 from Port Elizabeth is the main national route inland to Bloemfontein. Access to the Klipgat site is via the Holvlakte main access road off the Dwaal-Noupoort road. The farm house of Holvlakte is located ~20 km from the Dwaal turnoff on the N1 22 km north of Hanover, and Noupoort to the south-east. The road is essentially aligned along the Dwaal railway line sideline.

5.4 Biophysical Characteristics of the Study Area

5.4.1 Topography

The site (Portion 2 of Farm 80) is situated has a gently undulating topography (Figure 5.2). Further north and south of the property, hills and low mountains are evident. The slope of the land is generally flat to moderately undulating, with approximately 90% of the site having slopes of less than 2% and the rest of the site with slopes between 3% and 5%.

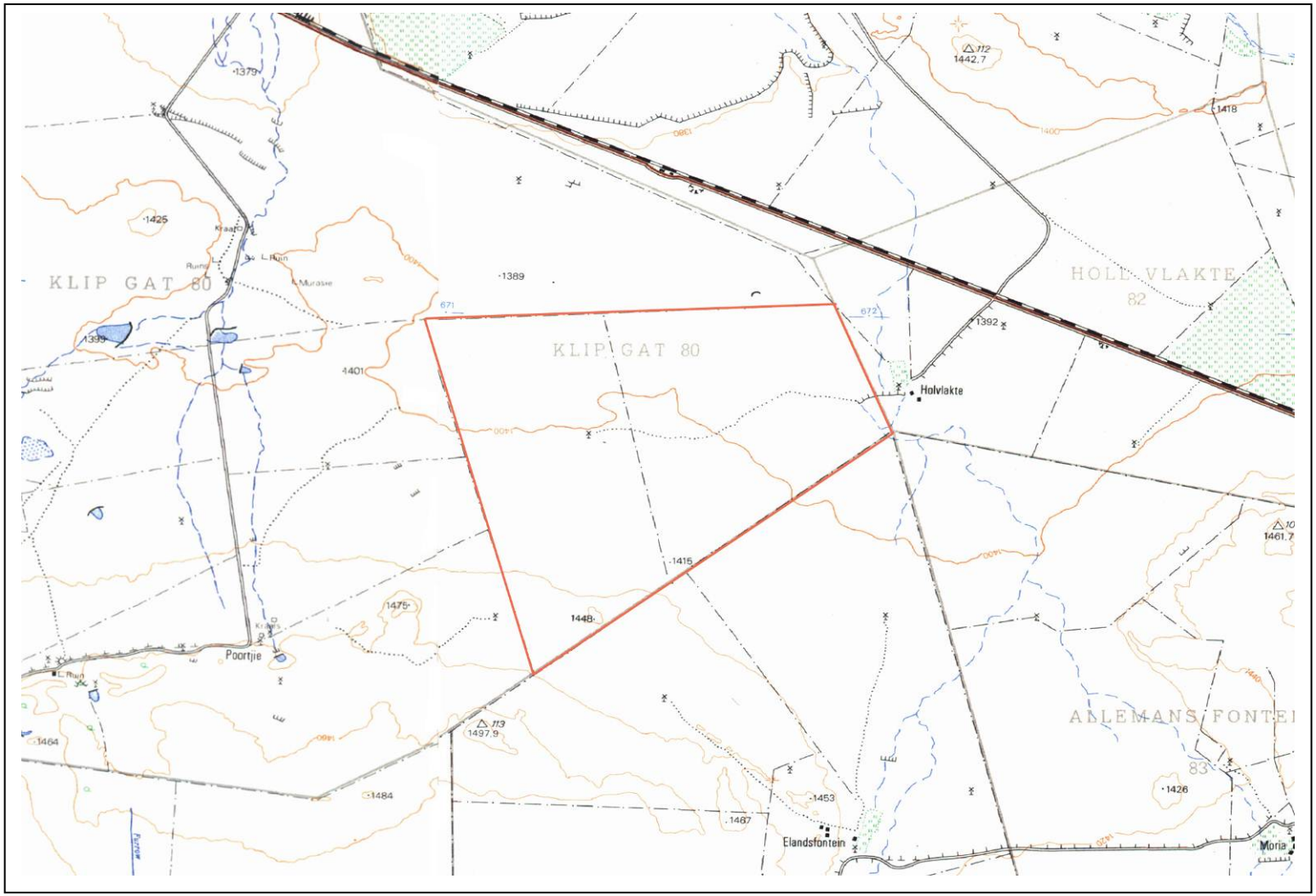

Figure 5.2: A map indicating the general topography of the proposed Klip Gat Solar Energy Facility sites and surrounding environment

5.4.2 Geology & Land Types

The site's geology can be categorized as shale, mudstone & sandstone of the Adelaide Subgroup of the Beaufort Group, Karoo Sequence, with dolerite intrusions common.

The site is situated within land types Da14 (95% of the site area) and Da6 (5% of the site area). The Da land types consist of soils with either prismacutanic and/or pedocutanic diagnostic horizons, with a red colour in the B-horizon. The soils are generally shallow and the effective depth varies between 30mm and 1200mm. The clay content varies between 15% and 30% in the A-horizon, and between 10% and 45% in the B21-horizon. Considering the soil types and soil depths occurring in the area puts the site in a category of "not suitable for cultivation"

Generally the site consists of soils with a marked clay accumulation, strongly structured and with a reddish colour. The susceptibility of the soils to wind erosion is categorised as somewhat susceptible, while the susceptibility to water erosion is categorised as low to moderate and the soil loss potential is categorised as moderate.

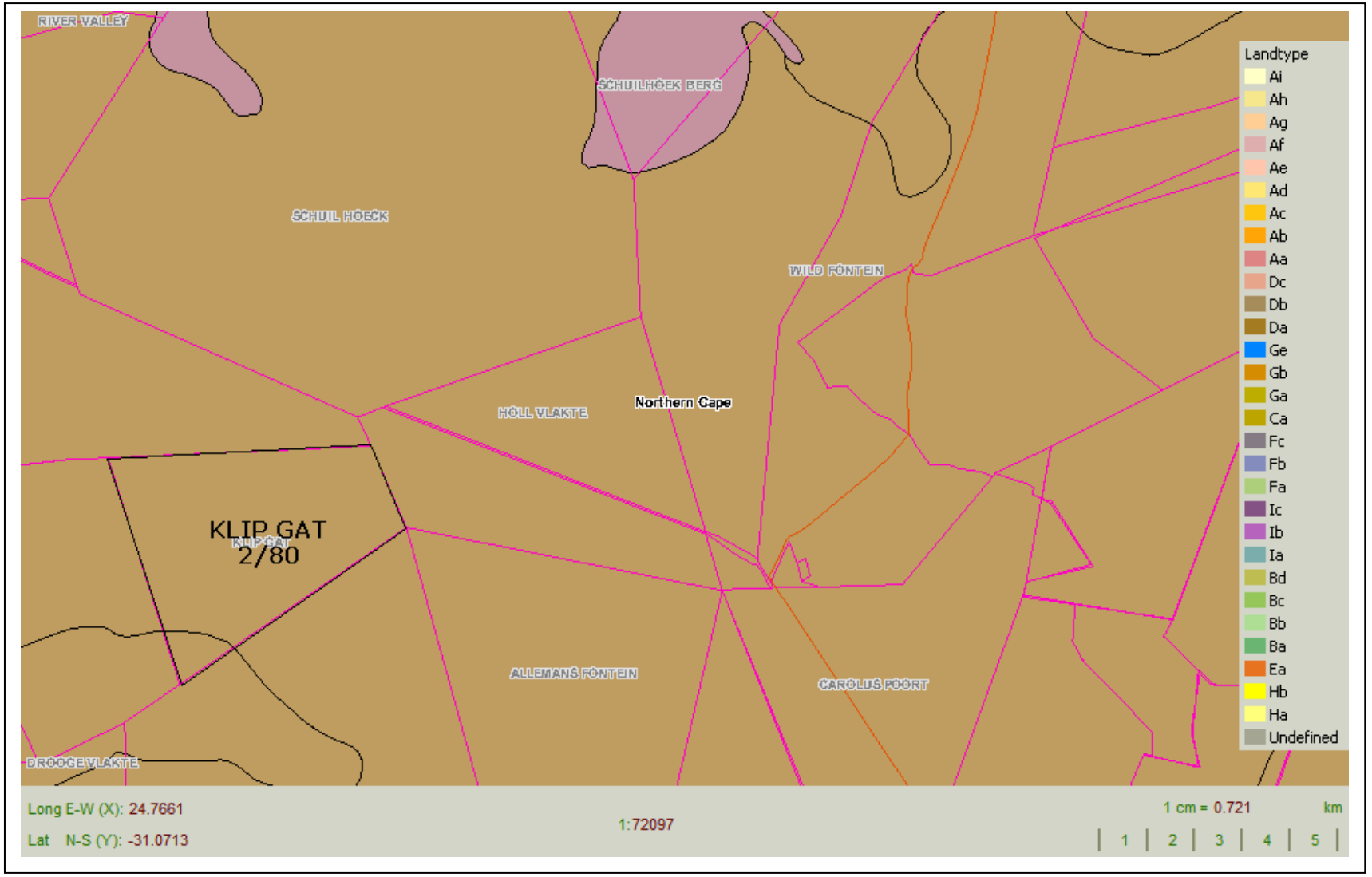

Figure 5.3: Land type of the proposed Klip Gat Solar Energy Facility in relation to the surrounding environment.

5.4.3 Soil Types

The following soil forms (as per the MacVicar *et al* 1991 classification) were identified on the site, i.e. Oakleaf, Augrabies, Swartland, Glenrosa and Mispah. The size of land where the Swartland soil form was sampled was too small to map and was therefore omitted from the verified soil map:

» The Oakleaf soil form consists of an ortic A-horizon over a neocutanic B-horizon over unconsolidated material (which is the limiting soil layer). It is a moderately deep soil of between 300mm and 500mm, a sandy to loamy texture (15% clay in the A horizon and 25% clay in the B horizon) and a favorable water holding capacity. These are physically and chemically inactive soils and moderately sensitive to water and wind erosion. The current soil surface condition is moderately eroded with a crust. The Oakleaf soil form is categorized as a cumulic soil. Cumulic soils are generally highly suitable for cultivation. The relatively low rainfall of the area excludes these Oakleaf soils from dryland cultivation, while the absence of irrigation water excludes it from cultivation under irrigation. The best land use for the Oakleaf soil on this site if for veld grazing.The Augrabies soil form consists of an ortic A-horizon over a neocarbonate B-horizon (the soil samples of the B horizon effervesced visibly when treated with a 10% hydrochloric acid solution) over unconsolidated material (which is the limiting soil layer). It is a moderately deep soil of 300mm, a sandy to loamy texture (15% clay in the A horizon and 25% clay in the B horizon) and a favorable water holding capacity. These are physically and chemically inactive soils and moderately sensitive to water and wind erosion. The Augrabies soil form is by categorized as a cumulic soil. Cumulic soils are generally highly suitable for cultivation , although factors such as high pH, high salinity, as well as low available P and trace elements (especially Fe) may limit its use for cultivation purposes. The relatively low rainfall of the area excludes these Augrabies soils from dryland cultivation, while the absence of irrigation water excludes it from cultivation under irrigation. The best land use for the Augrabies soil on this site if for veld grazing.The Glenrosa soil form consists of an Ortic A-horizon over a lithocutanic B-horizon. It is shallow and at the most 100mm deep, moderately physically active and slightly sensitive to both wind and water erosion. The current soil surface condition is generally good with some surface water erosion visible in isolated areas. Glenrosa soils are categorized as lithic soils. Livestock ranching and wildlife conservation are the most common types of land use on lithic soils.The Mispah soil form consists of an Ortic A-horizon over hard rock (which is the limiting soil layer). It is shallow and at the most 50mm deep, moderately physically active and slightly sensitive to both wind and water erosion. The current soil surface condition is generally good with some surface water erosion visible in isolated areas.

Glenrosa soils are categorized as lithic soils. Livestock ranching and wildlife conservation are the most common types of land use on lithic soils.

5.4.4 Agricultural Potential

There are no agricultural sensitive areas, areas of high agricultural value, wetlands, watercourses or cultivated lands on the site that shall be interfered with. There are no agricultural important infrastructure, i.e. (i.e. silos, irrigation lines, pivot points, channels and feeding structures, etc.) or any conservation works (i.e. contour banks, waterways, etc.) that will be interfered with, visible on the topographic maps or Google Earth Images.

The grazing capacity of the region varies between 18 ha/LSU and 25 ha/LSU. The site is situated in a Relative Homogenous Farming Area with an area of 208 350ha. The area of the site represents less than 0,5% of this area, while the carrying capacity is at best 53 large stock units, making the site insignificant in terms of agricultural production and food security. This region is categorized as non-arable with low to moderate potential grazing land. The "best use" for the area is for grazing with sheep, goats and beef cattle.

5.4.5 Land use and Land capability of the Study Area

The site falls within Veld Type 36 (False Upper Karoo) (Acocks, 1988) and Biome NKu4 (Eastern Upper Karoo) (Mucina & Rutherford, 2006). This biome occurs on flats and gently sloping plains, interspersed with hills and rocky areas between Carnarvon and Loxton in the west, De Aar, Petrusville and Venterstad in the north and Burgersdorp, Hofmeyr and Cradock in the east, with the great escarpment in the south. This veld type constitutes the most spectacular of all the changes in the vegetation of South Africa. This former primarily grass veld changed to a mixture of grasses and karoo shrubs and is dominated by dwarf microphyllous shrubs, with white grasses of the genera Aristida and Eragrostis. A land cover/ land use map is shown in Figure 5.4.

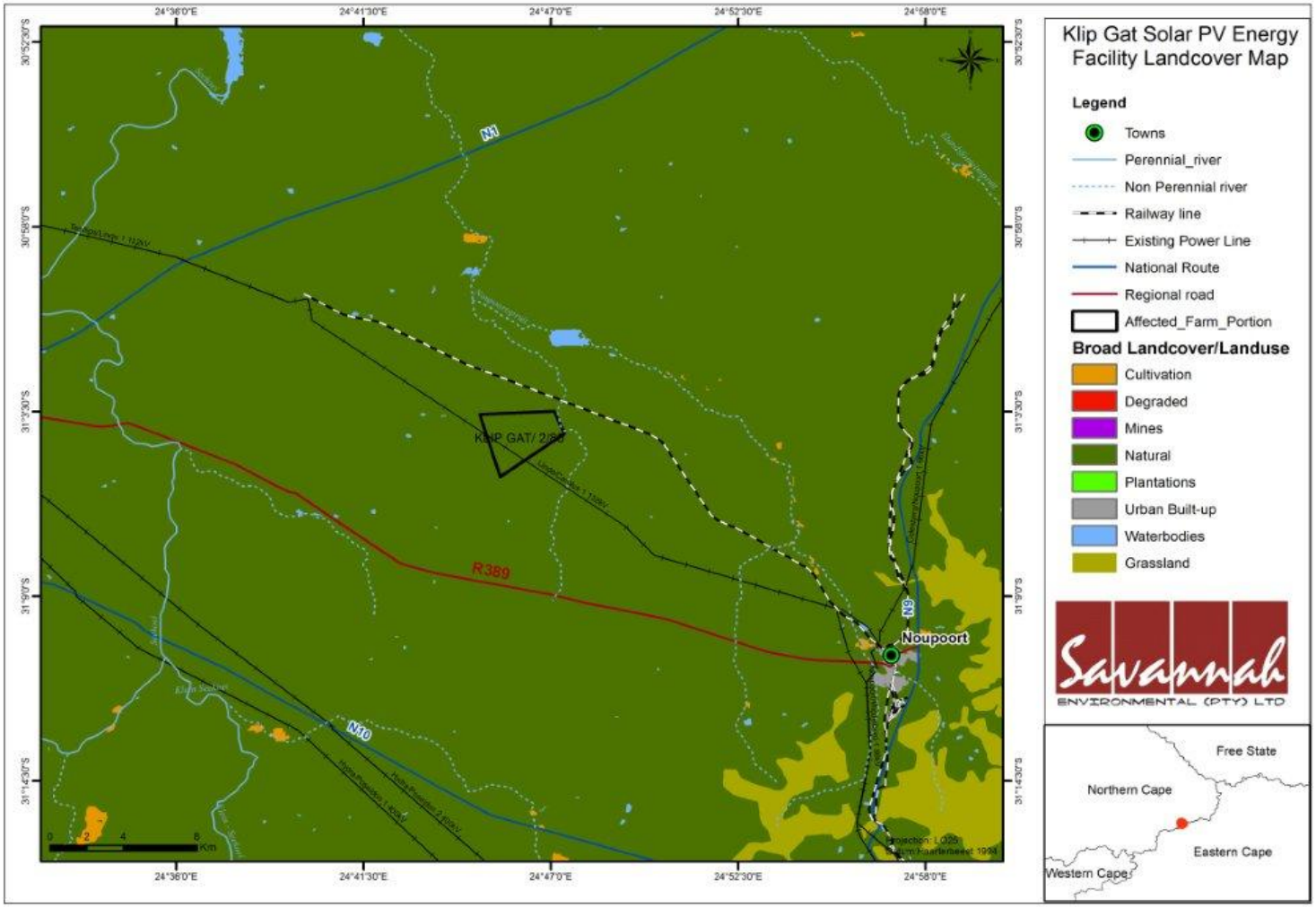

Figure 5.4: Land cover for the Klip Gat Solar Energy Facility

5.4.6 Watercourses

There are no rivers on the site. No drainage lines are indicated on the topocadastral map however, the satellite images indicate areas that could potentially be seasonal washes and this was confirmed by the site investigation. These areas are however situated outside of the boundaries of the proposed development.

5.5. Ecological Profile

5.5.1 Vegetation

The site falls within the Eastern Upper Karoo (NKu4) of the Nama Karoo Biome (Mucina & Rutherford 2006. This vegetation type is dominated by grasses and dwarf microphyllous (small-leaved) shrubs. Important taxa include *Lycium* spp. (tall shrubs), the dwarf shrubs *Eriocephalus* spp., *Pentzia* spp., *Helichrysum* spp. and the grasses *Aristida* spp., *Eragrostis* spp. and *Tragus* spp.

The Eastern Upper Karoo (NKu4), according to Mucina and Rutherford (2006), is the largest vegetation type mapped of all the vegetation types (49821 km^2). The conservation status of this vegetation type is listed as Least Threatened with a 21% conservation target (Mucina and Rutherford 2006). Large dams have been built in this vegetation type and about 2% of the land surface has been transformed. Oviston, Commando Drift, Rolfontein and Gariep Dam Nature Reserves, formally conserve this vegetation type.

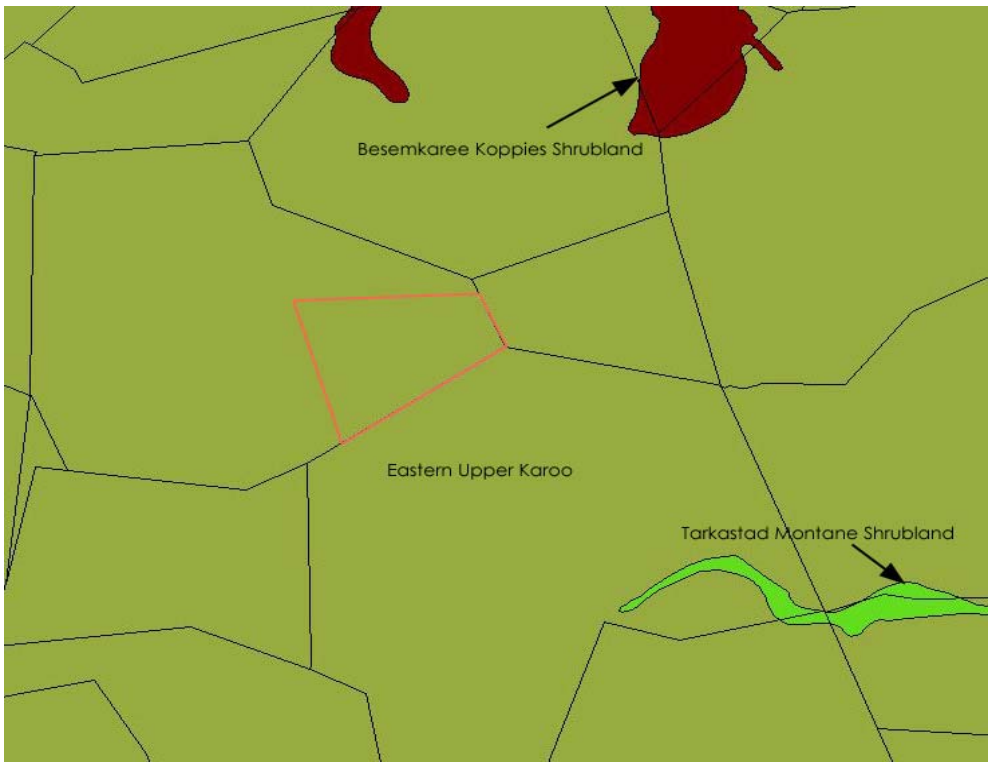

Figure 5.6: The proposed Klip Gat Solar Energy Facility site (indicated in red) located within the Eastern Upper Karoo vegetation type (Mucina & Rutherford (2006).

The site is characterised by a combination of dwarf shrubs and grass species. Two plant communities were identified on the site (Figure 5.7). These communities are the (1) *Pentzia incana* dominated mixed dwarf shrubland-grassland community and the (2) *Tragus koeleroides* dominated mixed dwarf shrubland-grassland community. These are described below.

Figure 5.7: Map indicating the two plant communities found on the proposed Klip Gat development site.

Pentzia incana dominated mixed dwarf shrubland-grassland community

This plant community is characterised by dwarf shrub species such as *Pentzia incana* (dominant), *Eriocephalus ericoides* (dominant), *Rosenia oppositifolia* (dominant), *P. globosa* and *Ruschia cradockensis*. Grass species found in this community include *Sporobolus fimbriatus* (dominant), *Tragus koeleroides* (dominant), *Eragrostis obtusa, Enneapogon desvauxii, Melica decumbens* and *S. iocladus*, (Figure 5.8). The vegetation cover in this plant community is highly variable and numerous bare areas and capped soils are found throughout this community (Figure 5.9).

Figure 5.8: *Pentzia incana* dominated mixed dwarf shrubland-grassland community.

Figure 5.9: Bare capped soils scattered through community 1.

Species of conservation significance found in community 1 are the *Euphorbia* species, the family Iridaceae and therefore all *Morea* species and the family Mesembryanthemaceae/Aizoaceae and therefore all *Ruschia* species (according to the Northern Cape Nature Conservation Act (NCNCA), Red Data status and CITES). All the species noted in this plant community are listed as Least Concern according to the IUCN Red Data list. However, the NCNCA regulates activities with respect to all flora indigenous to the Northern Cape.

Table 5.1: Species characteristic of the *Pentzia incana* dominated mixed dwarf shrubland-grassland

Species	Red Data status	NCNCA status	CITES status
Albuca sp.	-		
Asparagus capensis	LC		
Asparagus mucronatus	LC		
Berkheya cf. *annectens*	LC		
Enneapogon desvauxii	LC		
Eragrostis obtusa	LC		
Eriocephalus ericoides	LC		
Euphorbia cf. *aequoris*	LC	P	II
Lycium cinerium	LC		
Melica decumbens	LC		
Moraea cf. *pallida*	LC	P	
Osteospermum spinescens	LC		
Pentzia globosa	LC		
Pentzia incana	LC		
Pteronia sordida	LC		
Rosenia oppositifolia	LC		
Ruschia cradockensis	LC	P	
Salsola tuberculata	LC		
Selago cf. *saxatilis*	LC		
Sporobolus fimbriatus	LC		
Sporobolus iocladus	LC		
Tragus koeleroides	LC		
Wahlenbergia sp.	-		

Tragus koeleroides dominated mixed dwarf shrubland-grassland community

The second plant community is characterised by the following dwarf shrubs: *Pteronia glomerata* (dominant), *Rosenia oppositifolia* (dominant), *Eriocephalus ericoides*, *Nenax microphylla* and *Selago* cf. *saxatilis*. Grass species include *Tragus koeleroides* (dominant), *Eragrostis chloromelas* (dominant), *Aristida diffusa* and *Sporobolus iocladus* (Figure 5.10).

Figure 5.10: *Tragus koeleroides* dominated mixed dwarf shrubland-grassland community.

Species of conservation significance, according to the NCNCA, IUCN Red Data lists and CITES found in community 2 are the family Iridaceae (therefore *Morea* species) and the family Mesembryanthemaceae/Aizoaceae (and therefore *Trichodeodema* species), (Table 2). All the species noted in this plant community are listed as Least Concern according to the IUCN Red Data lists. All indigenous flora, indigenous to the Northern Cape, are regulated by the NCNCA.

Table 5.2: Species characteristic of the *Tragus koeleroides* dominated mixed dwarf shrubland-grassland

Species	Red Data status	NCNCA status	CITES status
Albuca sp.	-		
Amphiglossa triflora	LC		
Aptosimum procumbens	LC		
Aristida diffusa	LC		
Asparagus capensis	LC		
Berkheya cf. *annectens*	LC		
Chrysocoma ciliata	LC		
Diospyros austro-africana	LC		
Enneapogon desvauxii	LC		
Eragrostis obtusa	LC		
Eriocephalus ericoides	LC		
Eriocephalus spinescens	LC		
Helichrysum luciloides	LC		
Moraea cf. *pallida*	LC	P	
Nenax microphylla	LC		
Pteronia glomerata	LC		
Pteronia sordida	LC		

Rosenia glandulosa	LC		
Rosenia humilus	LC		
Rosenia oppositifolia	LC		
Selago cf. *saxatilis*	LC		
Sporobolus iocladus	LC		
Thesium hystrix	LC		
Tragus koeleroides	LC		
Trichodeodema pomeridianum cf.	LC	P	

5.5.2 Red List Animal Species

Various species of conservation significance were found within the 3124BA and 3124BB quarter degree grids. Mammals such as the black-footed cat (VU, CITES II), African wild cat (CITES II), white-tailed mouse (EN), leopard (NT, CITES I), aardwolf (CITES III) and birds, for example, the blue crane (VU, CITES II), Verreaux's eagle (CITES II), black stork (CITES II), blue bustard (NT), lesser kestrel (CITES II), greater kestrel (CITES II), rock kestrel (CITES II), Ludwig's bustard (EN, CITES II), black harrier (VU) and martial eagle (NT) are listed as of conservation significance.

The Klip Gat site is situated in the Platberg-Karoo conservancy (border farm) which is an Important Bird Area. Additional bird data collected from the Southern African Bird Atlas Project (SABAP 2) was used to flag additional bird species of conservation significance. The bird species that could potentially be residents in the area, as well as migrants are listed in Appendix C of the Ecology Report. This SABAP 2 list indicates the blue crane (VU), Lesser Kestrel (VU), Ludwig's Bustard (VU), blue korhaan (NT), greater flamingo (NT), secretary bird (NT), Lanner falcon (NT), kori bustard (NT) and Caspian Tern (NT) as species of conservation importance. Blue cranes were sighted during the field survey and the land owner mentioned the presence of martial eagles in the past.

Signs of mole activity as well as porcupines were seen during the field survey. The landscape is littered with termitaria (Figure 11).

Figure 5.11: Termitaria present in the Klip Gat proposed development site.

5.5.3 Water Bodies

No drainage lines are indicated on the topocadastral map of Section 2 of farm 80. However, a stratification of satellite images indicated areas that could potentially be seasonal washes and pans systems. This was confirmed by the field survey however, these areas are situated outside of the 'buildable areas' on which the proposed development could take place.

5.6 Social Characteristics of the Study Area and Surrounds

5.6.1 Population

Despite having the largest surface area in South Africa, the Northern Cape has the smallest population - 1.8% of the population, of South Africa. The population has declined by 2.1% from 1996 (840 321) to 2001 (822 727), resulting in a decrease in the population density, of an already sparsely populated province, from 2.32 to 2.27 persons per km^2. Of the five districts, Frances Baard has the largest population of 303 239. The other districts and their respective populations are Siyanda (209 889), Pixley ka Seme (164 607), John Taolo Gaetsewe DM (36 881) and Namakwa (108 111). The population can be classified as a young population with 57.7% of the population being younger than 30 years old. The female proportion makes up approximately 51.2% of the total with males making up the remaining 48.8%. The 2001 Census data indicates a significant shift in the 20 – 24 cohort occurs, which can possibly be attributed to, amongst others, people in this age group moving to other provinces in search of better career and job opportunities and tertiary education. Research indicates that approximately 36% of the migrants from the Northern Cape moved to the

Western Cape, while 19.4% moved to the North West (19.4%), 18.5% to Gauteng and 12.8% to the Free State (12.8%). In addition, there has also been an increase in migration from the rural areas to the larger towns in the province over the last five years. This movement is in response to the improved access to opportunities and services within the larger urban centers. This trend is reflected in the increase in the proportion of people living in urban areas from 75.2% in 1996 to 82.7% in 2001.

5.6.2 Age Structure

The age profile of the population reveals that approximately 65.2% of the population falls within the economically active age bracket of between 15-64 years of age. Approximately 30% of the population is 15 years old or less while the remaining 5% of the population are 64 years old or older. According to the Municipal IDP, 31% of the population falls within the school going age group of 7 to 19 years.

5.6.3 Education levels

In general, there has been an improvement in the educational qualifications of the labour force in the Northern Cape. There has also been an increase in the proportion of the labour force that has a secondary and tertiary education. This would appear to be the result of an increase in access to education since 1994, in particular, amongst new entrants to the labour force.

5.6.4 Employment

Unemployment within the Emthangeni Local Municipality (ELM) is estimated at 23.1% of the total labour force, which is below the Northern Cape average of ~27% while 43.5% of the population is not economically active[4]. The latter are made up of made up of scholars/students, homemakers/housewives, pensioners, the medically unfit, seasonal workers not currently employed, and those who choose not to work. The ELM IDP and supporting documents do not provide any detail regarding the relative size of the each of the economic sector's contribution to employment in the ELM.

[4] The term "not economically active" refers to people of working age not actively participating in the economy, such as early retirees, students, the disabled and home-makers.

5.6.5 Economic context

In terms of economic importance, the Northern Cape's share of the country's GDP in 2002 was 2%, the lowest contribution of the nine provinces. However, although the Northern Cape Province has the smallest economy of the nine provinces, Gross Domestic Product of the Region (GDPR) per capita is higher than the national average. In terms of economic activities, the economy of Northern Cape is heavily dependent on the primary sectors of the economy, which in 2002 made up 31.0% of GDPR. The largest sector is mining which has declined in contribution to the GDPR from 25.8% in 1996 to 23.7% in 2002. Agriculture, on the other hand, increased in its contribution from 6.2% to 7.3%.

Manufacturing contributes only 4.2% towards GDPR. All the industries in the secondary sector have decreased in their contribution to the GDPR, with electricity and water sector showing the greatest decrease of 0.7% and the construction industry making the lowest contribution of 1.9% to the GDPR of the Northern Cape. At the same time the contribution to regional GDPR by industries in the tertiary sector increased, with the exception of the wholesale and retail industry, which decreased by 1.1%.

5.6.6 Heritage

5.7.1. Stone Age

The Stone Age archaeology of southern Africa is divided into three categories, namely: the Early Stone Age, Middle Stone Age and the Late Stone Age. These Stone Age industries are well documented throughout the southern Africa regions (i.e. in countries that form the political geography of SADC).

Early Stone Age

In the Northern Cape some of the earliest known Early Stone Age (ESA) industry is the Victoria West Stone Industry which also spreads to the Free State Province, but is dominant in the Northern Cape. The Victoria West Stone Industry was first recorded and defined by R. A., Smith in 1915 and in the Free State region it is found along the Vaal River basin. Tools found in this industry included hand axes and what Smith refers to as 'Tortoise Cores' (Smith, 1920). The "Tortoise Cores" are most probably Smith's reference to the peculiar feature or morphology of Prepared Cores – where different pieces are chipped off from a single piece of parent material to make way for the ultimate removal or shaping of a specific tool and most likely a well-defined hand axe. A. H. J., Goodwin (1935) defines the Victoria West Industry as an industry that is with and without cores. Meaning that hand axes and cleavers could have been produced without necessarily having to prepare a parent material to a point to which a single definable tool could be

produced. The absence of prepared cores in relation to hand axes and cleaver did not mean the end to this stone tool manufacturing techniques for it becomes a dominant and defining feature towards the end of the ESA into the MSA (Middle Stone Age). What first became known as 'Tortoise Cores' was later defined as the transition marker between the ESA and the MSA. Therefore, the Prepared Cored of the Victoria West industry can be taken as the markers of transitional period in the Stone Age industry from Acheulian into the MSA, a second clearly defined phase in Stone Age technological innovation. Lycett (2009) sees the Victoria West as an evolutionary step towards the Levallois Prepared Core Technique which signifies the outwards spread of the Stone Age technology.

Middle Stone Age

During the MSA smaller and sizeable stone artefacts replace the dominant large and often imposing hand axes and cleavers that characterise the ESA. This distinction or transition in archaeological records has been dated to 250 k.y.a. During this period, smaller artefacts define the archaeological records and the most dominant ones are flake and blade industry. As such, this technological period has been defined by some in 'archaeological circles' as a period that signifies a secondary step towards the modern human behaviour through technology, physical appearance, art and symbolism (e.g. Binneman et al. 2011). This innovation is suggested to have been at its most probable peak during the last 120 k.y.a. With surface scatters of the flake and blade industries found throughout the southern Africa regions (e.g. Thompson & Maream, 2008). They often occur between surface and approximately 50-80cm below ground. At times, in some sites, fossil bones are found in association with the MSA stone artefacts. The flakes and blade industries are often found in secondary context as surface scatters and occurrence like their predecessor industries. Malan (1949) defines the earliest MSA stone industry as the Mangosia and its distribution stretching across the Limpopo, the Griqualand in Northern Cape, Natal, and the Cape Point as well as the Free State Province. Griqualand is located some hundred of kilometres north of the current study area and presents one of the cultural and political geographic landscape forming part of the South African heritage puzzle (refer to Figure for historic Griqualand boundaries). The Prepared Core Technique which had become the defining technological technique of the MSA is in this industry replaced by the Micro Lithics that become a dominant feature or trait in the LSA (Late Stone Age). In the Northern Cape Province artefacts associated with the Mangosia industry are known to have been made from indurate shale raw material (Binneman et al. 2011). They mostly occur as surface scatter. The MSA tools include flakes, blades and points. Their time sequence is often not known because they mostly occur in surface. Other industries within the MSA include:

» The Howieson's Poort which is known to have wide distribution throughout southern African including the Northern Cape Province.

» The Orangia 128 to 75 k.y.a.
» Florisbad and Zeekoegat industries dated between 64 and 32 k.y.a - Florisbad is dominant in the Free State Province but also found in the Northern Cape.

Late Stone Age

The southern Africa LSA is known to span a period from 30 k.y.a to the historical time i.e. the last 500 years to 100 years ago (e.g. Mitchell & Whitelaw, 2000). It is associated in archaeological records with the San hunter-gathers (ibid). This is particular important for the last 10 k.y.a whereby the San material culture dominate the archaeological records -mostly in rock shelters, caves as well as open air sites in both the interior and coastal regions (ibid). However, the San open air sites are not always easy to find because they are in most cases covered by the various forms and types of vegetation and the other contributing factor is the mobility nature of these people. They were not sedentary people like their Iron Age counter parts who needed to settle the land for ploughing and long term seasonal grazing periods etc. In the coastal regions, sand dunes sometimes become impediments in locating LSA sites. Owning to all these factors the preservation state of the LSA archaeology is often poor and not easily disenable (Deacon & Deacon 1999). Caves and rock shelters provide a more substantial preservation record of pre-colonial record of indigenous people's archaeology. This is in form of stone artefacts, rock art and other material culture such as beads etc. It has recently emerged that the LSA archaeology was not solely dominated by the San hunter-gathers particularly in the last half -in some 2 k.y.a the southern Africa landscape was penetrated by the Khoekhoe pastoralist introducing sheep, cattle and goal along with them (e.g. Hall & Smith, 2000; Sadr). Ceramic vessels are some of the material culture that signifies the Khoekhoe material culture in archaeological records – including the depiction of sheep and cattle often found in San hunter-gather rock art (ibid). Smith and Hall (2000) give detailed descriptions of potential relations that could have taken place between the San, the Khoekhoe and the Iron Age farmers. They also argue that the material culture of the Khoekhoe herders included among other things the art of making rock art. Binneman (et al. 2011) suggests that the diet of this new group of people would have also included muscle collected along the muddy river banks, coastal line and riverine and terrestrial foods. Other than the material culture such as artefacts found within the LSA industries, burials or human remains become dominant in the landscape. In the coast they are often found buried underneath middens (dumpsites) (e.g. Deacon & Deacon 1999). While in the interior regions they are sporadic and can occur across various features in the landscape.

5.7.2. Iron Age

The Early Iron Age communities first appear in southern African archaeological records in the 1st Millennium AD. During this time it is known that most of the southern Africa was occupied by the LSA hunter-gathers and the newly emerged agro-pastoralist known as the Khoekhoe herders. These early Iron Age communities selected specific routes in entering the southern African landscape. This becomes evident when one assesses the archaeological records associated with these communities. For example, the eastern regions of the country are argued to have been their preferred regions because of their rainfall patterns – summer rainfall climates conducive for ploughing and growing crops like sorghum and millet (e.g. Huffman, 1982 see also Huffman, 2007).

Stonewalls are one major characteristic of the Iron Age people – Humphreys (1988) study yielded such sites in the Northern Cape. However, stone walling is not the only characteristic of features of the Iron Age communities. Huffman (1982) described cattle dug, both vitrified and unverified, as one of the Iron Age traits. Huffman also included pits and burials, with some located inside the cattle kraals (ibid).

5.7.3 Colonial and Industrial Archaeology

The Colonial or Historical archaeology is a period in archaeological records that refers to the last 500 years when European settlers and colonialists entered into southern Africa. Noupoort is one of the interior towns that were established by the European settlers of Dutch descent – the Afrikaans communities after the Trekked from the then Cape Colony to avoid British Administration. Various monuments, statues and memorials associated with this period are found across the Northern Cape Province. The same is true with architectural structures resembling different styles and vernacular found in some of the still standing farmsteads and town buildings. Events also associated with colonial archaeology are two South African Wars commonly known as the Anglo-Boer Wars – the First South African War (1860s) and the Second South African War (late 1890s to early 1900s). The 19th Century Industrial Revolution is also closely linked to these wars and visa-versa.

5.7.4. Heritage Artefacts

Most of the MSA stone artefacts are made from the following materials: fine grain quartzite, quartz, silcrete, chalcedony and hornfels. Like the ESA artefacts, the MSA stone artefacts occur in secondary context owing to a variety of reasons. One is due to natural events and/or activities such as erosion and being wash down by water and riverine activities, animal and human disturbances and so forth.

The survey of the study area, broader PDA during the Scoping Phase, yielded 3 heritage resources sites – 2 located within the PDA (Klipgat-1 & Klipgat-2), the other a farmstead referred to as Klipgat farmstead is located just outside the PDA (*Figure 14*). These sites, however, fall outside the project development foot print as indicated in (the white marked area in the map) for the development footprint and proposed infrastructure within it. The identified sites are further categorised into 2 categories - 2 archaeological sites (i.e. Klipgat-1 & Klipgat-2) and a built environment and landscape site (i.e. Klipgat farmstead).

These sites were rated in terms of their field significance (including their density, uniqueness and context) in order to inform the decision making process regarding Heritage Sensitive Areas, any No Go Areas based on the identified sites heritage value and significance.

The areas circled yellow which will still need a walk down by an archaeologist before the project construction phase (refer to Figure 5.12 below)

Table 5.1: The archaeological artefacts found on site

 **Figure 5.12:** MSA stone scatter of approximately 8 or more stone artefacts. Please note the artefacts were collected and put together for purposes of photography.	 **Figure 5.13:** MSA stone scatter of approximately 3 stone artefacts. Please note the artefacts were collected and put together for purposes of photography.	 **Figure 5.14** Klipgatfarmstead, located on the Farm Klip Gat 802/80
Klipgat-1 S31 03 50.2 E24 46 38.1 (WGS -84) Generally Protected C (GPC) . This is not a site in terms of site density measure but a scatter of approximately 8 or more MSA stone artefacts.	**Klipgat -2** S31 03 45.9 E24 46 36.3 (WGS-84) Generally Protected C (GPC This is a scatter of three MSA retouched stone artefacts	**Klipgatfarmstead** S31 03 54.6 E24 47 27.3 (WGS-84)Generally Protected B (GPB) The farmstead is located immediately north-east of the study area. It is not directly located within the site, but just outside on the boundary line.

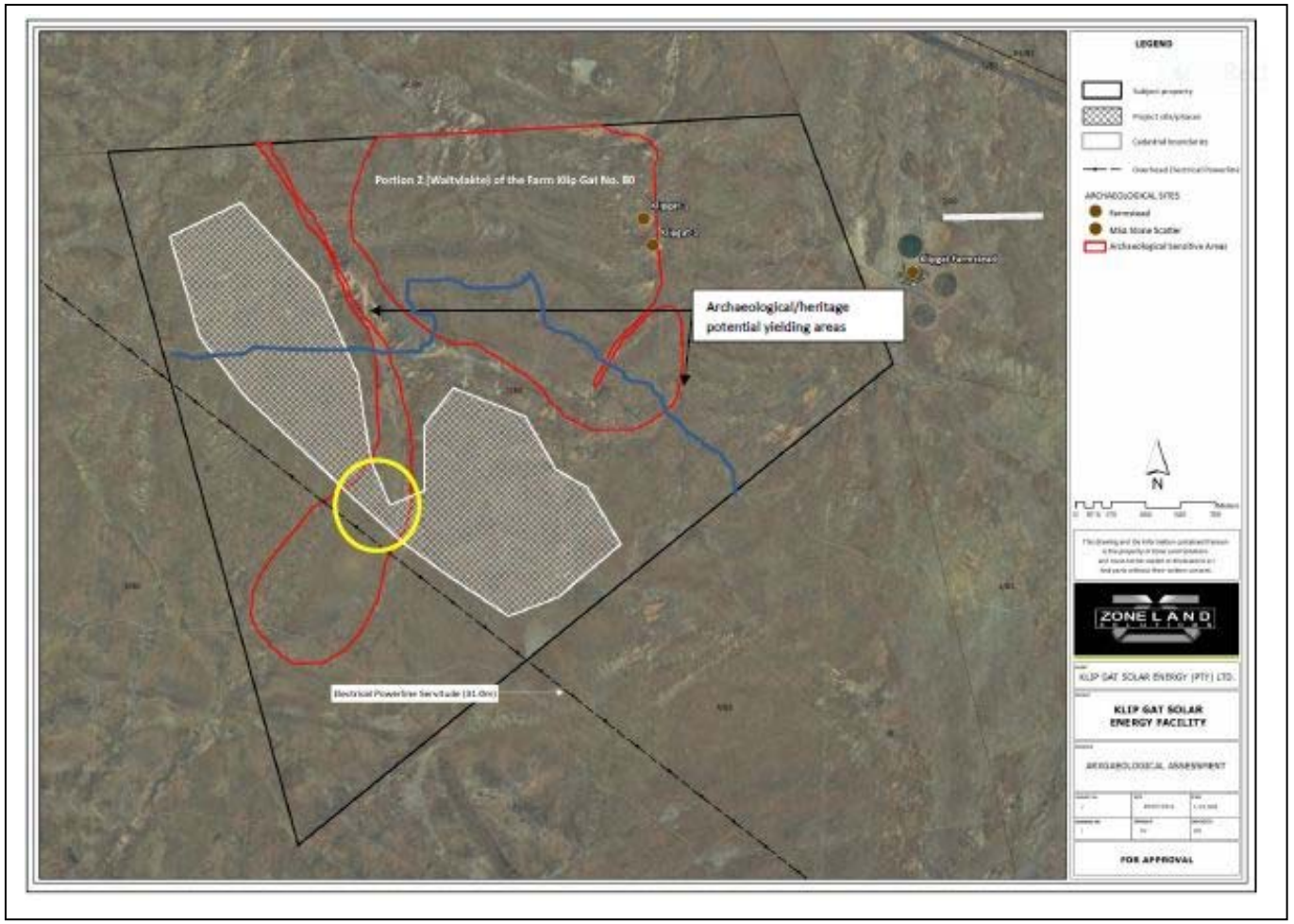

Figure 5.12: PV Footprint and associated infrastructure as well as access roads. Note the black line indicated through red arrows in the blue line that separated the PV footprint area in the PDA with the area in which the scatter resources and farmstead where located. The yellow circle represents the area recommended to be an archaeology potential yield area.

5.7.5 Palaeontology

The terrain surrounding the proposed facility is generally flat to undulating. According to the 1: 250 000 Middelburg geology sheet (3124 Middelburg Geological Survey, Pretoria; Smith, R. 1996), the entire study area is underlain by fluvial Lower Beaufort Group sediments of the Adelaide Subgroup, that are intruded by Early Jurassic dolerite dykes and sills. The Adelaide Subgroup (Pa) (Lower Beaufort Group, Karoo Supergroup) comprises of mudstones with subordinate sandstones. The sediments of the Lower Beaufort Group have yielded a vast number of fossil vertebrates and fossil plants of Permo-Triassic age

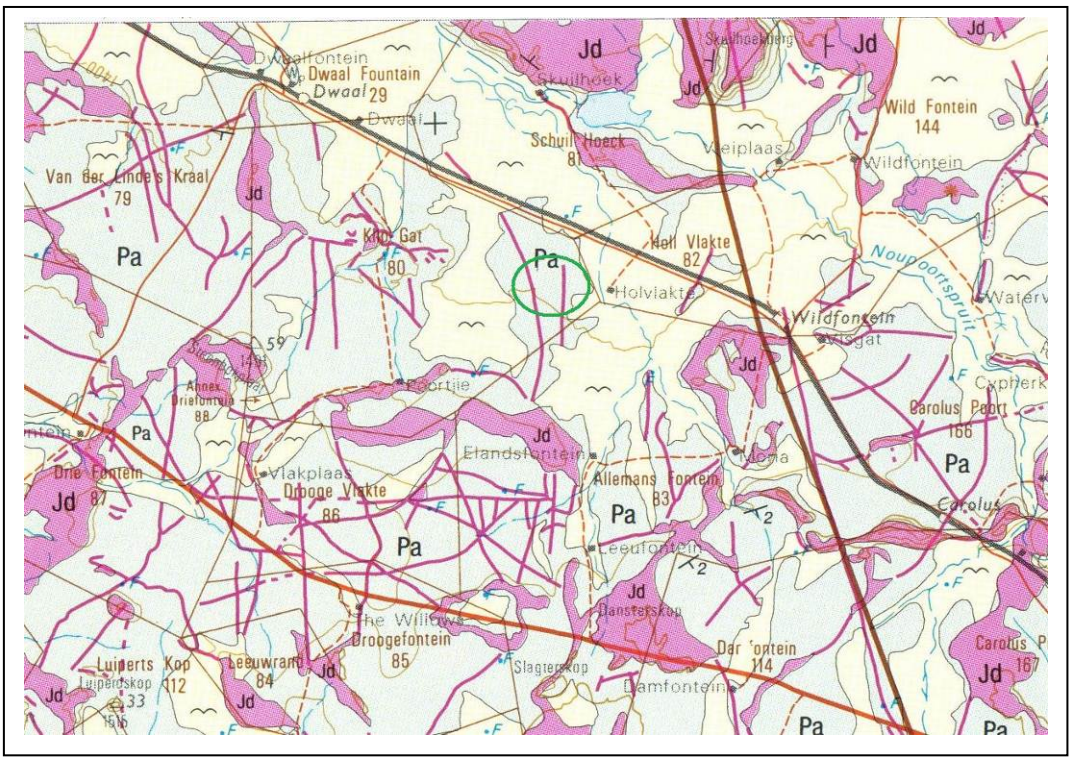

Figure 5.13: Extract from 1: 250 000 topographical sheet 3124 Middelburg showing the approximate location (Green circle) of the proposed Klip Gat Solar Energy Facility, Emthangeni Local Municipality, Northern Cape Province.

ASSESSMENT OF POTENTIAL IMPACTS CHAPTER 6

This chapter serves to assess the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) expected to be associated with the development of the proposed Klip Gat Solar Energy Facility. This assessment is done for the 75 MW facility and for all the facility's components including:

» An array of photovoltaic (PV) panels either static or tracking and up to 4m in height.
» Mounting structure to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
» Cabling (2-4 m deep) between the project components, to be lain underground where practical.
» Invertors (transformers) between the arrays.
» A new on-site substation (200m x 200m in extent) to evacuate the power from the facility into the Eskom grid via the Linde Carolus 132 kV power line which traverses the site.
» The substation is proposed to be connected to a loop-in loop-out power line to the existing Linde Carolus 132 kV power line. The power line will be up to 500m in length with a servitude of ~36m
» Internal access roads (up to 5m wide) and fencing (up to 3m in height).
» Workshop (200m X 200m) area for maintenance, storage, and offices (two locational alternatives are considered and assessed).
» During construction (temporary infrastructure) such as a laydown area will also be required. The temporary construction laydown area will occupy an area of ~157 ha.

The development of the Klip Gat 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, power line servitudes, 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. This phase is expected to take approximately 18-24 months.
» *Operation* – will include operation of the facility and the generation of electricity. The operational phase is expected to extend in excess of 20 years.
» *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.

6.1. Methodology for the assessment of Potentially Significant Impacts

A broader site of 845ha (i.e. Portion 2 of Farm Klip Gat 80) was identified by the project developer for the purpose of establishing the proposed Klip Gat Solar Energy Facility. The entire farm portion will not be utilised for the solar energy facility, the developmental footprint (panels and associated infrastructure) will cover an extent of ~325ha. This amounts to ~37% of the entire farm portion that will be utilised in the long term and that would suffer long term loss / disturbance and change in land-use (over a 20 year period).

The assessment of potential issues has involved key input from specialist consultants, the project developer, key stakeholders, and interested and affected parties (I&APs).

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

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

6.2.1 Potential Impacts on Ecology

Solar energy facilities require relatively large areas of land for placement of infrastructure. This PV facility requires ~325ha. The main expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual species. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix E - Ecology Report** for more details). The ecological sensitivity assessment identifies those parts of the study area that have high conservation value or that may be sensitive to disturbance. This sensitivity assessment is on a field evaluation of the site and analysis of aerial photography.

a) Summary of Ecological Impacts – PV Panels

The majority of impacts on ecology will occur during the construction of the proposed PV facility. Potential impacts for the construction of the solar panels, substation, power line, and the access road were identified as follows:

» Impact on the natural vegetation.
» Impact on the spread of declared weedy and alien invasive plant species.
» Impact on fauna.
» Impact on the drainage system.

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

Summary of impacts of the proposed solar energy facility on the Klip Gat site during the construction phase

Nature: Impact of the construction phase on the natural vegetation

A direct loss of vegetation will arise from the construction of the panel foundations, substation and workshop area. Similarly, the establishment of a construction laydown area and upgrading of the existing access road to the necessary standards will lead to a direct loss of vegetation. The linking of the new power line to the existing Eskom line will also disturb the vegetation. Removal or disturbance of vegetation and the associated loss of habitat impacts on all plant species, i.e. the common, endemic and Red Data species. However, the footprint of the proposed development in relation to the surrounding environment is small, and because no protected trees or threatened species were found at the proposed development site, the development of the site will not have a major effect on the functioning and processes across the vegetation of the region.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (55)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Partially irreplaceable	Partially irreplaceable
Can impacts be mitigated?	Low degree	

Mitigation:

» Development should be contained within the proposed development site and unnecessary disturbance adjacent to the site should be avoided.
» Construction areas should be clearly demarcated and all development contained within this area. The denuded and disturbed site should be re-vegetated as soon as possible.
» Declared weeds and invader species controlled throughout the construction phase.
» An ecological survey should be undertaken prior to the start of construction to

determine if any protected plant species will be removed/ destroyed and the relevant permit must be applied for, if required.
Cumulative impacts: Additional infrastructure development, for example, new power lines and upgrading the access road; the spread of alien invaders due to loss of natural vegetation; and increased water runoff (speed, amount, silt transportation) leading to erosion will exacerbate the negative impact of the development on the vegetation and will lead to a loss of habitat for indigenous fauna and flora.
Residual Impacts: Despite mitigation measures some loss of the vegetation is inevitable. However, because the vegetation type is large the overall impact on the vegetation type as a whole will be small.

Nature: Impact of the construction phase on the spread of declared weeds and alien invasive plant species

The removal or disturbance of the natural vegetation on the site during the construction phase provides an ideal opportunity for declared weeds and invasive species to establish. Declared weedy and invasive plant species in the surrounding environment pose a threat to the remaining natural vegetation as well as the re-establishing vegetation. S pecies such as *Gomophocarpus fruticosus, Opuntia lindheimeri, Datura* spp., Salsola *kali*, *Amaranthus* spp. *Chenopodium* sp. and *Cirsium vulgare* could possibly establish and spread on the development site and into the natural vegetation around the site.

	Without mitigation	**With mitigation**
Extent	Site & surrounds (2)	Site & surrounds (2)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (48)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Low degree	

Can impacts be mitigated? Reasonably

Mitigation:

» Development should be restricted to the proposed development site and the disturbance to the surrounding vegetation be restricted to a minimum. Disturbed areas should be rehabilitated as soon as possible following the construction of the development. A monitoring program should be established for the early detection and control of alien invasive plant species.

» Species listed in the Conservation of Agricultural Resources Act as Category 1 & 2 species will have to be controlled during the construction phase in order to limit their establishment and spread (on and off site) during the operational phase.

Cumulative impacts:

The establishment of declared weedy and alien invasive plant species could lead to their spread into the surrounding natural vegetation and onto neighbouring properties. Their presence may also slow down the recovery of the natural vegetation on disturbed/denuded areas.

Residual impacts:
Low residual impact if the declared weedy and alien invasive species are effectively controlled.

Nature: Impact of the construction phase on the fauna
The construction phase will lead to the disturbance and a loss of fauna habitat. Since the surrounding environment contains the same habitat, the mobile animal species are expected to disperse into these surrounding areas during the construction of the proposed development. The areas of natural vegetation left intact within the proposed development site are expected to be re-colonised by some of the faunal components that will return to the site once the construction phase has been completed. There are some threatened bird species, for example, blue crane, lesser kestrel, blue korhaan, secretary bird, Lanner falcon, Caspian tern, martial and tawny eagle, Cape vulture, Kori bustard and Ludwig's bustard, that utilise the habitats on site and in the surrounding environment. These species will avoid the area during the construction phase. Blue cranes were encountered on the development site and the land owner mentioned the presence of martial eagles.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Highly probable (4)
Significance	**Medium (60)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Partially irreplaceable	Partially irreplaceable
Can impacts be mitigated?	Low degree	

Mitigation:
» Limit disturbance to the clearly demarcated proposed development site and ensure that minimum disturbance takes place in the surrounding area. Disturbed areas should be rehabilitated as soon as possible following the construction of the facility in order to promote re-establishing faunal habitats.
» An avifauna specialist to ground-truth the final layout of the site in order to ensure that there are no blue crane nests and/or chicks on site before construction commences and no eagle nests are present in the immediate vicinity of the proposed development site.

Cumulative impacts:
Loss and/or disturbance of the natural vegetation and its associated habitat and an increase in declared weedy and alien invasive species could have a negative impact on the faunal component.

Residual Impacts:
Residual impacts depend on the intensity and permanence of the disturbance and the rate at which the natural vegetation returns. The degree to which the faunal component returns to the site will largely depend on the success of the re-vegetation of the site.

Nature: Impact of the construction phase on the drainage system
A stratification of satellite images indicated areas that could potentially be seasonal washes and pans systems. This was confirmed by the field survey however, these areas are situated outside of the 'buildable areas' on which the proposed development could take place.

Care should be taken to prevent any impact on the drainage system of the greater Klip Gat area. This will imply that measures need to be implemented to prevent erosion from occurring where the vegetation has been disturbed or removed during construction. Runoff speed should be sufficiently slowed down and the amount of water reduced in order to limit erosion on site and in the immediate surrounds. Silt transportation should also be considered and the influence of the development on silt transportation. The land owner relies on underground water for irrigation purposes and thus the development should take into consideration the impact of any additional development on the ground water of the area and not place additional pressure to underground water resources.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Medium (3)
Magnitude	High (8)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (56)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	High degree
Irreplaceable loss of resources?	Irreplaceable	Low degree
Can impacts be mitigated?	High degree	

Mitigation:

» Water runoff (amount and speed) from the proposed development site should be controlled to limit erosion damage to the developed site and surrounding areas.

» Silt transportation will also have to be mitigated in order to prevent a negative impact on the drainage system in the larger landscape.Implement a storm water management plan for construction and operations.

Cumulative impacts:

A lack of natural vegetation to stabilise soils will lead to soil erosion which will exacerbate the pressure on the hydrological processes in the region.

Residual Impacts:

Small, if mitigation takes place to limit/nullify the impact on the drainage system.

b) Summary of impacts of the proposed solar energy facility on the Klip Gat site during the operational phase

Nature: **Impact of the operational phases on the natural vegetation**

Natural vegetation should gradually begin to recolonise the disturbed and denuded areas following the construction phase. However, invasive weedy species will also colonise the area and may threaten the re-establishment of the natural vegetation. The rate at which the indigenous species re-establish will depend on the extent of the initial disturbance and the amount and types of seeds present in the seed bank. Different species may establish at different rates.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (40)**

Status (positive or negative)	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Partially irreplaceable	Partially irreplaceable
Can impacts be mitigated?	Low degree	

Mitigation:

» Disturbance should be contained within the proposed development and unnecessary disturbance adjacent to the site be avoided.

» An active re-vegetation plan should be implemented to assist the return of the natural indigenous species.

Cumulative impacts:

The spread of declared weeds and alien invaders and increased water runoff resulting in erosion will exacerbate the impact and lead to the further loss of natural vegetation and habitat for indigenous fauna and flora.

Residual impacts:

Although some of the natural vegetation will return to disturbed and denuded areas, it is highly unlikely that it will contain the full diversity of species present on the site before the development. If mitigation is successful in restricting disturbance to the site the residual impacts should be low.

Nature: **Impact of the operational phases on the spread of declared weeds and alien invasive plant species**

The operational phase may also provide declared weedy and invader plant species an opportunity to establish on the disturbed and denuded areas. These declared weed and alien invasive species will have to be actively controlled as not to negatively impact on the newly re-establishing natural vegetation. .

	Without mitigation	**With mitigation**
Extent	Site & surrounds (2)	Site & surrounds (2)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (40)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Low degree	Low degree
Can impacts be mitigated?	High degree	

Mitigation:

» Disturbance should be restricted to the proposed development site and disturbance to the surrounding vegetation should be kept to a minimum. Implement a monitoring program for the early detection of declared weedy and alien invasive plant species.

» Species listed in the Conservation of Agricultural Resources Act as Category 1 & 2 species will have to be monitored and controlled during the operational phase of the proposed solar facility,

Cumulative impacts:

The establishment of declared weeds and alien invasive plant species could lead to their spread into the surrounding natural vegetation and onto neighbouring properties.

Residual impacts:
Low residual impact if the declared weedy and alien invasive species are monitored and controlled throughout the operational phase.

Nature: **Impact of the operational phases on the fauna**
Faunal components will re-colonise habitats that become available with the return of the re-establishing natural vegetation following the construction phase. Vehicle movement and human activities may also make the site unsuitable for certain faunal species.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (36)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Partially irreplaceable	Partially irreplaceable
Can impacts be mitigated?	Low degree	

Mitigation:
» Limit disturbance to the proposed development site and ensure that the minimum disturbance takes place in the surrounding area.

Cumulative impacts:
Disturbance of the surrounding natural vegetation and an increase in declared weedy and alien invasive species could have a significantly negative impact on faunal habitat and thus the faunal component.

Residual impacts:
The degree to which the faunal component returns to the site will largely depend on the success of the re-vegetation of the site and the management of the site during the operational phase.

Nature: **Impact of the operational phases on the drainage system**
Changes in runoff patterns off of the developed site during the operational phase could affect the hydrological processes in the landscape. The necessary mitigation measures will have to be in place in order to mitigate, for example, increased water runoff amounts and speeds as well as silt transportation.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Medium degree
Irreplaceable loss of resources?	Irreplaceable	Low degree
Can impacts be mitigated?	High degree	

Mitigation:

» Substation and power line construction should not affect the drainage system as long as erosion and silt transportation are controlled.
Cumulative impacts: Soil erosion resulting from the changed/developed area will exacerbate the pressure on the hydrological processes in the region.
Residual impacts: None, if mitigation takes place to limit/nullify the impact on the drainage system.

c) Summary of impacts of the proposed substation and power line during construction and operational

Nature: Impact of the substation and power line on the natural vegetation during operations

Construction of the substation and power line will lead to a direct loss of vegetation at the footprint of the substation and pylon sites. Removal of vegetation and the associated loss of habitat impacts on the common, endemic and Red Data species. Some disturbance of the vegetation, beyond the footprints of the substation and power line will also result during the construction phase. Although the loss of the natural vegetation at the footprint of these infrastructural components will be permanent, the area covered will be small in relation to the surrounding environment.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (60)**	**Medium (50)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	Low degree	

Mitigation:

» Development should be contained in the proposed footprint of the substation and pylons and unnecessary disturbance adjacent to the site be avoided.

» The power line should be placed with caution and minimum damage should occur along the route of the power line during the construction phase even although it covers a short distance.

Cumulative impacts:

Additional infrastructure development, for example, access road; the spread of alien invaders due to loss of natural vegetation; and increased water runoff leading to erosion will exacerbate the impact and lead to a further loss of habitat for indigenous fauna and flora.

Residual impacts:

Despite mitigation measures the loss of vegetation at the substation site will be permanent. However, because the vegetation type is so large overall loss will be small.

Nature: Impact of the substation and power line on the spread of declared weeds and alien invasive plant species during operations

Declared weedy and invasive plant species are found in the environment surrounding the proposed solar facility site. The removal of the natural vegetation on the substation site and pylon sites and the associated disturbance of natural habitats provide an ideal opportunity for declared weeds and invasive species to establish.

	Without mitigation	**With mitigation**
Extent	Site & surrounds (2)	Site & surrounds (2)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (48)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Low degree	Low degree
Can impacts be mitigated?	High degree	

Mitigation:

» Development should be restricted to the substation site and pylon footprint and the disturbance to the surrounding vegetation be kept to a minimum.
» Rehabilitate disturbed areas as soon as possible following construction of the infrastructure.
» Establish a monitoring program for the early detection and control of alien invasive plant species.
» Species listed in the Conservation of Agricultural Resources Act as Category 1 & 2 species will have to be controlled during the construction and operational phases.

Cumulative impacts:

The establishment of declared weedy and alien invasive plant species could lead to their spread into the surrounding natural vegetation and onto neighbouring properties.

Residual impacts:

Low residual impact if the declared weedy and alien invasive species are effectively monitored and controlled.

Nature: Impact of the power line and substation on fauna and birds during operations

Impacts on the fauna populations on the substation and pylon sites relate to a loss of habitat and disturbance during the construction phase. Since the surrounding environment contains the same habitat, the fauna species are expected to move into these surrounding areas during construction. Because the loss of habitat at the substation and pylon footprint is permanent no return of animal species is likely during the operational phase however, the rehabilitating disturbed areas could provide suitable habitat over time. According to the Northern Cape Nature Conservation Act, various faunal species are specially protected and protected fauna and may not be hunted or harmed. The drainage system provides habitat to a special suite of animal species and care should be taken not to disturb this system.

Bird collisions with overhead power lines are of great concern. Threatened bird species such as blue cranes, bustards, flamingo's and water birds are usually among the most

affected species. This situation can be mitigated to a large degree by making the power lines more visible to the birds using various techniques.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (48)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	Low degree	

Mitigation:

» Limit disturbance to the proposed substation site and ensure that minimum disturbance takes place in the surrounding area.

» Power line construction should take fauna into account, especially birds, and important mitigation measures must include 'flappers' to make the power lines more visible to the birds. An avifauna specialist should ground-truth the construction areas before development commences in order to ensure no breeding pairs or chicks of conservation significant species are located in the areas and, if there are, how to mitigate the situation before construction begins. The use of bird diverters must be determined, prior to construction.

Cumulative impacts:

Loss and/or disturbance of the natural vegetation and an increase in declared weedy and alien invasive species will have a significantly negative impact on the faunal component. Additional power lines and reflective mirrors will impact on fauna, especially birds.

Residual impacts:

Despite mitigation measures the loss of vegetation at the substation site will be permanent and the return of faunal elements negligible. Increasing the visibility of power lines should aid in the reduction of bird collisions but this will have to be monitored constantly and remedied if necessary.

Nature: **Impact of the substation and power line on the drainage system** ***during operations***

The construction of the substation and overhead power lines could increase the erosion originating from the site and this could impact the drainage system. The necessary precautions to prevent erosion must be taken to limit the impact on hydrological processes in the landscape.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Medium (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (36)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Partially reversible	High degree
Irreplaceable loss of resources?	Partially irreplaceable	Low degree

Can impacts be mitigated?	High degree
Mitigation: Substation and power line construction should not affect the drainage system as long as erosion and silt transportation are controlled.	
Cumulative impacts: Soil erosion resulting from the changed/developed area will exacerbate the pressure on the hydrological processes in the region.	
Residual impacts: None, if mitigation takes place to limit/nullify the impact on the drainage system.	

d) Summary of impacts of the proposed access road during construction and operational

Nature: **Nature: Impact of the access roads on the natural vegetation** The main access road follows the same route as the current farm gravel track. Nevertheless, the access roads to the facility will be wider and surfaced by some means compared to the current track and some loss of the natural indigenous vegetation will inevitable occur. The loss and disturbance of natural vegetation should be limited as much as possible.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Highly probable (4)
Significance	**Medium (50)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	Low degree	
Mitigation: Disturbance should be contained in the footprint of the proposed access road (current farm track) and unnecessary disturbance adjacent to the route be restricted.		
Cumulative impacts: The spread of declared weeds and alien invaders and increased water runoff leading to erosion will exacerbate the impact and lead to a further loss of natural vegetation and habitat for indigenous fauna and flora.		
Residual impacts: Despite mitigation measures the loss of vegetation on the access road will be permanent. However, because the vegetation unit is so large overall loss will be small. Loss of vegetation adjacent to the road could be successfully mitigated.		

Nature: **Nature: Impact of the access roads on the spread of declared weeds and alien invasive plant species** The widening of the roads will create an opportunity for declared weeds and invasive species to establish and spread into disturbed and denuded areas.		
	Without mitigation	**With mitigation**
Extent	Site & surrounds (2)	Site & surrounds (2)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (40)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Low degree	Low degree
Can impacts be mitigated?	High degree	
» **Mitigation:** » Disturbance should be restricted to the footprint of the proposed access road and the disturbance to the surrounding vegetation be kept to a minimum. » Implement the monitoring program for the early detection of declared weeds and alien invasive plant species. » Implement a program to control declared weeds and alien invasive plant species.		
Cumulative impacts: The establishment of declared weeds and alien invasive plant species could lead to their spread into the surrounding natural vegetation and onto neighbouring properties.		
Residual impacts: Low residual impact if the declared weed and alien invasive species are effectively monitored and controlled.		

Nature: **Impact of the access roads on fauna** The construction of the access roads will cause a permanent loss of habitat to animal species. Disturbed areas should re-vegetate over time and re-create suitable habitats for fauna species that could gradually be recolonised.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (40)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	Low degree	
Mitigation: » Limit disturbance to the footprint of the proposed access roads/and roads and ensure that minimum disturbance takes place in the surrounding area.		
Cumulative impacts: Disturbance of the surrounding natural vegetation and an increase in declared weeds and		

alien invasive species along the access road could have a significantly negative impact on the faunal component.
Residual impacts: Despite mitigation measures the loss of habitat on the access road will be permanent. Residual impacts will furthermore depend on the intensity and permanence of disturbance adjacent to the access road as to whether the faunal component returns to these adjacent sites. Compaction of road surface may hamper the crossing of burrowing animals.

Nature: **: Impact of the construction and operational phases on few the drainage lines.** The construction of the access road could be done in such a way that there is no or a very limited impact on the drainage system. Water runoff (speed and amount) from the road will have to be controlled in order to avoid erosion and silt transportation mitigated in order to prevent damage to the drainage system further downstream.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Medium (3)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (48)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Medium degree
Irreplaceable loss of resources?	Irreplaceable	Low degree
Can impacts be mitigated?	High degree	
Mitigation: The access roads should not interfere with the hydrological processes of the drainage system if correctly placed and issues such as erosion effectively controlled.		
Cumulative impacts: Soil erosion originating from the access road will exacerbate the pressure on the hydrological processes in the region.		
Residual impacts: None if the location of the access road is carefully chosen and mitigation is successful.		

e) Comparative Assessment of Location Alternatives for Office

Both options are not situated on ecologically sensitive areas area. From an ecologically perspective, the impacts associated with either alternative are considered acceptable, and both locations are considered to be acceptable.

f) Implications for Project Implementation

» A collection/destruction permit be obtained from Northern Cape Nature Conservation for the species found on site and for the species that could

potentially occur on the site (Protected and protected families Aizoaceae/Mesembryanthemaceae, Amaryllidaceae, Apocynaceae, Asphodelaceae, Crassulaceae, Iridaceae and Orchidiaceae and genera *Androcymbium*, *Euphorbia*, *Diascia*, *Jamesbrittenia*, *Ornithogalum*, *Oxalis*, *Lachenalia*, *Lessertia*, *Manulea*, *Nemesia*, *Ornithogalum*, *Sutherlandia* and *Pelargonium* should be applied for since the development will in all probability disturb or destroy individuals belonging to these families and genera.

» Additionally, a permit for the disturbance or destruction of indigenous species should be applied for.
» Various declared weeds and invader species were also found in the surrounding areas and care will have to be taken during the construction and operational phases in order to prevent their establishment and spread on site and into the natural vegetation.
» Mitigation measures as contend in the EMP must be employed during construction and operations to manage impacts on ecology.

6.2.2 Potential Impacts on Geology and Soils and Agricultural Potential

The soils present on the site are susceptible to water erosion, specifically when subjected to high volumes of fast flowing runoff water. This is shown in Figure 6.2. With the necessary mitigation measures in place, though, water erosion need not be a major concern. It is therefore important that there should be strict adherence to the Environmental Management Programme and measures should be implemented regarding the management of storm water runoff and water erosion control during the construction phase of the project, as well as thereafter.

There are no agricultural sensitive areas, areas of high agricultural value, wetlands, watercourses or cultivated lands on the site that shall be interfered with. Apart from a fence running through the eastern section of the site there are no important agricultural infrastructure present on the site.

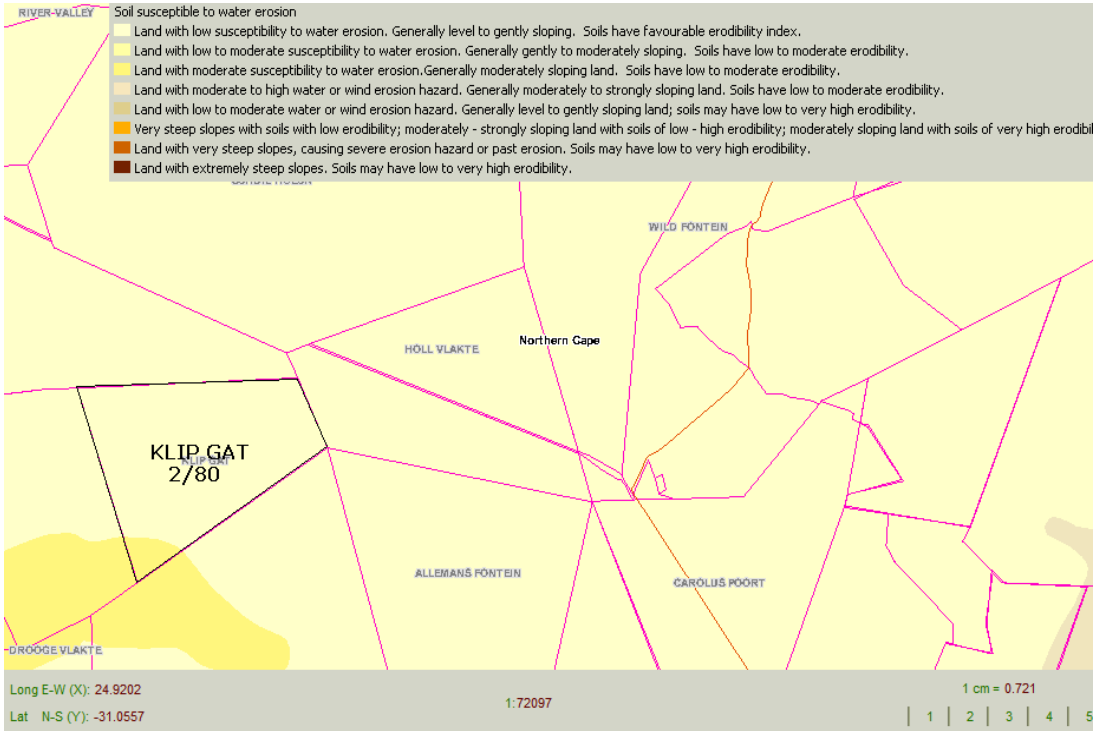

Figure 6.2: Erosion sensitivity map for the Klip Gat site

Activities that may have an impact:

» Solar facility footprint (i.e. an array of PV panels, mounting structures to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels, 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 positioning of a new on-site substation
» Construction and positioning of an on-site workshop area for maintenance, storage, and offices

Agricultural resources that may be impacted upon

» **Impact 1**: Soil (degradation due to wind and water erosion, as well as by contamination with oil, petrol, diesel and other contaminants used by the construction vehicles and equipment)
» **Impact 2**: Vegetation and grazing capacity (degradation due to a decrease in species composition and vegetation cover and a loss of grazing capacity)
» **Impact 3**: Livestock production systems (interference with farm and livestock management activities and a decline in the long term food production).

Impact tables summarising the significance of impacts on geology and soils (with and without mitigation)

a) Solar facility footprint

Impact 1: Soil

Nature: Soil erosion on construction sites during and after the construction phase due to decreased vegetation cover and increased water run-off. The soil forms present on the site is susceptible to water erosion.		
	Without mitigation	***With mitigation***
Extent	Regional (2)	Local (1)
Duration	Permanent (5)	Short-term (2)
Magnitude	High (8)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**60 (High)**	**15 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Care must be taken with the ground cover during and after construction on the site. If it is not possible to retain a good plant cover during construction, technologies should be employed to keep the soil covered by other means, i.e. straw, mulch, erosion control mats, etc., until a healthy plant cover is again established. » Care should also be taken to control and contain storm water run-off. » Rehabilitate construction sites by establishing it with indigenous grasses.		
Cumulative impacts: Little with the necessary mitigation in place		
Residual impacts: Little with the necessary mitigation in place		

Nature: Siltation of watercourses and other natural resources downstream as a result of improper storm water management and soil erosion due to increased and concentrated water run-off		
	Without mitigation	***With mitigation***
Extent	Regional (2)	Local (1)
Duration	Permanent (5)	Short-term (2)
Magnitude	High (8)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**60 (High)**	**15 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Care must be taken with the ground cover during and after construction on the site. If it is not possible to retain a good plant cover during construction, technologies should		

be employed to keep the soil covered by other means, i.e. straw, mulch, erosion control mats, etc., until a healthy plant cover is again established. » Care should also be taken to control and contain storm water run-off. » Rehabilitate construction sites by establishing it with indigenous grasses. » Control and stop soil degradation at the source.
Cumulative impacts: Little with the necessary mitigation in place
Residual impacts: Little with the necessary mitigation in place

Nature: Dust production and dust pollution of grazing plants		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Short term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**21 (Low)**	**10 (Low)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Apply dust control measures, i.e. water spraying.		
Cumulative impacts: » Little with the necessary mitigation in place		
Residual impacts: » Little with the necessary mitigation in place		

Impact 2: Vegetation and grazing capacity

Nature: Denudation of the soil due to construction activities and loss of carrying capacity The construction activities, including the construction of the PV panel foundations and the placing of underground cabling between the solar arrays and sites will lead to areas where the soil will be denuded of vegetation.		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	Low (4)	Small (1)
Probability	Definite (5)	Probable (3)
Significance	**40 (Medium)**	**12 (Low)**
Status	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation:		

Rehabilitate construction sites by establishing it with indigenous grasses.
Cumulative impacts:
Little with the necessary mitigation in place
Residual impacts:
Little with the necessary mitigation in place

Impact 3: Ground water

It is highly unlikely that the solar farm footprint will have any impact on the underground water resources.

Impact 4: Livestock production systems

Nature: Interference with the day-to-day livestock and grazing management due to construction and other activities on the site During the construction phase there will be an temporary and short term impact upon the normal day-to-day livestock and grazing management activities due to interference with systems like water reticulation and fencing.		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: When farming infrastructure, i.e. fences, water pipelines, water troughs, etc., is removed or damaged, it should be replaced as soon as possible. Construction and other activities must be communicated and co-ordinated with the land owner to put him in a position to properly plan his livestock and grazing management activities.		
Cumulative impacts: Little with the necessary mitigation in place.		
Residual impacts: Little with the necessary mitigation in place.		

b) <u>Construction, positioning, maintenance and upgrading of access roads</u>

Impact 1: Soil

Nature: Soil erosion due to roads The current internal access roads are in a fair condition.		
	Without mitigation	***With mitigation***
Extent	Regional (2)	Local (1)
Duration	Permanent (5)	Short-term (2)
Magnitude	High (8)	Minor (2)

Probability	Definite (5)	Improbable (2)
Significance	**60 (High)**	**10 (Low)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: Care should be taken to put gravel on road surfaces to protect the soil against water erosion. Cross mounds and other storm water drainage techniques must be employed to decrease the speed and force of the storm water properly from road surfaces.		
Cumulative impacts: Little with the necessary mitigation in place		
Residual impacts: Little with the necessary mitigation in place		

Impact 2: Vegetation and grazing capacity

Nature: Soil erosion due to roads The current internal access roads are in a fair condition.		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Short Term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Improbable (2)
Significance	**40 (Medium)**	**10 (Low)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Make use of existing roads as far as possible to minimise the construction of new roads.		
Cumulative impacts: Little, as long as the roads do not contribute to water erosion and storm water run-off.		
Residual impacts: Permanent		

Impact 3: Ground water

No impact expected.

Impact 4: Livestock production systems

Nature: Interference with the day-to-day livestock and grazing management due to construction and other activities on the site During the upgrading of roads there will be an impact on the normal day-to-day livestock and grazing management.		
	Without mitigation	***With mitigation***

Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Construction and other activities must be communicated and co-ordinated with the land owner in order for him to properly plan his management activities.		
Cumulative impacts: Little with the necessary mitigation in place		
Residual impacts: Little with the necessary mitigation in place		

c) <u>Use of chemicals on-site</u>

Impact 1: Soil

Nature: Contamination and degradation of the soil due to spillages of oil, petrol, diesel and other contaminants used by vehicles and equipment on the site or stored on the site		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**30 (Medium)**	**20 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Vehicles and equipment must be serviced regularly and maintained in a good running condition. » Storage of contaminants must be limited to low quantities and done under strict industry standards. » There must be strict control over the safe usage of vehicles and equipment to minimise vehicle accidents and damage to vehicles by rocks and boulders which may cause spillages.		
Cumulative impacts: Little with the necessary mitigation in place		
Residual impacts: Spillages of contaminants will have a long residual effect on the natural resources, specifically to the soil and vegetation, and possibly the underground water depending on the quantum of the spillage.		

Impact 2: Vegetation and grazing capacity

Nature: Contamination and degradation of the soil & vegetation due to spillages of oil, petrol, diesel and other contaminants used by vehicles and equipment on the site or stored on the site		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**30 (Medium)**	**20 (Medium)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Vehicles and equipment must be serviced regularly and maintained in a good running condition. » Storage of contaminants must be limited to low quantities and done under strict industry standards. » There must be strict control over the safe usage of vehicles and equipment to minimise vehicle accidents and damage to vehicles by rocks and boulders which may cause spillages.		
Cumulative impacts: Little with the necessary mitigation in place		
Residual impacts: Spillages of contaminants will have a long residual effect on the natural resources, specifically to the soil and vegetation, and possibly the underground water depending on the quantum of the spillage.		

Impact 3: Ground Water

Nature: Contamination and degradation of the soil due to spillages of oil, petrol, diesel and other contaminants used by vehicles and equipment on the site or stored on the site		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Very improbable (1)
Significance	**20 (Low)**	**9 (Low)**
Status	Negative	Negative
Reversibility	Unlikely	Unlikely
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation:		

» Vehicles and equipment must be serviced regularly and maintained in a good running condition. » Storage of contaminants must be limited to low quantities and done under strict industry standards. There must be strict control over the safe usage of vehicles and equipment to minimise vehicle accidents and damage to vehicles by rocks and boulders which may cause spillages.
Cumulative impacts: Little with the necessary mitigation in place
Residual impacts: Spillages of contaminants will have a long residual effect on the natural resources, specifically to the soil and vegetation, and possibly the underground water depending on the quantum of the spillage

d) Construction and positioning of a new on-site substation

Impact 1 Soil

Nature: Soil erosion in the area surrounding the substation

The buffer zone surrounding the substation and the storm water runoff from the substation roof may be agents of increased water runoff and water erosion.

	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» Care must be taken with the ground cover during and after construction on the site and the buffer zone surrounding it.
» During construction, technologies should be employed to keep the soil covered with agent like straw, mulch, erosion control mats, etc.
» After construction the buffer zone around the building should be covered with gravel.
» Care should also be taken to control and distribute the storm water run-off from the roof of the building in such a manner that it does not lead to water erosion of the surrounding soil.
» During maintenance activities of the substation, used oils and old transformers must be disposed of correctly. Used transformers are classified as hazardous waste and should be disposed of at a hazardous landfill site.

Cumulative impacts:
Little with the necessary mitigation in place

Residual impacts:
Little with the necessary mitigation in place

Impact 2 Vegetation and grazing capacity

Very little impact expected as it will only cover a very small area of land. Where possible this facility should be sited on the Glenrosa or Mispah soils, as these soils have the lowest grazing capacity.

e) Construction and positioning of an on-site workshop area

Impact 1 Soil

Nature: Soil erosion in the area surrounding the workshop area The buffer zone surrounding the workshop area and the storm water runoff from the roof/s may be agents of increased water runoff and water erosion.		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**50 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: » Care must be taken with the ground cover during and after construction on the site and the buffer zone surrounding it. » During construction, technologies should be employed to keep the soil covered with agent like straw, mulch, erosion control mats, etc. » After construction the buffer zone around the building should be covered with gravel. » Care should also be taken to control and distribute the storm water run-off from the roof of the building in such a manner that it does not lead to water erosion of the surrounding soil.		
Cumulative impacts: Little with the necessary mitigation in place		
Residual impacts: Little with the necessary mitigation in place		

Impact 2 Vegetation and grazing capacity

Very little impact expected as it will only cover a very small area of land. Where possible this facility should be sited on the Glenrosa or Mispah soils, as these soils have the lowest grazing capacity.

Impact 3: Livestock production systems

Nature: Interference with the day-to-day management of the livestock and veld due to construction and other activities on the site During the construction phase there will be an impact on the normal day-to-day management of the livestock and the veld management system		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**35 (Medium)**	**15 (Low)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Construction and other activities must be communicated and co-ordinated with the land owner in order for her to properly plan her management activities.		
Cumulative impacts: Little with the necessary mitigation in place		
Residual impacts: Little with the necessary mitigation in place		

g) Comparative Assessment of Location Alternatives for Office

The soils of the site are uniform and the soil erosion sensitivity of both alternatives is the same. Provided that good soil management measures are utilised during construction and use of the office, with storm water management and good-housekeeping, both alternatives for the office are acceptable.

From a soil perspective, the impacts associated with either alternative are considered acceptable, and both locations are considered to be acceptable.

f) Implications for Project Implementation

» The soils present on the site are susceptible to water erosion, specifically when subjected to high volumes of fast flowing runoff water.

» It is therefore important that there should be strict adherence to the Environmental Management Program and measures regarding the management of storm water runoff and water erosion control should be implemented during all phases of the project.

6.2.3 Assessment of Potential Impacts on Heritage & Palaeontology

The survey of the study area yielded 3 heritage resources sites:

» 2 located within the PDA (Klipgat-1 & Klipgat-2),and
» The other a farmstead referred to as Klipgat farmstead is located just outside the PDA (Figure 6.3).

These sites, however, fall outside the project development foot print as indicated in Figure 6.3 (the white marked area in the map). The grading of the heritage sites are generally protected, therefore the impact will be low. The area indicated in yellow on Figure 6.3 indicates the area that needs to be surveyed prior to construction (walk down by an archaeologist before the project construction phase).

a) Impact tables summarising the significance of impacts on heritage sites, or objects (with and without mitigation).

Nature: Destruction of Heritage sites / artefacts		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short term (2)	Long term (5)
Magnitude	Low (2)	Low (1)
Probability	Improbable (2)	Improbable (1)
Significance	**Low (12)**	**Low (8)**
Status	Negative	Positive
Reversibility	Irreversible	Reversible
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	No	Yes
Mitigation » No further mitigation is recommended provided bedrock is not to be disturbed.		
Cumulative impacts: » No cumulative effects are predicted for both Klipgat-1 and Klipgat-2 as they fall outside the development footprint		
Residual impacts: » None		

b) Impact tables summarising the significance of impacts on Palaeontology sites, or objects (with and without mitigation).

The likelihood of destruction of paleontological significant fossils and/or permanently sealing-in of fossiliferous mudstones through excavations for fencing, underground cabling, access roads and administrative buildings during the construction phase will be shallow and unlikely to reveal significant fossils.

Nature: Paleontological sites (fossils) could be affected if bedrock was to be disturbed during the excavation activities associated with the construction.		
	Without mitigation	***With mitigation***
Extent	Local (2)	Local (2)
Duration	Long term (5)	Long term (5)
Magnitude	Medium (4)	Low (1)
Probability	Probable (3)	Improbable (1)
Significance	**Medium (33)**	**Low (8)**
Status (positive or negative)	Negative	Positive
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Yes	No
Can impact be mitigated?	No	Yes
Mitigation measures: » It is recommended that a palaeontologist should be appointed do a site visit to determine whether fossils are exposed in the area earmarked for development, prior to construction. This survey would of course be limited to a surface inspection only. In the event of fossils being uncovered during the construction phase, the ECO should photograph and record the position of fossiliferous material.		
Cumulative impact: » None		
Residual impact: » Loss of fossils of heritage significance.		

c) Comparative Assessment of Location Alternatives for Office

The offices do not fall within the heritage sensitive areas. Also, the soils of the site are uniform and the soil erosion sensitivity of both alternatives is the same. From a heritage perspective, the impacts associated with either alternative are considered acceptable, and both locations are considered to be acceptable.

d) Implications for Project Implementation

» That there were no “Heritage Sensitive Areas” identified on the site, only 3 heritage artefacts, which will not be impacted by the development footprint of the PV facility.
» The pre-construction archaeological survey should be conducted in the yellow zone as indicated on Figure 6.3.
» It was concluded that there are no heritage “No Go Area” within the site and that the development should go ahead as planned.
» Should any of the three identified heritage artefacts be required to be destroyed/ removed a permit from SAHRA will be required.
» A preconstruction survey for palaeontology is required.

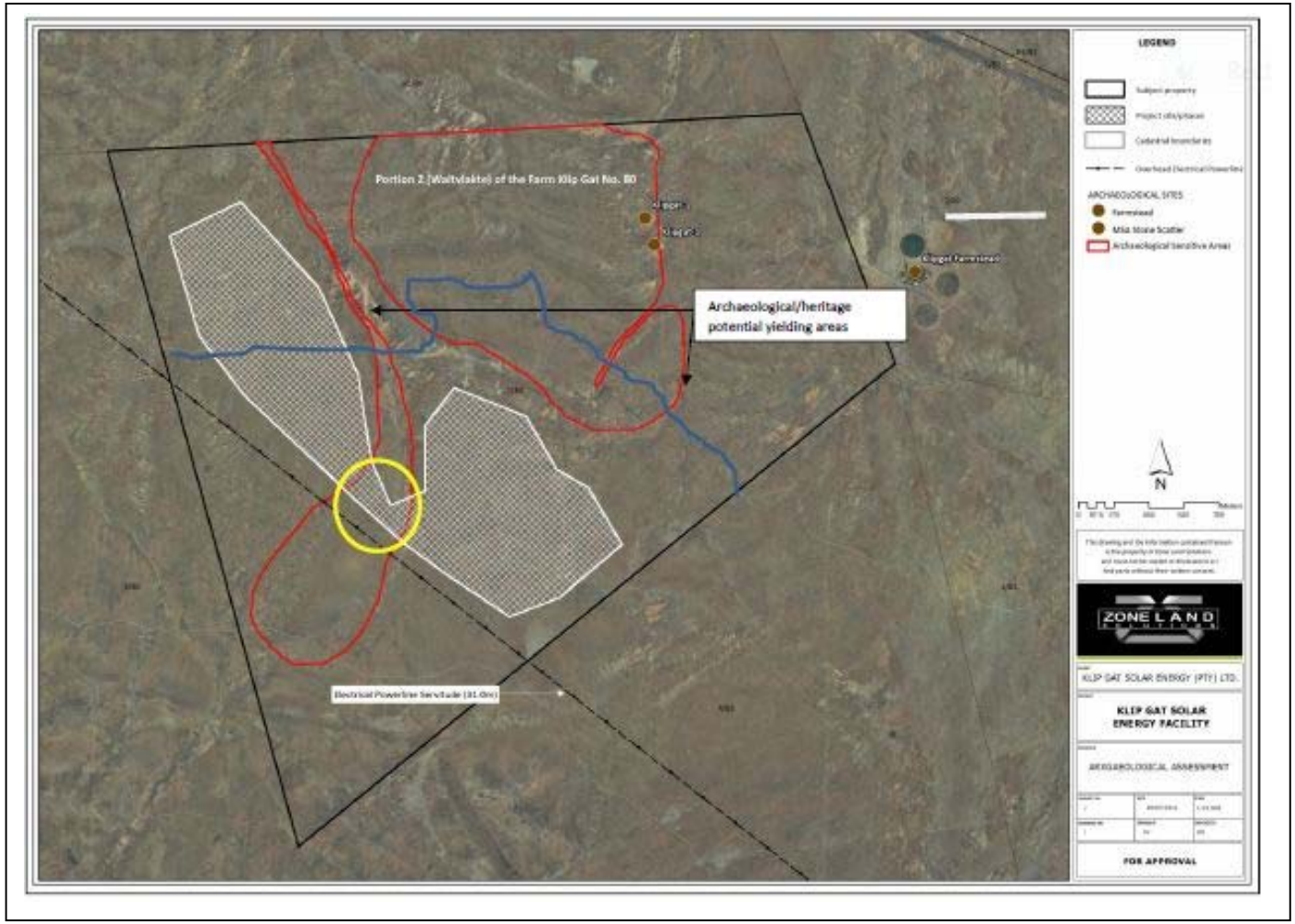

Figure 6.3: Distribution of heritage resources within Klipgat site and in relation to the proposed development footprint (indicated in white). The scatter resources located on the Farm Klip Gat 802/80 are within the yellow portion (and will require a further survey)

6.2.4 Assessment of Potential Visual Impacts

The topography and the major ridgelines of the area were determined and mapped by using a *Digital Elevation Model*[5] (DEM). The project site is located at a mean elevation of approximately 1407m above sea level on a slight downward northerly slope. The DEM shows that there are very few prominent topographical manifestations in close proximity to the project site from which the proposed activity is particularly visually exposed. The nearest prominent hill or mountain is that of Schuilhoekberg at some 1625m, situated some 7km north of the project site. Furthermore, as stated previously, the project site is located below any ridgeline. The proposed activity will not impact on the skyline as the height of the PV panels will be up to 4m above-ground level. .

In order to quantify and assess the visibility and potential impact of the proposed activity and to provide a basis for selecting appropriate observation points outside of the project site, a photographic study and analysis was undertaken in the vicinity of the project site. The analysis and ground-truthing identified several observation points with similar characteristics and assessments outcomes. A selection of Key Observation Points is therefore included under Annexure 2 of the Visual Impact Assessment Report in Appendix G.

Digital Viewshed Analysis

A viewshed[6] analysis was undertaken in accordance with the *Guideline Document for involving Visual Specialists in EIA Processes*. Geographic Information Systems (GIS) technology was used to analyse and map information in order to understand the relationships that exist between the observer and the observed view. Key aspects of the viewshed are as follows:

- It is based on a *single viewpoint* from the highest point of the project site.
- It is calculated at an assumed 4m above the natural ground level to reflect the highest point of the PV panels.
- It represents a '*broad-brush' designation*, which implies that the zone of visual influence may include portions that are located in a view of shadow and it is therefore not visible from the project site and *vice versa*. This may

[5] A Digital Elevation Model (DEM) is a geographic information system-based outcome generated from contours for a specific area. In this instance, 20m contour intervals for reference sheet nos. 2228bd, 2228db, 2229ac, 2229ad, 2229ca, 2229cb, 2229bc and 2229da were used to calculate the DEM for the region.

[6] A viewshed is defined as '*the outer boundary defining a view catchment area, usually along crests and ridgelines. Similar to a watershed'*. A Viewshed Analysis is therefore the study into the extent to which a defined area is visible to its surroundings.

be as a result of landscape features such as vegetation, buildings and infrastructure not taken into consideration by the DEM.

- The viewshed generated from each of the selected observation points referred to in Annexure 2 is calculated at 1.7m above the natural ground level to reflect the average height of person either walking or sitting in a vehicle.

Key Aspects of the Viewshed

The distance between the observer and the observed activity is an important determinant of the magnitude of the visual impact. This is due to the visual impact of an activity diminishing as the distance between the viewer and the activity increases. Viewsheds are categorised into three broad categories of significance, namely:

a) Foreground: The foreground is defined as the area within 1km from the observer within which details such as colour, texture, styles, forms and structure can be recognised. Objects in this zone are highly visible unless obscured by other landscape features, existing structures or vegetation.

b) Middle ground: The middle ground is the area between 1km and 3km from the observer where the type of detail which is clearly visible in the foreground becomes indistinguishable. Objects in the middle ground can be classified as visible to moderately visible, unless obscured by other elements within the landscape.

c) Background: the background stretches from approximately 3km onwards. Background views are only distinguishable by colour and lines, while structures, textures, styles and forms are often not visible.

The distance radii indicating the various viewing distances from the combined phases are illustrated by Figure 6.4. Also illustrated by the figure are the view corridors of the N1 and R389. As described above, these corridors are all situated in the background to the project site and should therefore not be affected by the proposed activity.

Figure 6. 4: Show that the facility will be visible within a 1-3km radius from the site. Visibility becomes limited further than 3km from the site. Within the northern parts of the study area, the facility may potentially be visible from up to 5km away from the site. The visibility beyond 3km in the southern parts of the site is limited and in many parts constitutes no visual impact. The facility will not be visible from the R389 to Noupoort/ Hanover, or any other major public road. The facility will not be visible from Hanover/ Noupoort.

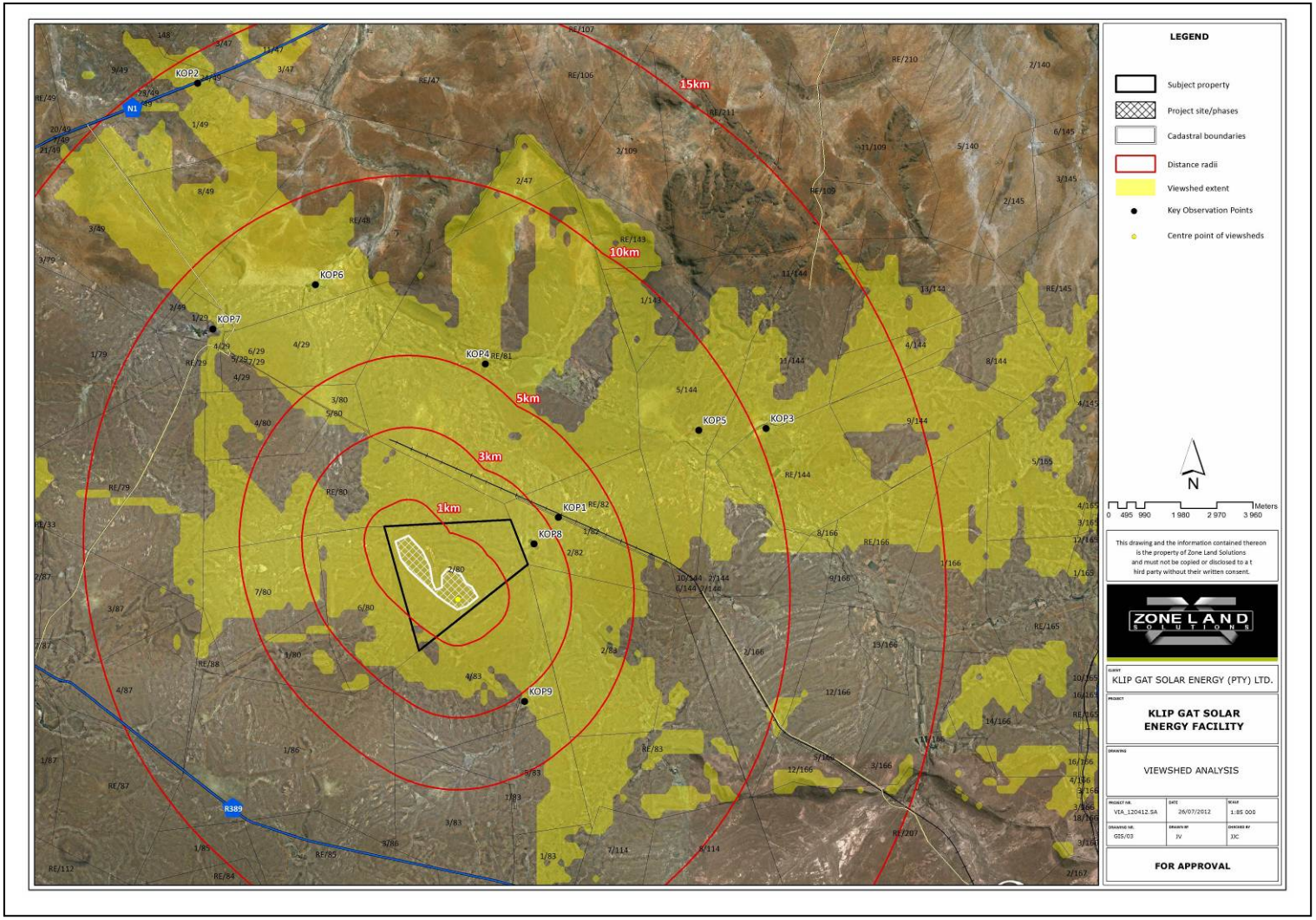

Figure 6.4: Viewshed generated from the project site.

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

Nature: Potential visual impact on the sensitive receptors in the region

All but one of the identified receptors is located in the *background.* In addition, no receptors are located in the *foreground* to the project site. The sensitive receptors in the *background* of the generated viewshed represent mostly private farmsteads and limited users of the farm access road, some 2.5km north of the project site.

The proposed activity will represent a change in land use and land form to what is currently the status quo. The introduction of foreign structures and forms in the agrarian landscape might have a limited impact on these sensitive receptors as described in the table below.

	No mitigation	***Mitigation considered***
Extent	Local(2)	Site-related(1)
Duration	Long term(4)	Long term(4)
Magnitude	Minor(4)	Low(2)
Probability	Probable(3)	Improbable(2)
Significance	**Medium(30)**	**Low(14)**
Status	Neutral	Neutral
Reversibility	Recoverable(3)	Recoverable(3)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	

Mitigation:

» Keep disturbed areas to a minimum.

» No clearing of land to take place outside the demarcated footprint.

» Institute a planting regime along the northern boundary of the project site. Only indigenous plant species to be introduced and planted in an organic manner and location that would not cast shadows on the PV 'strings'. Tall shrubs such as *Lyciumcinereum (d), L. horridum, L. oxycarpum* are suitable.

» Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits.

» Utilise existing roads and tracks to the extent possible. Where new roads are required, they should be two-track gravel roads, maintained to prevent dust plumes and erosion.

Cumulative impacts:

Apart from the two linear infrastructure lines (railway and electrical transmission), very little infrastructural improvements exist in the area. Therefore, the cumulative impact of the proposed activity will be negligible

Residual impacts:

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

Nature: Potential visual impact on the intrinsic value and sense of place in the region

Sense of place and intrinsic values are closely related to one another. Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria and specifically visual character of an area (informed by a combination of aspects, such as topography, level of development, vegetation, noteworthy features, cultural/historical features, etc.) play a significant role. A visual impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive . The sense of place of Noupoort is very much one of an agrarian landscape, dotted by agricultural farmsteads set against a backdrop of mountains and hills.

	No mitigation	***Mitigation considered***
Extent	Local**(2)**	Local**(2)**
Duration	Long term**(4)**	Long term**(4)**
Magnitude	Medium**(6)**	Medium**(6)**
Probability	Probable**(3)**	Probable**(3)**
Significance	Medium**(36)**	Medium**(36)**
Status	Negative	Negative
Reversibility	Recoverable**(3)**	Recoverable**(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	

Mitigation:

» Keep disturbed areas to a minimum.

» No clearing of land to take place outside the demarcated footprint.

» Institute a rigorous planting regime along the boundaries of the site. Only indigenous plant species to be introduced. Attend especially to the northern boundary of the proposed activity.

» Buildings and similar structures must be in keeping with regional planning policy documents, especially the principles of critical regionalism, namely sense of place, sense of history, sense of nature, sense of craft and sense of limits.

Cumulative impacts:

Apart from the two linear infrastructure lines (railway and electrical transmission), very little infrastructural improvements exist in the area. Therefore, the cumulative impact of the proposed activity will be negligible.

Residual impacts:

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

Nature: Potential visual impact of artificial lighting as a result of the activity.

The project site has a very low illumination factor. The occurrence of light sources in the vicinity of the project site is strictly confined to individual farmsteads. A slight sky glow[7] effect is associated with the town of Noupoort, but due to its distance from the project site, it is not visible from the site.

The proposed PV 'string' will not include lights of any kind, however, the associated ancillary buildings and infrastructure may include some degree of lighting.

It is not expected that the proposed activity will contribute to the effects of sky glow or artificial lighting of the area. In order to ensure this, the proposed mitigation measures will have to be complied with.

	No mitigation	***Mitigation considered***
Extent	Local**(2)**	Site-related**(1)**
Duration	Long term**(4)**	Long term**(4)**
Magnitude	Minor**(4)**	Low**(2)**
Probability	Probable**(3)**	Probable**(3)**
Significance	**Medium(30)**	**Low(21)**
Status	Negative	Negative
Reversibility	Recoverable**(3)**	Recoverable**(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	

Mitigation:

- Outdoor lighting must be strictly controlled so as to prevent light pollution.
- All lighting must be installed at downward angles.
- Sources of light must as far as possible be shielded by physical barriers.
- Consider the application of motion detectors to allow the application of lighting only where and when it is required.
- Only minimum wattage light fixtures must be used.

Cumulative impacts:

As mentioned above, the area within which the proposed activity is to be undertaken is relatively low lit. The occurrence of ancillary structures of the PV Plant will contribute to the cumulative lighting effect of the area but it is expected to be negligible in a local context.

Residual impacts:

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

Nature: Potential visual impact of desertification of the landscape / scarring.

The dangers of desertification are well documented. The lack of continued plant growth,

[7]Sky glow refers to the illumination of the night sky or parts thereof. The most common cause of sky glow is artificial light that emits light pollution, which accumulates into a fast glow that can be seen from miles away.

coupled with the periodic flash floods and severe thunderstorms, the Karoo is so well known for, could have dire consequences for any development.

Great concern therefore needs to be taken in the construction and operation of the plant to prevent desertification, erosion and scouring of the landscape.

	No mitigation	***Mitigation considered***
Extent	Site related(1)	Site related(1)
Duration	Permanent(5)	Long term(4)
Magnitude	High(8)	Low(2)
Probability	Highly probable(4)	Probable(3)
Significance	Medium(56)	Low(21)
Status	Negative	Negative
Reversibility	Recoverable(3)	Recoverable(3)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	

Mitigation:

» Outdoor lighting must be strictly controlled so as to prevent light pollution.

» All lighting must be installed at downward angles.

» Sources of light must as far as possible be shielded by physical barriers.

» Consider the application of motion detectors to allow the application of lighting only where and when it is required.

Cumulative impacts:

The immediate surrounding area to the project site is already impacted by lighting. The proposed will contribute to the cumulative lighting effect although it is expected to be negligible in a regional context.

Residual impacts:

» It is very possible that the status quo could be regained after decommissioning of the plant.

Nature: Potential visual impact of reflection of the PV Panels on the sensitive receptors

Photovoltaic solar panels are designed to absorb sunlight in order to convert it into electricity. The more sunlight that is absorbed, the more energy that can be produced. A solar cell absorbs two-thirds of the sunlight reaching the panel's surface. This effectively means that only one-third of the sunlight reaching the surface of a solar panel has a chance to be reflected.

In addition, the PV panels have a reflectivity of around 30%, while surface materials such as dry sand has a reflectivity of around 45% and grass-type vegetation at 25%. Moreover, PV panels are installed at a fixed angle of around 30°.

As the majority of receptors in the region are located at more or less the similar height of the project site (±40m variation), the solar panels will therefore not noticeably alter the site's current amount of reflected, indirect sunlight. Nor will the PV panels reflect light into or in the direction of any receptors.

	No mitigation	***Mitigation considered***
Extent	Regional (3)	Regional (3)

Duration	Long term (4)	Long term (4)
Magnitude	Medium (6)	Medium (6)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (26)**	**Low (26)**
Status	Neutral	Neutral
Reversibility	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	Yes	
Mitigation: » Consider installing anti-reflective coating or glass to reduce the sunlight that is reflected from PV panels and increase the amount of sunlight that is absorbed.		
Cumulative impacts: The introduction of all kinds of solar panels, coupled with the existing substation on site and the adjacent industrial buildings, contribute to an increased cumulative visual impact.		
Residual impacts: » The status quo could be regained after decommissioning of the plant, providing that the site is rehabilitated to its current state		

Implications for Project Implementation

» The anticipated visual impacts of the PV facility are expected to be of moderate to low significance.
» The sensitive receptors in the *background* of the generated viewshed represent mostly private farmsteads and limited users of the farm access road, some 2.5 km north of the project site.
» A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.

Comparative Assessment of Location Alternatives for Office

The height of the office is 2.7 m, the visual impact of the office in this remote site will be low. From a visual perspective, the impacts associated with either alternative are considered acceptable, and both locations are considered to be acceptable and no preference from a visual point of view was made, both alternatives for the office are acceptable.

6.3.5 Assessment of Potential Social Impacts

a) Social Impacts - Construction Phase

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.

Impact tables summarising the significance of social impacts associated with the construction phase of the project (with and without mitigation)

Nature of Impact: Potential impacts on family structures and social networks associated with the presence of construction workers.

Based on information from other Solar Facility projects the construction phase for a 75MW PV Solar Facility is expected to extend over a period of 18-24 months and create approximately 291 employment opportunities, depending on the final design. Of this total ~ 60% (175) will be available to low-skilled workers (construction labourers, security staff etc.), 15% (43) to semi-skilled workers (drivers, equipment operators etc.) and 25% (73) to skilled personnel (engineers, land surveyors, project managers etc.).

It is reasonable to assume that the majority of the low skilled workers (175) and at least 60% of the semi-skilled workers (24) can be sourced locally. Employing members from the local community to fill the semi and low-skilled job categories will reduce the risk posed by construction workers to local communities. These workers will be from the local community and form part of the local family and social network. The proponent has indicated that they are committed to implementing a local employment policy, specifically for the low and semi-skilled employment opportunities associated with the construction phase. The total number of construction workers from outside the area that will need to be accommodated will therefore be in the region of 100, the majority of which (73) will be skilled workers. Based on this the overall impact of construction workers on the local community with mitigation is likely to be low. However, due to the potential mismatch of skills and low education levels, the potential employment opportunities for the members from these local communities may be lower than anticipated. This is an issue that will need to be addressed during the recruitment process.

	Without enhancement	**With enhancement**
Extent	Local (2)	Local (1)
Duration	Medium Term for community as a whole (3) Long term-permanent for individuals who may be affected by STD's etc. (5)	Medium Term for community as a whole (3) Long term-permanent for individuals who may be affected by STD's etc. (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by

		STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Low** for the community as a whole (27) Moderate-High for specific individuals who may be affected by STD's etc. (57)	**Low** for the community as a whole (24) Moderate-High for specific individuals who may be affected by STD's etc. (51)
Status (positive or negative)	Negative	Negative
Reversibility	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 impacts be enhanced?	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 over weekends and or 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 phase is completed. This would reduce the risk posed by non-local construction workers to local family structures and social networks;

» 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. 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. The development of other solar energy projects in the area may exacerbate these impacts.

Residual impacts:

» Community members affected by STDs etc. See cumulative impacts.

Nature of Impact: Potential impacts on family structures and social networks associated with the presence of construction workers

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. While the proposed Klipgat Solar Facility may, on its' own, not result in influx of significant numbers of job seekers to the area, the establishment of a number of renewable energy projects in the area, specifically in the vicinity of De Aar, has the potential to attract job seekers to the area. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the manner in which they conduct themselves can affect the local community. There is also a concern that some of these job seekers may not leave town immediately and, in some cases, may stay indefinitely.

The potential social impacts associated with the influx of job seekers include:

- Impacts on existing social networks and community structures;
- Competition for housing, specifically low cost housing;
- Competition for scarce jobs;
- Increase in incidences of crime;
- An increase in sexually transmitted diseases (STDs).

Experience from other projects has also shown that the families of job seekers may also accompany individual job seekers or follow them later. In many cases the families of the job seekers that become "economically stranded" and the construction workers that decided to stay in the area, subsequently moved to the area. The influx of job seekers to the area and their families can also place pressure on the existing services in the area, specifically low income housing and schools. In addition to the pressure on local services the influx of construction workers and job seekers can also result in competition for scarce employment opportunities.

The Emthangeni Local Municipality (ELM) should also anticipate that the support for renewable energy projects in the ELM has the potential to result in the influx of job seekers to the area. This influx and the demand that is may have on local services should be borne in mind when the IDP is reviewed and up-dated

	Without enhancement	**With enhancement**
Extent	Local (2)	Local (2)
Duration	Permanent (5) (For job seekers that stay on the town)	Permanent (5) (For job seekers that stay on the town)
Magnitude	Minor for the community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)

Significance	**Low** for the community as a whole (27) Medium -High for specific individuals who may be affected by STD's etc. (54)	**Low** for the community as a whole (27) Medium-High for specific individuals who may be affected by STD's etc. (51)
Status (positive or negative)	Negative	Negative
Reversibility	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 impacts be enhanced?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

It is almost impossible to stop people from coming to the area in search of a job, specifically given that the PKSDM and ELM have identified renewable energy as a future growth sector. However, as indicated above, the proponent should ensure that the employment criteria favour local residents in the area. In addition the proponent should:

» In consultation with the ELM, investigate the option of establishing a MF (see above) to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in the area;

» Implement a policy that no employment will be available at the gate. This should be linked to the establishment of employment offices in Hanover and other towns in the ELM.

Cumulative impacts:

» Impacts on family and community relations that may, in some cases, persist for a long period. 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:

» See cumulative impacts.

Nature of Impact: Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site

The presence of construction workers on the site increases the potential risk of stock theft and poaching. The movement of construction workers on and off the site also poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock and game losses may also result from gates being left open and/or fences being damaged.

	Without enhancement	**With enhancement**
Extent	Local (4) (Rated as 4 due to potential severity of	Local (2)

	impact on local farmers)	
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate (6) (Due to reliance on agriculture and livestock for maintaining livelihoods)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, compensation paid for stock losses etc.	
Irreplaceable loss of resources?	No	
Can impacts be enhanced?	Yes	

Mitigation:

» Klip gat Solar Energy should enter into an agreement with the affected landowners whereby the company will compensate for damages to farm property and disruptions to farming activities. This includes losses associated with stock theft and damage to property etc.;

» Klip gat Solar Energy should investigate the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. Should such a MF be required it should be established prior to commencement of the construction phase. The Code of Conduct should be signed by Klip gat Solar Energy and the contractors before the contractors move onto site;

» Klip gat Solar Energy 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 Klip gat Solar Energy, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);

» 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 Klip gat Solar Energy should 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 Klip gat Solar Energy should ensure that construction workers who are found guilty of stealing livestock, poaching 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 limited to security personnel

Cumulative impacts:

» No, provided losses are compensated for

Residual impacts:

» See cumulative impacts.

Nature of impact: Potential impact on local farmers associated with loss of farm

labour to the construction phase

The potential impacts for the affected farmers associated with the loss of permanent farm labour to the construction phase are exacerbated by the security of tenure that permanent farm labourers enjoy in terms of the Extension of Security and Tenure Act (ESTA). Farm labourers who are eligible under ESTA and who take up jobs during the construction phase will be entitled stay on in their houses on the farms in question.

The farm workers that take up jobs during the construction phase are also at risk. While some farm workers may be re-employed once the construction has been completed, others may not be so fortunate. The low education levels associated with the farm worker community would effectively mean that alternative employment opportunities outside the agricultural sector will not be accessible to them. These farm workers and their families therefore stand to be negatively impacted upon in the medium to long term. The low education levels of local farm workers are however also likely to reduce the chances of them being employed during the construction phase.

On the positive side, some farm workers may view work associated with the construction phase as an opportunity to gain skills and relocate to the local towns in the area.

	Without enhancement	**With enhancement**
Extent	Local and Regional (2)	Local and Regional (1)
Duration	Medium Term (3) (Assumed that farm labour can be replaced)	Medium Term (3) (Assumed that farm labour can be replaced)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (24)
Status (positive or negative)	Negative	Negative
Reversibility	Yes, if farm workers return of are replaced	
Irreplaceable loss of resources?	No	
Can impacts be enhanced?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

» While the proponent can liaise with local farmers in the area and take steps not to employ local farm worker were possible, it is not possible to prevent farm workers from applying for work. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary.

» Farm workers who apply for construction related work should also be informed that the nature of the work is temporary. In addition they should be informed of the potential negative consequences of their actions, which include the potential loss of their permanent farm job

Cumulative impacts:

» Impacts on farm operations due to loss of experienced farm labour

Residual impacts:

» Increase in unemployment amongst local farm workers who are not rehired once construction worker comes to an end. On positive side, may result in increased skills for local farm workers and improve their economic mobility.

Nature of impact: Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site

The presence of construction workers on the site increases the potential risk of stock theft and poaching. The movement of construction workers on and off the site also poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Livestock and game losses may also result from gates being left open and/or fences being damaged. The local farm owners in the area who were interviewed indicated that stock theft was currently not a major concern. However, there are isolated cases involving the theft of sheep. However, concerns were raised regarding the presence of construction workers in the area. In this regard the local farmers noted that no construction workers should be allowed to stay on the site overnight with the exception of security personnel.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Medium Term (3)	Medium Term (3)
Magnitude	Moderate (6) (Due to reliance on agriculture and livestock for maintaining livelihoods)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, compensation paid for stock losses etc.	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

The mitigation measures that can be considered to address the potential impact on livestock, game, and farm infrastructure include:

» The proponent should enter into an agreement with the affected landowners whereby the company will compensate for damages to farm property and disruptions to farming activities. This includes losses associated with stock theft and damage to property etc. This agreement should be finalised before the commencement of the construction phase;

» 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 tender documents for contractors and 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 (see below);

» The 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 should 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 should ensure that construction workers who are found guilty of stealing livestock, poaching and/or damaging farm infrastructure should be charged as per the conditions 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 limited to security personnel
Cumulative impacts: » No**,** provided losses are compensated for
Residual impacts: » See cumulative impacts

Nature of impact: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires

The presence of construction workers and construction-related activities on the site poses an increased risk of veld fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened. The findings of the SIA indicate that the loss of grazing due to veld fires would impact on the livelihoods of local farmers in the area.

» The potential risk of veld fires is heightened by windy conditions in the area, specifically during the dry, windy winter months.
» The dominant agricultural activity in the broader area is livestock farming, specifically sheep. As such, the livelihoods of the farmers in the area are dependent on grazing on their farms. Any loss of grazing due to a fire would therefore impact negatively on the affected farmers livelihoods;

The risk of fire related damage is exacerbated by the limited access to fire-fighting vehicles.

	Without mitigation	**With mitigation**
Extent	Local (4) (Rated as 4 due to potential severity of impact on local farmers)	Local (2) (Rated as 2 due to potential severity of impact on local farmers)
Duration	Short Term (2)	Short Term (2)
Magnitude	Moderate due to reliance on livestock 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 losses and damage etc.	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:
As indicated above, the proponent should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated veld fires. In addition, the potential increased risk of veld fires can be effectively mitigated. Mitigation measures include:

- Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas;
- No smoking on the site, except in designated areas should be permitted;
- Contractor should 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 clearing working areas and 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 should provide adequate fire fighting equipment on-site;
- Contractor should provide fire-fighting training to selected construction staff;
- 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 fire fighting costs borne by farmers and local authorities.In addition the landowners and developers should also ensure that they join the local fire protection agency.

Cumulative impacts:

- No, provided losses are compensated for.

Residual impacts:

- Potential loss of income and impact on livelihoods and economic viability of affected farms.

Nature of impact: Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site

The main access to the site will be via the Dwaal Road and also via the railway line. The Dwaal Road links up with the N9 and N1 and also provides primary access to a number of farms (Caroluspoort, Toitdale, Visgat) located between the N1 and Noupoort along the Dwaal sideline. The findings of the SIA indicate that the volume of traffic along the Dwaal Road is low. The social impacts associated with the movement of construction related traffic along this road are therefore likely to be low.

However, the movement of large, heavy loads during the construction phase has the potential to impact on the quality of the road surface, which in turn would impact on the local farmers in the area who use the road. In addition, the heavy vehicles can also create delays and safety impacts for other road users travelling along the N9 and N10. These impacts can however be mitigated by timing the trips to avoid times of the year when traffic volumes are likely to be higher, such as start and end of school holidays, long weekends and weekends in general etc.

The option of railing material from Port Elizabeth to should be investigated. This would reduce the potential impact on other road users along the N10. Based comments from other renewable energy projects near De Aar, the option of using rail to transport equipment to the PKSDM should be investigated. Also the establishment proposed of a Renewable Energy Hub centred at De Aar would also create an opportunity to revitalise the railway sector in De Aar.

	Without Mitigation	**With Mitigation**
Extent	Local-Regional (2)	Local-Regional (1)
Duration	Medium Term (3)	Medium Term (3)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» The proponent should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes damage to local roads by construction vehicles. In addition, the potential impacts associated with heavy vehicles and dust can be effectively mitigated. The aspects that should be covered include:

» Abnormal loads should be timed to avoid times of the year when traffic volumes are likely to be higher, such as start and end of school holidays, long weekends and weekends in general etc.;

» The contractor must ensure that all damage caused to local farm roads by the construction related activities, including heavy vehicles, 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;All vehicles must be road-worthy and drivers must be qualified, made aware of the potential road safety issues, and need for strict speed limits.

» If possible, the option of using rail to transport materials and equipment from Port Elizabeth to the site via De Aar should be investigated.

Cumulative impacts:

» If damage to roads is not repaired then this will affect the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were no responsible for the damage.

Residual impacts:

» Reduced quality of road surfaces and impact on road users

Nature of impact: 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 PV facility and power lines will damage farmlands and result in a loss of farmlands for future farming activities.

The activities associated with the construction phase have the potential to result in the loss of land available for grazing. However, only one landowner is affected and it is assumed that he has entered into a lease agreement with the proponent. The loss of productive farmland would therefore be offset by the income from the lease agreement.

The final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. Recommended mitigation measures are outlined below.

	Without mitigation	**With mitigation**
Extent	Local (3)	Local (1)
Duration	Long term-permanent if disturbed areas are not effectively rehabilitated or compensation is not paid (5)	Medium Term if damaged areas are rehabilitated (3)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	
Can impacts be enhanced or mitigated?	Yes, however, loss of farmland cannot be avoided	

Mitigation:

The potential impacts associated with damage to and loss of farmland can be effectively mitigated. The aspects that should be covered include:

» 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 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 a suitably qualified ecologist;

The implementation of the Rehabilitation Programme should be monitored by the ECO.

Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmer, and the workers on the farm and their families. However, disturbed areas can be rehabilitated.

Residual impacts:

» See cumulative impacts.

b) Impacts during the Operational Phase

Nature of impact: Creation of employment and business opportunities associated

with the operational phase.

Based on the information provided by the proponent, the proposed PV Solar Facility will create ~ 60 permanent employment opportunities during the 20 year operational phase. Of this total ~ 30 (50%) will be low skilled (security and maintenance), 10 (17%) semi-skilled and 20 (33%) skilled employees. Members from the local community are likely to be in a position to qualify for the majority of the low skilled and some of the semi-skilled employment opportunities. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local community. Given the high unemployment levels and limited job opportunities in the area this will represent a social benefit. The remainder of the semi-skilled and majority of the skilled employment opportunities are likely to be associated with people from outside the area.

The proponent has also indicated that they are committed to implementing a training and skills development programme during the operational phase. Such a programme would support the strategic goals of promoting local employment and skills development contained in the ELM IDP.

Given the location of the proposed facility the majority of permanent staff is likely to reside in Hanover or Noupoort. The local hospitality industry in Hanover, Middelburg and Noupoort is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations. The proposed establishment of renewable energy facilities in the area was strongly supported by the ELM. In this regard the municipality had identified the establishment of a renewable energy as one of the key economic opportunities for the area.

	Without mitigation	**With mitigation**
Extent	Local and Regional (1)	Local and Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Highly Probable (4)
Significance	**Medium (33)**	**Medium (48)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

The enhancement measures listed in Section 4.4.1, i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition:

» The proponent should 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 locals employed during the operational phase of the project.

» The proponent, in consultation with the ELM, should investigate the opportunities for establishing a Community 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: » See cumulative impacts

Nature of impact: Establishment of a Community Trust funded by revenue generated from the sale of energy. The revenue can be used to fund local community development

In terms of the Request for Proposal document prepared by the Department of Energy all bidders for operating licences for renewable energy projects must demonstrate how the proposed development will benefit the local community. This can be achieved by establishing a community trust which is funded by revenue generated from the sale for energy. The proponent has indicated that they are committed to establishment of a community trust.
Community trusts provide an opportunity to generate a reliable and steady revenue stream over a 20 year period. This revenue can be used to fund development initiatives in the area and support the local economic and community development. The 20 year timeframe also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed Solar Facility can be used to support a number of social and economic initiatives in the area, including:

- » Education (adult and child);
- » Health care;
- » Training and skills development;
- » Support for SMME's.

Revenue from renewable energy projects could also be used to address the infrastructure backlogs in the ELM. As indicated above, the ELM should investigate the option of establishing a forum to assist the renewable energy sector with the establishment of Community Trusts. Experience has however also shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a Community Trust.

Due the number of other renewable energy facilities proposed in the ELM it is recommended that the ELM investigate the option of establishing a forum to assist the renewable energy sector with the establishment of Community Trusts. This would enable the ELM to ensure that the various Community Trusts established as per the requirements set out by the Department of Energy are aligned with and support the developmental objectives set out in the ELM's Integrated Development Plan (IDP) and Local Economic Development (LED) strategy.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (21)**
Status (positive or negative)	Negative	Negative

Reversibility	Yes
Irreplaceable loss of resources?	No
Can impacts be mitigated or enhanced?	Yes

Mitigation:

In order to maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented:

» The proponent in consultation with the ELM should establish criteria for identifying and funding community projects and initiatives in the area. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community;

» ELM should investigate the option of establishing a forum to assist the renewable energy sector with the establishment of Community Trusts;

» The proponent in consultation with the ELM should ensure that strict financial management controls, including annual audits, should be implemented to ensure that the funds generated for the community trust from the Solar Facility are managed for benefit of the community as a whole and not individuals within the community.

Cumulative impacts:

» Promotion of social and economic development and improvement in the overall well-being of the community

Residual impacts:

» See cumulative impacts

Nature of impact: Promotion of clean, renewable energy

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 establishment of a clean, renewable energy facility will therefore reduce, albeit minimally, South Africa's reliance on coal-generated energy and the generation of carbon emissions into the atmosphere.

The overall contribution to South Africa's total energy requirements of the proposed solar facility is relatively moderate. However, the 75 MW produced will help to offset the total carbon emissions associated with energy generation in South Africa. Given South Africa's reliance on Eskom as a power utility, the benefits associated with an IPP based on renewable energy are regarded as an important contribution.

	Without mitigation	**With mitigation**
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 or negative)	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impacts be mitigated or enhanced?	Yes	

Mitigation:

The establishment of the proposed facility represents an enhancement measure in itself. In order to maximise the benefits of the proposed project the proponent should:

» Use the project to promote and increase the contribution of renewable energy to the national energy supply;
» 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:

» Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.

Residual impacts:

» See cumulative impacts

Nature of impact: Potential impacts on family structures, social networks and community services associated with the influx of job seekers

While the proposed Solar Facility on its own is unlikely to result in a significant influx of job seekers during the operational phase. These issues are similar to the concerns associated with the influx of jobs seekers during the construction phase and include:

» Impacts on existing social networks and community structures;
» Competition for housing, specifically low cost housing;
» Pressure on local services, such as schools, clinics etc.;
» Competition for scarce jobs;
» Increase in incidences of crime;
» Increase in transmission of STD's etc.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Permanent (5) (For job seekers that stay on the town)	Permanent (5) (For job seekers that stay on the town)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc. (10)	Minor for community as a whole (2) High-Very High for specific individuals who may be affected by STD's etc. (10)
Probability	Probable (3)	Probable (3)
Significance	**Medium** for the community as a whole (33)	**Low** for the community as a whole (27)

	Medium -High for specific individuals who may be affected by STD's etc. (51)	Medium-High for specific individuals who may be affected by STD's etc. (51)
Status (positive or negative)	Negative	Negative
Reversibility	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 impacts be mitigated or enhanced?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

It is impossible to stop people from coming to the area in search of work, specifically given that the PKSDM and ELM have identified renewable energy as key growth sector. However, as indicated above, the proponent should ensure that the employment criteria favour local residents in the area. In addition the proponent should:

» In consultation with the ELM, should investigate the option of establishing a MF (see above) to monitor and identify potential problems that may arise due to the influx of job seekers to the area. Implement a policy that no employment will be available at the gate. This should be linked to the establishment of employment offices in Hanover and other local towns in the ELM.

Cumulative impacts:

» Impacts on family and community relations that may, in some cases, persist for a long period. 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:

» See cumulative impacts

Nature of impact: Potential impact on local farmers associated with loss of farm labour to the operational phase

Experience from other projects indicates that the loss of farm workers is an issue of concern. In most instances local farmers are unlikely to be in a position to compete with the salaries offered by the renewable energy companies. As a result farm labourers may be tempted to resign from their current positions on farms. The loss of skilled and experienced farm labor would have a negative impact on local farmers. The potential impacts for the affected farmers associated with the loss of permanent farm labour are exacerbated by the security of tenure that permanent farm labourers enjoy in terms of the Extension of Security and Tenure Act (ESTA). Those farm labourers which are eligible under ESTA and who take up jobs during the construction phase are entitled stay on in their houses on the farms in question. The net effect is that the farmer may have to incur the costs associated with the construction of new dwellings for new labour appointed to replace the labour lost to the renewable energy sector.

While the proposed Solar Facility on its own is unlikely to result in a significant loss of farm labour, the proposed establishment of a number of renewable energy projects in the area has the potential to impact on the farming sector. However, at the end of the day farm labor can be replaced. The potential impacts on farm operations are therefore likely to be temporary.

However, at the same time the employment opportunities associated with the renewable energy sector may offer local farm workers with an opportunity to get better paid jobs which would benefit them and their families. These jobs may also enable them to move of the farms and into Hanover and other local towns, which would improve their access to services such as schools and clinics etc. This would represent a positive social benefit for the farm workers in question.

	Without mitigation	**With mitigation**
Extent	Local and Regional (3)	Local and Regional (2)
Duration	Short term (2) (Assumed that farm labour can be replaced)	Short term (2) (Assumed that farm labour can be replaced)
Magnitude	**Low (4)**	**Low (4)**
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (24)
Status (positive or negative)	Negative	Negative
Reversibility	Yes, if farm workers return or are replaced	
Irreplaceable loss of resources?	No	
Can impacts be mitigated or enhanced?	Yes, to some degree. However, the risk cannot be eliminated	

Mitigation:

While the proponent could liaise with local farmers in the area and undertake not to employ farm worker were possible, it is not possible to prevent farm workers from applying for work in other sectors. There are therefore no recommended mitigation measures. Also it is assumed that farm labour can be replaced. The impacts would therefore be temporary.

Cumulative impacts:

» Impacts on farm operations due to loss of experienced farm labour

Residual impacts:

» See cumulative impacts

Nature of impact: Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place.

The components associated with the proposed Solar Facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. However, unlike wind energy facilities, the impact associated with Solar Facilities is lower due to the significantly lower height of the solar panels and infrastructure.

Based on the findings of the SIA the potential impact of the proposed solar facilities on the areas sense of place is likely to be limited. The areas sense of place has also been impacted by the Dwaal rail line and the existing 132 kV line (Linde-Carolus) that traverses the site. In addition the site is located within the proposed solar facility development corridor De Aar – Noupoort identified by the PKSDM.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (36)	Low (27)
Status (positive or negative)	Negative	Negative
Reversibility	Yes, solar facility can be removed.	
Irreplaceable loss of resources?	No	
Can impacts be mitigated or enhanced?	Yes	

Mitigation:
The recommendations contained in the VIA should be implemented.

Cumulative impacts:

» Potential impact on current rural sense of place

Residual impacts:

» See cumulative impacts

Nature of impact: Potential impact of the solar facility on local tourism

The Northern Cape PGDS notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile ecosystems and vulnerability to climatic variation. The document also indicates that due to the provinces exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa. Therefore caution must be taken to ensure that the development of renewable energy projects, such as the proposed SEF, do not impact negatively on the tourism potential of the Province.

In terms of the site, the findings of the SIA indicate that there are limited tourism facilities in the area. The closest appears to be New Holme, which is located ~20 km, to the west of the site. The Klipgat area not identified as tourism growth area, the focus is further to the north – along the Orange River. The potential impact on tourism in the area is therefore likely to be low.

The findings of the SIA also indicate that the establishment of the proposed solar facility may also attract tourists to the area. However, the significance of this potential benefit is also rated as Low positive.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (3)
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 (27) (Applies to both – and +)
Status (positive or negative)	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 impacts be mitigated or enhanced?	Yes	
Mitigation: In terms of efforts to enhance the proposed benefits to tourism: » The proponent should liaise with representatives from the ELM and local tourism representatives to raise awareness of the proposed facility; »		
Cumulative impacts: » Potential negative and or positive impact on tourism in the ELM.		
Residual impacts: » See cumulative impacts		

c) Comparative Assessment of Location Alternatives for Office

From a social perspective, the impacts associated with either alternative are considered acceptable, and both locations are considered to be acceptable.

Implications for Project Implementation

» The anticipated visual impacts identified are expected to be of low significance following the implementation of mitigation measures as recommended.
» A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass.

6.3. Summary of Impacts

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

Nature	Positive (+) ,Negative (-)or neutral Impact	Positive (+) ,Negative (-)or neutral Impact
	Without mitigation	**With mitigation**
Impacts on Ecology		
Construction of PV panels		
Impact of the construction phase on the natural vegetation	Medium (-)	Medium (-)
Impact of the construction phase on the spread of declared weeds and alien invasive plant species	Medium (-)	Low (-)
Impact of the construction phase on the fauna	Medium (-)	Medium (-)
Impact of the construction phase on the drainage system	Medium (-)	Low (-)
Operation of PV panels		
Impact of the operational phases on the natural vegetation	Medium (-)	Medium (-)
Impact of the operational phases on the spread of declared weeds and alien invasive plant species	Medium (-)	Low (-)
Impact of the operational phases on the fauna	Medium (-)	Low (-)
Impact of the operational phases on the drainage system	Medium (-)	Low (-)
Proposed substation, power line and access road during construction and operational		
Impact of the operational phase on the natural vegetation	Medium (-)	Medium (-)
Impact of the construction and operational phases on the spread of declared weeds and alien invasive plant species	Medium (-)	Low (-)
Impact of the construction and operational phases on the fauna	Medium (-)	Low (-)
Impact of the construction and operational phases on the drainage system	Medium (-)	Low (-)
Impacts on Geology and Soils and Agricultural Potential		

Nature	Positive (+) ,Negative (-)or neutral Impact	Positive (+) ,Negative (-)or neutral Impact
	Without mitigation	With mitigation
Solar facility footprint		
Impact 1: Soil		
Soil erosion on construction sites during and after the construction phase due to decreased vegetation cover and increased water run-off.	High (-)	Low (-)
Siltation of watercourses and other natural resources downstream as a result of improper storm water management and soil erosion due to increased and concentrated water run-off	High (-)	Low (-)
Dust production and dust pollution of grazing plants	Low (-)	Low (-)
Impact 2: Vegetation and grazing capacity		
Denudation of the soil due to construction activities and loss of carrying capacity	Medium(-)	Low (-)
Impact 4: Livestock production systems		
Interference with the day-to-day livestock and grazing management due to construction and other activities on the site	Medium (-)	Low (-)
Construction, positioning, maintenance and upgrading of access roads		
Impact 1: Soil		
Soil erosion due to roads	High(-)	Low (-)
Impact 2: Vegetation and grazing capacity		
Soil erosion due to roads	Medium (-)	Low (-)
Impact 4: Livestock production systems		
Interference with the day-to-day livestock and grazing management due to construction and other activities on the site	Medium (-)	Low (-)
Use of potential sources of contaminants on the site		
Impact 1: Soil		
Contamination and degradation of the soil due to spillages of oil, petrol, diesel and other contaminants used by vehicles and equipment on the	Medium (-)	Low (-)

Nature	Positive (+) ,Negative (-)or neutral Impact Without mitigation	Positive (+) ,Negative (-)or neutral Impact With mitigation
site or stored on the site		
Impact 2: Vegetation and grazing capacity		
Contamination and degradation of the soil & vegetation due to spillages of oil, petrol, diesel and other contaminants used by vehicles and equipment on the site or stored on the site	Medium (-)	Medium (-)
Impact 3: Ground water		
Contamination and degradation of the soil due to spillages of oil, petrol, diesel and other contaminants used by vehicles and equipment on the site or stored on the site	Low (-)	Low (-)
Construction and positioning of a new on-site substation		
Impact 1 Soil		
Soil erosion in the area surrounding the substation	Medium (-)	Low (-)
Impact 4: Livestock production systems		
Interference with the day-to-day management of the livestock and veld due to construction and other activities on the site	Medium (+)	Low (-)
Construction and positioning of an on-site workshop area		
Impact 1 Soil		
Soil erosion in the area surrounding the workshop area	Medium (-)	Low (-)
Impact 4: Livestock production systems		
Interference with the day-to-day management of the livestock and veld due to construction and other activities on the site	Medium (-)	Low (-)
Impacts on Heritage and Palaeontology sites		
Heritage	Low (-)	Low (+)
Palaeontology	Medium (-)	Low (+)
Visual Impacts		
Potential visual impact on the sensitive receptors in the background.	Medium (neutral)	Low (neutral)

Nature	Positive (+) ,Negative (-)or neutral Impact Without mitigation	Positive (+) ,Negative (-)or neutral Impact With mitigation
Potential visual impact on the intrinsic value and sense of place of the Noupoort region.	Medium (-)	Medium (-)
Potential visual impact of artificial lighting as a result of the activity.	Medium (-)	Low (+)
Potential visual impact of reflection of the PV Panels on the sensitive receptors	Low (neutral	Low (neutral)
Potential visual impact of desertification of the landscape.	Medium (-)	Low (+)
Potential visual impact of reflection of the PV Panels on the sensitive receptors	Low (neutral	Low (neutral)
Assessment of Potential Social Impacts		
Social Impacts during construction phase		
Potential impacts on family structures and social networks associated with the presence of construction workers.	Community : Low (-) Individual: High (-)	Community : Low (-) Individual: Medium - High (-)
Potential impacts on family structures and social networks associated with the presence of construction workers	Community : Low (-) Individual: Medium - High (-)	Community : Low (-) Individual: Medium - High (-)
Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site	Medium (-)	Low (-)
Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site	Low (-)	Low (-)
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires	Medium (-)	Low (-)
Potential noise, dust and safety impacts associated with movement of construction related traffic to and	Low (-)	Low (-)

Nature	Positive (+) ,Negative (-)or neutral Impact Without mitigation	Positive (+) ,Negative (-)or neutral Impact With mitigation
from the site		
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 PV facility and power lines will damage farmlands and result in a loss of farmlands for future farming activities.	Medium (-)	Low (-)
Impacts during the Operational Phase		
Creation of employment and business opportunities associated with the operational phase.	Medium (+)	Medium (+)
Establishment of a Community Trust funded by revenue generated from the sale of energy. The revenue can be used to fund local community development	Low (-)	Low (-)
Promotion of clean, renewable energy	Medium (+)	Medium (+)
Potential impacts on family structures, social networks and community services associated with the influx of job seekers	Community : Medium (-) Individual: Medium – High (-)	Community : Medium (-) Individual: Medium – High (-)
Potential impact on local farmers associated with loss of farm labour to the operational phase	Low (-)	Low (-)
Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place.	Medium (-)	Low (-)
Potential impact of the Solar Facility on local tourism	Low (-& +)	Low (-& +)

As can be seen from this table, there are no impacts of high significance expected to be associated with the construction and operation of the proposed facility, provided that the recommended mitigation measures are implemented. All identified impacts can therefore be mitigated to acceptable levels.

6.4. Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area[8].

Based on information available at the time of undertaking the EIA, the impact of solar facilities on the landscape is therefore likely to be a key issue in South Africa, specifically given South African's strong attachment to the land and the growing number of solar plant applications.

The Northern Cape is earmarked as a potential solar energy hub for South Africa, considering the vast amounts land available, cumulative impacts will be of acceptable levels within the Pixley Ka Seme District Municipality. There are more than 20 proposed solar energy facilities proposed in the Pixley ka Seme District Municipality, the majority of which are located around De Aar, Prieska and Hanover west of the N1. Klip gat solar energy is located ~ 8 km from the other proposed solar energy facilities in Noupoort. The projects that are near the proposed facility are Allemansfontien Solar Energy Facility, Carolus Poort Solar Energy Facility, and Wonderheulwel Solar Energy Facility (See Figure 6.5 below). There are no solar facilities that are next to the site.

The table below represent the proposed solar energy facilities in the Pixley ke Seme District Municipality. Refer Figure 6.5 for a geographical representation of the proposed solar energy facilities in relation to the proposed Klip Gat Solar Energy Facility.

Table 6.1: Proposed projects between Noupoort and Prieska

Project	Project Developer	Location	Status of the Project	DEA Reference No.
1.Naauw Poort Solar Energy Facility Near Noupoort	Naauw Poort Solar Energy (Pty) Ltd	Remaining Extent of the Farm 1/1	EIA phase	14/12/16/3/3/2/355
2.Proposed Inkululeko Solar Energy Facility Near Noupoort	Inkululeko Solar Energy (Pty)	Portion 2 of Farm 167 Carolus Poort .	EA issued	14/12/16/3/3/1/553.

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

Project	Project Developer	Location	Status of the Project	DEA Reference No.
3.Proposed Tollie Solar Energy Facility Near Noupoort	Tollie Solar Energy (Pty) Ltd	Portion 1 of Farm Naauw Poort 1.	EA issued	14/12/16/3/3/1/528.
4.Proposed Establishment of Dida Solar Energy Facility, Near Noupoort	Dida Solar Energy (Pty) Ltd	Portion 3 of Farm Rietfontein 140	dEA issued	14/12/16/3/3/1/529
5.Proposed Establishment of the Amandla Welanga Solar Energy Facility, Near Noupoort	Amandla Welanga Solar Energy (Pty) Ltd	Remaining extent of Farm Rietfontein 140	EA Issued	14/12/16/3/3/1/530
6.Five (5) Proposed Photovoltaic (Pv) Solar Energy Terra Solar (Pty) Ltd Facilities And One Proposed Substation, Near Noupoort	Terra Solar (Pty) Ltd	» Damfontein Solar Energy Facility- Portion 8 of Farm Damfontein 114 » Wonderheuwel Solar Energy Facility- Portion 7 of Farm Damfontein 114 » Proposed TSE Distribution Substation- Portion 8 of Farm Damfontein 114 » Allemans Solar Energy Facility- Remainder (RE) of Farm Allemans	Draft Basic Assessment Reports	» 14/12/16/3/3/728 » (Damfontein Solar Energy Facility) » 14/12/16/3/3/1/731 (Wonderheuwel Solar Energy Facility) » 14/12/16/3/3/1/732 (Proposed TSE Distribution Substation) » 14/12/16/3/3/1/730 » (Allemans Solar Energy Facility) » 14/12/16/3/3/1/729 » (Carolus Poort Solar Energy Facility) » 14/12/16/3/3/1/735 » (Gilmer Solar Energy Facility)

Project	Project Developer	Location	Status of the Project	DEA Reference No.
		Fontein 83 » Carolus Poort Solar Energy Facility- Remainder (RE) of Farm 207 » Gilmer Solar Energy Facility- Remainder (RE) of ERF 306		
7.Proposed development of the Toitdale Solar Energy Facility on a site near Noupoort	Toitdale Solar Energy	Portion 1 of the Farm Caroluspoort 167	EA Issued	12/12/20/2653
8.Proposed development of the Kleinfontien Solar Energy Facility on a site near Noupoort	Kleinfontien Solar Energy Facility (Pty) Ltd	Portion 4 of the Farm Caroluspoort 167	EA Issued	12/12/20/2654
9.Proposed Photovoltaic Power Generation Facility near Prieska	Mulilo Power (Pty) Ltd	Farm 104/1 near the Town of Prieska	EA issued Preferred Bidder	12/12/20/1722
10.Proposed establishment of a wind farm facility in Prieska, Siyathemba Local Municipality, Northern cape	South African Mainstream Renewable Power Development	Remainder of the Farm plat Sjambok No. 102; Portion 1 & 3 of the farm Kaffirs Kolk No. 118, near Prieska	EIA complete	12/12/20/2320/1
11.Proposed	South	Remainder of the	EIA in	12/12/20/2320/2

Project	Project Developer	Location	Status of the Project	DEA Reference No.
establishment of a PV Solar facility in Prieska, Siyathemba Local Municipality, Northern cape	African Mainstream Renewable Power Development	Farm plat Sjambok No. 102; Portion 1 & 3 of the farm Kaffirs Kolk No. 118, near Prieska	process	
12.Proposed Photovoltaic Energy Plant On Farm Klipgats Pan Near Copperton, Northern Cape	Mulilo Power (Pty) Ltd	Farm Klipgats Pan Near Copperton	EIA in process	12/12/20/2501
13.Proposed Wind Energy Facility Near Copperton, Northern Cape	Plan 8	Portions 4 and 7 of Farm Nelspoortje ("Struisbult") ~50 km southwest of Prieska	Unknown	12/12/20/2099
14.Proposed Garob Wind Energy Facility Project, Northern Cape Province	Juwi	Portion 5 of Farm Nelspoortje 103 east of Copperton	EIA in process	14/12/16/3/3/2/279

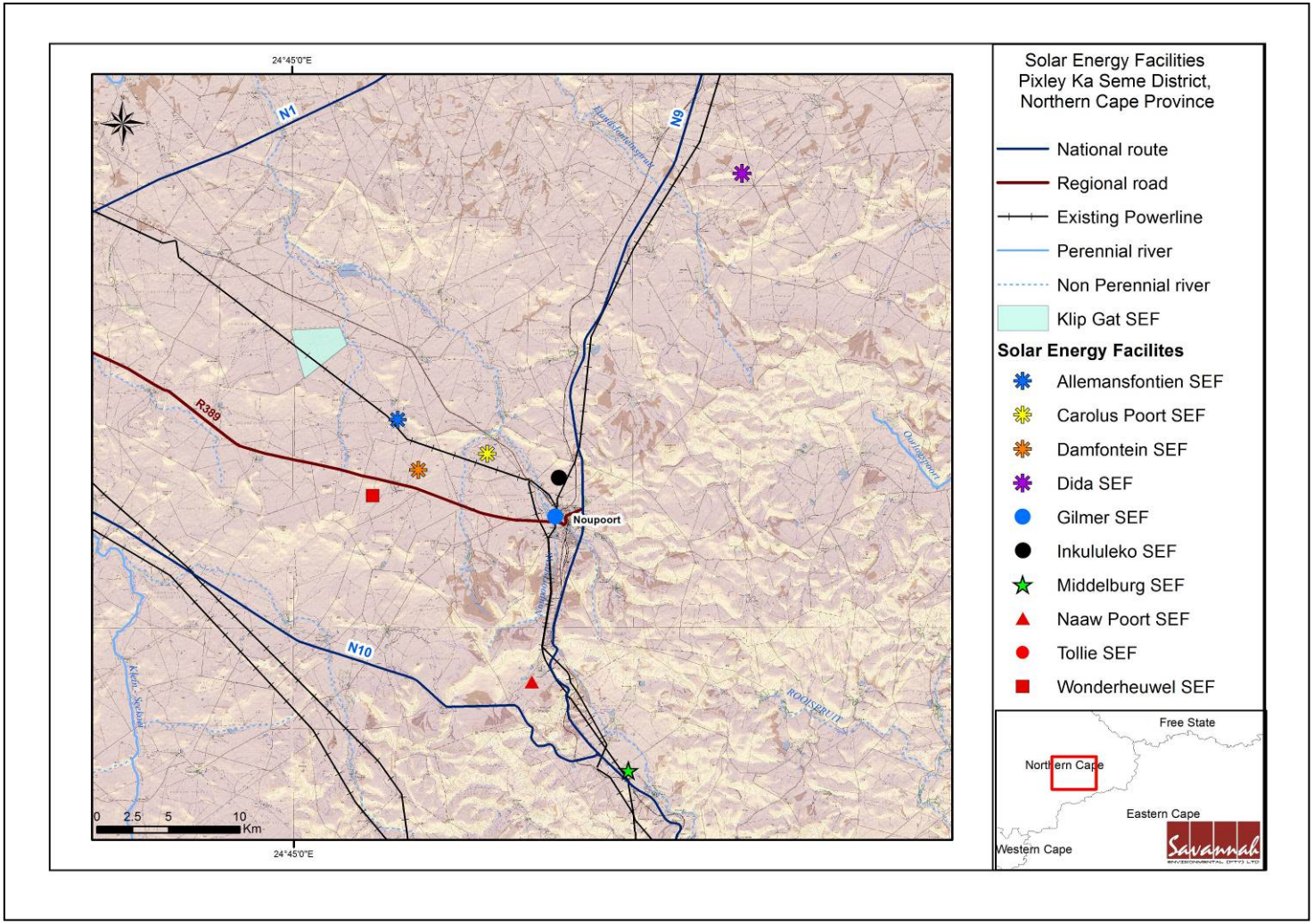

Figure 6.5: Locality map showing the Solar Energy Facilities proposed within the surrounding areas in Pixley ke Seme District Municipality

An assessment of the cumulative of environmental and social impacts are discussed below:

» Social:

Cumulative social impacts would be of medium (positive) significance as there would be creation of employment and business opportunities and would include the benefits associated with the establishment of a Community Trust. There would also be an increase in job opportunities and skills development due to these projects.

The negative cumulative impacts would be an influx of job seekers to the area but localised for each site, and if managed well it can be of low negative impact. The overall cumulative impacts are acceptable.

In terms of land use, the dominate land use in the district municipality will not be compromised due to the vast amounts of land available in the Northern Cape. The Northern Cape is earmarked as a potential solar energy hub for South Africa, considering the vast amounts land available.

» Visual:

The Klip Gat site is in a remote area within the Emthanjeni Local Municipality. Considering the low pop density in the District Municipality the visual impacts of multiple facilities will be low.

» Ecology:

Negative cumulative ecological impacts include habitat loss and disturbance, and soil erosion. Individual projects will require proper management of environmental impacts during construction and operation. Cumulative ecological impacts will be of medium significance.

6.5. Assessment of the Do Nothing Alternative

The 'do-nothing' alternative is the option of not constructing the proposed Klip Gat Solar Energy Facility. 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. .

From a local perspective, the identified site, is used extensively for livestock and – game farming. However, 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.

Nature of impact: The no-development option would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. The No-Development option would also result in the loss of the benefits to the local community and economy associated with the creation of employment opportunities and the establishment of a Community Trust.

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 producer of carbon emissions in the world, this would represent a negative social cost. However, the overall contribution of the proposed Klip Gat Solar Energy Facility to South Africa's total energy requirements will be small (75MW). In addition, the current application is not unique. The potential contribution of the proposed Klip Gat Solar Energy Facility should therefore be regarded as valuable, but should not be over-estimated.

The No-Development option would also result in the loss of the benefits to the local community and economy associated with the creation of employment opportunities and the establishment of a Community Trust. This would represent a negative social impact. Also, as indicated above, the No-Development option would exacerbate the current energy supply challenges facing the area.

	Without mitigation	**With mitigation**
Extent	Local-International (4)	Local-International (4)
Duration	Long term (4)	Long term (4)

Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (54)**	**Medium (54)**
Status (positive or negative)	Negative	**Positive**
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impacts be mitigated?	Yes	
Mitigation: » The proposed facility should be developed and the mitigation and enhancement measures identified in the SIA and other specialist studies should be implemented. However, the impact of large solar facilities on the sense of place and landscape are issues need to be addressed in the location, design and layout of the proposed plant.		
Cumulative impacts: » Cumulative visual impact on the regional area should other PV facilities also be constructed.		
Residual impacts: » Distinct change in character and quality of the area		

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 Northern Cape power supply will be deprived of an opportunity to benefit from the additional generated power being evacuated directly into the Province's grids. The 'do nothing alternative is, therefore, not a preferred alternative.

CONCLUSIONS AND RECOMMENDATIONS CHAPTER 7

The Klip Gat Solar Energy Facility is proposed to be developed as a commercial solar energy facility to be located on Portion 2 of Farm Klip Gat 80, which falls within the Emthanjeni Local Municipality of the Northern Cape Province (refer to Figure 7.1) 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 17,8GW 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. This is however dependent on the assumed learning rates and associated cost reductions for renewable options.

As such Klip gat Solar Energy Facility (Pty) Ltd, as an IPP, is investigating the establishment of a 75 MW photovoltaic solar energy facility and associated infrastructure for the purpose of commercial electricity generation. The proposed facility will require approximately <325ha and will be comprised of the following primary elements (refer to Chapter 2 for more details):

» An array of photovoltaic (PV) panels either static or tracking and up to 4m in height.
» Mounting structure to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
» Cabling (1-2 m deep) between the project components, to be lain underground where practical.
» Invertors (transformers) between the arrays.
» A new on-site substation (200m x 200m in extent) to evacuate the power from the facility into the Eskom grid via the Linde Carolus 132 kV power line which traverses the site.
» The substation is proposed to be connected to a loop-in loop-out power line to the existing Linde Carolus 132 kV power line. The power line will be up to 500m in length with a servitude of ~36m.

» Internal access roads (up to 5m wide) and fencing (up to 3m in height).
» Offices (200m X 200m) area for maintenance, storage, and offices (two locational alternatives are considered and assessed).
» During construction (temporary infrastructure) such as a laydown area will also be required. The temporary construction laydown area will occupy an area of ~157 ha.

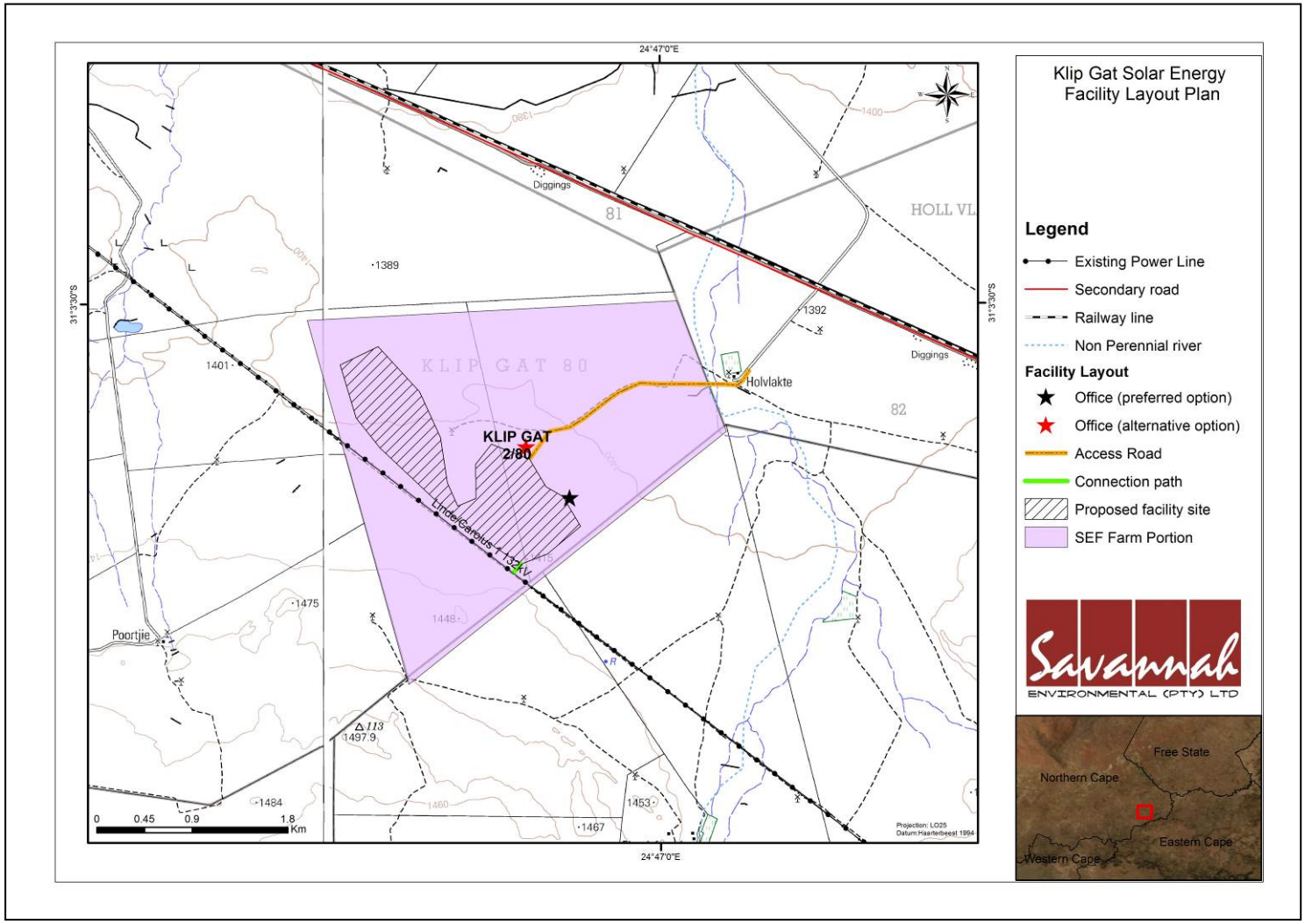

Figure 7.1: Locality map illustrating the location of the development site for the proposed Klip Gat Solar Energy Facility and preliminary layout of the proposed facility

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 feasibility phase 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), Klip Gat Solar Energy Facility (Pty) Ltd requires authorisation from the National Department of Environmental Affairs (DEA) (in consultation with the Northern Cape – Department of Environment and Nature Conservation (DENC) for the establishment of the proposed 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 involved thus far in the EIA Process.

» *Notification Phase* - organs of state, stakeholders, and interested and affected parties (I&APs) were notified of the proposed project using adverts, site notices, background information documents, and stakeholder letters. Details of registered parties have been included within an I&AP database for the project.
» *Scoping Phase* – potential issues associated with the proposed project and environmental sensitivities (i.e. over the broader project development site), as well as the extent of studies required within the EIA Phase were identified.
» *EIA Phase* – potentially significant biophysical and social impacts[9] and identified feasible alternatives put forward as parts of the project have been comprehensively assessed through specialist investigations. Appropriate mitigation measures have been recommended as part of a draft Environmental Management Programme (EMP) (refer to Appendix J).

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 are provided in this Chapter.

7.1. Evaluation of Klip Gat Energy Facility

The preceding chapters of this report together with the specialist studies contained within Appendices E -J provide a detailed assessment of the potential impacts that may result from the proposed project. This chapter concludes the EIA Report for Klip Gat Solar Energy Facility by providing a summary of the conclusions of the

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

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.

The assessment of potential impacts undertaken within this EIA, concluded that there were no impacts fatal flaws identified with the proposed development area. There are, however, areas within the site boundaries that should be avoided due to their sensitivity. Areas of sensitivity include the medium soil susceptibility to water erosion and potential heritage site (indicated as a yellow circle on the Figure 7.2 below). Areas of sensitivity outside the development area that should be avoided include the seasonal drainage lines and heritage sites. These areas should be avoided as far as possible, and where not possible to avoid, impacts on such sites should be minimised to reduce impacts to acceptable levels. In summary, the most significant environmental impacts associated with the Klip Gat Solar Energy Facility, as identified through the EIA, include:

» Local site-specific biophysical (flora, fauna and soils) impacts as a result of physical disturbance/modification to the site with the establishment of the facility.
» Visual impacts.
» Heritage impacts.
» Impacts on the social environment.

7.1.1. Local Site-specific Impacts

The construction of the Klip Gat Solar Energy Facility will lead to permanent disturbance of an area of < 325ha (the development footprint is 37% of the farm portion) in extent. Permanently affected areas include the area for the PV panels and associated infrastructure, as well as the internal power line route. From the specialist investigations undertaken for the proposed solar energy facility development site, it was determined that the majority of the site is in a natural state, but degraded. Areas of sensitivity within the proposed development site were identified through the EIA process. These relate to the local ecology (soil) and heritage artefacts (refer to the sensitivity map – Figure 7.2).

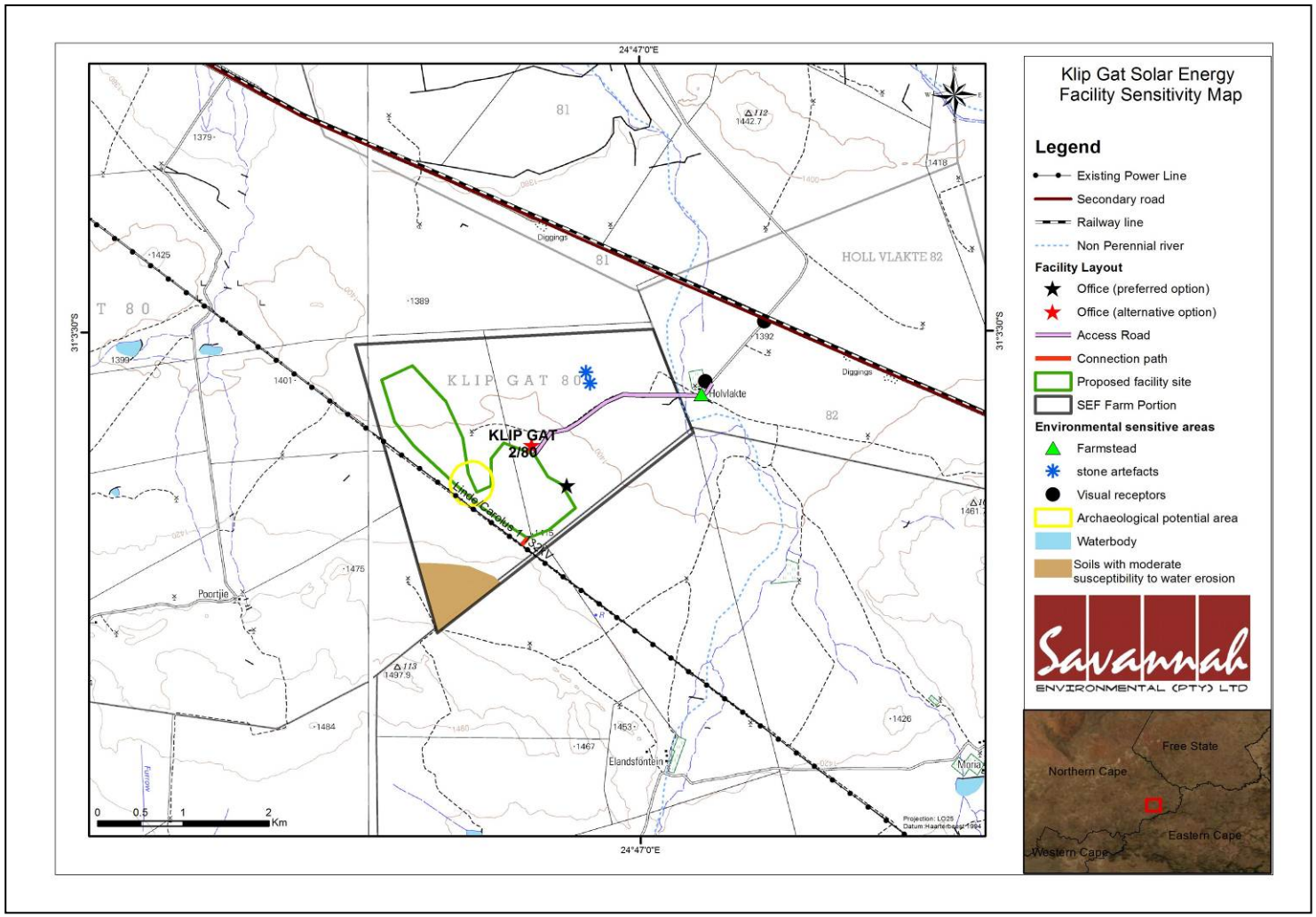

Figure 7.2: Environmental Sensitivity map for the Klip Gat Solar Energy Facility

In order to minimise potential impacts on these sensitive areas within the site during construction, no development should take place within these areas as far as possible. Where this is unavoidable, the relevant permits (threatened and/or protected plant (Northern Cape Nature Conservation Act) or for destruction of heritage sites) must be obtained prior to undertaking construction. The layout of the solar panels and associated infrastructure show that none of the infrastructure is proposed in highly sensitive areas and this is acceptable from an environmental perspective.

Each impact is summarised below.

7.1.2. Visual Impacts

All but one of the identified (Farm road - at the entrance to the farm Holvlakte) receptors is located in the *background*. In addition, no receptors are located in the *foreground* to the project site. The sensitive receptors in the *background* of the generated viewshed represent mostly private farmsteads and limited users of the farm access road, some 2.5km north of the project site.

In the case of cumulative visual impacts there approximately 20 Solar Energy Facilities proposed between Hanover and Noupoort. Klip Gat is the only solar energy facility one in Emthangeni Local Municipality east of the N1. The potential cumulative impacts associated with sequential visibility (e.g. the effect of seeing two or more wind farms (solar facilities) along a single journey, e.g. road or walking trail) is therefore likely to be medium. The Northern Cape is earmarked as a potential solar energy hub for South Africa, considering the vast amounts land available, cumulative impacts will be of acceptable levels within the Pixley Ka Seme District Municipality.

7.1.3. Heritage Impacts

The survey of the study area yielded 3 heritage resources sites – 2 located within the PDA (Klipgat-1 & Klipgat-2), the other a farmstead referred to as Klipgat farmstead is located just outside the proposed development area. These sites, however, fall outside the project development footprint. The identified sites are further categorised into 2 categories - 2 archaeological sites (i.e. Klipgat-1 & Klipgat-2) and a built environment and landscape site (i.e. Klipgat farmstead). The grading of the heritage sites are generally protected, therefore the impact will be low. The yellow area indicates the area that needs to be surveyed prior to construction (walk down by an archaeologist before the project construction phase).

7.1.4. Impacts on the Social Environment

Impacts on the social environment are expected during both the construction phase and the operational phases of the Klip Gat solar energy facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the solar energy facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region. Construction crew camps may be established on the site, and if required construction workers may also be housed in the nearest towns or other available/existing accommodation. Construction activities on the site will be largely restricted to daylight hours, and the construction phase is anticipated to extend for a minimum period of 8-months.

Negative impacts during construction relate mainly to impacts due to the presence of construction workers and visual impact imposed by the facility on the local environment. The findings of the SIA undertaken for the proposed project indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project. This will be a positive impact due to the high unemployment levels in the area. The positive impact due to employment creation will be lower during operation as there will be a limited number of staff required compared to the construction phase.

7.1.5 Comparative Assessment of Location Alternatives for Workshop/ Office

Two options for the location of the office have been provided by the developer. Chapter 6 contains the full comparative assessment of the office alternatives. In summary the assessment indicated that from an environmental (ecology, soil and heritage) and social (including visual) perspective, both the options are considered to be acceptable and there is no preference between the options. Therefore, it is supported that the technically preferred option to be implemented.

7.2. 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 generating capacity of 75 MW on a site located on Portion 2 of Farm Klip Gat 80, has been established Klip Gat Solar Energy Facility (Pty) Ltd. The positive implications of establishing a solar energy facility on the identified site within the Northern Cape include the following:

» The potential to harness and utilise solar energy resources within the Northern Cape.
» The consolidation of solar facility infrastructure within an area (specifically considering the proximity to the Pixley ka Seme District Municipality solar facilities to be developed).
» The project would assist the South African government in reaching their set targets for renewable energy.
» The project would assist the South African government in the implementation of its green growth strategy and job creation targets.
» The National electricity grid in the Northern Cape would 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 can be reduced by implementing the recommended mitigation measures. The project is therefore considered to meet the requirements of sustainable development. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMP) included within Appendix J.

With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

7.3. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the developmental impacts of the Klip Gat 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:

» Any component of the facility which could potentially affect sensitive areas should be avoided (i.e. best practice is impact avoidance). Where this is not possible, alternative mitigation measures as detailed in this report must be implemented and relevant permits must be obtained.
» Following the final design of the facility, a final layout must be submitted to DEA for review and approval prior to commencing with construction.
» An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMP for the duration of the construction period.
» An avifauna specialist to ground-truth the final layout of the site in order to ensure that there are no blue crane nests and/or chicks on site before construction commences and no eagle nests are present in the immediate vicinity of the proposed development site
» Power line construction should take fauna into account, especially birds, and important mitigation measures must include 'flappers' to make the power lines more visible to the birds. An avifauna specialist should ground-truth the construction areas before development commences in order to ensure no breeding pairs or chicks of conservation significant species are located in the areas and, if there are, how to mitigate the situation before construction begins. The use of bird diverters must be determined, prior to construction.
» During maintenance activities of the substation, used oils and old transformers must be disposed of correctly. Used transformers are classified as hazardous waste and should be disposed of at a hazardous landfill site.
» It is recommended that a palaeontologist should be appointed do a site visit to determine whether fossils are exposed in the area earmarked for development, prior to construction. This survey would of course be limited to a surface inspection only. In the event of fossils being uncovered during the construction phase, the ECO should photograph and record the position of fossiliferous material.

- The draft Environmental Management Programme (EMP) as contained within Appendix J of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMP should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
- All relevant practical and reasonable mitigation measures detailed within this report and the specialist reports contained within Appendices E to I must be implemented.
- Alien invasive plants should be controlled on site throughout the construction and operation of the facility.
- During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
- Disturbed areas should be rehabilitated as quickly as possible once construction is completed in an area.
- A comprehensive stormwater management plan should be compiled and implemented for the developmental footprint prior to construction.
- Applications for all other relevant and required permits required to be obtained by Klip Gat Solar Energy Facility (Pty) Ltd must be submitted to the relevant regulating authorities.

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