BIOTHERM ENERGY

Proposed Construction of the Tlisitseng 1 75MW Solar Photovoltaic (PV) Energy Facility near Lichtenburg, North West Province

Draft Scoping Report

DEA Reference:	**To be confirmed**
Issue Date:	29 September 2016
Version No.:	**1**
Project No.:	13303 - Tlisitseng

Date:	29 September 2016
Document Title:	Proposed Construction of the Tlisitseng 1 75MW Solar Photovoltaic (PV) Energy Facility near Lichtenburg, North West Province – Draft Scoping Report
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Version Number:	1
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For:	SiVEST Environmental Division

KEY PROJECT INFORMATION

FARM DESCRIPTION	21 DIGIT SURVEYOR GENERAL CODE
Portion 25 of the Farm Houthaalboomen No 31	T0IP00000000003100025

TLISITSENG PV APPLICATION SITE				
NORTH-WEST CORNER	**NORTH-EAST CORNER**	**CENTRE POINT**	**SOUTH-WEST CORNER**	**SOUTH-EAST CORNER**
S26° 3' 46.260"	S26° 3' 38.304"	S26° 4' 41.311"	S26° 5' 39.732"	S26° 5' 38.292"
E26° 5' 42.756"	E26° 7' 2.100"	E26° 7' 5.734"	E26° 6' 32.976"	E26° 8' 34.116"

DEVELOPMENT AREA			
PHASE	**AREA (HECTARES)**	**CENTRE POINT COORDINATES (DD MM SS.sss)**	
		SOUTH	**EAST**
TLISITSENG SOLAR 1 DEVELOPMENT AREA	246.191	S26° 5'1.243"	E26° 6' 41.674"

PV ARRAYS		
PHASE	**CENTRE POINT COORDINATES (DD MM SS.sss)**	
	SOUTH	**EAST**
TLISITSENG SOLAR 1 PV ARRAY AREA	S26°4' 54.430"	E26° 6' 44.117"

TLISITSENG SOLAR 1: DEVELOPMENT AREA		
CORNER POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
T1_01 (NW)	S26° 4' 40.898"	E24° 6' 7.471"
T1_02 (NE)	S26° 4' 25.711"	E24° 7' 4.567"
T1_03 (SE)	S26° 5' 31.103"	E24° 7' 4.077"
T1_04 (SW)	S26° 5' 39.493"	E24° 6' 33.107"

TLISITSENG SOLAR 1: COMPONENTS		
CENTRE POINT COORDINATES (DD MM SS.sss)		
COMPONENT	**ALTERNATIVE 1**	**ALTERNATIVE 2**
SUBSTATION (132kV)	S26° 5' 18.336"	S26° 5' 26.351"

	E26° 7' 2.190"	E26° 7' 1.886"
O&M BUILDINGS	S26° 5' 16.149"	S26° 5' 24.163"
	E26° 7' 3.457"	E26° 7' 3.153"
LAYDOWN AREA	S26° 5' 17.989"	S26° 5' 17.855"
	E26° 6' 55.286"	E26° 6' 33.355"

TITLE DEEDS: These are included within **the FSR**.

PHOTOGRAPHS OF SITE:

General Characteristics of the study area

TYPE OF TECHNOLOGY: Photovoltaic (PV)

STRUCTURE HEIGHT: The height of the PV panels is estimated to be approximately 4m although the final design details are yet to be confirmed. These details will become available during the detailed design phase of the project.

SURFACE AREA TO BE COVERED: The total area of the application site is approximately 1024 hectares (ha), with the proposed Tlisitseng 1 development area taking up approximately 246 ha. The proposed 132kV onsite Tlisitseng substation layout will require up to approximately 2.25 ha. The footprint of the Operations and Maintenance (O&M) buildings will be approximately 225m^2. The final design details are yet to be confirmed. These details will become available during the detailed design phase of the project.

PV DESIGN: The energy facility will comprise of either fixed tilted or horizontal single axis tracking structures. Either thin film or crystalline silicon modules will be used. The modules will be mounted in rows on support structures. An onsite switching substation will contain transformer (s) for voltage step up from medium voltage to high voltage. DC power from the panels will be converted into AC power in the inverters and the voltage will be stepped up to medium voltage in the inverter transformers. The medium voltage cables will be run underground in the facility, to a common point before being fed to the onsite substation.

STRUCTURE ORIENTATION: This will be confirmed during the detailed design phase of the project. For single axis tracking the structures will be mounted on a north-south horizontal axis and will track the sun from east to west. For fixed tilted structures the modules will be north facing, tilted at an angle between 15-30 degrees.

FOUNDATIONS: The foundations will be either concrete or rammed pile. The final foundation design will be determined at the detailed design phase of the project.

LAY-DOWN AREA DIMENSIONS: Up to approximately 5 ha is required for the temporary laydown area. Permanent laydown for the containers will be required for the storage of spares, which is to be located close to the O&M building. Approximately 6, 3x12m containers will be required.

GENERATION CAPACITY: The project will have a total generation capacity of 75MW.

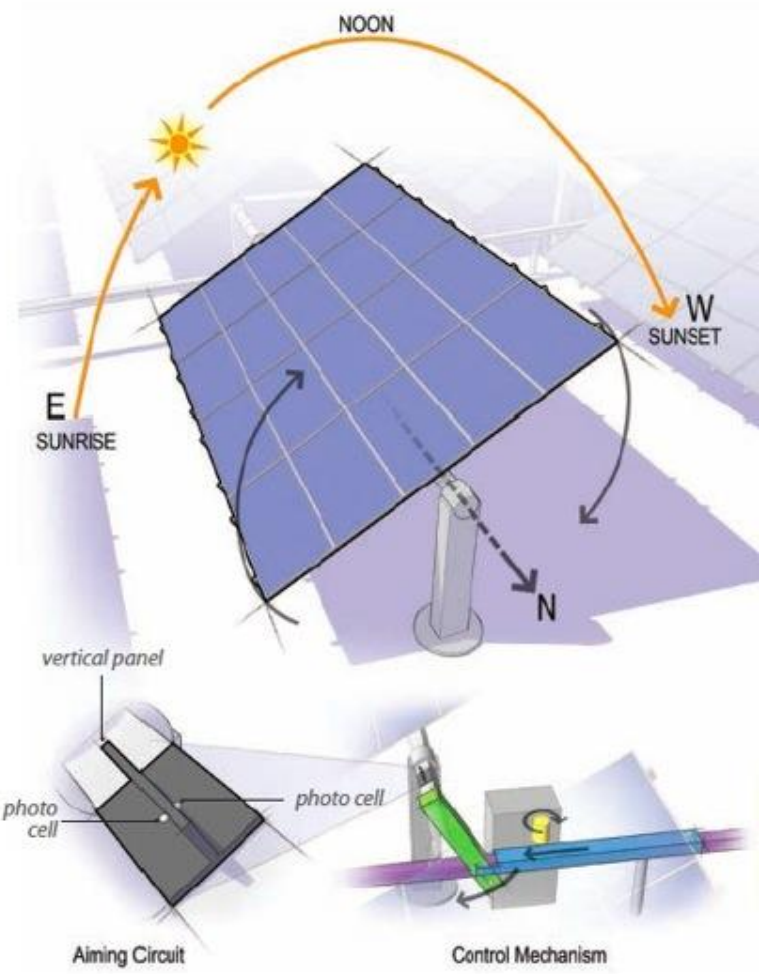

Figure i. Example of a Photovoltaic Panel with tracking capability (Source: http://solartoday.org/2009/07/single-axis-solar-tracking/).

TECHNICAL DETAILS:

Component	Description / Dimensions
Generation capacity	Maximum of 75MW
Capacity of the on-site substation	132kV
Number of Panels	Approx. 275 000
Area occupied by each panel	Approx. 2m^2 per panel
Dimensions of panels	1956mm x 992mm x 40mm
Max panel height from the ground	Approx. 4m
Area of the application site	Approx. 1024 hectares
Footprint of Substation	Substation will require a footprint area of up to approx. 2.25 ha
Footprint of O&M building(s)	Approx. 225 m^2

Area of construction laydown area	Up to approx. 5 ha
Area of permanent laydown area	Permanent laydown for the containers will be required for the storage of spares, which is to be located close to the O&M building. Approximately 6, 3x12m containers will be required.
Width of internal roads	Up to 8m wide.
Length of internal roads	To be confirmed once the EPC contractor has been selected and the design is finalised.
Number of inverters required	To be confirmed once the EPC contractor has been selected and the design is finalised.
Area occupied by inverter / transformer stations / substations	To be confirmed once the EPC contractor has been selected and the design is finalised.
Proximity to grid connection	Grid connection is to the existing Eskom Watershed substation. A **power line** with a voltage of 132kV is proposed and will run from the onsite substation to the Eskom Watershed substation. The power line is not part of this EIA, and are being applied for as part of a separate ongoing Basic Assessment (BA) process.
Width of the power line servitude	A 31m wide servitude will be required, however, the power line is not part of this EIA, and are being applied for as part of a separate ongoing BA process.
Power line tower types and height	Power line is likely to be standard self-supporting suspension monopole structures where the line is relatively straight. However the power line is not part of this EIA, and are being applied for as part of a separate ongoing BA process.
Diagrams of tower types	The power line is not part of this EIA, and are being applied for as part of a separate ongoing BA process.
Approximate distance between towers	200m to 250m apart
Height of fencing	Approx. 2m high.
Type of fencing	Galvanized steel.

A3 Maps of all smaller maps included in the report are included in **Appendix 5**.

BIOTHERM ENERGY

PROPOSED CONSTRUCTION OF THE TLISITSENG 1 SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY NEAR LICHTENBURG, NORTH WEST PROVINCE

DRAFT SCOPING REPORT

Executive Summary

BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) intends to develop the Tlisitseng 1 solar photovoltaic (PV) energy facility and associated infrastructure near Lichtenburg in the North West Province of South Africa. SiVEST Environmental Division has subsequently been appointed as independent consultants to undertake the Environmental Impact Assessment (EIA) for the proposed energy facility and associated onsite substation. The overall objective of the project is to generate electricity to feed into the National Grid. The proposed project will therefore consist of a 75MW export capacity solar PV energy facility and associated infrastructure which includes an onsite substation with a voltage capacity of up to 132kV.

This proposed PV energy facility forms one (1) of two (2) PV energy facilities with a 75MW export capacity that BioTherm are proposing to develop on Portion 25 of the Farm Houthaalboomen No 31 (**Figure ii**). In addition, BioTherm are proposing to construct two (2) 132kV onsite substations namely Tlisitseng 1 and Tlisitseng 2 Substations, and two (2) 132kV power lines, which will feed the electricity generated by the proposed PV energy facility into the National grid. In order to accommodate the Department of Energy's (DoE) competitive bidding process for procuring renewable energy from Independent Power Producers in South Africa, each PV energy facility will be developed under a separate Special Purpose Vehicle (SPV) and therefore each requires a separate Environmental Authorisation (EA). Additionally, the two (2) 132kV power lines which will connect each of the proposed Tlisitseng onsite Substations to the existing Eskom Watershed Main Transmission Substation (MTS) will also require a separate EA. It must however be noted that the proposed 132kV power lines will require a Basic Assessment (BA) process and not an Environmental Impact Assessment (EIA). Although each PV energy facility and the electrical infrastructure will be assessed separately, a single public participation process is being undertaken to consider all four (4) proposed developments. The potential environmental impacts associated with all four (4) developments will be assessed as part of the cumulative impact assessment. The reference number allocated by the Department of Environmental Affairs (DEA) for the other proposed PV energy facility, Tlisitseng 2, will be provided in the Final Scoping Report (FSR) once allocated by the DEA. The reference numbers for the 132kV power line BAs, have not as yet been allocated by the DEA. They will be provided in the Final Environmental Impact Assessment Report (FEIAr).

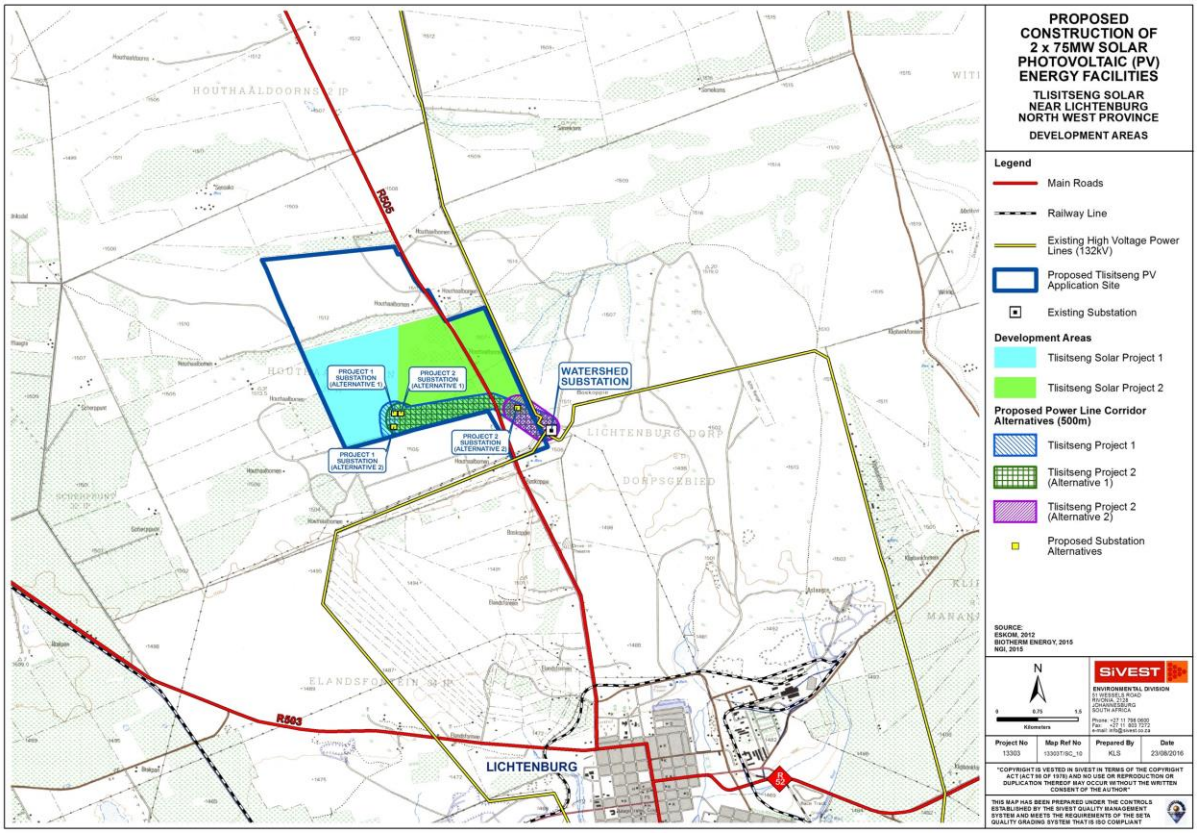

Figure ii: Site locality for the proposed PV energy facility and 132kV onsite substation

DEVELOPMENT AREA			
PHASE	**AREA (HECTARES)**	**CENTRE POINT COORDINATES (DD MM SS.sss)**	
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	SOUTH	**EAST**
TLISITSENG SOLAR 1 PV ARRAY AREA	S26°4' 54.430"	E26° 6' 44.117"

The total area of the assessed application site is approximately 1024 hectares, with the proposed Tlisitseng 1 development taking up approximately 246 hectares.

The proposed development requires Environmental Authorisation (EA) from the DEA. However, the provincial authority will also be consulted (i.e. the North West Department of Rural, Environment and Agricultural Development). The EIA for the proposed development will be conducted in terms of the EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on the 8th of December 2014. In terms of these regulations, a full EIA is required for the proposed project. All relevant legislations and guidelines (including Equator Principles) will be consulted during the EIA process and will be complied with at all times.

As previously mentioned, the proposed project involves the construction of one (1) 75MV solar PV energy facility and associated infrastructure. Layout alternatives have been investigated which relate to the location of the infrastructure on the site. These are illustrated below:

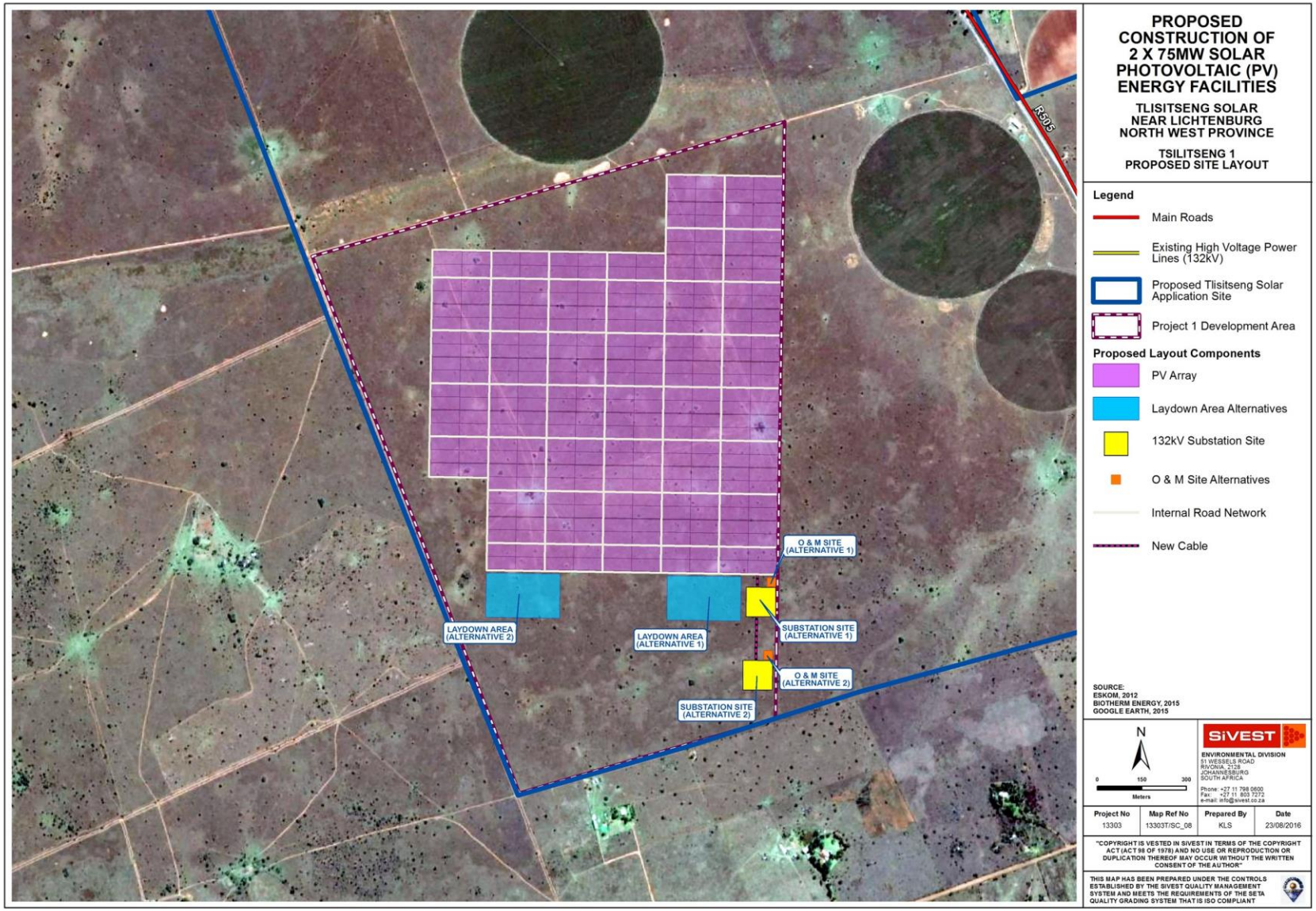

Figure iii: Tlisitseng 1 Layout Alternatives

It is important to note that this Draft Scoping Report (DSR) is the second version which will be submitted to the DEA and made available for public comment for the proposed Tlisitseng 1 Solar PV energy facility. On the 18th of January 2016 an application for EA and the DSR for the proposed Tlisitseng 1 Solar PV energy facility were received by the DEA and a reference number was allocated to the proposed development (**DEA reference number: 14/12/16/3/3/2/889**). This original DSR was made available for public review from the 11th of January 2016 to the 9th of February 2016. The DSR was thereafter updated and the Final Scoping Report (FSR) was submitted to the DEA on the 19th of February 2016. After evaluating the FSR the DEA issued a letter indicating that the documents complied with the minimum requirements of the EIA Regulations, 2014 and that SiVEST could proceed with the EIA process (i.e. Draft EIA Report and Final EIA Report). The original FSR was therefore accepted by the DEA. It should however be noted that due to a change in the layout of the proposed Tlisitseng 1 Solar PV energy facility, SiVEST was not able to submit the Final EIA Report within the legislated timeframes. . On the 20th of June 2016, SiVEST therefore sent the DEA a letter requesting a sixty (60) day extension in terms of Regulation 3 (7) of the EIA Regulations, 2014, in order to provide the specialists with the opportunity to update their specialist reports in-line with the revised layouts. On the 20th of July 2016, the DEA issued a letter refusing the extension request. For this reason the application for EA lapsed in accordance with Regulation 45 of the EIA Regulations, 2014 and the departmental file was closed for the project.

In order to reapply for EA for the proposed Tlisitseng 1 solar PV energy facility BioTherm has appointed SiVEST to recommence with the EIA process. It should however be noted that all comments received by Interested and Affected Parties (I&APs) during the Public Participation Process (PPP) which was undertaken for the original EIA process (including those received during meetings) will form part of this EIA process. The public participation process will be re-conducted in accordance with the EIA Regulations, 2014 and all I&APs, Stakeholders and Organs of State will be afforded an extra opportunity to review the DSR and to provide comments.

The following assessments were conducted during the Scoping phase in order to identify and assess the issues associated with the proposed development:

- Biodiversity Assessment;
- Avifauna Assessment;
- Surface Water Impact Assessment;
- Soils and Agricultural Potential Assessment;
- Visual Impact Assessment;
- Heritage and Palaeontological Assessment;
- Socio-economic Impact Assessment;
- Traffic Impact Assessment; and
- Geotechnical Impact Assessment.

These studies were also undertaken to inform the impact assessment to take place in the EIA phase of the project. In the scoping phase the specialists assessed the entire application site (Portion 25 of the Farm Houthaalboomen No 31) and therefore both proposed PV energy facilities were assessed in one (1)

specialist report. During the EIA phase, the specialist reports will be split into two (2) separate reports which assess site specific impacts of each proposed PV energy facility in detail.

Based on the scoping studies which were conducted, a few potentially sensitive sites have been identified within the study area. These have informed the preliminary assessment of layout alternatives which are included in **Chapter 7** and will be further assessed during the EIA phase. The table below summarises the specialist findings of the Scoping Report for the entire project.

Biodiversity	The biodiversity specialist report concludes that there are some issues related to the ecology of the site that could result in potentially significant ecological impacts. The seriousness of many of these impacts can be determined during the field investigation of the site. Some impacts require permits to be issued, either by National or Provincial authorities and field data is required for the permit applications.
Avifauna	The proposed project is located in the endemic region with the fourth highest number of endemics in southern Africa. With 20% of all southern African endemics or near endemics potentially occurring at the core study area and immediate surroundings, the application site and immediate surroundings as a whole should be regarded as moderately sensitive from an avifaunal perspective. Within the core study area, potential high sensitive areas are surface water (boreholes) and high voltage lines. Within the immediate surroundings, high voltage lines, a vulture restaurant, and wetlands and dams are potential high sensitive areas, as all of these micro-habitats are potential focal points of bird activity. The wetlands and dams may be an aggravating factor in that birds commuting to and from them could mistake the solar panels for surface water and attempt to land on them, thereby exposing themselves to the risk of collision. Boreholes could potentially be declassified as high sensitivity should it be confirmed that they will be removed and therefore cease to function as potential focal points for bird activity after the construction of the solar panels. In the case of the existing high voltage lines in the study area, the sensitivity and potential no-go areas will only become apparent once a field inspection has been conducted. Should no priority raptor nests be present, there will be no need for buffer zones. However, if there are nests present, an appropriate buffer zone will be required around the nest, depending on the species.
Surface Water	Database findings revealed that one (1) non-NFEPA, unnamed non-perennial river was located within the study area with five (5) segments of this river located within close proximity to the study area to the east. Additionally, the study area was found to span across a CBA 2 area. The study site was, however, not identified to span across any Ecological Support Areas (ESAs). The desktop findings supported the presence of the unnamed, non-perennial river observed in the database findings as well as the five (5) additional segments/reaches of this river. This surface water system was, however, observed to be larger in size, and one (1) of the stream segments identified during the database assessment was also found to continue/flow

	into the study site. The desktop assessment additionally revealed a second river which passes within very close proximity to the northern portion of the study site. It is not certain whether this is a separate river or whether it is part of one (1) of the desktop identified river segments. Three (3) river systems in total were therefore observed at a desktop level. Furthermore, the desktop findings revealed thirty seven (37) additional surface water resources, in the form of potential depression wetlands, located within the study area or within close proximity. It must be noted, however, that from a desktop perspective, some of these systems appeared to be connected as one greater system while others appeared to be separate, isolated systems.
Soils and Agricultural Potential	All of the study area comprises land type Fa11, which is dominated by shallow, calcareous soils with rock. However, there is a significant proportion of deeper, red, structureless soils in the area (probably around 20% of the land type), with depths of 1.2 m or more. These soils have a high potential for agriculture. The rainfall in the area is adequate for rain-fed cultivation, but due to the unreliability of the distribution, irrigation is a viable means of supplementing the rainfall in times of shortage, especially in the areas where deeper soils occur. The Google Earth image of the area shows several centre pivot irrigation fields in and adjacent to the northern half of the study area. The climatic characteristics mean that the grazing capacity of this part of North West Province is relatively low, around 10-12 ha/large stock unit. The predicted impact is therefore low to high, depending on the soils occurring, which vary from shallow soils with low potential, to deeper, high potential arable soils.
Visual	A scoping-level visual study has been conducted to identify the potential visual impact and issues related to the development of two (2) solar PV energy facilities near Lichtenburg in the North West Province. The study area has a rural visual character with a low to moderate visual sensitivity. However, several solar energy facilities are proposed within relatively close proximity to the proposed PV energy facility. These facilities and their associated infrastructure, will significantly alter the visual character and baseline in the study area if constructed and make it appear to have a more industrial-type visual character. The proposed PV energy facility development is likely to visually influence eighty-seven (87) receptors identified within the visual assessment zone, seventy-seven (77) of which are considered to be potentially sensitive visual receptor locations. The sensitivity of the receptor locations will need to be confirmed through further assessment in the next phase of the study. The nature of the visual impacts associated with a development of this size on the receptors in the assessment zone could be significant.
Heritage	The Heritage Scoping Report has shown that the proposed Tlisitseng Solar projects may have heritage resources present on the property. This has been confirmed through archival research and evaluation of aerial photography of the sites. Through the analysis of the aerial photographs and available maps of the study area no obvious heritage sensitive areas were identified inside the study area. The only possible sensitivities identified is related to farmsteads situated outside the study

	area but within close proximity to the proposed development area. These farmsteads' experience of the rural cultural landscape could possibly be impacted on by the development. A single small farmstead was also identified inside the study area and will require assessment during the fieldwork component of the Heritage Impact Assessment (HIA). The study area is underlain by Vaalian aged dolomite of the Monte Christo Formation, Chuniespoort Group. Stromatolites are known to occur within these deposits and more modern fossiliferous Caenozoic cave breccias have been recorded associated with carst formation in the dolomite.
Socio-economic	No fatal flaws or contraventions from a socio-economic policy perspective exist for the implementation of the proposed project. The national, provincial, and to some extent local, governments do prioritise the development of renewable energy projects to reduce carbon emissions, create new jobs, increase economic growth and achieve security of electricity supply. However, it is very clear that these developments need to be undertaken in a sustainable manner and should not jeopardise the growth of the other sectors that are considered to be economic drivers in the local area where the project is to be developed.
Traffic	The general freight for the solar farms comprise of building materials, solar panels and frames and an 80MVA transformer(s). The imported freight will be transported from South African ports to the site. Building materials will be transported from sources in surrounding towns while certain elements will be transported from various manufacturing centres in South Africa. The preferred import origin of the imported elements to the proposed Tlisitseng 1 Solar PV Energy Facilities will be from the Durban Port. The distance of 765 km comprises of surfaced roads the full way. However, should the Durban Port not be available for handling the freight, the Port Elizabeth/Coega Port could be used as an alternative port. The transport distance in this case is 1035 km. Toll fees are required on the route from the preferred port. Abnormal Permits will be required for transport of the transformer in any event. The traffic during construction and during operation will have negligible impact on existing and future traffic. The route is predominantly on National or Provincial Roads with suitable standards for transport of container freight. It is also suitable for abnormal loads with permits. There is a possibility of limited risk of delays for normal routine maintenance works (repairs and reseals) depending of the time of transport and scheduling of roads contracts. The transport of elements from manufacturing centres within South Africa is predominantly on National and Provincial roads, which presents no limitations for normal freight. The proposed preferred access roads from the R505 to the site is situated close to the site and requires minimal upgrades. The access is at an acceptable safe point with sufficient sight distance which would be acceptable to SANRAL. In general, no obvious problems are expected with freight transport along the proposed routes to the site necessary for the construction and maintenance of the site.

Geotechnical	Substation Alternative 1 and 2 are possibly underlain by shallow dense pedogenic material or chert residuum. These materials are likely to be suitable as founding medium for lightly to medium loaded structures. Due to fact that this entire site is underlain at depth by dolomite, it is a legal requirement that a Dolomite Stability Investigation (DSI) be undertaken in accordance with the South African National Standards SANS 1936-Parts 1 to 4 Development of Dolomitic Land. For the substation as indicated in the layout, this DSI will comprise a gravity survey and the drilling of a minimum of 3 boreholes for a feasibility level (Phase 1) investigation. It is also evident from the Topographical maps and Google Images that a water borehole is present near both Alternative 1 and 2 site. This borehole is probably used for irrigation purposes, dewatering has a significant effect on the underlying dolomite stability.

Based on the above mentioned studies, the Scoping Report has identified several aspects that warrant further investigation in the EIA Phase. These are as follows:

- Biodiversity Assessment;
- Avifauna Impact Assessment (including preconstruction monitoring);
- Surface Water Impact Assessment;
- Soils and Agricultural Potential Assessment;
- Visual Impact Assessment;
- Heritage Impact Assessment;
- Socio-economic Impact Assessment; and
- Palaeontological Impact Assessment.

The Traffic Impact Assessment and a Geotechnical Impact Assessment will also be included in the EIA reports.

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PROPOSED CONSTRUCTION OF THE TLISITSENG 1 SOLAR PHOTOVOLTAIC (PV) SOLAR ENERGY FACILITY NEAR LICHTENBURG, NORTH WEST PROVINCE

DRAFT SCOPING REPORT

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Glossary of Terms

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

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

Cultural Significance: This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

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

"Equator Principles": A financial industry benchmark for determining, assessing and managing social and environmental risk in project financing.

Environmental Impact Assessment: 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 the application.

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

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

Heritage Significance Grades:
a) Grade I: Heritage resources with qualities so exceptional that they are of special national significance;
(b) Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
(c) Grade III: Other heritage resources worthy of conservation.

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

Historical Period: Since the arrival of the white settlers - c. AD 1840 - in this part of the country

Iron Age: Period covering the last 1800 years, when new people brought a new way of life to southern Africa. They established settled villages, cultivated domestic crops such as sorghum, millet and beans, and they herded cattle as well as sheep and goats. These people, according to archaeological evidence, spoke early variations of the Bantu Language. Because they produced their own iron tools, archaeologists call this the Iron Age.
Early Iron Age AD 200 - AD 900
Middle Iron Age AD 900 - AD 1300
Late Iron Age AD 1300 - AD 1830

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

Precipitation: Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

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

Riparian: The area of land adjacent to a stream or river that is influenced by stream induced or related processes.

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

Stone Age: The first and longest part of human history is the Stone Age, which began with the appearance of early humans between 3-2 million years ago. Stone Age people were hunters, gatherers and scavengers who did not live in permanently settled communities. Their stone tools preserve well and are found in most places in South Africa and elsewhere.
Early Stone Age 2 000 000 - 150 000 Before Present
Middle Stone Age 150 000 - 30 000 BP
Late Stone Age 30 000 - until c. AD 200

List of Abbreviations

AP	- Action Plan
BID	- Background Information Document
CARA	- Conservation of Agricultural Resources Act
CISPR	- International Special Committee of Radio Interferences
CSP	- Concentrated Solar Power
DEA	- Department of Environmental Affairs
DSR	- Draft Scoping Report
DoE	- Department of Energy
DM	- District Municipality
DSI	- Dolomite Stability Investigation
DWS	- Department of Water and Sanitation
EAP	- Environmental Assessment Practitioner
EHS	- Environmental, Health, and Safety
EIA	- Environmental Impact Assessment
EIR	- Environmental Impact Report
EMPr	- Environmental Management Programme
ECA	- Environmental Conservation Act No 73 of 1989
EMI	- Electromagnetic Interference
EP	- Equator Principles
EPFI	- Equator Principles Financial Institutions
ERA	- The Electricity Regulation Act No. 4 of 2006
FGM	- Focus Group Meeting
FSR	- Final Scoping Report
GDP	- Gross Domestic Product
GIIP	- Good International Industry Practice
GIS	- Geographic Information System
GW	- Gigawatts
HIA	- Heritage Impact Assessment
I&AP(s)	- Interested and Affected Parties
IBA(s)	- Important Bird Area(s)
IDP	- Integrated Development Plan
IEP	- Integrated Energy Plan
IFC	- International Finance Corporation
IPP(s)	- Independent Power Producers
IRP	- Integrated Resource Plan
IUCN	- International Union for the Conservation of Nature and Natural Resources
KSW	- Key Stakeholder Workshop
kV	- Kilo Volt
LM	- Local Municipality
MSA	- Middle Stone Age

MW	- Megawatt
NEA	- The National Energy Act No. 34 of 2008
NEMA	- National Environmental Management Act No. 107 of 1998
NEMBA	- National Environmental Management: Biodiversity Act No. 10 of 2004
NHRA	- National Heritage Resources Act No. 25 of 1999
NSBA	- National Spatial Biodiversity Assessment
NWA	- National Water Act No. 36 of 1998
NEMAA	- National Environmental Management: Air Quality Act of 2004
NPAES	-National Parks Area Expansion Strategy
OHSA	- Occupational Health and Safety Act No. 85 of 1993
PoS	- Plan of Study
PM	- Public Meeting
PPA	- Power Purchase Agreement
PPP	-Public Participation Process
PV	- Photovoltaic
RFI	- Radio Frequency Interference
RFP	- Request for Proposals
RFQ	- Request for Qualifications
SA	- South Africa
SABAP 2	- Southern African Bird Atlas Project 2
SAHRA	- South African Heritage Resources Agency
SALT	- Southern African Large Telescope
SANBI	- South African National Biodiversity Institute
SDF	- Spatial Development Framework
SKA	- Square Kilometre Array
SPVs	- Special Purpose Vehicles
TL	- Terrain Loss
WETFEPA	- Wetland Freshwater Priority Areas

BIOTHERM ENERGY

PROPOSED CONSTRUCTION OF THE TLISITSENG 1 SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY NEAR LICHTENBURG, NORTH WEST PROVINCE

DRAFT SCOPING REPORT

1 INTRODUCTION

BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) intends to develop the Tlisitseng 1 solar photovoltaic (PV) energy facility and associated infrastructure near Lichtenburg in the North West Province of South Africa. SiVEST Environmental Division has subsequently been appointed as independent consultants to undertake the Environmental Impact Assessment (EIA) for the proposed energy facility and associated onsite substation. The overall objective of the project is to generate electricity to feed into the National Grid. The proposed project will therefore consist of a 75MW export capacity solar PV energy facility and associated infrastructure which includes an onsite substation with a voltage capacity of up to 132kV.

This proposed PV energy facility forms one (1) of two (2) PV energy facilities with a 75MW export capacity that BioTherm are proposing to develop on Portion 25 of the Farm Houthaalboomen No 31. In addition, BioTherm are proposing to construct two (2) 132kV onsite substations namely Tlisitseng 1 and Tlisitseng 2 Substations, and two (2) 132kV power lines, which will feed the electricity generated by the proposed PV energy facility into the National grid. In order to accommodate the Department of Energy's (DoE) competitive bidding process for procuring renewable energy from Independent Power Producers in South Africa, each PV energy facility will be developed under a separate Special Purpose Vehicle (SPV) and therefore each requires a separate Environmental Authorisation (EA). Additionally, the two (2) 132kV power lines which will connect each of the proposed Tlisitseng onsite Substations to the existing Eskom Watershed MTS will also require a separate EA. It must however be noted that the proposed 132kV power lines will require a Basic Assessment (BA) process and not an Environmental Impact Assessment (EIA). Although each PV energy facility and the electrical infrastructure will be assessed separately, a single public participation process is being undertaken to consider all four (4) proposed developments. The potential environmental impacts associated with all four (4) developments will be assessed as part of the cumulative impact assessment. The reference number allocated by the Department of Environmental Affairs (DEA) for the other proposed PV energy facility, Tlisitseng 2, will be provided in the Final Scoping Report (FSR) once allocated by the DEA. The reference numbers for the 132kV power line BAs, have not as yet been allocated by the DEA. They will be provided in the Final Environmental Impact Assessment Report (FEIAr).

The proposed development requires Environmental Authorisation (EA) from the DEA. However, the provincial authority will also be consulted (i.e. the North West Department of Rural, Environment and

Agricultural Development). The EIA for the proposed development will be conducted in terms of the EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on the 8th of December 2014. In terms of these regulations, a full EIA is required for the proposed project. All relevant legislations and guidelines (including Equator Principles) will be consulted during the EIA process and will be complied with at all times.

It is important to note that this Draft Scoping Report (DSR) is the second version which will be submitted to the DEA and made available for public comment for the proposed Tlisitseng 1 Solar PV energy facility. On the 18th of January 2016 an application for EA and the DSR for the proposed Tlisitseng 1 Solar PV energy facility were received by the DEA and a reference number was allocated to the proposed development (**DEA reference number: 14/12/16/3/3/2/889**). This original DSR was made available for public review from the 11th of January 2016 to the 9th of February 2016. The DSR was thereafter updated and the Final Scoping Report (FSR) was submitted to the DEA on the 19th of February 2016. After evaluating the FSR the DEA issued a letter indicating that the documents complied with the minimum requirements of the EIA Regulations, 2014 and that SiVEST could proceed with the EIA process (i.e. Draft EIA Report and Final EIA Report). The original FSR was therefore accepted by the DEA. It should however be noted that due to a change in the layout of the proposed Tlisitseng 1 Solar PV energy facility, SiVEST was not able to submit the Final EIA Report within the legislated timeframes. On the 20th of June 2016, SiVEST sent the DEA a letter requesting a sixty (60) day extension in terms of Regulation 3 (7) of the EIA Regulations, 2014, in order to provide the specialists with the opportunity to update their specialist reports in-line with the revised layouts. On the 20th of July 2016, the DEA issued a letter refusing the extension request. For this reason the application for EA lapsed in accordance with Regulation 45 of the EIA Regulations, 2014 and the departmental file was closed for the project.

In order to reapply for EA for the proposed Tlisitseng 1 solar PV energy facility BioTherm has appointed SiVEST to recommence with the EIA process. It should however be noted that all comments received by Interested and Affected Parties (I&APs) during the Public Participation Process (PPP) which was undertaken for the original EIA process (including those received during meetings) will form part of this EIA process. The public participation process will be re-conducted in accordance with the EIA Regulations, 2014 and all I&APs, Stakeholders and Organs of State will be afforded an extra opportunity to review the DSR and to provide comments.

As previously mentioned, this Scoping Report is compiled in accordance with the Equator Principles (EP), which is a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing (Equator Principles, 2013). This proposed development is considered a Category B project, which are those with potential limited adverse social or environmental impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures (Equator Principles, 2013). The project will also comply with the International Finance Corporation's (IFC) Social and Environmental Performance Standards (2012) and General Environmental Health and Safety (EHS) Guidelines (2007).

1.1 Objectives of the Scoping Phase

The NEMA EIA Regulations (GN. R. 982) state that the objective of the scoping phase is to:

(a) identify the relevant policies and legislation relevant to the activity;
(b) motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
(c) identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
(d) identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
(e) identify the key issues to be addressed in the assessment phase;
(f) agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and
(g) identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

A scoping report must contain the information that is necessary for a proper understanding of the process, informing all preferred alternatives, including location alternatives, the scope of the assessment, and the consultation process to be undertaken through the environmental impact assessment process. The content requirements for a Scoping Report, as well as details of which section of the report fulfils these requirements, are shown in **Table 1** below.

Table 1: Content requirements for a Scoping Report

Content Requirements	Applicable Section
(a) details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Details of the EAP and full project team are included in **section 1.5** on page 9. The expertise (including curriculum vitae) of the EAP and full project team are include in Appendix 2.
(b) the location of the activity, including- (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name;	The location of the proposed project is detailed in on page *i* of the report, as well as in **section 5.2** on page 45.

(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	A map of the regional locality is shown in **section 5.1** on page 44, and the site locality is shown in **section 5.2** on page 45. Additionally, all project maps are included in **Appendix 5**. Coordinates are shown on page *i* of the report, as well as in **section 5.2** on page 45.
(d) a description of the scope of the proposed activity, including- (i) all listed and specified activities triggered; (ii) a description of the activities to be undertaken, including associated structures and infrastructure;	The listed and specified activities triggered as per NEMA are detailed in **section 3.1.2** on page 24. The technical project description is included in **section 2** on page 15. This includes a description of activities to be undertaken, including associated structures and infrastructure.
(e) a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process;	A description of all legal requirements and guidelines is provided in **section 3** on page 23. This includes key legal and administrative requirements as well as key development strategies and guidelines.
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	The need and desirability of the proposed project is discussed in **section 4** on page 40.
(h) a full description of the process followed to reach the proposed preferred activity, site and location within the site, including - (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	A description of the alternatives considered in terms of the Regulations is included in **section 0** on page 21. A preliminary assessment of layout alternatives is included in **section 7** on page 147. The public participation process followed is detailed in **section 0** on page 164. Additionally, all public participation documents are

(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	included in **Appendix 7**. This includes a summary of issues raised by I&APs, and the responses to their comments. A full description of the environmental attributes within the application site is included in **section 5** on page 44. The impacts and risks associated with each alternative are assessed in **section 7** on page 147. The methodology used in identifying the impacts and risks associated with each alternative is included in **section 7** on page 147. The positive and negative impacts that the proposed activity will have on the environment are discussed in **section 6.1** on page 114. Potential mitigation measures are included in **section 6.2** on page 138. The outcome of the site selection matrix is included in **section 4.4** on page 42. The inclusion of alternatives is discussed in **section 0** on page 21, and in **section 7** on page 147. A concluding statement indicating the preferred alternatives is contained in **section 7** on page 147.
(i) a plan of study for undertaking the environmental impact assessment process to be undertaken, including- (i) a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity; (ii) a description of the aspects to be assessed as part of the environmental impact assessment process; (iii) aspects to be assessed by specialists; (iv) a description of the proposed method of assessing the environmental aspects, including a description of the proposed method of assessing the environmental aspects including aspects to be assessed by specialists;	The plan of study for the EIA phase is included in **section 0** on page 196. A description of alternatives to be considered is included in **section 11.8** on page 212. A summary of the aspects to be assessed is included in **section 11.1** on page 196 and in **section 11.3** on page 197. The description of the proposed EIA phase methodology is in **section 11.3** on page 197. An indication of planned authority consultation is contained in **section 11.2** on page

(v) a description of the proposed method of assessing duration and significance; (vi) an indication of the stages at which the competent authority will be consulted; (vii) particulars of the public participation process that will be conducted during the environmental impact assessment process; and (viii) a description of the tasks that will be undertaken as part of the environmental impact assessment process; (ix) identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.	197. The particulars of the planned public participation process are included in **section 11.10** on page 214. All tasks to be undertaken during the EIA phase are described in **section 0** on page 196. Detailed mitigation measures will be included in the EIA phase of the project, following detailed specialist studies, as indicated in **section 11.9** on page 214.
(j) an undertaking under oath or affirmation by the EAP in relation to- (i) the correctness of the information provided in the report; (ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and (iii) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	The EAP declaration is included in **Appendix 3**.
(k) an undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties (I&APs) on the plan of study for undertaking the environmental impact assessment;	The plan of study is included within this DSR which has been made available for review and comment by I&APs. Should any I&APs identify any issues or concerns with respect to the plan of study for undertaking the EIA, it will be updated accordingly.
(l) where applicable, any specific information required by the competent authority; and	At this stage there is no specific information required by the competent authority. However a record of authority consultation is kept in **section 1.4** on page 8, and should there be any specific information requested, this will be detailed in the same section.
(m) any other matter required in terms of section 24(4)(a) and (b) of the Act.	All requirements in terms of section 24(4)(a) and (b) of the Act have been met in this report.

1.2 Applicable Documentation

The following documentation should be read in conjunction with this Scoping Report:

- "Equator Principles" 2013
- International Finance Corporation's (IFC) Performance Standards on Social and Environment, January 2012, namely:
    - Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
    - Performance Standard 2: Labour and Working Conditions
    - Performance Standard 3: Resource Efficiency and Pollution Prevention
    - Performance Standard 4: Community Health, Safety and Security
    - Performance Standard 5: Land Acquisition and Involuntary Resettlement
    - Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
    - Performance Standard 7: Indigenous Peoples
    - Performance Standard 8: Cultural Heritage
- International Finance Corporation – World Bank Guidelines, General Environmental Health and Safety (EHS) Guidelines 2007.

The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). These EHS Guidelines are applied as required by the World Bank's respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. The IFC handbook is contained in **Appendix 1**.

1.3 Specialist Studies

Specialist studies have been conducted in terms of the stipulations contained within Appendix 6 of the 2014 NEMA EIA regulations.

The following specialist studies have been conducted to assess the site:

- Biodiversity Assessment;
- Avifauna Assessment (including preconstruction monitoring);
- Surface Water Impact Assessment;
- Soils and Agricultural Potential Assessment;
- Visual Impact Assessment;
- Heritage and Palaeontological Assessment;

- Socio-economic Assessment;
- Traffic Assessment; and
- Geotechnical Assessment.

These studies have been used to identify issues at a scoping level and will be supplemented with more site specific studies during the EIA phase of the project. Key issues relating to the proposed site are discussed below in **section 5**.

1.4 Authority Consultation

The National Department of Environmental Affairs (DEA) is the competent authority on this project. As such an application for EA for the proposed development was submitted to DEA on the 29th of September 2016. A proof of payment, details of the EAP and declaration of interest, a project schedule, details of landowners, and locality map formed part of the application form and were submitted accordingly on the same date.

It is important to note that this Draft Scoping Report (DSR) is the second version which will be submitted to the DEA and made available for public comment for the proposed Tlisitseng 1 Solar PV energy facility. On the 18th of January 2016 an application for EA and the DSR for the proposed Tlisitseng 1 Solar PV energy facility were received by the DEA and a reference number was allocated to the proposed development (**DEA reference number: 14/12/16/3/3/2/889**). This original DSR was made available for public review from the 11th of January 2016 to the 9th of February 2016. The DSR was thereafter updated and the Final Scoping Report (FSR) was submitted to the DEA on the 19th of February 2016. After evaluating the FSR the DEA issued a letter indicating that the documents complied with the minimum requirements of the EIA Regulations, 2014 and that SiVEST could proceed with the EIA process (i.e. Draft EIA Report and Final EIA Report). The original FSR was therefore accepted by the DEA. It should however be noted that due to a change in the layout of the proposed Tlisitseng 1 Solar PV energy facility, SiVEST was not able to submit the Final EIA Report within the legislated timeframes. On the 20th of June 2016, SiVEST sent the DEA a letter requesting a sixty (60) day extension in terms of Regulation 3 (7) of the EIA Regulations, 2014, in order to provide the specialists with the opportunity to update their specialist reports in-line with the revised layouts. On the 20th of July 2016, the DEA issued a letter refusing the extension request. For this reason the application for EA lapsed in accordance with Regulation 45 of the EIA Regulations, 2014 and the departmental file was closed for the project.

In order to reapply for EA for the proposed Tlisitseng 1 solar PV energy facility BioTherm has appointed SiVEST to recommence with the EIA process. It should however be noted that all comments received by Interested and Affected Parties (I&APs) during the Public Participation Process (PPP) which was undertaken for the original EIA process (including those received during meetings) will form part of this EIA process. The public participation process will be re-conducted in accordance with the EIA Regulations,

2014 and all I&APs, Stakeholders and Organs of State will be afforded an extra opportunity to review the DSR and to provide comments.

1.5 Expertise of Environmental Assessment Practitioner

SiVEST has considerable experience in the undertaking of EIAs. Staff and specialists who have worked on this project and contributed to the compilation of this Scoping Report are detailed in **Table 2** below.

Table 2: Project Team

Name and Organisation	Role
Rebecca Thomas – SiVEST	Internal Peer Reviewer
Andrea Gibb – SiVEST	Environmental Assessment Practitioner (EAP) and Visual
Stephan Jacobs - SiVEST	Environmental Consultant / Public Participation Practitioner and Visual
David Hoare – David Hoare Consulting	Biodiversity
Chris van Rooyen – Chris van Rooyen Consulting	Avifauna
Shaun Taylor – SiVEST	Surface Water
D.G. Paterson – ARC Institute for Soil, Climate and Water	Agricultural Potential
Wouter Fourie and Jessica Angel – PGS	Heritage
Elena Broughton – Urban-Econ Development Economists	Socio-economic
Colin Dalton and Thanduxolo Msengana – Geopractica	Geotechnical
Hermanus Steyn – Aurecon	Traffic
Nicolene Venter – Zitholele Consulting	Senior Public Participation Practitioner
Kerry Schwartz – SiVEST	GIS and Mapping and Visual

As per the requirements of the NEMA (2014), the details and level of expertise of the persons who prepared the FSR are provided in **Table 3** below.

Table 3: Expertise of the EAP

Environmental Project Manager	SiVEST (Pty) Ltd – Rebecca Thomas
Contact Details	rebeccat@sivest.co.za
Qualifications	B.Sc. Environmental Science, Post Graduate Diploma in Business Management
Expertise to carry out the EMPr	Rebecca is an Environmental Scientist with 10 years' experience across various sectors. She specialises in the overall management and compilation of

	Environmental Impact Assessments (EIAs) and Environmental Management Programmes (EMPs) primarily related to mining, energy generation and electrical transmission projects. Rebecca has extensive knowledge of the South African Environmental legislation as well as World Bank Guidelines and Equator Principles. She has been involved in several projects to which these skills have been applied. **Environmental Impact Assessments and Environmental Management Programmes:** ▪ EIA for the proposed Eskom 400kV Thyspunt Transmission Lines Integration Project (TTLIP) near Port Elisabeth, Eastern Cape Province (2013 – 2015); ▪ EIA and BA for the proposed Mookodi I and II Integration Projects respectively near Vryburg, North West Province (2013 – 2015); ▪ BA for the Proposed development of the 75MW Droogfontein PV2 and PV3 Photovoltaic Solar Power Plant and associated power lines near Kimberley, Northern Cape Province (2013); ▪ Environmental Advisory Services for the Moloto Development Corridor (MDC) Project which is located between the City of Tshwane Local municipality in Gauteng Province and Groblersdal, Limpopo Province, traversing Mpumalanga Province. Project Leader, SMEC/VelaVKE, 2012 – Current; ▪ Environmental Advisory Services for the Moloto Development Corridor (MDC) Project which is located between the City of Tshwane Local municipality in Gauteng Province and Groblersdal, Limpopo Province, traversing Mpumalanga Province. Project Leader, SMEC/VelaVKE, 2012 – Current; ▪ 3 Year Appointment: Environmental Management Compliance for the Integrated Rapid Transit project for Polokwane Municipality. Project Leader, City of Polokwane, 2013 – Current; ▪ EIA and EMPr for the proposed 150 MW Renosterberg Wind Energy Company (RWEC) Wind Farm and 75 MW Solar Photovoltaic (PV) Plant, Northern Cape Province. The EIA includes the scoping process and detailed environmental impact assessment. The project includes detailed specialist studies such as social, visual, noise, heritage and biophysical as well as a full public participation process. RWEC, 2012 – Current.
Environmental Practitioner	SiVEST (Pty) Ltd – Andrea Gibb
Contact Details	andreag@sivest.co.za
Qualifications	BSc Landscape Architecture and BSc (Hons) Environmental Management

Expertise to carry out the EMPr	Andrea has 8.5 years' work experience and specialises in undertaking and managing Environmental Impact Assessments (EIAs) and Basic Assessment (BAs), primarily related to energy generation and electrical distribution projects. She also specialises in undertaking visual impact and landscape assessments, by making use of ArcGIS technology and field surveys. She has extensive experience in overseeing public participation and stakeholder engagement processes and has been involved in environmental baseline assessments, fatal flaw / feasibility assessments and environmental negative mapping / sensitivity analyses. From a business and administrative side, Andrea is actively involved in maintaining good client relationships, mentoring junior staff and maintaining financial performance of the projects she leads. **Environmental Impact Assessments and Basic Assessments:** ▪ EIA for the proposed construction of a 75MW Solar Photovoltaic (PV) Power Plant near Dennilton, Limpopo Province. ▪ EIA for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province. ▪ BA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province. ▪ BA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province. ▪ BA for the proposed Construction of the SSS1 5MW Solar Photovoltaic (PV) Plant on the Western Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province. ▪ BA for the proposed Construction of the SSS2 5MW Solar Photovoltaic (PV) Plant on the Eastern Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province. ▪ BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the proposed Bophirima Substation to the existing Schweizer-Reneke Substation, North West Province. ▪ BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the Mookodi Substation to the existing Magopela Substation, North West Province. ▪ BA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province. ▪ Amendment of the Final Environmental Impact Report for the Proposed Mookodi 1 Integration Project near Vryburg, North West Province. ▪ BA for the proposed 132kV power line and associated infrastructure for the

	proposed Redstone Solar Thermal Energy Plant near Lime Acres, Northern Cape Province. ▪ BA for the proposed construction of a 132kV power line and substation associated with the 75MW Photovoltaic (PV) Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province. ▪ BA for the proposed establishment of a Learning and Development Retreat and an Executive Staff and Client Lodge at Mogale's Gate, Gauteng Province. ▪ Amendment application in order to increase the output of the proposed 40MW PV Facility on the farm Mierdam to 75MW, Northern Cape Province. ▪ BA for the proposed construction of a power line and substation near Postmasburg, Northern Cape Province. ▪ BA for the proposed West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng. ▪ EIA for the proposed construction of a wind farm and PV plant near Prieska, Northern Cape Province. ▪ Public Participation assistance as part of the EIA for the proposed Thyspunt Transmission Lines Integration Project – EIA for the proposed construction of 5 x 400kV transmission power lines between Thyspunt to Port Elizabeth, Eastern Cape Province. ▪ EIA assistance for the proposed construction of three Solar Power Plants in the Northern Cape Province. ▪ Public Participation as part of the EIA for the proposed Delareyille Kopela Power Line and Substation, North West Province. ▪ Public Participation as part of the EIA for the Middelburg Water Reclamation Project, Mpumalanga Province.
Environmental Consultant	SiVEST (Pty) Ltd – Stephan Jacobs
Contact Details	stephanj@sivest.co.za
Qualifications	BSc Environmental Sciences and BSc (Hons) Environmental Management and Analysis
Expertise to carry out the EMPr	Stephan joined SiVEST in May 2015 and holds the position of Graduate Environmental Consultant in the Johannesburg office. Stephan specialises in the field of Environmental Management and has been involved in the compilation of Environmental Impact Assessments (EIAs) and Basic Assessments (BAs). Stephan has also assisted extensively in the undertaking of field work and the compilation of reports for specialist studies such as surface water and visual impact assessments. Stephan also has experience in Environmental Compliance and Auditing and has acted as an Environmental Control Officer (ECO) for several infrastructure projects.

	Project Experience: ▪ Environmental Control Officer (ECO) for the Polokwane Integrated Rapid Public Transport System (IRPTS), Limpopo Province. ▪ BA for the construction of a Non-Motorised Transport (NMT) Training and Recreational Park adjacent to the Peter Mokaba Stadium in Polokwane, Limpopo Province. ▪ BA for the Proposed Expansion of the Tissue Manufacturing Capacity at the Twinsaver Kliprivier Operations Base, Gauteng Province. ▪ Environmental Control Officer (ECO) for Phase 1 and Phase 2 of the Newmarket Retail Development, Gauteng Province. ▪ Environmental Review of the Xakwa Coal Operations, adjacent to the proposed Eastside Junction Development. ▪ Environmental Due Diligence for the Woodlands and Harrowdene Office Parks in Woodmead, Gauteng Province. ▪ Visual Impact Assessment for the Helena Solar PV Plant, Northern Cape Province. ▪ Visual Impact Assessment for the Nsoko Msele Integrated Sugar Project, Swaziland. ▪ Visual Impact Assessments for the proposed construction of the Sendawo Solar 1, Sendawo Solar 2 and Sendawo Solar 3 Photovoltaic (PV) Energy Facilities near Vryburg, North West Province. ▪ Visual Impact Assessment for the proposed construction of the Sendawo Substation and Associated 400kV Power Line near Vryburg, North West Province. ▪ Visual Impact Assessment for the proposed construction of the 3000MW PhilCo Green Energy Wind Farm and Associated Infrastructure near Richmond, Northern Cape Province. ▪ Visual Impact Assessment for the proposed construction of the Aletta 140MW Wind Energy Facility neat Copperton, Northern Cape Province. ▪ Visual Impact Assessment for the proposed construction of the Aletta Substation and associated 132kV Power Line near Copperton, Northern Cape Province. ▪ Visual Impact Assessment for the proposed construction of the Eureka 140MW Wind Energy Facility and associated Infrastructure near Copperton, Northern Cape Province. ▪ Visual Impact Assessment for the proposed construction of the Eureka Substation and associated 132kV Power Line neat Copperton, Northern Cape Province.

	▪ Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the Rooipunt Solar Thermal Power Plant near Upington, Northern Cape Province. ▪ Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberly, Free State and Northern Cape Provinces. ▪ Surface Water Assessment for the Steve Tshwete Local Municipality, Mpumalanga Province. ▪ Surface Water Delineation and Assessment for the proposed coal Railway Siding at the Welgedacht Marshalling Yard and associated Milner Road Upgrade near Springs, Ekurhuleni Metropolitan Municipality.

Please refer to attached CV's for more information in **Appendix 2**. Declarations of independence of each specialist are contained in **Appendix 3**.

1.6 Draft Scoping Report Structure

This Draft Scoping Report (DSR) is structured as follows:

- Chapter 1 introduces the project and explains the objectives of the Scoping phase. The chapter also outlines the relevance of the Equator Principles as well as the IFC Performance Standards and points out the specialist studies for the project. It describes the authority consultation thus far. Furthermore, the chapter discusses the experience of the Environmental Assessment Practitioners (EAP), including specialists, who have contributed to the report.
- Chapter 2 presents the technical description of the project, including a description of alternatives being considered.
- Chapter 3 expands on the relevant legal ramifications applicable to the project and describes relevant development strategies and guidelines.
- Chapter 4 provides explanation to the need and desirability of the proposed project.
- Chapter 5 provides a description of the region in which the proposed development is intended to be located. Although the chapter provides a broad overview of the region, it is also specific to the application. It contains descriptions of the site and the specialist studies are also summarised.
- Chapter 6 identifies potential impacts associated with the proposed solar PV energy facility. The chapter further identifies these impacts per specialist study and discusses potential cumulative impacts.
- Chapter 7 discusses layout alternatives, including how they relate to sensitive areas identified by specialists and provides a preliminary comparison of alternatives.

- Chapter 8 describes the Public Participation Process (PPP) undertaken during the Scoping Phase and tables issues and concerns raised by Interested and Affected Parties (I&APs).
- Chapter 9 provides an assessment of the report in terms of the Equator Principles.
- Chapter 10 provides a conclusion to the DSR and recommendations to be addressed in further assessment.
- Chapter 11 describes the environmental impact reporting phase of the EIA (i.e. the way forward for this study and includes the Plan of Study for EIA).
- Chapter 12 lists references indicated in the DSR.

2 TECHNICAL DESCRIPTION

The proposed project will encompass the installation of a solar PV field and associated components, which includes a 132kV onsite substation (Tlisitseng 1 Substation), in order to generate and feed electricity into the national grid. The PV energy facility will have a maximum export capacity of 75MW while the proposed Tlisitseng onsite substation will have a voltage capacity of up to 132kV. The total area of the application site is approximately 1024 hectares, with the proposed Tlisitseng 1 development taking up approximately 246 hectares. Within the development area a smaller area will be required for the solar PV arrays. The proposed Tlisitseng 132kV onsite substation will cover an area of up to approximately 2.25 hectare. The footprint of the Operations and Maintenance (O&M) buildings will be approximately 225m^2. The final design details are yet to be confirmed. These details will become available during the detailed design phase of the project. During the scoping phase the entire application site has been assessed in order to inform the preliminary comparison of layout alternatives for the solar PV energy facility. These layout alternatives have been discussed in **Chapter 7** and are presented in the Plan of Study for the EIA Phase (**Chapter 11**). The voltage of the connection lines from the solar PV energy facility's onsite substation (Tlisitseng 1 Substation) to the grid is likely to be 132kV. As mentioned above, this power line will be assessed as part of a separate BA process.

2.1 PV Project Components

BioTherm is proposing the establishment of a solar PV energy facility and associated infrastructure, which includes a 132kV onsite substation on the development site near Lichtenburg (**Figure 1**). As mentioned, the objective of the solar project is to generate and feed electricity into the national grid. The solar PV energy facility will have a maximum export capacity of 75MW while the proposed Tlisitseng onsite substation will have a voltage capacity of up to 132kV.

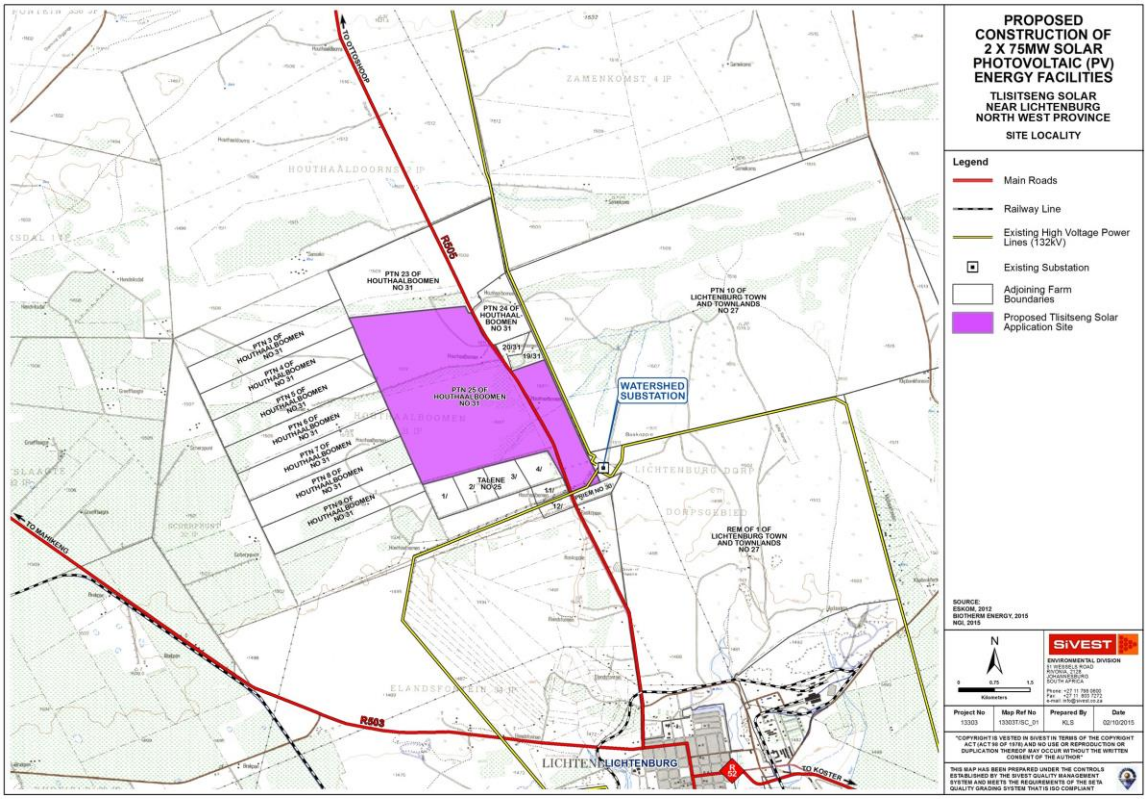

Figure 1: Proposed solar PV energy facility and 132kV onsite substation study area

The key technical details and infrastructure required is presented in the table below (**Table 4**).

Table 4: Tlisitseng 1 technical summary

Project Name	Farm name and area	Technical details and infrastructure necessary for each phase
Tlisitseng 1	Portion 25 of the Farm Houthaalboomen No 31 PV Site Area: Tlisitseng 1 approximately 246 ha Onsite Substation Site	▪ Approximately 275 000 **solar PV panels** with a total export capacity of 75MW; ▪ The technology used will be either **fixed tilt mounting or single axis tracking mounting**, and the modules will be either crystalline silicon or thin film technology; ▪ Onsite **substation**, with the transformers for voltage step up from medium voltage to high voltage; ▪ The **onsite substation** will require an area of up to approximately 2.25 ha ▪ The modules will be connected in strings to inverters. Inverter stations will typically house several inverters and a transformer;

	Area: Up to approximately 2.25 ha	▪ DC power from the panels will be converted into AC power in the inverters and the voltage will be stepped up to 22 or 33kV (medium voltage) in the transformers. ▪ The **medium voltage cables** will be run underground in the facility to a common point before being fed to the **onsite substation** where the voltage will typically be stepped up to 132kV. ▪ **Onsite substation** (Tlisitseng 1 Substation) with a voltage capacity of up to 132kV; ▪ The **Tlisitseng 1 onsite substation** will require an area of up to approximately 2.25 ha; ▪ Grid connection is from the proposed Tlisitseng 1 onsite substation to Watershed Main Transmission Station (MTS) via a **power line** with a voltage capacity of 132kV. The power line is not part of this EIA, and is being applied for as part of a separate ongoing BA process. ▪ The **power line** pylons will be suspension / strain / steel monopole structures, which may be self-support or guyed suspension. The height will vary based on the terrain, but will ensure minimum Overhead Line (OHL) line clearances with buildings and surrounding infrastructure. The minimum vertical clearances will be 3.8m with buildings and 6.7m between conductors and the ground ▪ A **lay-down area** of up to approximately 5 ha for the temporary storage of materials during the construction; ▪ **Construction of access roads and internal roads**; ▪ Construction of a **car park and fencing** around the project; and ▪ **Administration, control and warehouse buildings.**

As previously mentioned, this proposed solar PV energy facility forms one (1) of two (2) PV energy facilities with a 75MW export capacity that BioTherm is developing on Portion 25 of the Farm Houthaalboomen No 31. In addition, BioTherm are proposing to construct two (2) 132kV onsite substations namely Tlisitseng 1 and Tlisitseng 2 Substations, and two (2) 132kV power lines from each onsite substation, which will feed the electricity generated by the proposed PV energy facility into the national grid. Each PV energy facility will be developed under a separate Special Purpose Vehicle (SPV) and therefore each requires a separate Environmental Authorisation. Additionally, the two (2) 132kV power lines which will connect each of the proposed Tlisitseng onsite Substations to the existing Eskom Watershed MTS will also require a separate Environmental Authorisation. It must however be noted that the proposed 132kV power lines will require a Basic Assessment (BA) process and not an Environmental Impact Assessment (EIA).

2.2 Solar Field

Solar PV panels are usually arranged in rows consisting of a number of PV modules. The area required for the PV arrays will likely need to be entirely cleared or graded.

Approximately 275 000 solar PV panels will be required for the facility for a total export capacity of 75MW. Support structures will either be fixed tilted mounting or single axis tracking solutions and the modules will be either crystalline silicon or thin film technology. The solar PV modules are variable in size, and are dependent on advances in technology between project inception and project realisation. At this stage crystalline PV module solar panels will be 1956mm x 992mm x 40mm. The actual size of the PV modules to be used will be determined in the final design stages of the project. The PV modules are mounted on metal frames. Rammed piles are commonly used for the support of such structures (Error! Reference source not found.).

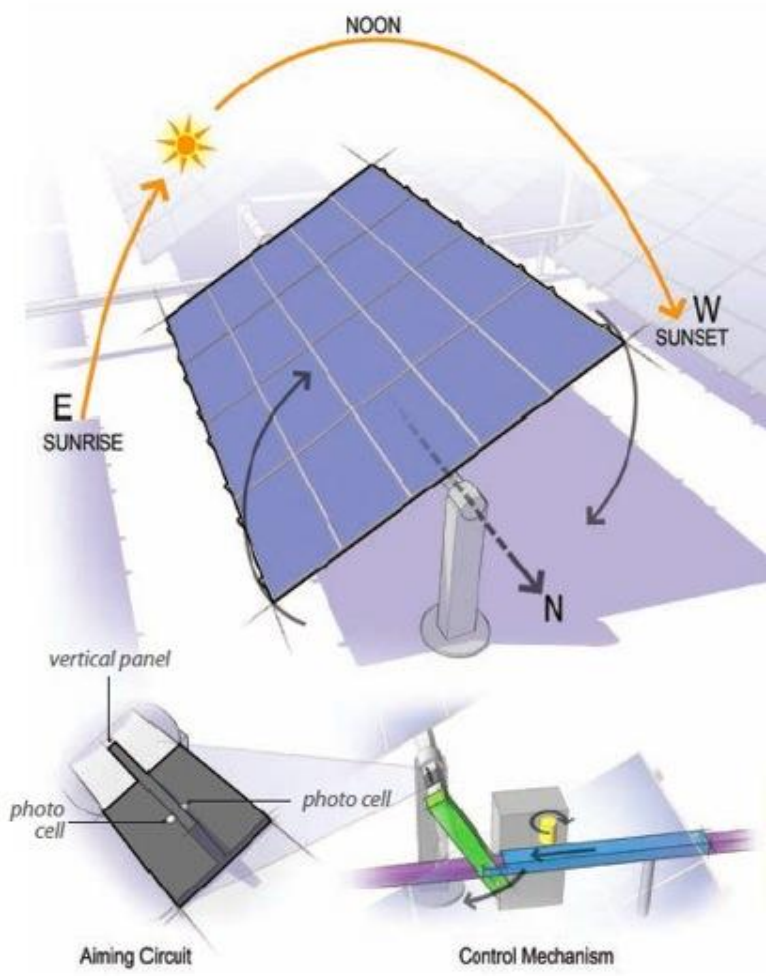

Figure 2: Example of a Photovoltaic Panel with tracking capability
(**Source: http://solartoday.org/2009/07/single-axis-solar-tracking/)**

2.3 Associated Infrastructure

2.3.1 Electrical Infrastructure

The solar arrays are connected in strings, which are in turn connected to inverters. For a 75MW size facility, typically 2-4MW inverter stations which are containerised stations housing inverters and transformers will be used (**Figure 3**). DC power from the panels will be converted into AC power in the inverters and the voltage will be typically stepped up to 22 or 33kV (medium voltage) in the transformers. The medium voltage cables will be run underground in the facility before being fed to the onsite switching substation where the voltage will typically be stepped up to 132kV. An onsite power line with a voltage capacity of 132kV will run from the onsite substation to the proposed connection point at the Eskom Watershed MTS. The power line pylon will be a tower (suspension / strain) / Steel monopole structure, which may be self-support or guyed suspension. The height will vary based on the terrain, but will ensure minimum OHL line clearances with buildings and surrounding infrastructure.

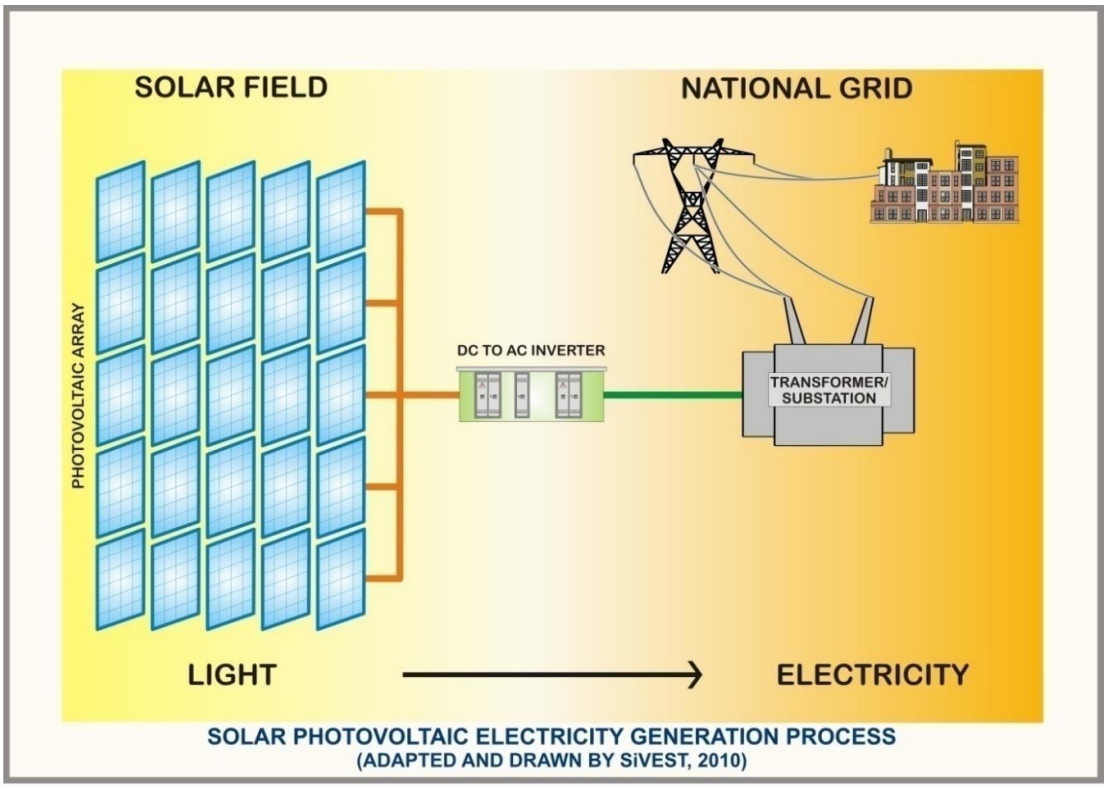

Figure 3: PV process

2.3.2 Buildings

The solar field will require onsite buildings which will be used in the daily operation of the energy facility and includes an administration building (office). Potential locations for the administration building will be determined during the EIA process based on any environmental constraints identified and design factors that need to be considered. The buildings will likely be single storey buildings which will be required to accommodate the following:

- Control room;
- Workshop;
- Kitchen;
- Toilets;
- Storage; and
- Car park and fencing around the project.

2.3.3 Construction Lay-down Area

A general construction lay-down area will be required for the construction phase of the proposed solar PV energy facility. The exact size of this area will be determined during the detailed deisgn phase, but approximately 5 hectares is likely. A permanent storage area will be required for the storage of spares, which is to be located close to the O&M building.

2.3.4 Other Associated Infrastructure

Other associated infrastructure includes the following:

- Access roads and internal roads;
- A car park; and
- Fencing around the project which is likely to be galvanized steel type at approximately 2m high.

2.4 Alternatives

As per Chapter 1 of the EIA regulations (2014), feasible and reasonable alternatives are required to be considered during the EIA process. Alternatives are defined at "different means of meeting the general purpose and requirements of the activity" These alternatives may include:

(a) The property on which or location where it is proposed to undertake the activity;
(b) The type of activity to be undertaken;
(c) The design or layout of the activity;
(d) The technology to be used in the activity;
(e) The operational aspects of the activity; and
(f) The option of not implementing the activity.

Each of this alternatives is discussed in relation to the proposed project in the sections below.

2.4.1 The property on which or location where it is proposed to undertake the activity;

No site alternatives for this project are being considered because the placement of solar PV installations is dependent on several factors, all of which are favourable at the proposed site location. These include solar resource, climate, topography, grid connections and access to the site. The project site has been identified by BioTherm through a pre-feasibility desktop analysis based on the estimation of the solar energy resource as well as weather, dust and dirt effects. The North West Province in South Africa has favourable solar irradiation potential. The project site receives an annual global horizontal irradiation of approximately 2120 kWh/ m^2/year. The project site has access to the national grid via the existing Watershed MTS located approximately 2.4 km from the site. There are no operational projects which surround the site. The project site has a relatively flat topography which is suitable for the development of a solar PV facility. The project site is easily accessible as the tarred R505 road transects the farm and connects to the N14 national road which leads to the R503, Lichtenburg. The site is therefore considered highly suitable for the proposed development and no other locations are being considered.

2.4.2 The type of activity to be undertaken;

No other activity alternatives are being considered. Renewable energy development in South Africa is highly desirable from a social, environmental and development point of view. Wind energy installations are not feasible on the site as there is not enough of a wind resource. Concentrated solar power (CSP) installations are also not feasible because they have a high water requirement and the project site is located in an arid area. Therefore solar PV is the only activity being considered for the proposed site.

2.4.3 The design or layout of the activity;

Design or layout alternatives are being considered in the EIA process. Various environmental specialists assessed the site during the scoping phase. Their assessments encompassed the entire proposed development site and included the identification of sensitive areas. These sensitive areas were used during the scoping phase to perform a preliminary comparison of layout alternatives (**Figure 4**).

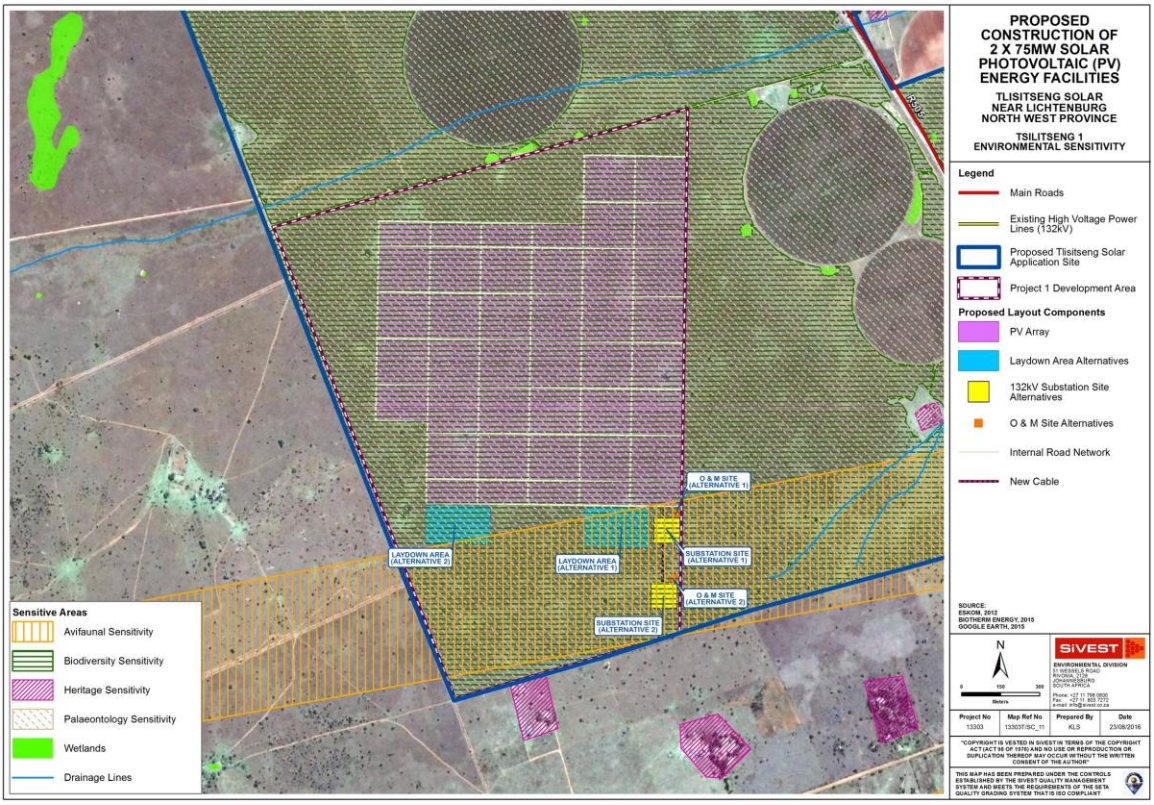

Figure 4: Proposed Scoping Phase Layout Alternatives with Scoping Phase sensitivity

These layout alternatives will be extensively investigated in the EIA phase of the project (see the plan of study for the EIA phase in **Chapter 11** of the DSR). The design and layout alternatives include; alternative locations for the laydown area, onsite substation, and O&M building. The layout alternatives are based on both environmental constraints and design factors. The above scoping phase layout alternatives will be further assessed in the EIA phase and are presented in **Chapter 11**. The proposed layouts were constrained in terms of the area available and it was therefore not possible to have two (2) layout alternatives for the PV array area.

2.4.4 The technology to be used in the activity;

There are very few technological alternatives for PV technology. For the Tlisitseng 1 solar energy facility the mounting structures will be either fixed tilt mounting or single axis tracking solutions, and the modules will be either crystalline silicon or thin film technology. The impacts on the environment of the different types of PV technology are the same during construction, operation and decommissioning. Therefore no technology alternatives will be considered during the EIA. The choice of technology used will ultimately be determined by technological and economic factors at a later stage.

2.4.5 The operational aspects of the activity; and

No operational alternatives were assessed in the EIA, as none are available for solar PV installations.

2.4.6 The option of not implementing the activity.

The option of not implementing the activity, or **the 'no-go' alternative, is considered in the EIA**. South Africa is under immense pressure to provide electricity generating capacity in order to reduce the current electricity demand in the country. With the global focus on climate change, the government is under severe pressure to explore alternative energy sources in addition to coal-fired power stations. Although solar power is not the only solution to solving the energy crisis in South Africa, not establishing the proposed solar PV energy facility and 132kV onsite substation would be detrimental to the mandate that the government has set to promote the implementation of renewable energy. It is a suitable sustainable solution to the energy crisis and this project could contribute to addressing the problem. This project will aid in achieving South Africa's goals in terms of sustainability, energy security, mitigating energy cost risks, local economic development and national job creation.

3 LEGAL REQUIREMENTS AND GUIDELINES

3.1 Key Legal and Administrative Requirements Relating to the Proposed Development

3.1.1 National Environmental Management Act No. 107 of 1998 – NEMA EIA Requirements

The National Environmental Management Act (Act No. 107 of 1998) was promulgated in 1998 but has since been amended on several occasions from this date. This Act replaces parts of the Environment Conservation Act (Act No 73 of 1989) with exception to certain parts pertaining to Integrated Environmental Management. The act intends to provide for:

- co-operative environmental governance by establishing principles for decision-making on matters affecting the environment;
- institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state;
- to provide for the prohibition, restriction or control of activities which are likely to have a detrimental effect on the environment;
- and to provide for matters connected therewith.

NEMA now governs the EIA process with the recent promulgation of the new EIA regulations in December 2014 (Government Gazette No. 38282 of 4th December 2014).

Activities that may significantly affect the environment must be considered, investigated and assessed prior to implementation.

In terms of the newly released EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on 8th December 2014, a full EIA is required for the proposed project.

3.1.2 NEMA EIA Requirements

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an environmental authorisation, the result being that NEMA now governs the EIA process with the said promulgation of EIA Regulations in December 2014 (Government Gazette No. 38282 of 04 December 2014). This EIA has therefore been undertaken in accordance with the NEMA EIA 2014 Regulations which are contained in four Government Notices (GN R 982, 983, 984, and 985) which came into effect on 8th December 2015.

In terms of these Regulations, a full Environmental Impact Assessment is required for the proposed development based on triggered activities. However, several activities which trigger a basic assessment were also identified and need also be specified. Ultimately, these activities will not form a separate assessment, but will fall into the greater EIA.

The following Schedules of the Government Notice No. R. 983 – 985 of the 4th December 2015 are of relevance to the project in question. All of the Listed Activities identified in terms of Sections 24(2) and 24D include:

Table 5: Listed activities in terms of the NEMA Regulations

Activity number of	**Listed activity as described in GNR 983, 984 and 985**	**Description of Listed Activity**

the relevant notice:		
GN R. 983 Item 11	*The development of facilities or infrastructure for the transmission and distribution of electricity-* *(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts*	**An onsite substation is required to connect the PV energy facility to the national grid. The proposed Substation will be located outside an urban area and will have a voltage capacity of 132kV.**
GN R. 983 Item 28	*Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development:* *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;* *excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.*	**The proposed project site is currently used for cattle and crop farming, and the proposed project will result in an area greater than 1 hectare being transformed into an industrial land use.**
GN R. 983 Item 56	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre -* *(ii) where no reserve exists, where the existing road is wider than 8 metres –* *excluding where widening or lengthening occur inside urban areas.*	**It is likely that existing access roads will need to be upgraded in order to access the site. The required width and length of the expansion will be determined during the detailed design phase.**
GN R. 984 Item 1	*The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area.*	**It is proposed that a solar PV energy facility with a maximum export capacity of 75MW will be constructed.**
GN R. 984 Item 15	*The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.*	**The proposed development will transform more than 20 hectares (ha) of undeveloped, vacant or derelict land to industrial use (solar PV energy facility and 132kV onsite substation). The proposed PV energy facility is expected to have a footprint area of approximately 246 ha while the onsite substation will require an area of up to approximately 2.25 ha.**

GN R. 985 Item 4	The development of a road wider than 4 metres with a reserve less than 13,5 metres. *(e) In the North West Province* *i Outside urban areas, in:* *(ee) Critical biodiversity areas (Terrestrial Type 1 and 2) as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans*	**Internal roads will be constructed and these are planned to be 5m wide. The project is located within a critical biodiversity area (CBA). Refer to the CBA map in Appendix 5.**
GN R. 985 Item 12	*The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *(a) In the North West Province* *ii. Within critical biodiversity areas identified in bioregional plans*	**More than 300 square metres of vegetation would need to be cleared for the proposed solar PV energy facility, 132kV onsite substation and associated infrastructure. The project is located within a critical biodiversity area (CBA). Refer to the CBA map in Appendix 5.**
GN R. 985 Item 18	*The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *(e) In the North West Province* i *Outside urban areas, in:* *(ee) Critical biodiversity areas (Terrestrial Type 1 and 2) as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans*	**Existing access roads will need to be upgraded in order to access the site. The access roads will be located within a critical biodiversity area (CBA). Refer to the CBA map in Appendix 5.**

3.1.3 Environmental Impact Assessment Guideline for Renewable Energy Projects, DEA Notice 989 of 2015

The purpose of this document is primarily to provide guidance on the environmental management legal framework applicable to renewable energy operations and all the role players in the sector. The guideline is principally intended for use by the following stakeholder groups:

- Public Sector Authorities (as regulator and/or competent authority);
- Joint public sector authorities and project funders, e.g., Eskom, IDC, etc.
- Private Sector Entities (as project funder/developer/consultant);
- Other interested and affected parties (as determined by the project location and/or scope).

This guideline seeks to identify activities requiring authorisation prior to commencement of that activity, and provide an interface between national EIA regulations and other legislative requirements of various authorities.

The guidelines are applicable for the construction, installation and/or development of the following renewable energy projects:

- Concentrating Solar Power Energy facility;
- Wind Farm;
- Hydropower Station; and
- Photovoltaic Power Facility.

As the proposed development is for a photovoltaic energy facility it is subject to the recommendations proposed in the guidelines.

3.1.4 National Energy Act No. 34 of 2008

The National Energy Act (Act no, 34 of 2008), promulgated in 2008, has, as one of its key objectives, the promotion of diversity of supply of energy and its sources. From this standpoint, the Act directly references the importance of the renewable energy (RE) sector, with a mention of the solar energy sector included. The aim is to ensure that the South African economy is able to grow and develop, fast tracking poverty alleviation, through the availability of a sustainable, diverse energy mix. Moreover, the goal is to provide for the increased generation and consumption of RE (Republic of South Africa, 2008).

3.1.5 National Heritage Resources Act No. 25 of 1999

This Act requires all developers to undertake archaeological impact studies whenever any type of development activity is undertaken. Preliminary archaeological impact studies will consequently become a common procedure for all development activities, even if such development may be exempted in terms of the National Environmental Management Act (Act No 107 of 1998).

The law ensures community participation in the protection of national heritage resources and will involve all three levels of government in the management of the country's national heritage. The South African Heritage Resources Agency (SAHRA) will establish and maintain a national policy, strategy plans and standards for heritage resources management and will monitor the system as a whole.

Heritage authorities will assist and co-operate with individuals and organisations concerned with the study, the conservation, promotion and utilisation of national heritage resources. A newly established National Heritage Resources Fund will provide financial assistance for heritage projects.

A heritage assessment has been conducted to explore how the proposed development may impact on heritage resources as protected by the Act.

3.1.6 National Water Act No. 36 of 1998, as amended

The National Water Act (NWA) No 36 of 1998 was promulgated on the 20th August 1998. This Act is important in that it provides a framework to protect water resources against over exploitation and to ensure that there is water for socio-economic and economic development, human needs and to meet the needs of the aquatic environment. The Act also recognises that water belongs to the whole nation for the benefit of all people.

It is important to note that water resources are protected under the Act. Under the act, water resources as defined include a watercourse, surface water, estuary or aquifer. A watercourse is defined as a river or spring, a natural channel in which water flows regularly or intermittently, or a wetland, lake or dam into which, or from which water flows.

One of the main aims of the Act is the protection of water resources. 'Protection' in relation to a water resource entails:

- Maintenance of the quality of the water resource to the extent that the water use may be used in a sustainable way;
- Prevention of degradation of the water resource; and
- The rehabilitation of the water resource.

In the context of the proposed development and any potential impact on water resources, the definition of pollution and pollution prevention contained within the Act is relevant. 'Pollution', as described by the Act is the direct or indirect alteration of the physical, chemical or biological properties of a water resource, so as to make it (*inter alia*):

- less fit for any beneficial purpose for which it may reasonably be expected to be used; or
- harmful or potentially harmful to the welfare or human beings, to any aquatic or non-aquatic organisms, or to the resource quality.

This definition of pollution is quite wide ranging, and it applies to all types of water resource. Activities which cause alteration of the biological properties of a watercourse (i.e. the fauna and flora contained within that watercourse are also considered pollution).

In terms of section 19 of the Act owners / managers / people occupying land on which any activity or process undertaken which causes, or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. These measures may include (inter alia):

- measures to cease, modify, or control any act or process causing the pollution;
- comply with any prescribed waste standard or management practice;
- contain or prevent the movement of pollutants;
- remedy the effects of the pollution; and
- remedy the effects of any disturbance to the bed and banks of a watercourse.

A surface water assessment has been conducted to explore how the proposed development may impact on water resources as protected by the Act.

3.1.7 National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004 as amended)

The overarching aim of the National Environmental Management: Biodiversity Act (NEMBA) No. 10 of 2004, within the framework of NEMA, is to provide for:

- The management and conservation of biological diversity within South Africa, and of the components of such biological diversity;
- The use of indigenous biological resources in a sustainable manner; and
- The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources.

The South African National Biodiversity Institute (SANBI) was established by the NEMBA, its purpose being (*inter alia*) to report on the status of the country's biodiversity and the conservation status of all listed threatened or protected species and ecosystems.

NEMBA provides for a range of measures to protect ecosystems and for the protection of species that are threatened or in need of protection to ensure their survival in the wild, including a prohibition on carrying out a "restricted activity" involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7. Lists of critically endangered, endangered, vulnerable and protected species have been published and a permit system for listed species has been established.

It is also appropriate to undertake a Faunal and Botanical Impact Assessment where proposed developments, in an area that is considered ecologically sensitive, require an environmental authorisation in terms of NEMA, with such Assessment taking place during the basic assessment or EIA. These two studies will be undertaken during the project.

The NEMBA is relevant to the proposed projects as the construction of the solar PV energy facility and other components (such as power lines and the substations) may impact negatively on biodiversity. The project proponent is therefore required to take appropriate reasonable measures to limit the impacts on biodiversity, to obtain permits if required and to also invite SANBI to provide commentary on any documentation resulting from the proposed development.

3.1.8 National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003 as amended)

The overarching aim of the National Environmental Management: Protected Areas Act (NEMPAA) No. 57 of 2003, within the framework of NEMA, is to provide for:

- provide for the declaration and management of protected areas;
- provide for co-operative governance in the declaration and management of protected areas;
- effect a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity;
- provide for a representative network of protected areas on state land, private land and communal land;
- promote sustainable utilisation of protected areas for the benefit of people, in a manner that would preserve the ecological character of such areas;
- promote participation of local communities in the management of protected areas, where appropriate; and
- provide for the continued existence of South African National Parks.

3.1.9 National Forests Act, 1998 (Act No. 84 of 1998)

The National Forest Act (NFA) was enacted to:

- Provide for the protection, management and utilisation of forests;
- The protection of certain plant and animal life;
- The regulation of trade in forest produce;
- The control and management of a national hiking way system and National Botanic Gardens.

The NFA enforces the necessity for a license to be obtained prior to destroying any indigenous tree in a natural forest and, subject to certain exemptions, cutting, disturbing, damaging, destroying or removing any protected tree. The list of protected trees is currently contained in GN 908 of 21 November 2014. Licenses are issued by the Minister and are subject to periods and conditions as may be stipulated.

The NFA is relevant to the proposed project as the removal and/or disturbance and/or clearance of indigenous vegetation may be required and a license in terms of the NFA may be required for this to be done.

3.1.10 Conservation of Agricultural Resources Act No. 43 of 1983

The Conservation of Agricultural Resources Act (CARA) No. 43 of 1983 controls the utilization of natural agricultural resources in South Africa. The Act promotes the conservation of soil, water sources and vegetation as well as the combating weeds and invader plants. The Act has been amended in part by the Abolition of Racially Based Land Measures Act, No. 108 of 1991.

The primary objective of the Act is to conserve natural agricultural resources by:

- maintaining the production potential of land;
- combating and preventing erosion and weakening or destruction of the water resources;
- protecting vegetation; and
- combating weeds and invaders plants.

The CARA is relevant to the proposed projects as the construction of a solar energy facility as well as other components (such as power lines and the substations) may impact on agricultural resources and vegetation on the site. The Act prohibits the spreading of weeds and prescribes control measures that need to be complied with in order to achieve this. As such, measures will need to be taken to protect agricultural resources and prevent weeds and exotic plants from invading the site as a result of the proposed development.

An agricultural potential assessment has been conducted to explore how the proposed development may impact on the agricultural production potential of the proposed site.

3.1.11 Subdivision of Agricultural Land Act No. 70 of 1970, as amended

The Subdivision of Agricultural Land Act No. 70 of 1970 controls the subdivision of all agricultural land in South Africa; prohibiting certain actions pertaining to agricultural land. Under the Act the owner of agricultural land is required to obtain consent from the Minister of Agriculture in order to subdivide agricultural land.

The purpose of the Act is to prevent uneconomic farming units from being created and degradation of prime agricultural land. To achieve this purpose the act also regulates leasing and selling of agricultural land as well as registration of servitudes.

The Act is of relevance to the proposed development as any land within the study area that is zoned for agricultural purposes will be regulated by this Act.

Although the whole of this Act has been repealed by section 1 of the Subdivision of Agricultural Land Act Repeal Act 64 of 1998, this Repeal Act has not been implemented and no date of coming into operation has been proclaimed.

It is important to note that the implementation of this act is problematic as the Act defines 'Agricultural Land' as being any land, except land situated in the area of jurisdiction of a municipality or town council, and subsequent to the promulgation of this Act uninterrupted Municipalities have been established throughout South Africa.

3.1.12 National Road Traffic Act No. 93 of 1996, as amended

The National Road Traffic Act (NRTA) No. 93 of 1996 provides for all road traffic matters and is applied uniformly throughout South Africa. The Act enforces the necessity of registering and licensing motor vehicles. It also stipulates requirements regarding fitness of drivers and vehicles as well as making provision for the transportation of dangerous goods.

All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed solar PV energy facility.

3.1.13 Civil Aviation Act No. 13 of 2009

The Civil Aviation Act No. 13 of 2009 controls and regulates aviation within South Africa. It provides for the establishment of a South African Civil Aviation Authority and independent Aviation Safety Investigation Board in compliance with Annexure 13 of the Chicago Convention. It gives effect to various conventions related to aircraft offences, civil aviation safety and security, and provides for additional measures directed at more effective control of the safety and security of aircrafts, airports and matters connected thereto.

Although the Act is not directly relevant to the proposed development, it should be considered as the establishment of a photovoltaic energy facility may impact on aviation and air traffic safety if located directly within aircraft flight paths.

ATNS (Air Traffic and Navigation Services Company Limited) and the Civil Aviation Authority will be consulted and the required approvals will be obtained.

3.1.14 Additional Relevant Legislation

- Occupational Health and Safety Act No. 85 of 1993
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008 as amended)
- Development Facilitation (Act No. 67 of 1995)
- The Hazardous Substances Act (Act No. 15 of 1973)
- Water Services Act (Act No. 108 of 1998)
- Electricity Regulation Act (Act No. 4 of 2006 as amended)
- Municipal Systems Act (Act No. 32 of 2000)
- Mineral and Petroleum Resource Development Act (Act No. 28 of 2002 as amended)
- North West Entrepreneurial Development and Sustainable Resources Utilization Act, 2003, as amended
- North West Parks and Tourism Board Act (Act. No. 3 of 1997)

3.2 Key Development Strategies and Guidelines

3.2.1 Integrated Development Plans

An Integrated Development Plan (IDP) is defined in the Local Government: Municipal Systems Act No. 32 of 2000), as an inclusive and strategic plan that:

- Links, integrates and co-ordinates plans and takes into account proposals for the development of the municipality;
- Aligns the resources and capacity of the municipality with the implementation of the plan
- Forms the policy framework on which annual budgets must be based; and
- Is compatible with national and provincial development plans and planning requirements binding on the municipality in terms of legislation.

The main purpose of the IDP is considered the enhancement of service delivery and fighting poverty through an integrated and aligned approach between different role-players and stakeholders.

Each municipality is required to produce an IDP which would address pertinent issues relevant to their municipality. However, common concerns include municipal transformation and development, and service delivery and infrastructural development.

The proposed solar PV energy facility and onsite substation falls within the Ditsobotla Local Municipality (LM), which is located within the greater Ngaka Modiri Molema District Municipality (DM). The Ditsobotla LM IDP for 2011/12 – 2015/16 details the LM's objectives and strategies, among these is the provision of the expansion of the current load supply to the CBD in order to aid the expansion of the property and

business markets. Aligned with this is the identification of “low energy resources” as a critical economic factor impacting on the municipality’s ability to achieve its growth and development objectives. It is therefore evident that the proposed development is aligned with the goals of the municipal IDP in the study area.

3.2.2 Draft Integrated Energy Plan for the Republic of South Africa, 2013

The Draft Integrated Energy Plan (IEP), developed by the DoE, was undertaken to determine the best way to meet current and future energy service needs in the most efficient and socially beneficial manner, while:

- Maintaining control over economic costs;
- Serving national imperatives such as job creation and poverty alleviation; and
- Minimising the adverse impacts of the energy sector on the environment.

The IEP takes into consideration the crucial role that energy plays in the entire economy and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple objectives, some of which include:

- To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector;
- To guide the selection of appropriate technologies to meet energy demand (i.e. the types and sizes of new power facilities and refineries to be built and the prices that should be charged for fuels);
- To guide investment in and the development of energy infrastructure in South Africa; and
- To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors.

3.2.3 Integrated Resource Plan, 2010 and updated 2013

The Integrated Resource Plan (IRP) was created in order to plan for projected national electricity demand. Whilst the medium-term power generation mix will continue to lean heavily on the use of fossil fuels, the Revised Balanced Scenario (RBS) of the 2010 Integrated Resource Plan (IRP) includes for a total additional supply capacity of 17.8GWh from renewable sources by 2030. It recommends continuing with the current renewable bid programme with additional annual rounds (of 1000 MW PV capacity; 1000 MW wind capacity and 200 MW CSP capacity), with the potential for hydro at competitive rates.

3.2.4 Department of Energy White Paper on Renewable Energy, 2003

The Department of Energy (DoE) gazetted its White Paper on Renewable Energy in 2003, and introduced it as a "policy that envisages a range of measures to bring about integration of renewable energies into the mainstream energy economy." At that time the national target was fixed at 10 000GWh (0.8Mtoe) renewable energy contribution to final energy consumption by 2013. The White Paper proposed that this would be produced mainly from biomass, wind, solar and small-scale hydropower. It went on to recommend that this renewable energy should to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. Since the White Paper was gazetted, South Africa's primary and secondary energy requirements have remained heavily fossil-fuel dependant, both in terms of indigenous coal production and use, as well as the use of imported oil resources. Alongside this, the projected electricity demand of the country has led the National utility Eskom, to embark upon an intensive build programme to secure South Africa's longer-term energy needs, together with an adequate reserve margin.

3.2.5 Independent Power Producer Process

(The following information was extracted from the Eskom website: Guide to Independent Power Producer (IPP) processes in South Africa and Eskom**,** June 2010
http://www.eskom.co.za/live/content.php?Item_ID=14324)

The objective of this section is to provide an overview of the processes in the country and within Eskom relating to Independent Power Producers (IPPs). It is important that certain enabling policies, rules and regulations are in place to provide certainty and transparency in the introduction of IPPs.

- Country Process

South Africa has two acts that direct the planning and development of the country's electricity sector:

i. The National Energy Act of 2008 (No. 34 of 2008); and
ii. The Electricity Regulation Act (ERA) of 2006 (No. 4 of 2006).

In August 2009, the Department of Energy (DoE) gazetted the Electricity Regulations on New Generation Capacity under the ERA. The New Generation Regulations establish rules and guidelines that are applicable to the undertaking of an IPP Bid Programme and the procurement of an IPP for new generation capacity. They also facilitate the fair treatment and non-discrimination between IPPs and the buyer of the energy.

- Formal Programmes

In terms of the New Generation Regulations, the Integrated Resource Plan (IRP) developed by the DoE sets out the new generation capacity requirement per technology, taking energy efficiency and the demand-

side management projects into account. This required, new generation capacity must be met through the technologies and projects listed in the IRP and all IPP procurement programmes will be executed in accordance with the specified capacities and technologies listed in the IRP. The table below highlights the energy plan that has been proposed until 2030.

Table 6: Government Energy Plans up until 2030 in terms of the IRP

New Build Options								
	Coal	**Nuclear**	**Import Hydro**	**Gas - CCGT**	**Peak - OCGT**	**Wind**	**CSP**	**Solar PV**
2010	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	300
2013	0	0	0	0	0	0	0	300
2014	500	0	0	0	0	400	0	300
2015	500	0	0	0	0	400	0	300
2016	0	0	0	0	0	400	100	300
2017	0	0	0	0	0	400	100	300
2018	0	0	0	0	0	400	100	300
2019	250	0	0	237	0	400	100	300
2020	250	0	0	237	0	400	100	300
2021	250	0	0	237	0	400	100	300
2022	250	0	1143	0	805	400	100	300
2023	250	1600	1183	0	805	400	100	300
2024	250	1600	283	0	0	800	100	300
2025	250	1600	0	0	805	1600	100	1000
2026	1000	1600	0	0	0	400	0	500
2027	250	0	0	0	0	1600	0	500
2028	1000	1600	0	474	690	0	0	500
2029	250	1600	0	237	805	0	0	1000
2030	1000	0	0	948	0	0	0	1000
	6250	**9600**	**2609**	**2370**	**3910**	**8400**	**1000**	**8400**

A decision that additional capacity be provided by an IPP must be made with the concurrence of the Minister of Finance. Once such a decision is made, a procurement process needs to be embarked upon to procure that capacity in a fair, equitable and transparent process.

The New Generation Regulations set out the procurement process. The stages within a bid programme are prescribed as follows:

i. Request for Qualifications (RFQ)
ii. Request for Proposals (RFP)
iii. Negotiation with the preferred bidder(s).

A successful bidder will be awarded a Power Purchase Agreement (PPA) subject to approval by the Regulator.

3.2.6 Renewable Energy Strategy for the North West Province

The Renewable Energy Strategy for the North West Province (RES NWP) was released by the Department of Economic Development, Environment, Conservation and Tourism (DEDECT) in December 2012. It was developed in in response to the need of the North West Provinces to participate meaningfully within the renewable energy sector of South Africa. The renewable energy strategy aims to improve the North West Province's environment, reduce the North West Province's contribution to climate change, and alleviate energy poverty, whilst promoting economic development and job creation in the province whilst developing its green economy. This strategy attempts to focus the efforts of all stakeholders and provides a foundation to make the North West Province a primary contributor towards the renewable energy sector within South Africa. The RES NWP states that the North West province has a very good solar potential with an average daily solar radiation greater than 8,000 MJ/m^2.

3.2.7 North West Provincial Growth and Development Strategy, 2004 to 2014

The North West Provincial Growth and Development Strategy provides a framework for integrated and sustainable growth and economic development for the province and its people over the next ten years. It addresses the formulation of a common vision, goals and objectives of what should be achieved and how the provincial government and its social partners should achieve its objectives. The Strategy establishes the foundation blocks from where the Provincial Programme of Action is negotiated in partnership with a variety of stakeholders in the province. It forms the benchmark from which progress and achievements are monitored and evaluated. The strategy identifies several growth and economic development pillars, ones of which is Mining and Energy.

3.2.8 North West Provincial Development Plan, 2013

The North West Provincial Development Plan (PDP) is predominantly based on the National Development Plan (NDP) in an attempt to align with the objectives and priorities it identifies as well as with the vision for 2030 of a united South-Africa. In the North West province eight of the priorities identified in the National Development Plan (NDP) were identified as key focus areas for the North West Provincial Development Plan (PDP). The selected focus areas represent the main challenge areas hampering growth in the province. The chosen development priorities with which the North West intends to align to the National Development Plan (NDP) include the following:

1. Economy and employment

2. Economic infrastructure

The PDP encourages diversification of the economic base, including in industries such as renewable energy. Expanding renewable energy, with special reference to solar power, is one of the stated actions aimed at addressing economic infrastructure. The renewable energy sector is also highlighted as having potential to create jobs in the province.

3.2.9 The Ngaka Modiri Molema DM Integrated Development Plan (2015/16)

The Ngaka Modiri Molema DM Integrated Development Plan (IDP) (2015/16) states the DM's mission as "To provide a developmental municipal governance system for a better life for all in the Ngaka Modiri Molema DM". The following have been listed as priorities for the IDP (Ngaka Modiri Molema District Municipality, 2012):

- Provision of water and sanitation;
- Improvement of local road infrastructure;
- Local economic development and job creation;
- Environmental health management;
- Promote integration of services;
- Promote intergovernmental coordination and relations; and
- Support local municipalities.

The IDP also finds that the following are the DM's most prominent development challenges:

- In general, the DM is significantly under-serviced in terms of social as well economic infrastructure;
- The area is large, with respect to, any settlements across various municipalities;
- Such dispersed settlement patterns impact on the cost of erecting, operating, and maintaining infrastructure;
- The affordability of infrastructure is further impacted by the level of poverty and human development issues;
- The most economically active and productive individuals are drawn away from the DM;
- The structure of the economy requires an overhaul through targeted and accelerated interventions; and
- Diversification of the economy, while maintaining the triple bottom-line principle, is critical.

In the 2015 adaption of the IDP, the Environmental Management Framework and State of the Environment Report are discussed briefly. The adapted 2015 – 2016 IDP states that the plan is currently under review but will include a comprehensive analysis of key emerging issues, such as the opportunity for alternative energy in the DM, as these issues will impact on the future state of the environment. Also related to the proposed project is the discussion around the DM's Rural Development Strategy, with the objective of

facilitating integrated development and social cohesion through participatory approaches in partnership with all sectors of society. The strategy aims to stimulate rural development and food security by creating vibrant, equitable, and sustainable rural communities. Some of the measures that could be used to achieve this may include (Ngaka Modiri Molema District Municipality, 2015):

- Creating business opportunities;
- Decongestion and rehabilitation of overcrowded rural areas;
- Expanding opportunities for youth, women, people with disabilities, and older people from rural areas; and
- Addressing issues such as; creation of decent jobs, as well as the development of road infrastructure. All key factors in achieving economic growth and development.

3.2.10 The Ditsobotla LM Integrated Development Plan (2011/12 – 2015/16)

According to the Ditsobotla LM Integrated Development Plan (IDP) (2011/12 – 2015/16), the municipality's electricity provision is a joint function of the Ditsobotla LM and Eskom, with the DM being licensed to provide electricity to Lichtenburg, Blydeville, and Coligny. It furthermore states that areas without access to electricity is mostly located in the rural regions, such as Grasfontein and Bakerville, and that universal electrification will be addressed by a joint planning programme between the LM and Eskom. The IDP also states that there is a need for renovation and/or replacement of the electrical infrastructure in the Lichtenburg CBD as this infrastructure is old. There is also a requirement for the provision of the expansion of the current load supply to the CBD in order to aid the expansion of the property and business markets. Aligned with this is the identification of "low energy resources" as a critical economic factor impacting on the municipality's ability to achieve its growth and development objectives (Ditsobotla Local Municipality, 2011).

The LM's Spatial Development Framework (SDF) of 2006 is available in a summary format in the IDP document. If required, attempts will be made during the EIA-phase of the project to obtain the full SDF document. Regardless, the IDP does provide some insight into the LM's spatial goals and objectives.

The SDF takes the approach of developmental clusters, referring to a grouping of more than one settlement within the LM. One such cluster is the Lichtenburg cluster, which includes the settlements of Lichtenburg, Boikhutso, and Blydeville. The relatively high percentage of the population residing in rural areas in the region, as well as various land claims is likely to cause a unique service delivery scenario for the LM and all of its developmental clusters, not least the Lichtenburg cluster (Ditsobotla Local Municipality, 2011).

Directly north of Lichtenburg (the proposed project location is located north-west of Lichtenburg) lies the Lichtenburg Game Breeding Centre. The SDF has identified this area as an ideal location for the potential development of the Open Space System in the LM; however, the extensive diamond mining located north of the Lichtenburg Game Breeding Centre in Bakerville, Grasfontein, and Carlsonia, goes against this

proposal. Similarly, the area south west of Lichtenburg, where the upper catchment area of the Hartriver is located, has also been earmarked as important for protection. This area is the origin of the Hartsriver, traversing a number of other municipalities in the western parts of the North West Province. Moreover, the Hartsriver feeds into Barperspan, which is an international RAMSAR site (i.e. wetlands of international importance). It is therefore, important that this catchment area, the river, and adjacent areas are protected from undesirable developments. The north western parts of the LM are characterised by abandoned, un-rehabilitated diamond mining activities, or extensive farming activities focused predominantly on livestock grazing. (Ditsobotla Local Municipality, 2011).

The IDP also provides some feedback on the spatial development strategies set out in the 2006 SDF. Urban integration is an important strategy, aimed at moving away from the fragmented urban structure currently prevalent within the Ditsobotla LM. The vision is that a more compact system will lead to more cost-effective municipal services and public transportation infrastructure. It goes on to state that an important factor in achieving a more desirable urban settlement pattern is the provision of bulk infrastructure development in a rationalised manner. Just as important as the extension of the network, is ensuring that the existing infrastructure has sufficient capacity to deal with expected future development pressures. Upgrading of the existing electricity network in Lichtenburg, as the economic core of the municipality, is required to ensure that the expected residential and economic growth can be accommodated.

Although no mention is made of the potential for RE projects in the Ditsobotla LM, the inference is that the implementation and operation of the proposed Tlisitseng Solar PV project will assist in the extension and strengthening of the electrical network in the region and beyond, thereby aiding in ensuring that the LM is able to accommodate the envisioned growth and development.

4 PROJECT NEED AND DESIRABILITY

4.1 National Renewable Energy Requirement

In 2010 South Africa (SA) had 44, 157MW of power generation capacity installed. Current forecasts indicate that by 2025, the expected growth in demand will require the current installed power generation capacity to be almost doubled to approximately 74,000MW (SAWEA: 2010).

This growing demand, fuelled by increasing economic growth and social development within Southern Africa, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmental impact, climate change and the need for sustainable development. Despite the worldwide concern regarding GHG emissions and climate change, South Africa continues to rely heavily on coal as its primary source of energy, while most of the country’s renewable

energy resources remain largely untapped (DME, 2003). There is therefore an increasing need to establish a new source of generating power in SA within the next decade.

The use of renewable energy technologies, as one of a mix of technologies needed to meet future energy consumption requirements is being investigated as part of Eskom's long-term strategic planning and research process. It must be remembered that solar energy is plentiful, renewable, widely distributed, clean and reduces greenhouse gas emissions when it displaces fossil-fuel derived from electricity. In this light, renewable solar energy can be seen as desirable.

4.2 National Renewable Energy Commitment

In support of the need to find solutions for the current electricity shortages, the increasing demand for energy, as well as the need to find more sustainable and environmentally friendly energy resources, South Africa has embarked on an infrastructure growth programme supported by various government initiatives. These include; the National Development Plan (NDP), the Presidential Infrastructure Coordinating Commission (PICC), the Department of Energy's Integrated Resource Plan, the National Strategy for Sustainable Development, the National Climate Change Response White Paper, the Presidency of the Republic of South Africa's Medium-Term Framework, and the National Treasury's Carbon Tax Policy Paper.

The Government's commitment to growing the renewable energy industry in South Africa is also supported by the *White Paper on Renewable Energy* (2003) which sets out the Government's principals, goals and objectives for promoting and implementing renewable energy in South Africa. In order to achieve the long term goal of achieving a sustainable renewable energy industry, the Department of Energy has set a target of contributing 17,8*GW* of renewable energy to the final energy consumption by 2030. This target is to be produced mainly through, wind and solar; but also through biomass and small scale hydro (DME, 2003; IRP, 2010).

4.3 Solar PV Power Potential in South Africa and Internationally

Internationally, PV is the fastest-growing power generation technology, South Africa has some of the highest levels of solar radiation in the world and as much as 8GW PV could potentially be installed by 2020 (DEA Guideline for Renewable Energy, 2013). Between 2000 and 2009 the installed capacity globally grew on average by 60% per year. Worldwide more than 35GW of PVs are installed and operating, and in South Africa as much as 8GW PV could potentially be installed by 2020.

4.4 Site Specific Suitability

According to the solar map (**Figure 5**) the North West Province of South Africa has a solar energy concentration of between 8001 and 9000 MJ/m^2. The North West is the province in South Africa with the second highest solar potential. The project site falls within the range of 8501 – 9000 MJ/m^2 and is thus suitable for the establishment of the solar PV energy facility. Based on an estimation of the solar energy resource as well as weather, dust, dirt, and surface albedo, pre-feasibility studies conducted by BioTherm have identified the site as optimal for the proposed Tlisitseng solar PV project.

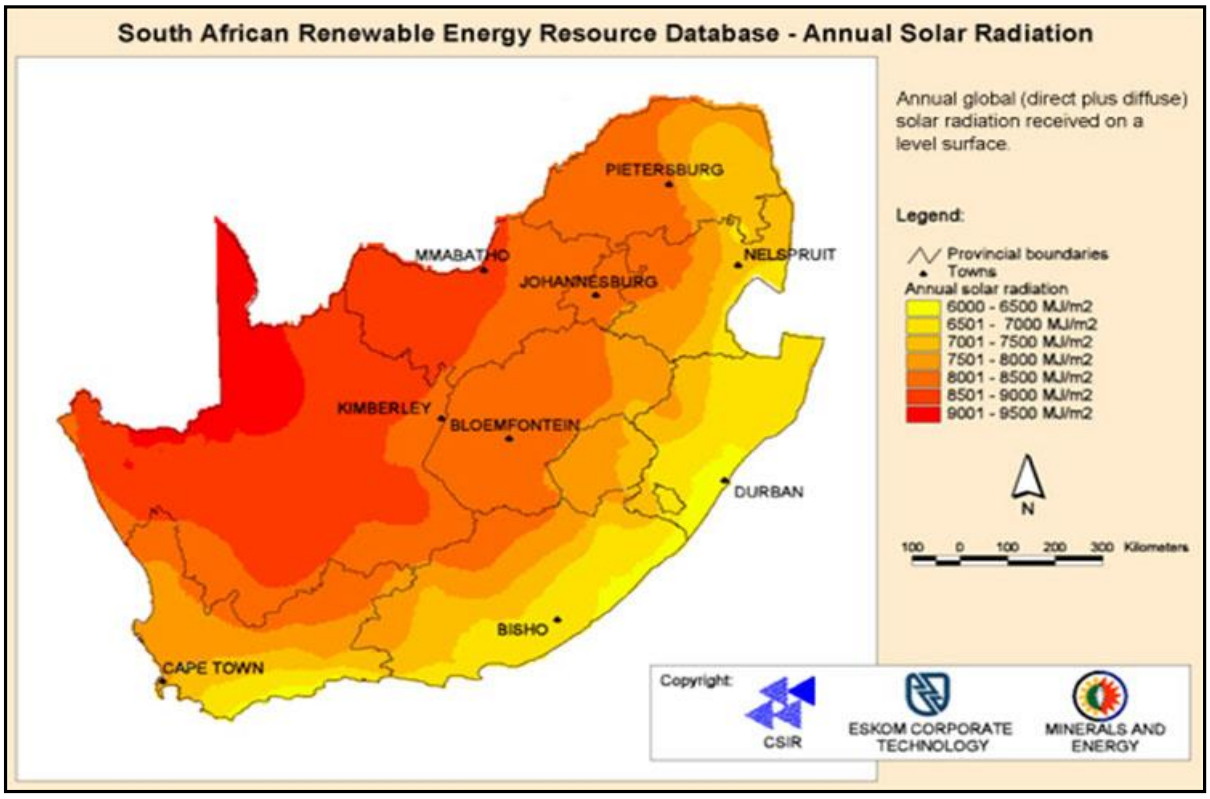

Figure 5: National Solar Resource Map (Source: Solar Vision, 2010)

The proposed solar PV energy facility is situated on the farm Portion 25 of the Farm Houthaalboomen No 31. Portion 25 of the Farm Houthaalboomen No 31 is used for cattle farming and irrigated agricultural activities such as maize farming. In addition, irrigated agricultural activities are also taking place on surrounding farm portions as well as scattered farm houses. Four (4) workers currently reside in two (2) houses on the farm. It is expected that the land under maize (86ha) will be unaffected by the proposed project. The cattle's grazing area will however be affected as the farmer plans to use the rental payment from BioTherm to acquire land elsewhere so that the scale of his cattle farm does not have to be reduced. Land is regularly available in the area. The two (2) permanent houses located within the proposed development area will need to be moved. BioTherm will however reimburse the individuals affected by this.

Should infrastructure changes be required the farmer understands that BioTherm will offer reimbursements. It must also be noted that the landowner is in support of the project as he understands the importance of building generation capacity. The site is therefore considered to be suitable from a land use perspective.

The project site near Lichtenburg has been identified through pre-feasibility studies based on the solar resource. Grid connection and land availability were also important initial considerations. The project site has a relatively flat topography that is suitable for facilities of this kind. The project site also has advantageous grid connection potential, with the existing Watershed MTS which is located adjacent to the affected farm. The project site is easily accessible as the tarred R505 road transects the farm and connects to the N14 national road which leads to the R503, Lichtenburg.

4.5 Local Need

The Renewable Energy Policy for the North West Province acknowledges that the province is the country's fourth biggest electricity user, with the bulk of this usage taking place in the mining sector. In addition to the job creation opportunities that could ensue from the creation of an RE industry in the province, the RE Policy recognises the impact that this would have on the province's contribution towards a green South Africa. More specifically, the North West RE Policy mentions the opportunities for the province in the solar energy sphere, making specific reference of the fact that the Ngaka Modiri Molema DM represents one of the best regions in the province for the exploration of the possibility of a solar energy industry (Department of Economic Development, Environment, Conservation, and Tourism, 2012).

Concerning spatial planning policy, the NSDP identifies the Mafikeng-Lichtenburg area as one of South Africa's key economic centres, highlighting the fact that the area is characterised by an undiversified economy, high migration towards certain areas, and marginalisation of the poor. Policy makers believe that coordinated government interaction is required to address the challenges facing the country's municipalities. It specifically recommends exploring the possibilities of using natural resources to generate economic growth and address poverty, as well as seeking out new areas of comparative advantage (The Presidency of the Republic of South Africa, 2006); these are all aligned to exploration and the establishment of a solar energy industry in the North West Province. The North West PSDF – EMP highlights the fact that large parts of the Province are still underdeveloped, under-resourced, and under-serviced. It follows the NSDP in stating that the Province's natural resources must be effectively used to address this and other developmental challenges, such as high illiteracy levels and rapid urbanisation, for example, in a sustainable manner.

The review of applicable socio-economic development policies state the importance of the RE sector, as well as solar electricity in addressing climate change issues while achieving job growth and economic development. The NDP identifies the expansion and acceleration of a commercial RE sector as a key intervention strategy in order to ultimately eliminate poverty and reduce inequality (National Planning

Commission, 2011). The North West PDP focusses on the rural economy and the transformation of human settlements. It identifies the RE sector, specifically solar and biomass initiatives, as becoming increasingly important in the province, especially since its contribution to the province's consumption will become increasingly important over the next two decades (North West Planning Commission, 2013).

Local level policy documents reveal that some of the biggest socio-economic challenges faced by the study community include: an under-serviced region in terms of social as well as economic infrastructure, undesirable settlement patterns, and a relatively undiversified economy (Ngaka Modiri Molema District Municipality, 2015). The Ditsobotla LM states that the identification of low energy resources is a critical factor of the LM's ability to achieve its growth and development objectives.

5 DESCRIPTION OF THE RECEIVING ENVIRONMENT

The North West Province is considered to be a suitable region for the establishment of a solar PV energy facility. Accordingly, a land portion located near Lichtenburg has been identified as a potential site. A general description of the study area is outlined in the section below. The receiving environment in relation to each specialists study is also provided.

5.1 Regional Locality

The proposed project is located within the North West Province approximately 8km north-west of Lichtenburg. It falls within the Ditsobotla Local Municipality that forms part of the Ngaka Modiri Molema District Municipality (**Figure 6**). The proposed solar PV energy facility and 132kV onsite substation will be accessed by the R505 which traverses the site. The centre point co-ordinates for the development site and the substation assessment area as well as the start and end point coordinates for the power line alternatives, are included in **Table 7** and **Table 8**.

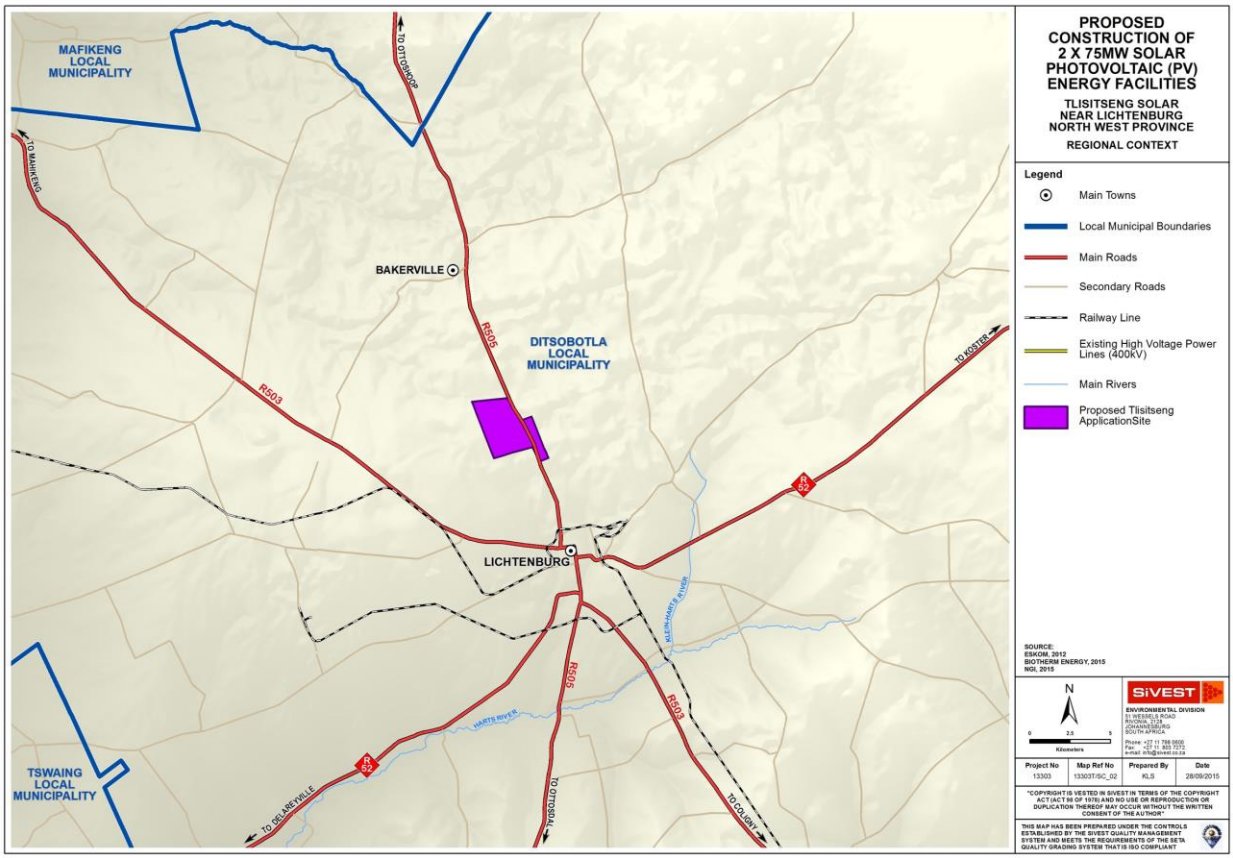

Figure 6: Regional Study Area.

5.2 Study Site Description

The site that is proposed for the Tlisitseng 1 solar PV energy facility near Lichtenburg is located on the following farm:

- Portion 25 of the Farm Houthaalboomen No 31, cadastral number: T0IP00000000003100025

Table 7: Application Site Location

TLISITSENG PV APPLICATION SITE				
NORTH-WEST CORNER	**NORTH-EAST CORNER**	**CENTRE POINT**	**SOUTH-WEST CORNER**	**SOUTH-EAST CORNER**
S26° 3' 46.260"	S26° 3' 38.304"	S26° 4' 41.311"	S26° 5' 39.732"	S26° 5' 38.292"

E26° 5' 42.756"	E26° 7' 2.100"	E26° 7' 5.734"	E26° 6' 32.976"	E26° 8' 34.116"

Table 8: PV Array and Development Area

DEVELOPMENT AREA			
PHASE	**AREA (HECTARES)**	**CENTRE POINT COORDINATES (DD MM SS.sss)**	
		SOUTH	**EAST**
TLISITSENG SOLAR 1 DEVELOPMENT AREA	246.191	S26° 5'1.243"	E26° 6' 41.674"

PV ARRAYS		
PHASE	**CENTRE POINT COORDINATES (DD MM SS.sss)**	
	SOUTH	**EAST**
TLISITSENG SOLAR 1 PV ARRAY AREA	S26°4' 54.430"	E26° 6' 44.117"

Please note that all maps within the report are included in **Appendix 5** and are in A3 format.

The application site as shown on the locality map below comprises Portion 25 of the Farm Houthaalboomen No 31 which is approximately 1024 ha in extent. The proposed Tlisitseng 1 75MW energy facility layout will require approximately 246 ha, with the proposed Tlisitseng 1 132kV onsite substation requiring up to approximately 2.25 ha (**Figure 7**). The entire application site has been assessed during the scoping phase. Portion 25 of the Farm Houthaalboomen No 31 is used for cattle breeding and irrigated agricultural activities such as maize farming. In addition, irrigated agricultural activities also take place on surrounding farm portions as well as scattered farm houses. The land under maize will be unaffected while the cattle's grazing area will be affected. However, the farmer plans to use the rental payment from BioTherm to acquire land elsewhere so that the scale of his cattle farm does not have to be reduced. Land is regularly available in the area. It should however be noted that the farmer will only receive rental payment once construction of the proposed development commences. The farmer will acquire land elsewhere between the Preferred Bidder and Financial Close phases and will relocate his cattle to this land at his own cost. In addition, the farmer will be given sufficient time in order to do this. There are four (4) workers that reside in two (2) houses on the farm. The two (2) permanent houses within the proposed development area will need to be moved and some infrastructure changes will need to take place. BioTherm will however offer reimbursements for this. The land owner is in support of the project. The proposed development will therefore have very little impact on current land use on the affected farm.

Preliminary layouts are discussed in **Chapter 7** of the DSR and are presented in the EIA plan of study in **Chapter 11** of this report. These will be assessed in detail during the EIA phase, and refined to avoid sensitive areas as required.

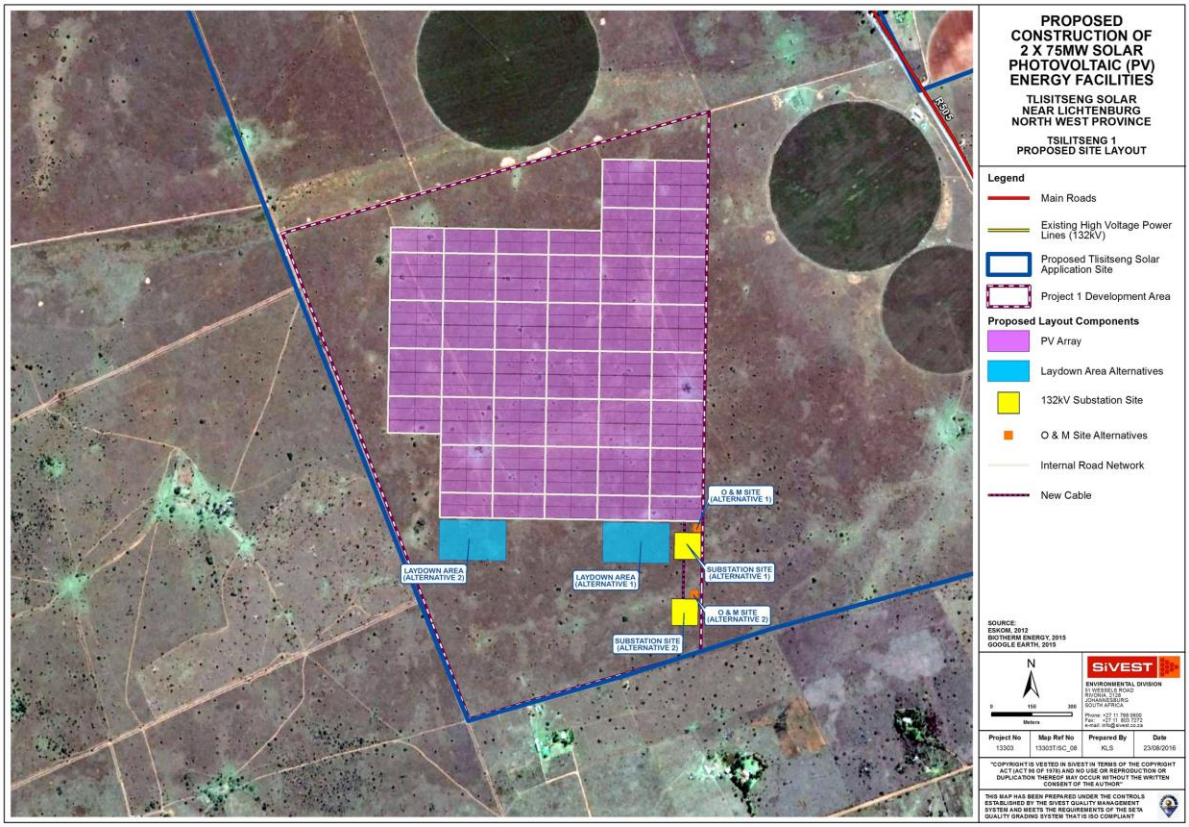

Figure 7: Site layout

5.3 Topography

The topography of the study site and surrounds is shown below (**Figure 8**). The topography within and in the immediate vicinity of the proposed application site is characterised by a flat to gently undulating landscape. The topography in the wider study area is largely characterised by level plains with little noticeable relief and very gradual slopes. In general, the study area slopes down in a southerly direction towards the town of Lichtenburg. The degree of slope of the site and surrounding area are shown in **Figure 9**.

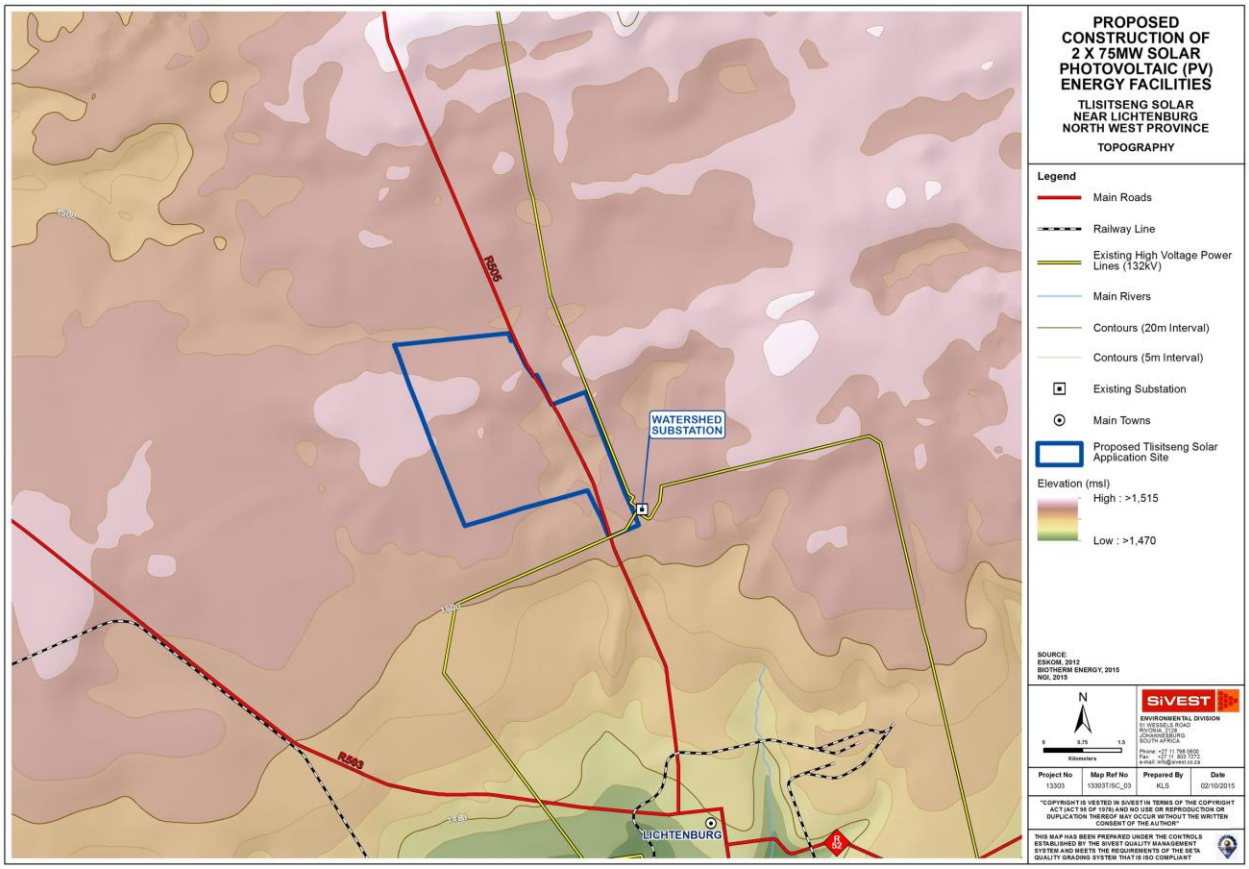

Figure 8: Topography of the study area.

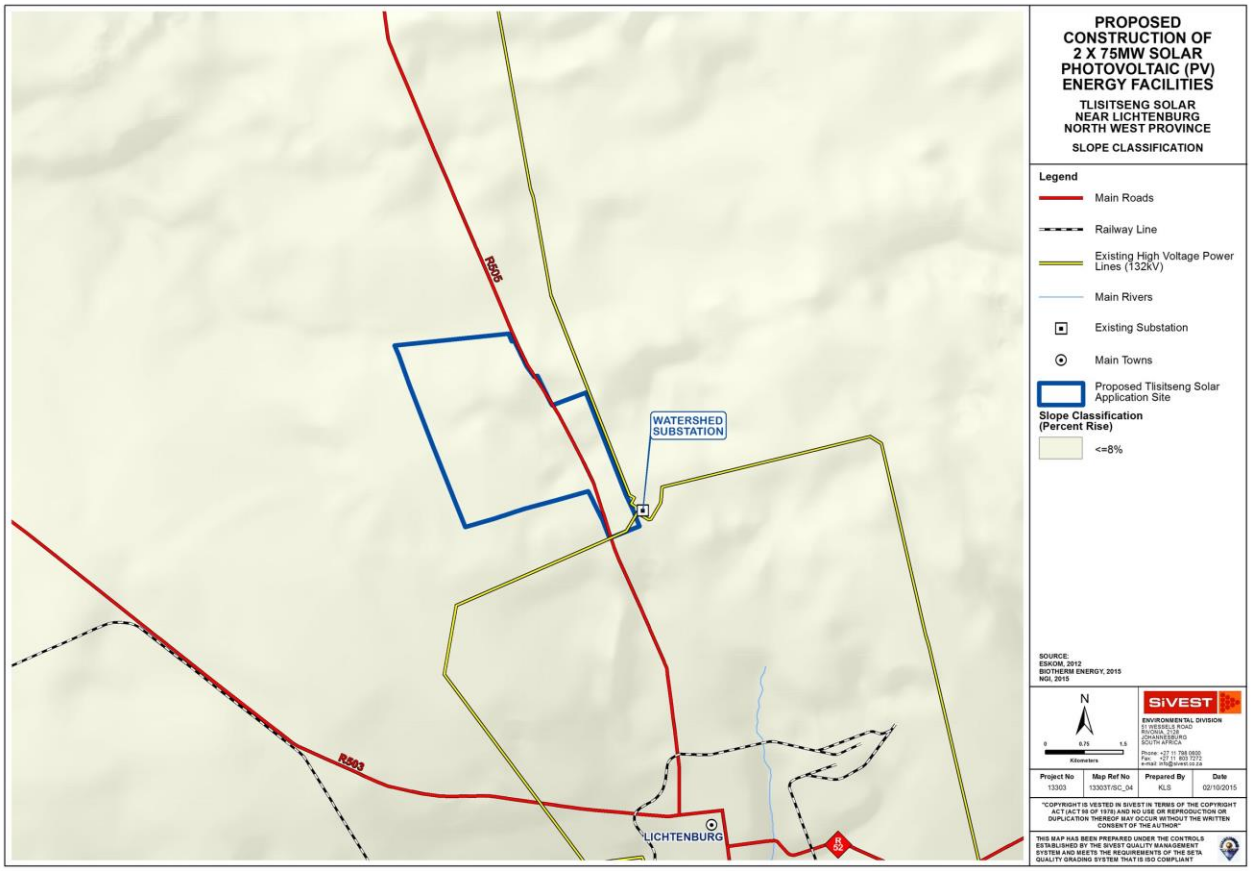

Figure 9: Degree of slope in region of the study area.

5.4 Geology

The geology of the area comprises dolomite of the Malmani Formation (Geological Survey, 1984).

The distribution of the geological units in the area is shown in **Figure 10** below.

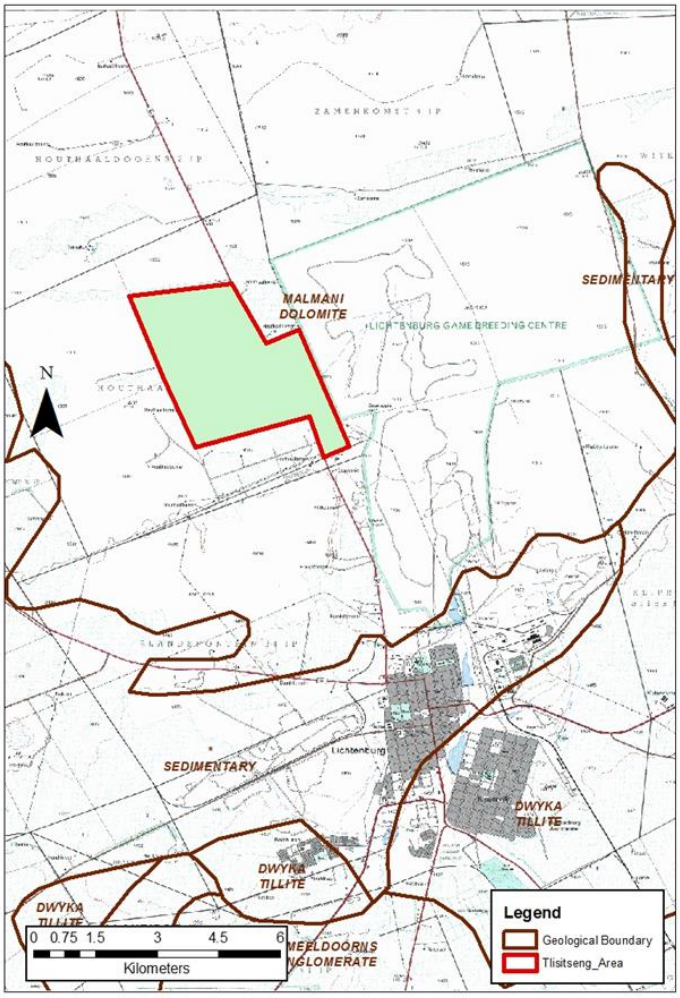

Figure 10: Geological units in the region of the study area

5.5 Land Use

Much of the assessment area is characterised by natural unimproved vegetation (**Figure 11**). Cultivated land is largely concentrated on the western boundary of the study area, with smaller, scattered patches of cultivation evident throughout the study area. Maize is the main crop produced in the area with both dryland and irrigated farming practises in evidence.

Human influence is also visible in the form of the R505 main road which traverses the study area in a north-west to south-east direction as well as electricity transmission infrastructure comprising three (3) 132kV power lines feeding into the Watershed MTS. In addition, there are some relatively small scale mining/quarrying activities in the study area.

The closest built-up area is the agricultural town of Lichtenburg, which is located approximately 5km south of the application site. Urban development on the outskirts of Lichtenburg comprises a mix of commercial, light/service industrial and residential development as well as road and rail infrastructure largely concentrated on the eastern side of the R505 main road.

A large portion of the study area situated to the east of the R505 has been demarcated as the Lichtenburg Game Breeding Centre, a largely untransformed area which offers game drives and limited accommodation facilities for visitors.

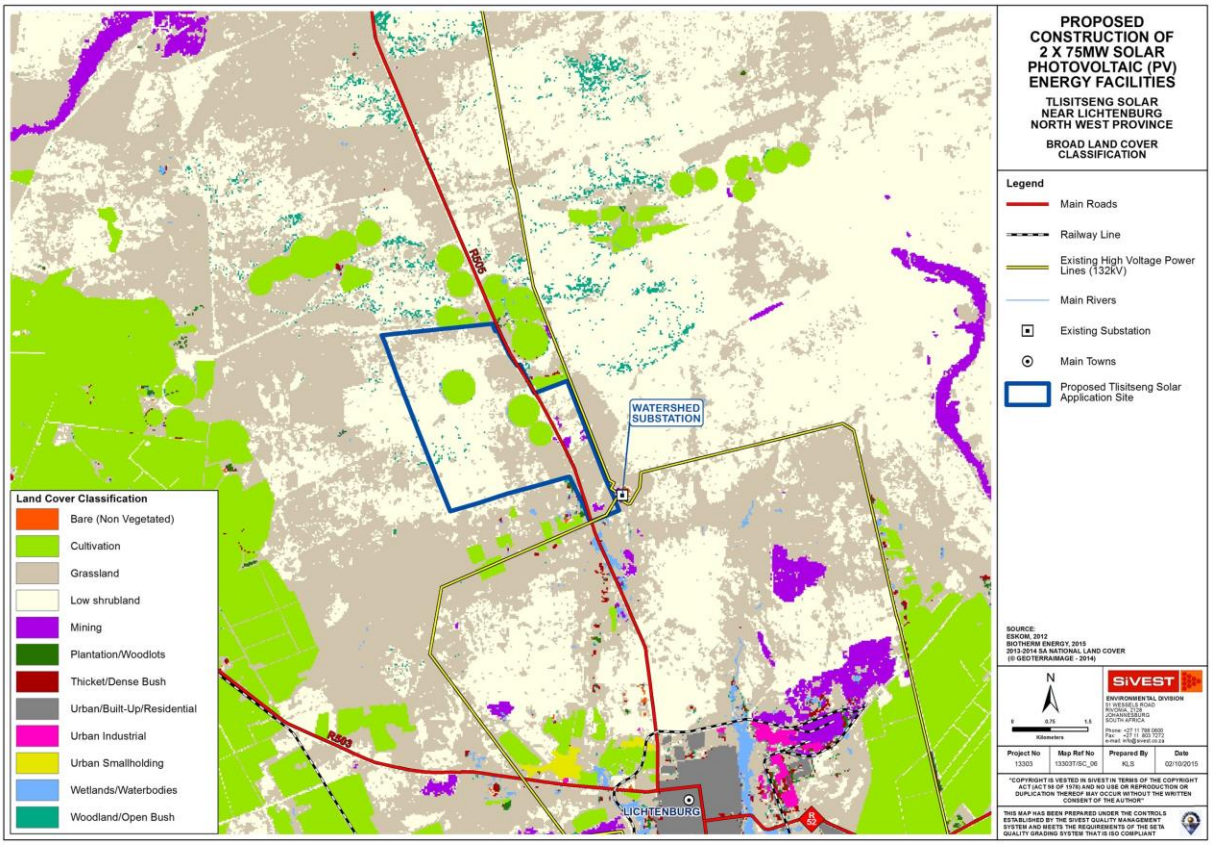

Figure 11: Land use in the region of the study area.

5.6 Climate

The climate of the study area (Kotze & Lonergan, 1984) can be regarded as warm to hot with moist summers and dry winters. The long-term average annual rainfall is 545 mm, of which 452 mm, or 83%, falls from October to March. The average evaporation over the same period is 2 335 mm. Temperatures vary from an average monthly maximum and minimum of 31.1ºC and 16.2ºC for January to 17.6ºC and 2.0ºC

for July respectively. The extreme high temperature that has been recorded is 36.0ºC and the extreme low –4.1ºC.

5.7 Biodiversity

The Biodiversity Assessment was conducted by David Hoare and is included as **Appendix 6A**. The environmental baseline from a biodiversity perspective is presented below.

5.7.1 Landuse and landcover of the study area

A landcover map of the study area (Fairbanks *et al.* 2000) indicates that the study consists of natural vegetation, classified as “thicket and bushland”. The 1:50 000 topocadastral map of the site and a Google image of the site (**Figure 12**) show essentially the same pattern. There is a cluster of farm buildings within the site, otherwise the entire site consists of natural habitat.

Figure 12: Aerial image of the study area.

5.7.2 Broad vegetation types of the region

The sites fall within the Grassland Biome (Rutherford & Westfall 1986, Mucina & Rutherford 2006). The most recent and detailed description of the vegetation of this region is part of a national map (Mucina, Rutherford & Powrie, 2005; Mucina *et al*. 2006). This map shows one vegetation type occurring within the area of interest, Carletonville Dolomite Grassland. This vegetation type is described in more detail below.

- Carletonville Dolomite Grassland

This vegetation type is found mainly in the North-West Province but also in Gauteng and marginally in the Free State Province. It is found in the region of Potchefstroom, Ventersdorp and Carletonville, extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in Gauteng Province. Carletonville Dolomite Grassland is characterised by slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands form a complex mosaic pattern dominated by many species.

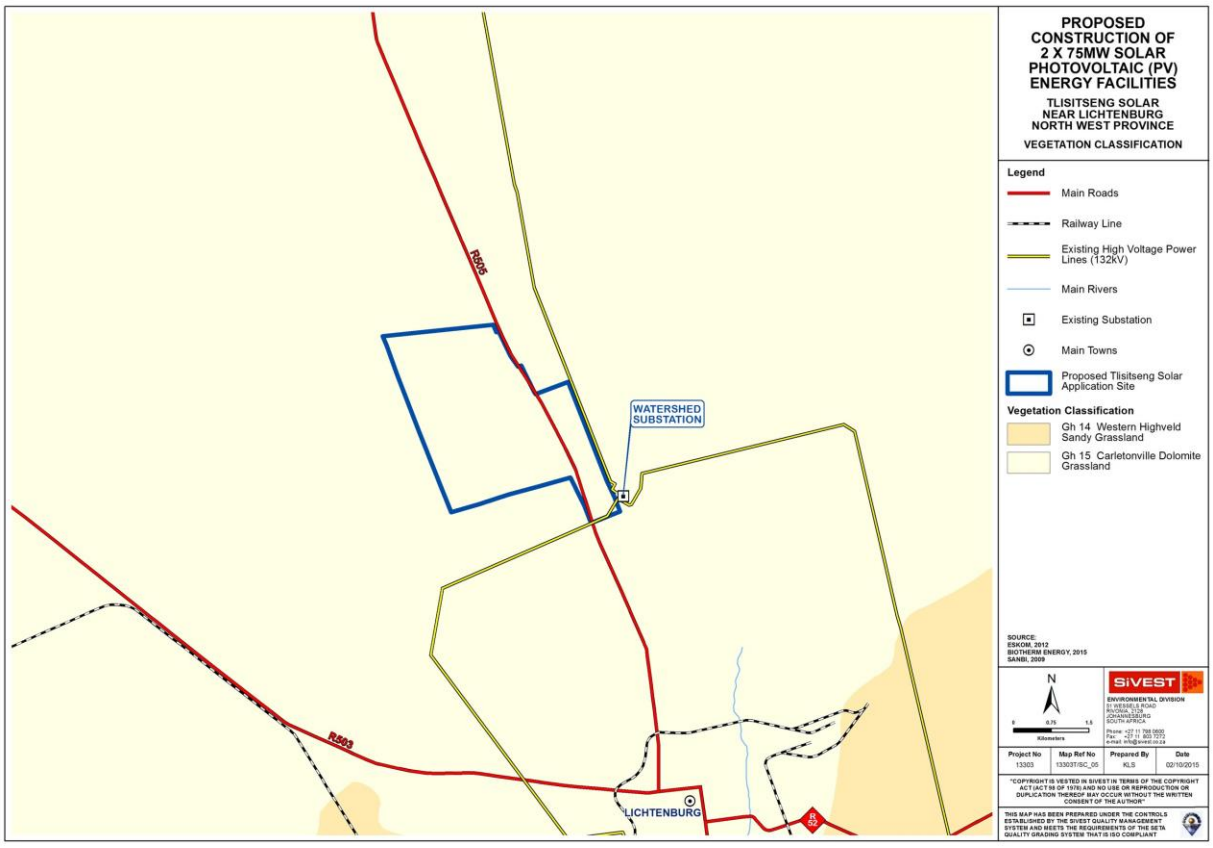

Figure 13: Vegetation types of the project study area

5.7.3 Conservation status of broad vegetation types

On the basis of a recently established approach used at national level by SANBI (Driver *et al*. 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale the thresholds are as depicted in **Table 9**, as determined by best available scientific approaches (Driver *et al*. 2005).

The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver *et al*. 2005).

The vegetation type occurring in the study area (**Table 10**) is classified as Vulnerable (Driver *et al*. 2005; Mucina *et al*., 2006) and is therefore flagged as being of potential conservation concern.

Table 9: Determining ecosystem status (from Driver *et al*. 2005)

*BT = biodiversity target (the minimum conservation requirement).

Habitat remaining (%)			
	80–100	least threatened	LT
	60–80	vulnerable	VU
	*BT–60	endangered	EN
	0–*BT	critically endangered	CR

Table 10: Conservation status of different vegetation types occurring in the study area, according to Driver *et al*. 2005 and Mucina *et al*. 2005.

Vegetation Type	**Target (%)**	**Conserved (%)**	**Transformed (%)**	**Conservation status**	
				Driver *et al*. 2005; Mucina *et al*., 2006	**Draft Ecosystem List (NEMBA)**
Carletonville Dolomite Grassland	24	3	24	Vulnerable	Not listed

5.7.4 Biodiversity Conservation Plans

The North-West Province Biodiversity Conservation Assessment (obtained from bgis.sanbi.org) provides maps that show Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), corridors and hills. This shows a variety of features within the study area, including the following:

1. Wetland CBAs: a single small pan on site mapped in the class that is considered to be irreplaceable wetlands;
2. Wetland ESAs: buffer areas of terrestrial habitat adjacent to wetlands that are important ecological support areas for the aquatic systems (500 m wide). A buffer is shown around the single pan on site; and
3. ESA dolomites: Areas of dolomite and their associated aquifers, important as groundwater recharge areas. The entire site falls within this category.

5.7.5 Proposed Protected Areas

According to the National Parks Area Expansion Strategy (NPAES), there is an area 20 km to the north-west of the project study area that has been identified as priority areas for inclusion in future protected areas. This particular component of the landscape is considered to be of high biodiversity value by National Parks, but the proposed project does not affect this area at all.

5.7.6 Red List plant species of the study area

Lists of plant species of conservation concern previously recorded in the quarter degree grids in which the study area is situated were obtained from the South African National Biodiversity Institute. These are listed in the biodiversity specialist report. Additional species that could occur in similar habitats, as determined from database searches and literature sources, but have not been recorded in these grids are also listed.

There are four species that may occur in the study area, the bulb, *Boophone disticha*, listed as Declining, the bulb, *Crinum macowanii*, listed as Declining, the succulent herb, *Brachystelma incanum*, listed as Vulnerable, and the herb, *Cleome conrathii*, listed as Near Threatened (see **Table 11** for explanation of categories). *Boophone disticha* is found in dry grassland and rocky areas. The species has been recorded in grid in which the site is located in the type of habitat that is probably found on site and the possibility of it occurring in the study area is therefore considered to be high. *Crinum macowanii* is found in mountain grassland and stony slopes in hard dry shale, gravely soil or sandy flats. The species has been recorded in grid in which the site is located in the type of habitat that is probably found on site and the possibility of it occurring in the study area is therefore considered to be high. *Brachystelma incanum* is found in sandy loam soils in bushveld. It is not known whether such habitat occurs on site or not. The species has been previously recorded in the grid to the north of the site and there is therefore the possibility that it occurs on

site. *Cleome conrathii* is found in stony quartzite slopes, usually in red sandy soil, in grassland or deciduous woodland, at all aspects. It is possible that it could also occur on site.

Table 11: Explanation of IUCN Ver. 3.1 categories (IUCN, 2001), and Orange List categories (Victor & Keith, 2004).

IUCN / Orange List category	**Definition**	**Class**
EX	Extinct	Extinct
CR	Critically Endangered	Red List
EN	Endangered	Red List
VU	Vulnerable	Red List
NT	Near Threatened	Orange List
Declining	Declining taxa	Orange List
Rare	Rare	Orange List
Critically Rare	Rare: only one subpopulation	Orange List
Rare-Sparse	Rare: widely distributed but rare	Orange List
DDD	Data Deficient: well-known but not enough information for assessment	Orange List
DDT	Data Deficient: taxonomic problems	Data Deficient
DDX	Data Deficient: unknown species	Data Deficient

5.7.7 Red List animal species of the study area

All Red List vertebrates (mammals, birds, reptiles, amphibians) that could occur in the study area are listed in the biodiversity specialist report.

There are 93 mammal species that have a geographical distribution that includes the study area, of which nine are listed in a conservation category of some level. Of the listed species, there are three of low conservation concern and one of high conservation concern that could occur in available habitats in the study area. These are the Brown Hyaena, the Honey Badger and Southern African Hedgehog. All of these species are classified nationally as near threatened (NT), but globally as Least Concern. They are, therefore, of relatively low conservation concern in comparison to more threatened species found in other parts of the country. The Honey Badger and the Hedgehog are protected under the National Environmental Management: Biodiversity Act and any impacts on a specimen of this species or that may negatively affect the survival of the species would require a permit. The species of high conservation concern that could occur on site is the White-tailed Rat (*Mystromys albicaudatus*), listed as Endangered. The White-tailed Rat is restricted to savannas and grasslands of South Africa and Swaziland. They tend to inhabit burrows of

meerkats and cracks in the soil during the day and venture out at night. They apparently require black loam soils with good cover (Coetzee & Monadjem 2008). It has been previously recorded in the grid in which the study area is located (Friedmann & Daly 2004, http://vmus.adu.org.za). The survey capture rate for this species is very low, suggesting that there are low numbers of the species (Coetzee & Monadjem 2008). Information sources suggest that there is a likelihood of this species occurring on site, although, if it does occur there, it is likely to be at a low density.

There are a total of 17 frog species with a geographical distribution that includes the study area. The Giant Bullfrog is the only amphibian species with a distribution that includes the study area and which could occur on site. This species is listed as Least Concern globally and Near threatened in South Africa. It is, however, protected under the National Environmental Management: Biodiversity Act and any impacts on a specimen of this species or that may negatively affect the survival of the species would require a permit.

There are a total of 58 reptile species with a geographical distribution that includes the study area. There is one reptile species of conservation concern that has a distribution that includes the study area, the Southern African Python. This species is not listed in a threat category, but is protected under the National Environmental Management: Biodiversity Act.

There are a total of 386 bird species that have a geographical distribution that includes the study area, of which 29 species are listed in a conservation category. Many of these listed bird species could potentially occur on site, because they have wide ranges and forage over wide areas. However, few of these species are likely to breed on site and none of them are likely to be dependent on the site relative to surrounding areas. Barrow's Korhaan, the Melodious Lark, the Short-clawed Lark and the Secretarybird are the species probably most likely to be found on the site itself, but any of the others could potentially be seen there.

5.7.8 Protected Plants (National Environmental Management: Biodiversity Act)

Plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) are listed in the biodiversity specialist report. One plant species that appears on this list that could potentially occur in the general region, although they have not previously been recorded in the grids of the study area, is *Harpagophytum procumbens*.

Harpagophytum procumbens occurs in Angola, Botswana, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe. Within South Africa this species occurs in the Northern Cape, North West, Free State, and Limpopo Provinces and the largest populations are found in the communally owned areas of the North West Province and the north eastern parts of the Northern Cape. The species is found in well drained sandy habitats in open savanna and woodlands. It has not been previously recorded in this grid in which the site is located and may be outside the scattered geographic range of the species. However, it is considered possible, but unlikely that this species could occur on site due to habitat conditions found there relative to the species requirements.

5.7.9 Protected Trees

Tree species protected under the National Forest Act are listed in the biodiversity specialist report. There are three that have a geographical distribution that includes the study site, *Acacia erioloba*, *Combretum imberbe* and *Boscia albitrunca*. There are a number of others that have a geographical distribution that ends close to the study site, including *Sclerocarya birrea* subsp. *caffra*, *Prunus africana*, *Pittosporum viridiflorum* and *Erythrophysa transvaalensis*. There is therefore a small possibility that they could also occur on site if suitable habitat occurs there.

Acacia erioloba (Camelthorn / Kameeldoring) is found in savanna, semi-desert and desert areas with deep, sandy soils and along drainage lines in very arid areas, sometimes in rocky outcrops. This species could potentially occur on site in areas affected by the proposed project. *Boscia albitrunca* (Shepherd's Tree / Witgatboom / !Xhi) occurs in semi-desert areas and bushveld, often on termitaria, but is common on sandy to loamy soils and calcrete soils. This species could potentially occur on site in areas affected by the proposed project.

Combretum imberbe (Leadwood / Hardekool / Motswere) is found in bushveld and mixed woodland, often in alluvial soils along dry and active river beds. This species could potentially occur on site in areas affected by the proposed project, although the habitat on site does not appear from the desktop assessment to be suitable.

Erythrophysa transvaalensis (Transvaal Red Balloon / Rooiklapperboom / Mofalatsane) grows on the rocky slopes of hills, often amongst boulders. This species has a limited distribution in South Africa occurring in Gauteng, Limpopo and the North West Province. It was first thought to be endemic to syenite hills in the Pilanesburg National Park, but is found in a wider area. It is considered unlikely that it occurs on site.

Pittosporum viridiflorum (Cheesewood / Bosboekenhout / Mosetlela) is widely distributed in the eastern half of South Africa, occurring from the Western Cape up into tropical Africa and beyond to Arabia and India. It grows over a wide range of altitudes and varies in form from one location to another. Pittosporum viridiflorum grows in tall forest and in scrub on the forest margin, kloofs and on stream banks. No such habitat occurs on site and it is considered unlikely that this species occurs there.

Prunus africana (Bitter Almond / Bitteralmandelhout / Mogohloro) is found in evergreen forests near the coast, inland mistbelt forests and afromontane forests up to 2100 m. The species is listed as Vulnerable in the Red List of South African plants. Based on habitat requirements, it is not expected that it occurs there.

Sclerocarya birrea subsp. caffra (Marula / Maroela / Morula) is widespread in Africa from Ethiopia in the north to KwaZulu-Natal in the south. In South Africa it is more dominant in the Baphalaborwa area in

Limpopo. It occurs naturally in various types of woodland, on sandy soil or occasionally sandy loam. If there is woodland on site, it could potentially occur there.

5.7.10 Protected Animals

There are a number of animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004). According to this Act, "a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7". Such activities include any that are "of a nature that may negatively impact on the survival of a listed threatened or protected species". This implies that any negative impacts on habitats in which populations of protected species occur or are dependent upon would be restricted according to this Act.

Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in Appendix 6, marked with the letter "N". This includes the following species: Roan Antelope, Black Wildebeest, Reedbuck, Cape Clawless Otter, Brown Hyaena, Spotted-necked Otter, Honey Badger, Leopard, Cape Fox, Southern African Hedgehog, Southern African Python, Giant Bullfrog, Blue Crane, Martial Eagle, Lesser Kestrel, Black Stork, Cape Vulture, Lappet-faced Vulture and White-backed Vulture.
Due to habitat and forage requirements and the fact that some species are restricted to game farms and/or conservation areas, only the Brown Hyaena, Black-footed Cat, Honey Badger, Leopard, Cape Fox, Giant Bullfrog and some of the birds (Blue Crane, Martial Eagle, Lesser Kestrel and Black Stork) have a likelihood of occurring on site. All of these species are mobile animals that are likely to move away in the event of any activities on site disturbing them. They are therefore unlikely to be affected by the proposed development of the solar power facility and associated infrastructure.

5.7.11 Important Bird Areas

The study area is not within an Important Bird Area (IBA). The nearest IBAs are the Botsolano Nature Reserve IBA, which is 70 km away to the north-west, the Barberspan and Leeupan IBA, which is 70 km away to the south-west and the Magaliesberg IBA, which is 100 km away to the east.

5.7.12 Habitats on site

Aerial imagery indicates that most of the site consists of natural vegetation (grassland called Carletonville Dolomite Grassland). There is a small pan indicated on the Provincial C-Plan, but this could not be identified on aerial imagery. The distribution of main habitats on site, as identifiable from aerial imagery, is shown in **Figure 14**.

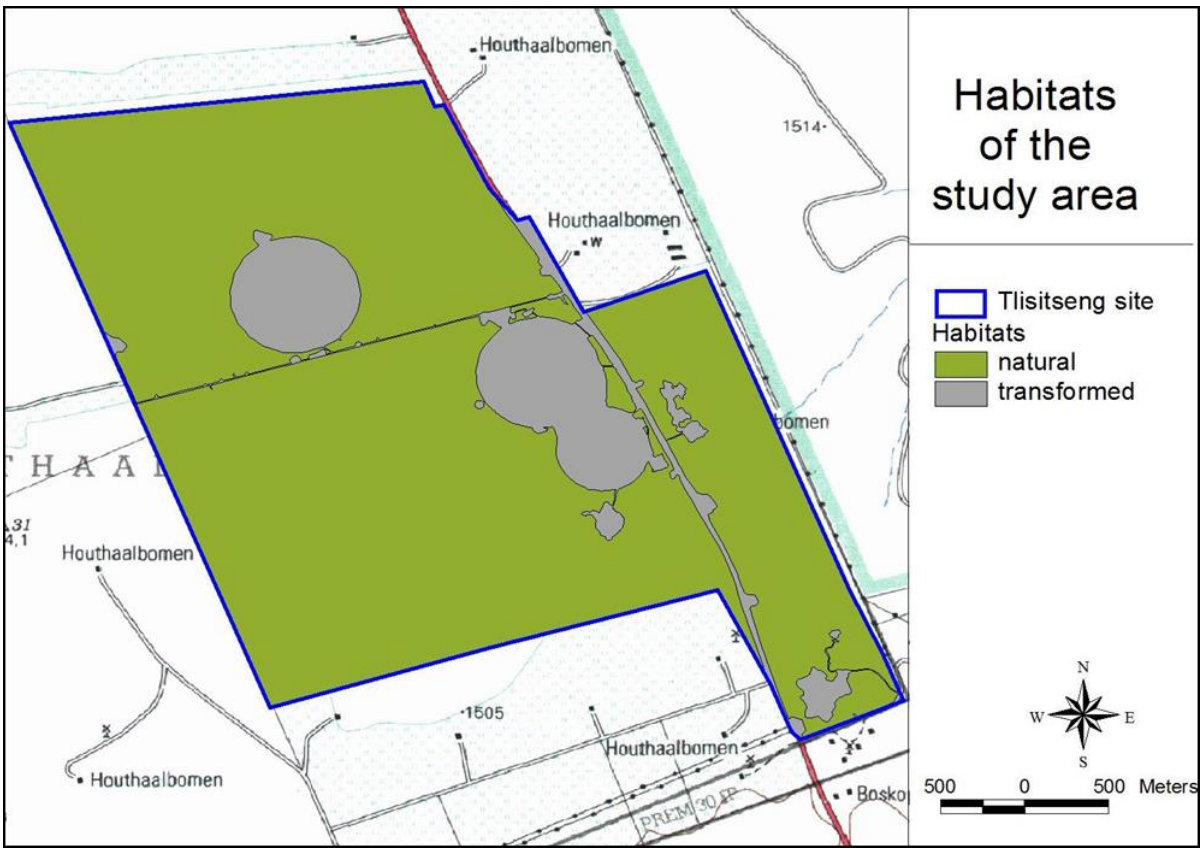

Figure 14: Main habitats of the study area

5.7.13 Watercourses

The study area contains no watercourses / drainage lines that are visible from aerial imagery, although the Surveyor-General's 1:50 000 topocadastral map indicates a small drainage line in the southern part of the site. The presence of this will have to be confirmed in the field.

5.7.14 Sensitivity assessment

The sensitivity assessment identifies those parts of the study area that have high conservation value or that may be sensitive to disturbance. Areas of potentially high sensitivity are shown in **Figure 15**. The information provided in the preceding sections was used to compile a map of remaining natural habitats and areas important for maintaining ecological processes in the study area. The only feature of potential concern that needs to be taken into account in order to evaluate sensitivity in the study area is the presence

of non-perennial watercourses. These represent ecological processes, including groundwater dynamics, hydrological processes, nutrient cycling and wildlife dispersal;

These factors have been taken into account in evaluating sensitivity within the study area. Watercourses are considered to be the most sensitive features on site. The sensitivity classification is as follows:

- MEDIUM-HIGH: The majority of the study area is classified as having medium sensitivity (see **Figure 15**). These are areas of natural vegetation which may harbour features of conservation concern (listed or protected plants and/or animals), as well as falling within C-Plan Ecological Support Areas and being part of a vegetation type classified as Vulnerable.
- LOW: Transformed areas are classified as having low sensitivity (see **Figure 15)**. These are areas in which no intact natural habitat still remains.

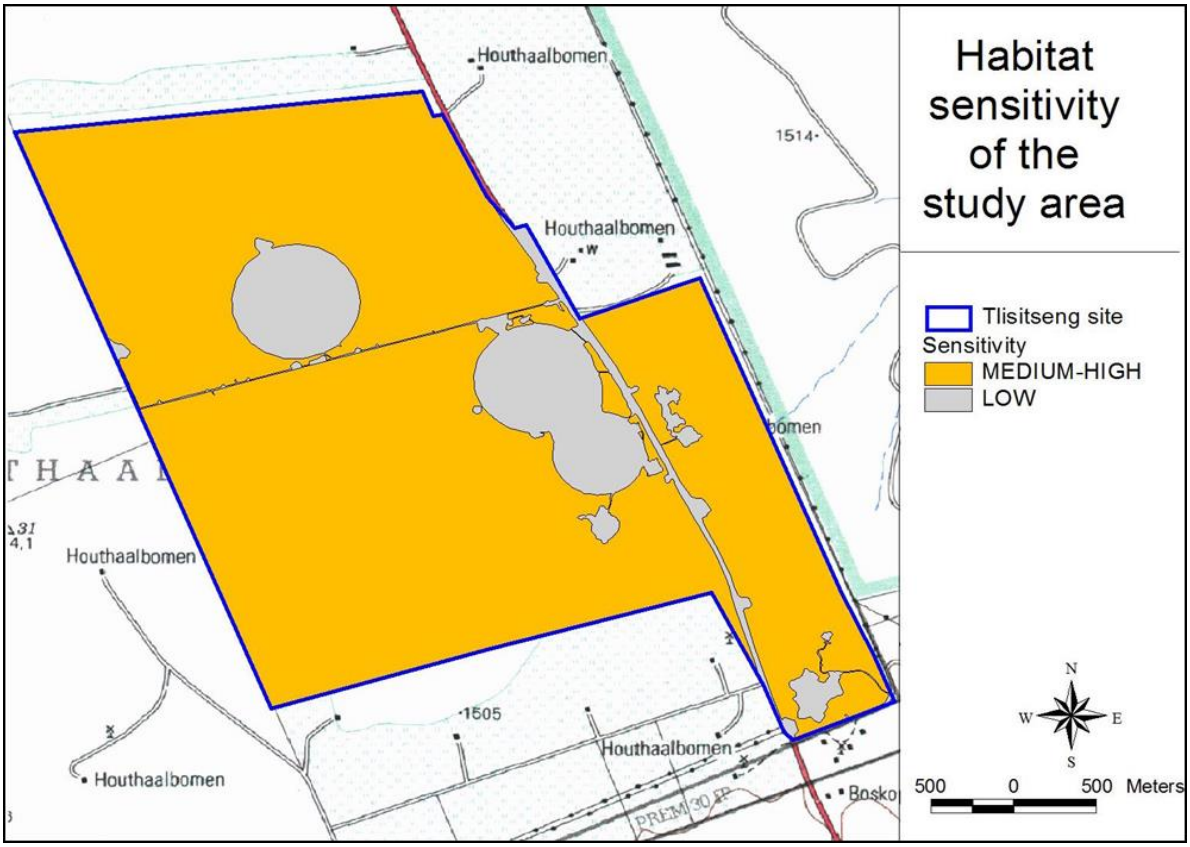

Figure 15: Habitat sensitivity of the study area

5.8 Avifauna

The Avifauna Assessment was conducted by Chris van Rooyen and is included as Appendix 6B. The environmental baseline from an avifaunal perspective is presented below.

5.8.1 Biomes and Important Bird Areas

The proposed site is situated in the grassland biome approximately 9km north-west of the town of Lichtenburg in the North-West Province (Harrison *et al* 1997). From satellite imagery and general knowledge of the area it can be ascertained that the habitat in the core study area is highly homogenous and consists of extensive grassy plains, with scattered, stunted mostly Vachellia trees and a variety of shrubs. The closest Important Bird Areas (IBAs), the Baberspan and Leeupan SA026, and the Botsalano Nature Reserve SA024 are located approximately 70km away to the south-west and north-west respectively (Barnes 1998, Birdlife 2014). The development is too far away from these IBAs to have any direct impact on them. The application site is situated directly adjacent to the 6000ha Lichtenburg Game Breeding Centre which contains an important vulture restaurant. The centre contains good grassland habitat and is a refuge for many grassland avifauna. Directly south of the Game Breeding Centre is an extensive network of dams and wetland areas, which is situated approximately 5km from the application site at its closest point (see **Figure 16**). The dams and wetlands area attract an abundance of waterbirds.

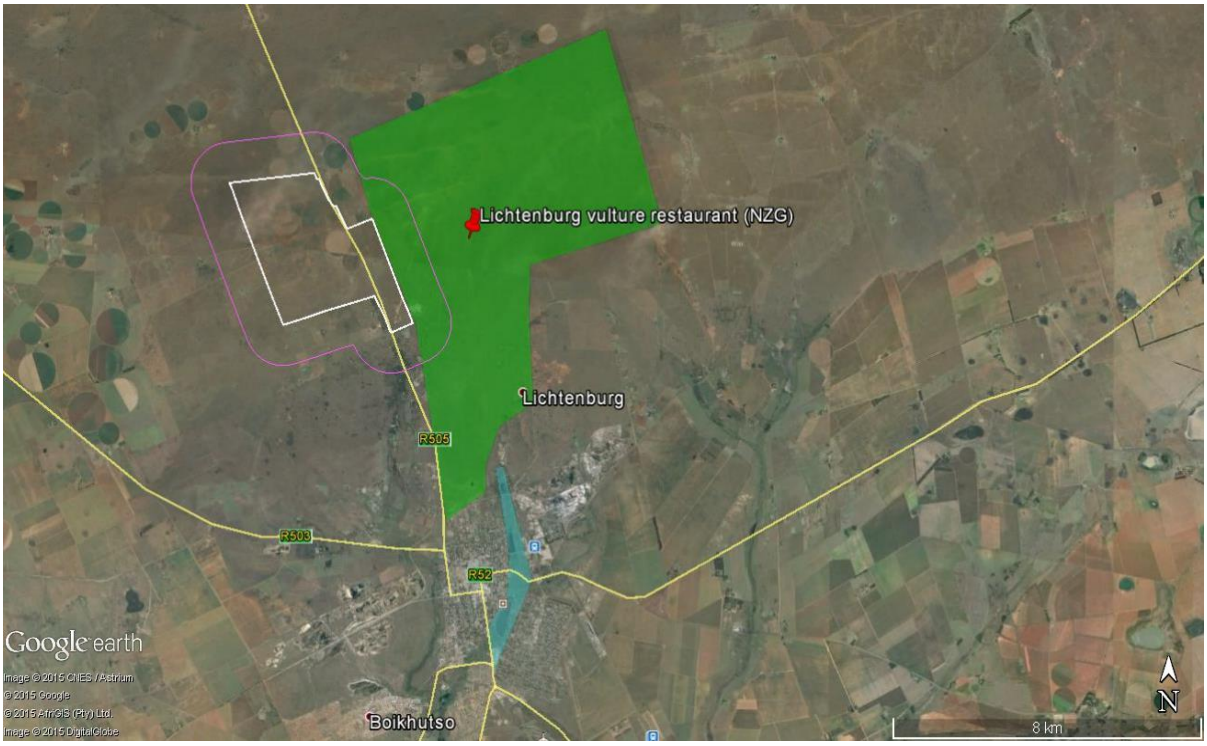

Figure 16: The location of the Lichtenburg Game Breeding Centre and vulture restaurant (green) and dams and wetlands (blue) relative to the core study area (purple border).

5.8.2 Habitat classes and avifauna in the study area

Whilst much of the distribution and abundance of the bird species in the core study area can be explained by the description of the natural vegetation, it is as important to examine the modifications which have changed the natural landscape, and which may have an effect on the distribution of avifauna. These are sometimes evident at a much smaller spatial scale than the biome or vegetation types.

The following bird habitat classes have been identified at the core study area and immediate surroundings from satellite imagery and general knowledge of the area, subject to further field investigations:

- *Grassland*

The dominant natural vegetation type in the core study area and immediate surroundings is Carltonville Dolomite Grassland. Carltonville Dolomite Grassland occurs on slightly undulating plains dissected by chert ridges. In the study area, small, mostly Vachellia trees, and a variety of shrubs are scattered across the landscape. Species-rich grassland forms a complex mosaic pattern dominated by many grass species. Rainfall is in summer with an overall mean annual precipitation of 593mm, with temperatures ranging from very cold with frost in winter to very hot in summer (Mucina & Rutherford 2006).

Priority species that could be found in natural grassland vegetation on the development site are Cape Sparrow, Scaly-feathered Finch, Yellow Canary, Kalahari Scrub-robin, Red-headed Finch, Black-chested Prinia, Crimson-breasted Shrike, Cape Penduline-Tit, Bokmakierie, Eastern Clapper Lark, Lark-like Bunting, Fiscal Flycatcher, Northern Black Korhaan, White-backed Mousebird, Ant-eating Chat, South African Cliff-swallow, Pied Starling, Orange River White-eye, African Red-eyed Bulbul, Sabota Lark and Spike-heeled Lark. Occasional priority visitors to the site could include Lanner Falcon, Martial Eagle, Tawny Eagle, Secretarybird, Kori Bustard, Blue Crane, Fairy Flycatcher, Namaqua Sandgrouse, Burchell's Sandgrouse, Southern Pale Chanting Goshawk, Grey-backed Sparrowlark, White-backed Vulture, Lappet-faced Vulture and Cape Vulture.

- *Surface Water*

Surface water is of specific importance to avifauna in this relatively arid study area. The core study area contains at least eleven boreholes with water troughs for livestock (see **Figure 17**). Boreholes with open water troughs are important sources of surface water and are used extensively by various species, including large raptors, to drink and bath. Smaller priority species such as Cape Sparrow, Red-headed Finch, Scaly-feathered Finch, Yellow Canary, Namaqua Sandgrouse, Pied Starling and Lark-like Bunting congregate in large numbers around water troughs which in turn could attract priority predators such as Southern Pale Chanting Goshawk and Lanner Falcon. If the mortality is significant, Marabou Stork could also scavenge between the panels. The habitat around boreholes (shrubs and trees) often attract other priority species such as Bokmakierie, Kalahari Scrub-robin, Crimson-breasted Shrike, Fiscal Flycatcher, Karoo Thrush,

African Red-eyed Bulbul, Orange River White-eye, Fairy Flycatcher and White-backed Mousebird. The water troughs and reservoirs are also attractive to large raptors and vultures, and could attract Martial Eagle, Tawny Eagle, White-backed Vulture, Lappet-faced Vulture and Cape Vulture.

The wetland areas indicated in **Figure 16** might become relevant in that the waterbirds flying over the study area on their way to the wetlands area might mistake the PV area for surface water and attempt to land on the PV panels (the so-called lake effect), which could expose them to collision risk. Priority species that could occur at the wetlands and dams are South African Shelduck, Black Stork, Yellow-billed Stork, Greater Flamingo, Lesser Flamingo, Great White Pelican and Marabou Stork.

- *Agriculture*

The core study area contains several pivots, where a variety of agricultural crops are cultivated. Although agricultural lands completely destroy the structure of the original vegetation, some birds do benefit from this transformation. Blue Crane, Abdim's Stork and Black-winged Pratincole are the priority species most likely to utilise agricultural clearings in the study area. Abdim's Stork and Black-winged Pratincole can occur in flocks of several hundred on irrigated fields, although the species apparently do not occur in large numbers in the area. The clearings could also be utilised by Secretarybirds, but the species is likely to occur sparsely.

- *High voltage lines*

High voltage lines are an important potential roosting and breeding substrate for large raptors and vultures. Existing high-voltage lines are used extensively by large raptors, especially Martial Eagles, but also Tawny Eagles for breeding purposes (Jenkins *et al*. 2006). The study area is located directly adjacent to the Watershed MTS. Several high-voltage lines bisect the core study area which will require further investigation from a potential priority raptor breeding perspective (see **Figure 17** below). The lines in the Lichtenburg Game Breeding Centre are used extensively by Cape, White-backed and Lappet-faced Vultures which are attracted to the vulture restaurant, for roosting (pers. obs).

Figure 17: The location of boreholes and HV lines (yellow lines) relative to the study area (purple polygon).

- *Avifauna*

An estimated 284 species could potentially occur at the core study area and immediate surroundings (which includes the Lichtenburg Game Breeding Centre and wetland areas south-east of the core study area). Of these, 21 are South African Red Data species, 12 are southern African endemics and 21 are near-endemics. This means that 7.8% of the species that could potentially occur at the core study area and immediate surroundings are Red Data species, and 11.7% are southern African endemics of near-endemics. Southern Africa contains 13 avifaunal endemic regions, namely Western Arid, Woodland, Evergreen Forest, Grassland, Montane, Rocky slopes and cliffs, Fynbos, Marine and Inland Waters (MacLean 1999). Of these regions, Grassland, where the study area is located, contains the fourth highest number of endemics. Overall, the core study area and immediate surroundings potentially contains a total of 33 endemics and near-endemics, which is 20% of the 167 southern African endemics and near-endemics (Hockey *et al.* 2005).

See the bird specialist report for a list of species potentially occurring in the core study area and immediate surroundings. Potential impacts on priority species are listed in

Table 12

Table 12.

Table 12: Priority species potentially occurring at the core study area and immediate surroundings. Red Data species are indicated in red.

EN = Endangered
VU = Vulnerable
NT = Near-threatened
LC = Least concern
End = Southern African Endemic
N-End = Southern African near endemic

Name	Scientific name	National Red Data Status	Global status	Collisions with PV panels	Displacement through disturbance	Displacement through habitat transformation*
Eagle, Martial	*Polemaetus bellicosus*	EN	VU		x	x
Eagle, Tawny	*Aquila rapax*	EN	LC		x	x
Stork, Yellow-billed	*Mycteria ibis*	EN	LC	x		
Vulture, Cape	*Gyps coprotheres*	EN	VU		x	
Vulture, Lappet-faced	*Torgos tracheliotus*	EN	VU		x	
Vulture, White-backed	*Gyps africanus*	EN	VU		x	
Chat, Ant-eating	*Myrmecocichla formicivora*	End		x	x	x
Cliff-swallow, South African	*Hirundo spilodera*	End		x	x	x
Flycatcher, Fairy	*Stenostira scita*	End		x	x	x
Flycatcher, Fiscal	*Sigelus silens*	End		x	x	x
Korhaan, Northern Black	*Afrotis afraoides*	End		x	x	x
Marsh-harrier, African	*Circus ranivorus*	End		x		

Name	Scientific name	National Red Data Status	Global status	Collisions with PV panels	Displacement through disturbance	Displacement through habitat transformation*
Shelduck, South African	*Tadorna cana*	End		x		
Starling, Pied	*Spreo bicolor*	End		x	x	x
Thrush, Karoo	*Turdus smithi*	End		x	x	x
White-eye, Cape	*Zosterops virens*	End		x	x	x
White-eye, Orange River	*Zosterops pallidus*	End		x	x	x
Mousebird, White-backed	*Colius colius*	End		x	x	x
Bokmakierie	*Telophorus zeylonus*	N-end		x	x	x
Bulbul, African Red-eyed	*Pycnonotus nigricans*	N-end		x	x	x
Bunting, Cape	*Emberiza capensis*	N-end		x	x	x
Bunting, Lark-like	*Emberiza impetuani*	N-end		x	x	x
Canary, Yellow	*Crithagra flaviventris*	N-end		x	x	x
Chanting Goshawk, Southern Pale	*Melierax canorus*	N-end		x	x	x
Clapper-Lark, Eastern	*Mirafra fasciolata*	N-end		x	x	x
Finch, Red-headed	*Amadina erythrocephala*	N-end		x	x	x
Finch, Scaly-feathered	*Sporopipes squamifrons*	N-end		x	x	x
Lark, Eastern Clapper	*Mirafra fasciolata*	N-end		x	x	x

Name	Scientific name	National Red Data Status	Global status	Collisions with PV panels	Displacement through disturbance	Displacement through habitat transformation*
Lark, Sabota	*Calendulauda sabota*	N-end		x	x	x
Lark, Spike-heeled	*Chersomanes albofasciata*	N-end		x	x	x
Penduline – Tit, Cape	*Anthoscopus minutus*	N-end		x	x	x
Prinia, Black-chested	*Prinia flavicans*	N-end		x	x	x
Sandgrouse, Burchell's	*Pterocles burchelli*	N-end		x		
Sandgrouse, Namaqua	*Pterocles namaqua*	N-end		x		
Scrub-Robin, Kalahari	*Cercotrichas paena*	N-end		x	x	x
Shrike, Crimson-breasted	*Laniarius atrococcineus*	N-end		x	x	x
Sparrow, Cape	*Passer melanurus*	N-end		x	x	x
Sparrowlark, Grey-backed	*Eremopterix verticalis*	N-end		x	x	x
Wheatear, Mountain	*Oenanthe monticola*	N-end		x	x	x
Bustard, Kori	*Ardeotis kori*	NT	NT		x	x
Courser, Double-banded	*Rhinoptilus africanus*	NT	LC	x	x	x
Crane, Blue	*Anthropoides paradiseus*	NT	VU		x	x
Falcon, Red-footed	*Falco vespertinus*	NT	NT	x	x	x
Flamingo, Greater	*Phoenicopterus ruber*	NT	NT	x		
Flamingo, Lesser	*Phoenicopterus minor*	NT	NT	x		

Name	Scientific name	National Red Data Status	Global status	Collisions with PV panels	Displacement through disturbance	Displacement through habitat transformation*
Pratincole, Black-winged	*Glareola nordmanni*	NT	NT	x	x	x
Roller, European	*Coracias garrulus*	NT	NT	x	x	x
Stork, Abdim's	*Ciconia abdimii*	NT	LC	x	x	x
Stork, Marabou	*Leptoptilos crumeniferus*	NT	LC	x		
Falcon, Lanner	*Falco biarmicus*	VU	LC	x	x	x
Painted-snipe, Greater	*Rostratula benghalensis*	VU	LC	x		
Pelican, Great White	*Pelecanus onocrotalus*	VU	LC	x		
Secretarybird	*Sagittarius serpentarius*	VU	VU	x	x	x
Stork, Black	*Ciconia nigra*	VU	LC	x		

With smaller species this impact might result in partial but not total exclusion from the site, depending on the level of vegetation transformation.

5.9 Surface Water

The Surface Water Assessment was conducted by Shaun Taylor and Stephan Jacobs of SiVEST. The full report is included in **Appendix 6C**. The environmental baseline from a surface water perspective is presented below.

5.9.1 Database Identified Surface Water Resource Occurrence in the Study Area

The following findings from the study are limited to the databases that were directly relevant and where information was available. Not all databases and corresponding information were relevant for this study.

In terms of the **National** and **North West ENPAT (2000)** databases, the study area is found within the Lower Vaal Water Management Area. The study area was further found to be situated within the Vaal Primary Catchment. More specifically, the study area is found within the C31A quaternary catchment. This quaternary catchment is considered to have a moderate ecological sensitivity.

Of the surface water resources identifiable in the databases (National and North West ENPAT and NFEPA), the study area was found to contain:

- One (1) non-NFEPA, unnamed non-perennial River.

Within close proximity to the study area, the following surface water resources identifiable in the databases (**National** and **North West ENPAT** and **NFEPA**) were noted:

- Five (5) stream segments of the unnamed, non-perennial river located roughly 390m east, 1400m east, 2200m east, 1050m northeast and 2300m northeast of the study area respectively.

Over and above the already mentioned, no wetlands or other surface water features were identifiable from other remaining databases consulted that are in close proximity to the proposed Tlisitseng Solar PV facilities, and are expected to be affected by the proposed PV facilities (**Figure 18**).

In addition, the study area was deemed to fall within a Critical Biodiversity Area 2 (CBA 2). The study area was, however, not located within any Ecological Support Areas (ESAs).

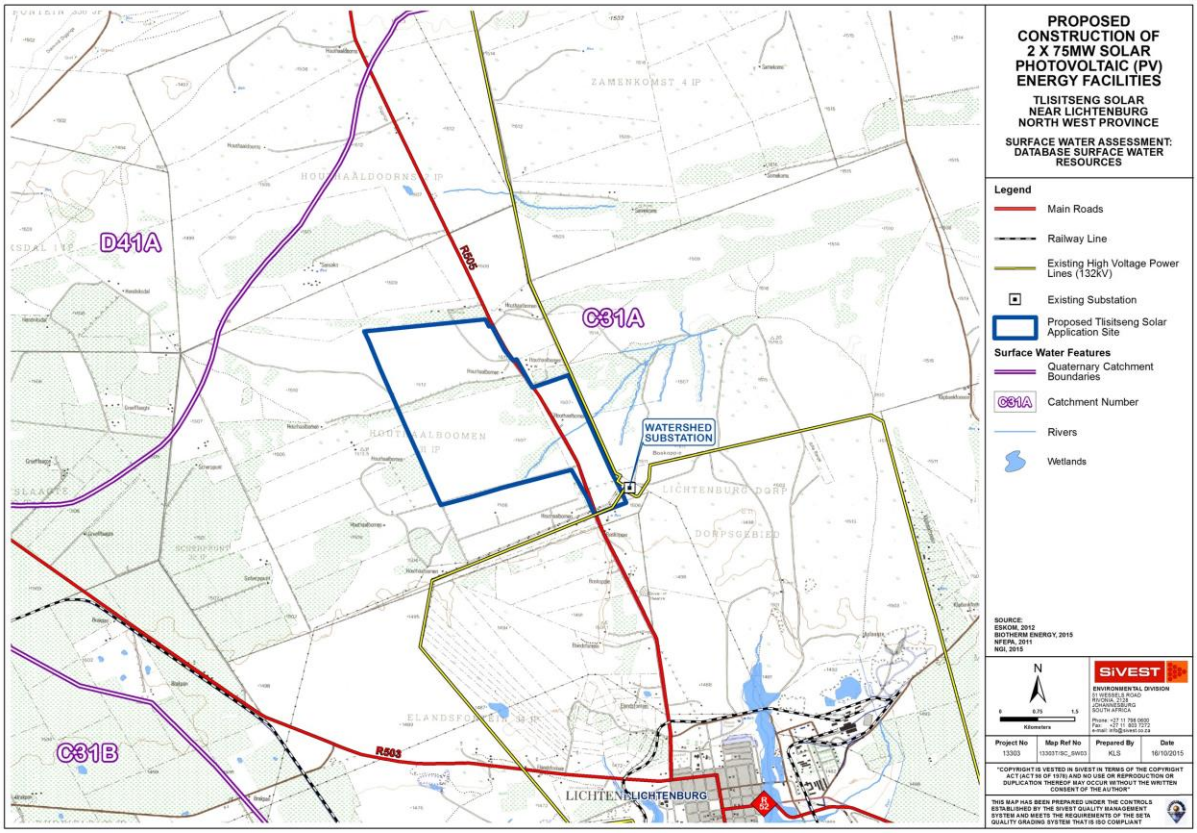

Figure 18: Database Surface Water Resources for the Tlisitseng Solar PV Facilities' Application Site

5.9.2 Desktop Surface Water Resource Occurrence in the Study Area

Utilising the database findings above, Google™ satellite imagery overlaid with 1:50 000 topographical images were consulted to refine/confirm surface water resources that were identified. Several drainage lines and potential surface water resources were apparent and could be delineated for the all-inclusive study area (**Figure 19**). In summary, it was found that there were a total of:

- Three (3) unnamed, non-perennial rivers;
- Four (4) stream segments of the unnamed river identified in the database assessment; and
- Thirty seven (37) potential depression wetlands.

The database and desktop findings verify the presence of the unnamed, non-perennial river located within the study area, as well as the five (5) stream segments of this river. However, from what had been observed in the desktop findings, one (1) of these stream segments (segment 5) was found to cross the study area and was therefore treated as a separate river for assessment purposes. A third river, not identified during the database assessment, was also found to pass within very close proximity of the northern section of the study area. A total of three (3) rivers were therefore identified for assessment purposes. In addition, the

database findings identified the presence of approximately thirty seven (37) surface water features (within approximately 2km radius of the application site) which were considered to be potential depression (natural or artificial) wetlands. It must be noted, however, that from a desktop findings perspective, some of these wetland systems appeared to be connected as one greater system while others appeared to be separate systems. An in-field site visit involving a ground-truthing exercise will need to be undertaken to verify the database and desktop findings.

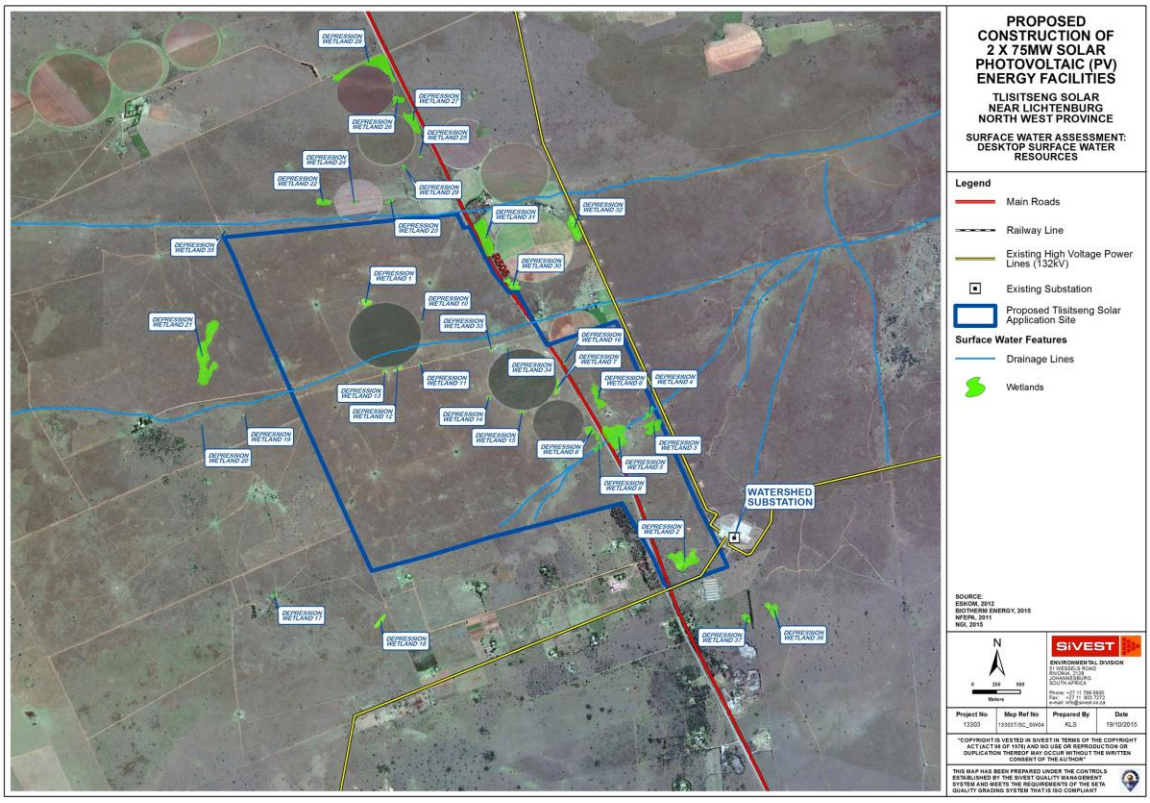

Figure 19: Desktop surface water resources for the Tlisitseng solar PV energy facilities application site

5.10 Soils and Agricultural Potential

The Soils and Agricultural Potential Assessment was conducted by D.G. Paterson. The full report is included in **Appendix 6D**. The environmental baseline from a soils and agricultural perspective is presented below.

5.10.1 Soils

Existing soil information was obtained from the map sheet 2626 West Rand (Bruce & Schoeman, 1978) from the national Land Type Survey, published at 1:250 000 scale. A ***land type*** is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The soils are classified according to MacVicar et al (1977).

The area under investigation is covered by only one land type, as shown on the map in the soils and agriculture specialist report, namely:

- **Fa11** (Shallow soils, mainly non-calcareous)

It should be clearly noted that, since the information contained in the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be given, and not the actual areas of occurrence within a specific land type. Also, other soils that were not identified due to the scale of the survey may also occur. **The site was not visited during the course of this study, and so the detailed composition of the specific land types has not been ground-truthed.**

A summary of the dominant soil characteristics of each land type is given in **Table 13** below.

The distribution of soils with high, medium and low agricultural potential within each land type is also given, with the dominant class shown in **bold type.**

5.10.2 Soil Pattern

The soils are generally shallow to very shallow (<500 mm), usually sandy loam and calcareous, overlying either rock or cemented hardpan calcrete. Some rock outcrops occur in places in the landscape. However, some areas of deeper red soils, which will have a higher agricultural potential, also occur.

The occurrence and distribution of the land types is shown in the soils and agriculture specialist report.

A summary of the dominant soil characteristics is given in **Table 13** below.

Table 13: Land types occurring (with soils in order of dominance)

Land Type	Depth (mm)	Dominant soils	Percent of land type	Characteristics	Agric. Potential* (%)
Fa11	100-200	Mispah 10/11 + Glenrosa 14/15/17	50%	Brown and red, sandy loam topsoils on rock or saprolite	High: 20.0 Mod: 20.2

	250-1200	Hutton 23/24/26 Rock	38% 10%	Brown, sandy loam soils, on rock or saprolite	**Low: 59.8**

*Note: Agricultural Potential refers to **soil characteristics only**, without potentially restricting climatic factors

5.10.3 Agricultural Potential

All of the study area comprises land type **Fa11**, which is dominated by shallow, calcareous soils with rock, as can be seen from the information contained in **Table 13** and the Appendix. However, there is a significant proportion of deeper, red, structureless soils in the area (probably around 20% of the land type), with depths of 1.2 m or more. These soils have a high potential for agriculture.

The rainfall in the area is adequate for rain-fed cultivation, but due to the unreliability of the distribution, irrigation is a viable means of supplementing the rainfall in times of shortage, especially in the areas where deeper soils occur. Several centre pivot irrigation fields were found to be located adjacent to the northern half of the study area.

The climatic characteristics mean that the grazing capacity of this part of North West Province is relatively low, around 10-12 ha/large stock unit (ARC-ISCW, 2004).

- Land Use

The land use in the area is dominantly grazing, but with areas of cultivation, some under irrigation as classified by the National Land Cover (Thompson, 1999).

5.11 Visual

The Visual Assessment was conducted by Kerry Schwartz and Andrea Gibb at SiVEST. The full report is included in **Appendix 6E**. The environmental baseline from a visual perspective is presented below.

The physical and land use related characteristics are outlined below as they are important factors contributing to the visibility of a development and visual character of the study area. Defining the visual character is an important part of assessing visual impacts as it establishes the visual baseline or existing visual environment in which the development would be constructed. The visual impact of a development is measured according to this visual baseline by establishing the degree to which the development would contrast or conform with the visual character of the surrounding area. The inherent sensitivity of the area

to visual impacts or visual sensitivity is thereafter determined, based on the visual character, economic importance of the scenic quality of the area, inherent cultural value of the area and presence of visual receptors.

5.11.1 Topography

The very flat nature of the topography is a strong factor influencing the types of vistas typically present in the study area, as there are few areas of rising ground to block views and limit viewsheds. As a result, typically wide-ranging vistas are experienced within the study area, especially from locally higher elevations.

5.11.2 Vegetation

The predominant very low shrub layer and open areas of cultivated fields / grasslands results in wide-open vistas across most of the study area. Only in areas where artificial wooded vegetation has been established around farmhouses, would the vegetation provide visual screening. The relatively low density of human habitation and the presence of natural vegetation cover across large portions of the study area would give the viewer the general impression of a largely natural rural setting.

5.11.3 Land Use

As stated above, sparse human habitation and the predominance of natural vegetation cover across large portions of the study area would give the viewer the general impression of a largely natural rural setting. There are however significant patches of cultivation in the study area which have transformed the natural characteristics of the area. High levels of human transformation and visual degradation only become evident in the southern sector of the study area where urban/peri-urban development has taken place on the outskirts of Lichtenburg.

The influence of the level of human transformation on the visual character of the area is described in more detail below.

5.11.4 Visual Character

Visual character can be defined based on the level of change or transformation from a completely natural setting, which would represent a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite

end of the scale to a largely natural undisturbed landscape. Visual character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as electricity infrastructure.

As mentioned above, much of the study area is characterised by rural areas with low densities of human settlement. Agriculture in the form of maize cultivation is the dominant land use, which has transformed the natural vegetation in some areas. However, a large portion of the study area has retained a natural appearance due to the presence of the low shrubs and grasslands. The most prominent anthropogenic elements in these areas include the R505 main road, 132kV power lines, a substation and other linear elements, such as telephone poles, communication poles and farm boundary fences. The presence of this infrastructure is an important factor in this context, as the introduction of the proposed PV energy facility would result in less visual contrast where other anthropogenic elements are already present. Other human infrastructure in this setting occurs at a low density, and includes several gravel access roads and a west-east aligned railway line on the northern perimeter of Lichtenburg. Overall, the study area has a natural visual character, with certain areas displaying a rural or pastoral component where maize cultivation and farmsteads occur.

The relatively low density of human transformation throughout the surrounding area is an important component contributing to the largely natural visual character of the study area. This is important in the context of potential visual impacts associated with the proposed development of a PV energy facility as introducing this type of development could be considered to be a degrading factor in this context.

It should however be noted that other solar energy facilities are proposed in relatively close proximity to the proposed development. These facilities and their associated infrastructure, typically consist of very large structures which are highly visible. As such, these facilities will significantly alter the visual character and baseline in the study area once constructed and make it appear to have a more industrial-type visual character.

5.11.5 Visual Sensitivity

Visual Sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e. topography, landform and land cover), spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development (Oberholzer: 2005). A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the area SiVEST has developed a matrix based on the characteristics of the receiving environment which, according to the Guidelines for Involving Visual and Aesthetic Specialists in the EIA Processes, indicate that visibility and aesthetics are likely to be 'key issues' (Oberholzer: 2005).

Based on the criteria in the matrix (**Table 14**), the visual sensitivity of the area is broken up into a number of categories, as described below:

i) **High** - The introduction of a new development such as a solar energy facility would be likely to be perceived negatively by receptors in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptors.

ii) **Moderate** - Presence of receptors, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.

iii) **Low** - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

The table below outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Table 14: Environmental factors used to define visual sensitivity of the study area

FACTORS	RATING									
	1	2	3	4	5	6	7	8	9	10
Pristine / natural character of the environment										
Presence of sensitive visual receptors										
Aesthetic sense of place / scenic visual character										
Value to individuals / society										
Irreplaceability / uniqueness / scarcity value										
Cultural or symbolic meaning										
Scenic resources present in the study area										
Protected / conservation areas in the study area										
Sites of special interest present in the study area										
Economic dependency on scenic quality										
Local jobs created by scenic quality of the area										
International status of the environment										
Provincial / regional status of the environment										
Local status of the environment										
**Scenic quality under threat / at risk of change										

**Any rating above '5' will trigger the need to undertake an assessment of cumulative visual impacts.

Low							Moderate							High
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Based on the above factors, the assessment area is rated as having a low to moderate visual sensitivity. This is mainly owing to the relatively uninhabited character of the area and the presence of road, rail and electricity transmission infrastructure which would likely reduce the scenic quality of the area. An important

factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs.

*Other solar energy facilities are proposed in close proximity to the proposed project. As such, an assessment of the cumulative impact that will be experienced from each potentially sensitive receptor will be undertaken in the next phase of this study, once the sensitive receptor locations have been confirmed.

5.12 Heritage

The Heritage Assessment was conducted by Wouter Fourie of Professional Grave Solutions. The full report is included in **Appendix 6F**. The environmental baseline from a heritage perspective is presented below.

The examination of heritage databases, historical data and cartographic resources represents a critical additional tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Therefore an Internet literature search was conducted and relevant archaeological and historical texts were also consulted. Relevant topographic maps and satellite imagery were studied.

5.12.1 Archival findings

The aim of the archival background research is to identify possible heritage resources that could be encountered during the field work, as summarised in **Table 15**.

Table 15: Summary of History of Lichtenburg Town and Surrounding Area

DATE	DESCRIPTION
2.5 million to 250 000 years ago	**The Earlier Stone Age (ESA)**. The Earlier Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these technological phases is known as Oldowan which is associated with crude flakes and hammer stones and dates to approximately 2 million years ago. The second technological phase in the Earlier Stone Age is known as the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial handaxe. The Acheulian phase dates back to approximately 1.5 million years ago. The rock engraving site at Bosworth Farm, near Klerksdorp also contains many stone artefacts (lithics) which date to over one million years ago (http://www.nasmus.co.za/departments/rock-art/public-rock-art-sites). No sites are known in or near the study area.
250 000 to 40 000 years ago	**The Middle Stone Age (MSA)**. The Middle Stone Age is the second oldest phase identified in South Africa's archaeological history. It is associated with flakes, points

	and blades manufactured by means of the prepared core technique. No sites are known in the vicinity of the study area.
40 000 years ago to the historic past	**The Later Stone Age (LSA)** is the third phase in South Africa's Stone Age history. It is associated with an abundance of very small stone artefacts (microliths). The Later Stone Age is also associated with rock engravings and rock paintings. Rock engravings are known from the wider vicinity of the study area (Bergh, 1998). See below for two well-known sites in the greater vicinity of the study area (Thaba Sione and Bosworth Farm).
Rock Art	**Thaba Sione:** this site is located in the middle of Thaba Sione town, some 60km south-west of Mmabatho. The site contains over 559 engravings located on rocks and boulders. The engravings are dominated by depictions of rhinoceros – some have been rubbed smooth. There are also buffalo, eland, shamanic human figures, wildebeest and a rare lizard. The site is still important today to local Tswana people and is used by the Zion Christian Church as a rain-making centre. (http://www.nasmus.co.za/departments/rock-art/public-rock-art-sites) **Bosworth Farm:** this site is located some 22km north-west of Klerksdorp on the Bosworth Farm property. It is a large site with over 400 San and Khoe (herder) rock engravings. There many depictions of human figures as well as animals: a charging rhinoceros, a large elephant, and a flight of birds. There are also many geometric motifs. The site also has many stone artefacts (lithics) which date to over one million years ago. Bosworth is one of South Africa's 12 Rock Art sites formally protected under the National Heritage Resources Act (25 of 1999). (http://www.nasmus.co.za/departments/rock-art/public-rock-art-sites)
AD 200 - 900	**Early Iron Age (EIA)**. Known sites in the region include Kruger Cave near Rustenburg and Broederstroom near Hartebeespoort Dam. Both sites are located to the east of the study area and date to approximately 460 AD (Mason 1974). No recorded sites were located within the study area during the desktop study.
AD 900 - 1300	**Middle Iron Age (MIA)**. No recorded sites were located during the desktop study.
AD 900 - 1840	**Late Iron Age (LIA)**. Various well-known sites from this period are located in the greater North-West Province, including the stone walled complexes at Buispoort and Braklaagte, the Makgame megasite, the 18th century capital at Kaditshwene and the copper mines at Dwarsberg in the Madikwe Game Reserve. These sites date to between the 15th and 19th centuries and record the arrival and development of the early Moloto Sotho-Tswana speakers (Boeyens, 2003).
	Four groups are of importance in the study area. These are the Bakolobeng, Batloung, Banogeng, and the Barolong. The following information was derived from a study conducted by the Lichtenburg Museum under P. M. Ntamu, 1996. The origins of the tribes of the Lichtenburg area follows (Fourie, 2009). *The Bakolobeng:*

	Oral sources indicate that the Bakolobeng originated from Tsaong near Silverkrans. Chief Kelly Molete concurs with Breutz's informants that the Bakolobeng were led through the present Kwena-Reserve of Botswana by Chief VI Molete-wa-Modikwagae in about 1769 or 1770, and later moved to Tsaong. Around 1830, they experienced a difficult period, which began with the death of their Chief, Kgosi VIII Molete when the Ndebele Group attacked them. This period of Difagane was also characterised by the Bakolobeng's flight to Thaba 'Nchu (in the Free State) and to Dimawe (Klerksdorp District) were they joined other refugees like the Batloung and Banogeng. After 1837, the Thaba 'Nchu Group of the Bakolobeng returned and settled temporarily at Bodumatau (Lichtenburg District) until they came into contact with Hermannsburg Mission. *Batloung:* They are also known as Batlhako, because they were originally with the Batlhako when they departed from the present Pretoria District and migrated to the areas of Rustenburg in about 1650. Oupa Mogorosi, one of the oldest informants, stated that: "... (they) departed from Mabalstadt along with Baphiring ... who controlled a section of people who were later to settle at Putfontein." Breutz's informants hold that in about 1750, the Batloung became an independent chiefdom and went to settle at Dipakane, in the Klerksdorp area. The Batloung later went to stay in a farm at Gruisfontein, accompanied by Rev Schnell of the Hermannsburg Lutheran Mission. At that time the Tribe was so scattered that one section was at Bodibe (Polfontein) and other places in the district. The idea of buying a farm as their ultimate settlement brought them together. *Banogeng:* According to oral sources collected by Breutz, the Banogeng are believed to be an ancient branch of the Digoja, i.e. forerunners of the Batswana Tribes who passed the Mafikeng area in small clan units. They are believed to be related to the Bakubung, Bataung and the Barolong Tribes, who originally shared the same totem; Tholo (Kudu) with them. For reasons better known to themselves; the Banogeng were destroyed and separated even before the period of Mzilikatzi attacks, except for remnants who stayed in the Lichtenburg District. The Ndebele continued to pose a threat to them so that they fled to Dimawe in the District of Klerksdorp. Here they merged with refugees from Baphiring, Batloung and Bakolobeng Tribes. Except for those who were assimilated into the already mentioned tribal groups, Ramosiane attempted to gather the remains of the Banogeng. They stayed at Kolong (Rietfontein) until 1960 when the tribe applied for its recognition and the re-establishment of the tribe. *The two Barolong tribes:*

	There are presently so many Barolong Tribes whose origin has been attributed to the first Chief Morolong, and the second Chief Noto. It is interesting to note that the totems, Tholo (Kudu) and Tshipi (Iron), were respectively taken from the names of the Chiefs mentioned. In his book, "History of the Batswana", Natal, 1989, Breutz indicate that "the first Tswana Tribe to come to South Africa under the rule of a Chief were the Barolong who arrived sometime between 1 200 and 1 300 or earlier". These migrations which continued even beyond the years 1450 and 1700 made the divisions of the Batswana Tribes like the Bahurutshe and the Bakwena more conspicuous. From 1823 - 1830, several Barolong Tribes fled from their Tribal land in the Transvaal as a result of Bataung raids and the Mzilikazi raids. Towards the end of the eighteenth century, the Barolong had divided into four groups, under Rratlou, Rrapulana, Seleka and Tshidi. The first two groups, namely the Barolong Boo-Ratlou and the Barolong Boo-Rapulana came to stay in the District of Lichtenburg. The Barolong Boo-Rapulana's residence was Lotlhakane (Rietfontein) in the Lichtenburg District. In 1882 moved to Bodibe (Polfontein) in the District of Lichtenburg. The last of the Barolong Boo-Ratloung, Chief Noto Moswete and his tribe were moved to Kopela.
AD 1873	**Historical period** The town of Lichtenburg: Hendrik Adriaan Greeff was born on the farm Lichtenburg close to Durbanville in the Cape Province. He became a hunter and started to frequent the then ZAR area. Greef settled in the late 1860 on the farms Doornfontein and Kaalplaats. Potchefstroom was the closest trading centre and approximately 150 km or "14 uur rijdens te paarde" away. A need for a town with a church and shops became stronger and Greeff and the Boers in the area saw Doornfontein with its abundant water, firewood and building material as the designated place. In 1865 the first application for town establishment was addressed to the House of Assembly, signed by 132 males in the area, and they started compiling a number of town regulations. Greeff wanted to name the town Lichtenburg, a name that he carried from his birth and because he wanted it to be a town whose light would shine over the area, not just with regard to hospitality and prosperity, but also in respect of religion. In 1868 the name "Lichtenberg", (a mistake still commonly made) appeared on the official map of the SAR, but the House of Assembly did not react yet. The men met again to discuss the town regulations and to obtain an appeal on speedy proclamation from the House of Assembly. The well-known Voortrekker savant, JG Bantjes, also established himself in Lichtenburg and signed the regulation as witness. Eventually Lichtenburg was officially proclaimed as town in mid-winter on 25 July 1873 by Pres. TF Burgers. (Lichtenburg Museum, 2009; cited in Fourie 2009).
1900-1902	**Boer War** During the Boer War the town of Lichtenburg was occupied by a British garrison of 620 men under the command of Lieutenant-Colonel CGC Money. The market square

	was turned into a fortified redoubt and strong pickets and sangars on the outskirts of town. On 3 March 1901, General De la Rey planned to attack the town with the help of General Cilliers and Commandant Lemmer and their followers, amounting to 1200 men. An attacking force of between 300-400 men was to assault the town. Due to the marshy terrain and a premature charge by General Liebenberg, the attack was repulsed with equal loses on both sides (Cloete, 2000).
Diamond Rush 1927	**Diamond Rush 1927** The Lichtenburg area is known for the 1926-27 diamond rush. In December 1924, a diamond of 3 carats was discovered by the Voorendyk family on the farm Elandsputte. Initial prospecting in 1925 produced a high yield of diamonds and the area was proclaimed as a “diggings” in February 1926. By 1945 a total of 104 diggings were proclaimed on 13 farms. It was the richest public diggings in the world, with the biggest gathering of diggers in history. A shanty town rose within a year or two, which housed in the region of 150 000 people, about 5 times as big as Lichtenburg today. Bakers, called after the owner Albert Baker, and later known as Bakerville, was the "main town". Here the houses and shacks stood ‘cheek by jowl’ for several kilometers. In the business centre there were as many as 250 diamond buyers' offices, as well as about 60 cafes, shops, barbers, butcheries and other businesses (Lichtenburg Museum, 2009). Bakerville is situated 10 kilometers to the north of Houthaalboomen, the proposed development farm for this project.

- *Findings from the studies*

Through the analysis of the aerial photographs and available maps of the study area no obvious heritage sensitive areas were identified inside the study area. The only possible sensitivities identified is related to farmsteads situated outside the study area but within close proximity to the proposed development area. These farmsteads’ experience of the rural cultural landscape could possibly be impacted on by the development. A single small farmstead was also identified inside the study area and will require assessment during the fieldwork component of the HIA. **Figure 20** Indicates the possible heritage sensitive areas.

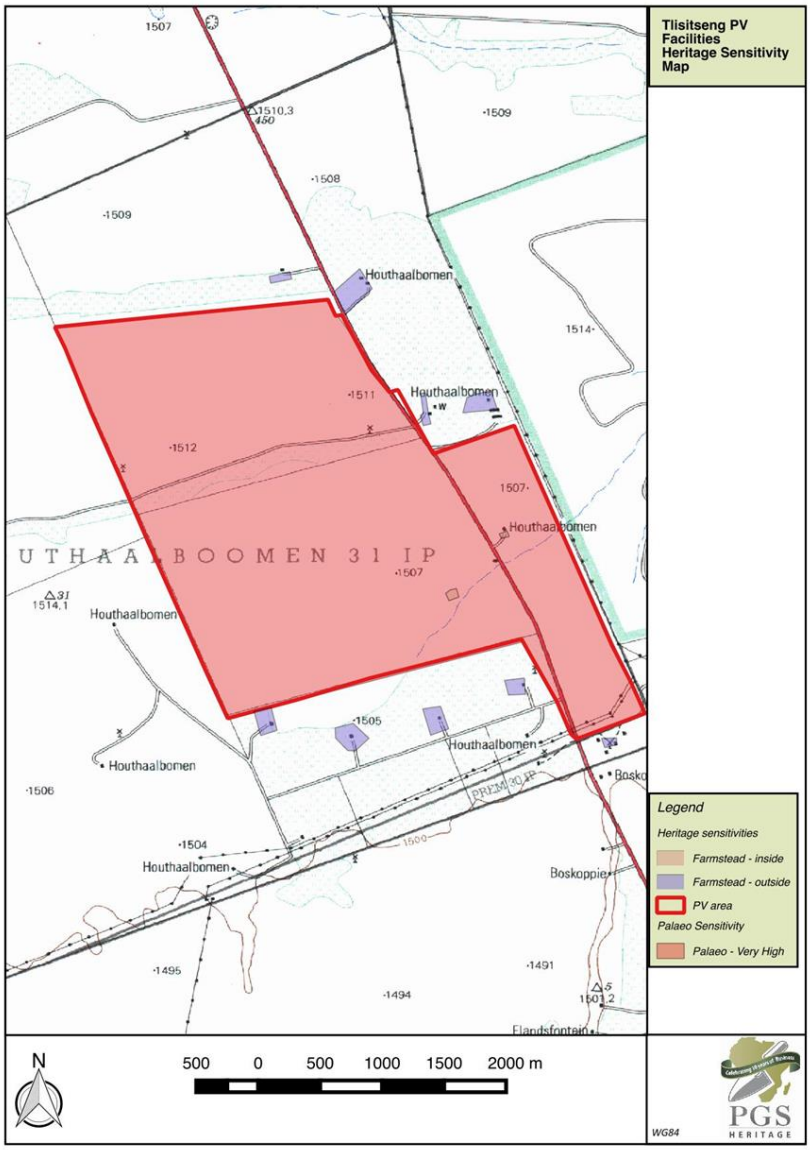

Figure 20: Tlisitseng Solar heritage sensitivity map

To be able to compile a heritage management plan to be incorporated into the Environmental Management Plan the following further work will be required for the EIA.

- Archaeological walk through of the areas where the project will be impacting;
- Full Palaeontological Impact Assessment, the entails fieldwork and assessment of the potential impacts of the findings of such fieldwork;

5.13 Socio-economic Environment

The Socio-economic Assessment was conducted by Mariette Steynberg of Urban-Econ Development Economists. The full report is included in **Appendix 6G**. The environmental baseline from a socio-economic perspective is presented below.

This section examines key socio-economic characteristics of the study area. This is essential as it provides both qualitative and quantitative data related to the economies and communities being studied. The outcome is a baseline against which the potential impacts, both positive and negative resulting from the proposed project, can be studied and analysed.

5.13.1 Study area's composition

- *Spatial context and regional linkages*

The proposed Tlisitseng Solar PV energy facility project is located close to Lichtenburg, which is the administrative centre and economic hub of the Ditsobotla LM. The Ditsobotla LM is one of five local municipalities comprising the Ngaka Modiri Molema DM, one of the four districts of the North West Province.

The North West Province is mostly rural in nature, comprising 9.7% of the total surface area of South Africa. Four of Botswana's districts border the Province. Domestically, the provinces of Limpopo, Gauteng, Free State, and the Northern Cape border the North West Province. Also located within the Ngaka Modiri Molema DM, is the Mafikeng LM, capital of the district and province.

One national road, the N14, traverses the primary study area. A section of the N14, which connects the western parts of Gauteng with the central parts of the North West Province, passes through the south eastern parts of the Ditsobotla LM, through the towns of Coligny and Biesiesvlei. Other important main roads linking the Ditsobotla LM with surrounding LMs include (Ditsobotla Local Municipality, 2011):

- Road 52 from Koster to Lichtenburg, and further westwards from Lichtenburg to Mafikeng (R503). This road carries high traffic volumes, and traverses the municipality in an east-west direction.
- The R503 connects Lichtenburg in a south eastern direction with Coligny and ultimately Klerksdorp.
- The R505, traversing the LM in a north-south direction, connects Lichtenburg to Ottoshoop when travelling north and Gerdau and Ottosdal when travelling south.
- The R52 connects Lichtenburg with Itekeng and Biesiesvlei.
- Parts of Route R53, the road that connects Ventersdorp and Swartruggens, transverses the eastern parts of the Ditsobotla LM.

- *Towns and Settlements*

The closest major town to the proposed project site is Lichtenburg, the administrative hub of the Ditsobotla LM. Other settlements in close proximity include Bakerville, Boikhutso, and Itsoseng.

Lichtenburg is situated approximately 230 kms from Johannesburg and is located in the middle of the maize triangle, South Africa's main maize growing area. The production of cement is also another main economic activity taking place in close proximity, with three major cement producers operating within an 80 km radius of the town.

Bakerville is located approximately 20 kms north of Lichtenburg. The settlement is a world-renowned diamond site, covering an area of roughly 35 km from east to west. The town originated due to the significant diamond deposit that was found there, and grew at a rate that eventually meant Bakerville was larger than Cape Town at the time. As previously mentioned, today the diamond mining activities are mostly abandoned, leaving the land on which it took place largely un-rehabilitated.

The Ditsobotla LM's SDF groups towns within the LM according to certain specific geographical locations. These clusters of towns and settlements are (Ditsobotla Local Municipality, 2011):

- The Lichtenburg cluster: including Lichtenburg, Boikhutso, and Blydeville.
- The Coligny cluster: includes Coligny and Tlhabologang.
- The Itsoseng cluster: Comprising of Sheila, Verdwaal 1 and 2, and Itsoseng.
- The Bodibe cluster: Includes Bodipe, Springbokpan, Welverdiend, and Matile / Meetmekaar.

The Lichtenburg cluster is not only considered the core area of the municipality, but is also spatially located in the centre of the Ditsobotla LM. It is within the area between the Lichtenburg and Itsoseng clusters that approximately 60% of the population is located. However, the fact that 28% of the population reside on farms within the LM, comparatively more than other LMs in the district, means that service delivery is required to take consideration of the rural areas.

- *Resources and land capability*

According to the Ditsobotla LM's 2006 SDF, the area of the project site is dominated by agriculture activities. More specifically, cattle and grazing. The entire southern part of the Ditsobotla LM is focused on commercial dry land and irrigated agricultural activities.

- The LM has a number of mining and quarrying activities taking place in proximity to Lichtenburg:
- The limestone quarries and operations of Afrisam around Dudfield.
- The limestone quarry of Lafarge between Bodipe and Springbokpan.
- The quarrying areas of Lafarge immediately west of Lichtenburg and in the area north east of the main Lafarge plant situated at the Lichtenburg industrial area.
- The extensive diamond mining activities occurring in the north western parts of the LM, specifically Bakersville, Grasfontein, and Welverdiend.
- The state quarries found in the northern parts of the LM.

Apart from the agricultural, and mining and quarrying activities taking place in the LM, there exists an opportunity for conservation and tourism, with Lichtenburg considered arguably the prettiest town in the North West based on the rich diamond mining history of the area. Aligned with this aim of conservation is the LM's SDF goal of creating an Open Space System by linking all natural elements of value and the "High Environmental Control Zones" in the LM. Elements that may be included into this system in close proximity to the proposed project site include: Molope Eye conservancy and nature reserve, the Malmanies Eye Natural Reserve, the Lichtenburg Game Breeding Centre, and the upper catchment areas of the Hartsriver. The SDF states that the linking of these natural resources in an Open Space System, will create an environment where conservation and environmental protection is considered as a primary factor, making sure no undesirable developments take place there (Ditsobotla Local Municipality, 2011).

- *Land-uses within the affected zone of influence*

It is envisioned that the proposed solar PV facility will be established on Portion 25 of Farm Houthaalboomen 31. From the preliminary land use map in the socio-economic specialist report, it can be seen that irrigated agricultural activities are taking place on Portion 25 of Farm Houthaalboomen 31. Also visible on this map are irrigated agricultural activities taking place on surrounding farm portions as well as scattered farm houses. Finally, the Watershed MTS is present. Grid connection from the proposed PV energy facility to the MTS will be analysed in a separate report where the applicable land uses that may be impacted by this element of the proposed Tlisitseng project will be discussed. **Table 16** provides land use information from initial interaction with the owners or managers. It is expected that more information on the adjacent land uses will be available once the site visit is conducted. The initial interaction with the landowner of the proposed site did reveal that no significant objection to the proposed project is present from the directly affected individuals.

Table 16: Land use profile of the affected farm portions

Farm	Owner/contact details	Type of effect	Information
Portion 25 of Farm Houthaalboomen 31	Klein Uitschot Boerdery Pty Ltd – Ferdi Hartzenberg 0824146988, drferdi@denand.co.za	Directly affected – PV site	• Farming with maize and cattle. • Four workers reside on two houses on the farm. • The land under maize (86 ha) will be unaffected. • The cattle's grazing area will be unaffected – The farmer plans to use the rental payment from BioTherm to acquire land elsewhere so that the scale of his cattle farm does not have to be reduced. Land is regularly available in the area. • The two permanent houses on the farm will need to be removed. BioTherm will reimburse. • Some infrastructure changes will need to take place, once again the farmer understands that BioTherm will offer reimbursements.

			• The landowner is in support of the project as he understands the importance of building generation capacity.

5.13.2 Demographic Profile and Income Levels

The population of any geographical area is the cornerstone of the development process, as it affects the economic growth through the provision of labour and entrepreneurial skills, and determines the demand for the production output. Examining population dynamics is essential in gaining an accurate perspective of those who are likely to be affected by any prospective development or project.

The Ngaka Modiri Molema DM is home to 842 702 people residing in 227 003 households, with 20% of the DM's total population residing in the Ditsobotla LM. At the same time Lichtenburg's population is estimated as 26 337 (7 540 households), 15.6% and 3.1% of the populations of the LM and DM respectively (Stats SA).

According to the National Census of 2011, 99.99% of Lichtenburg's population is settled in urban areas, with the remaining 0.01% (3 persons) living on farms. This is markedly different from the scenario in the study area's DM and LM where 61.5% and 24.1% of the respective populations reside on tribal or traditional land; this signifies the relative rural nature of the municipalities being studied. The Ditsobotla LM's IDP, as well as the Ngaka Modiri Molema DM's IDP, takes cognisance of the fact that the high number of its population residing in rural or tribal areas increases the complexity of adequate service delivery, and that service delivery backlogs in the economic as well as social services sphere are present for these rural communities. The fact that nearly all of Lichtenburg's population is staying in the urban area can thus be seen as an indication that this population group enjoys relatively better service delivery; although, the LM's IDP does state that the infrastructure in Lichtenburg, especially the electrical infrastructure, is in need of maintenance or replacement (Ditsobotla Local Municipality, 2011).

The majority of the DM's population is African, (94%), with Whites being the next biggest population group at 3.6%; 89% of the LM's population is African, with the African population in Lichtenburg being the smallest of the respective study areas at 60%. Within the LM, 8% of the population is White with a further 1.9% being Coloured. In Lichtenburg the White population is slightly bigger at 30%, with a Coloured population of 7.7% (Stats SA). According the 2011 Census, the most prominent home language spoken across all of the study areas is Setswana, with Afrikaans and English the preferred home language of the next biggest groups of the population.

Within Lichtenburg the male to female ratio is virtually 1:1, with 49.97% of the town's population being male and 50.03% female. The situation is slightly different in the LM and DM, where the respective populations have slightly more females than males (Stats SA). In all of the areas being studied, the majority of the population is of working age (15 – 64); however, in some cases the dependency ratio is relatively high when compared to that of the country (Stats SA):

- In the Ngaka Modiri Molema DM, 60.8% of the population is of working age, with 39.2% being aged 0 – 14 or older than 65. This means that the dependency ratio for the DM is higher than the average for the country (34.5%).
- The Ditsobotla LM's population consists of a slightly higher percentage of working aged individuals – 61.9%, regardless the number of individuals who would be dependent on those of working age is still higher than the country average at 38.1%.
- Lichtenburg is the only study area where the dependency ratio is smaller than that of the country. With a dependency ratio of 33.8%, and 66.2% of the population aged 15 – 64, Lichtenburg has a slightly higher proportion of individuals being economically active than the rest of the study areas. This could be seen as a driver for growth if employment creation is able to provide sufficient opportunities and the work force is suitably skilled.

According to the 2011 Census, literacy levels in Lichtenburg are relatively on par with the level of literacy recorded in South Africa. The literacy levels in the municipalities being studied are below that of the country though, indicating a community that is relatively less employable than the Lichtenburg community or the broader South Africa. Approximately 17% and 15% of the DM and LM's respective populations, aged 20 years and older, have had no access to formal education, while 8.7% of the population of Lichtenburg has had no schooling. In the DM, only 20.3% of the population aged 20 years and older successfully completed matric, with 8.1% achieving a higher education. The situation is even worse in the LM, where only 19.7% of the population, aged 20 and older, has obtained a matric certificate. In Lichtenburg, 27.7% of the population has completed matric, while 12% successfully completed tertiary studies.

In Lichtenburg the average monthly household income is R12 194, which is significantly more than the average national household income of R9 235 per month. The broader population of the study area is earning considerably less, with the average monthly income for the DM and LM at R5 772 and R6 004, respectively, per household (Stats SA). The lower than average national income levels could be indicative of a limited number of job opportunities available, which in turn is associated with a smaller than average economic base.

Easier access to employment opportunities can be viewed as the reason why Lichtenburg has a smaller proportion of households living with no income (10.2%), compared to the 15.3% and 12.5% of households in the DM and LM not receiving any monthly income. Furthermore, the fact that fewer (39%) of Lichtenburg's households, versus 58.6% and 59.3% of the households in the DM and LM, earn an income of R3 200 or less per month can be seen as an indication of the relative quality of the employment opportunities offered in Lichtenburg compared to that of the DM and LM.

5.13.3 Economy and its dynamics

The structure of the economy and the composition of its employment provide valuable insight into the dependency of an area on specific sectors and its sensitivity to fluctuations of global and regional markets. Knowledge of the structure and the size of each sector are also important for the economic impact results' interpretation, as it allows the assessment of the extent to which the proposed activity would change the economy, its structure, and trends of specific sectors.

Based on current prices, the economy of the North West Province is valued at R199 551 million. This is the equivalent of a 6.5% contribution to the national GDP. At the same time, the economy of the Ngaka Modiri Molema DM was valued at R31 007 million in current prices, while the economy of the Ditsobotla LM was estimated to have a GDP of R8 122 million in current prices. The LM comprises more than a quarter (26.2%) of the GDP of the DM, and 4.1% of the North West Province's GDP is attributable to Dibotla LM (Quantec, 2014).

Over a ten-year period ranging from 2003 to 2013, the Ditsobotla LM's economy grew by a Compounded Average Growth Rate (CAGR) of 5%. The growth recorded in the LM is higher than the rate at which the DM and province's respective economies grew. It is estimated that these economies grew by 3.2% and 22% in the DM and province respectively, over the same five-year period. In turn, the growth of 2.2% recorded in the province is below that of the country, which was estimated at 3.3% for the same ten-year period (Quantec, 2014).

The comparatively high growth rate in the LM can be attributed to the growth recorded in the Wholesale, trade, and accommodation, and Finance, insurance, and real estate sectors. Based on current prices, the Wholesale, trade, and accommodation sector comprises 23.9% of the Ditsobotla economy, with the Finance, insurance, and real estate sector accounting for a further 23% of the LM's GDP in current prices (Quantec, 2014). Thus a CAGR of 6.5% in the Wholesale, trade, and accommodation sector, and 8.5% in the Finance, insurance, and real estate sector is likely to have driven the bulk of the LM's economic growth based on the importance and contribution of these sectors to its economy.

In terms of the structure of the economies being studied, and the most significant economic activities taking place within these, the economy of the Ditsobotla LM is not unlike that of the country. Based on current prices, the economy of South Africa is a service economy with the tertiary sector contributing 70.5% of the national GDP. The importance of tertiary activities increases slightly in the LM – here the tertiary sector comprises 77% of the economy's GDP. It can furthermore be stated that wholesale, trade, and accommodation industries are contributing more to the LM's economy when comparing the proportionate contribution to that in the country's economy (16.6%). Other significant structural differences between the Ditsobotla and the South African economy relate to manufacturing industries being a slightly more important contributor to the national GDP. This sector contributes 11.3% to South Africa's economy and 9.4% to the economy of the LM. The importance of the primary economy is also lower in the LM (8%), versus the 11.5% that the primary sector contributes to the country's GDP. In addition, the primary sector is structured

differently in the LM, here agriculture is more important (6.8% of the LM's GDP), compared to the 1.2% contribution of the mining sector. In the country, the mining sector contributes 9.2% to the national GDP.

The structure of the Province's economy as seen in **Table 17**, is remarkably different to that of the country and LM, whereas the DM's economy is structured similarly to that of the LM. In the Province the importance of the primary sector increases significantly due to the mining activities that have been so prevalent in this Province, with 30.8% of the Province's GDP being generated by mining activities. The reliance of the North West Province's economy on tertiary industries is also significantly below that of the other economies being studied. It is estimated that the tertiary sector contributes 58.1% to the province's GDP. In contrast to this is the importance of the tertiary sector in the DM, here service activities are the most important contributor, generating 81.9% of the Ngaka Modiri Molema DM's GDP. This comparatively high reliance is mostly due to the higher than average importance of the general government services sector – 22.7% of the DM's GDP is generated by government services.

Table 17: Economic structure of the various delineated study areas

Economic Sector	**Ngaka Modiri Molema DM**		**Ditsobotla LM**	
	GDP in current prices (R'm)	% of GDP	GDP in current prices (R'm)	% of GDP
Agriculture	R1 361	4.4%	R101	3.5%
Mining and quarrying	R683	2.2%	R10	0.4%
Manufacturing	R1 871	6.0%	R112	3.9%
Electricity, gas and water	R689	2.2%	R85	3.0%
Construction	R1 005	3.2%	R104	3.6%
Trade	R6 388	20.6%	R365	12.8 %
Transport and communication	R2 403	7.7%	R364	12.7 %
Finance and business services	R6 373	20.6%	R551	19.3 %
Personal services	R3 187	10.3%	R327	11.5 %
General government	R7 045	22.7%	R838	29.3 %
TOTAL	**R31 007**	**100%**	**R2 857**	**100%**
Economic Sector	**South Africa**		**North West Province**	
	GDP in current prices (R'm)	% of GDP	GDP in current prices (R'm)	% of GDP
Agriculture	R72 202	2.3%	R4 815	2.4%
Mining and quarrying	R282 366	9.2%	R61 478	30.8 %
Manufacturing	R349 066	11.3%	R9 580	4.8%

Economic Sector	Ngaka Modiri Molema DM		Ditsobotla LM	
	GDP in current prices (R'm)	% of GDP	GDP in current prices (R'm)	% of GDP
Electricity, gas and water	R91 201	3.0%	R2 642	1.3%
Construction	R114 754	3.7%	R5 065	2.5%
Trade	R510 666	16.6%	R24 937	12.5 %
Transport and communication	R272 303	8.8%	R15 383	7.7%
Finance and business services	R680 443	22.1%	R30 209	15.1 %
Personal services	R182 795	5.9%	R16 588	8.3%
General government	R524 716	17.0%	R28 855	14.5 %
TOTAL	**R3 080 513**	**100%**	**R199 551**	**100%**

(Quantec, 2014)

5.13.4 Labour Force and Employment Structure

Employment is the primary means by which individuals who are of working age may earn an income that will enable them to provide for their basic needs and improve their standard of living. As such, employment and unemployment rates are important indicators of socio-economic well-being.

Table 18: Labour force of the delineated study areas

	South Africa	North West Province	Ngaka Modiri Molema DM	Ditsobotla LM	Lichtenburg
Working age population	33 928 806	2 273 362	512 630	104 628	17 407
Non-economically active population	13 238 633	907 948	243 945	44 487	6 169
Labour force	18 841 453	1 236 786	226 903	53 005	10 683
Employed	13 254 829	848 107	150 683	37 933	8 495
Unemployed	5 586 624	388 679	76 220	15 072	2 188
Unemployment rate	29.7%	31.4%	33.6%	28.4%	20.5%
Labour force participation rate	55.5%	54.4%	44.3%	50.7%	61.4%
Discouraged work seekers	5.4%	5.7%	8.2%	6.8%	3.2%

(Stats SA)

The Ngaka Modiri Molema DM has a working age population (15 – 64 years of age) of 512 630 individuals – 60.8% of its total population. According to South Africa's official unemployment definition, it is estimated that 33.6% of the DM's labour force is unemployed, while 8.2% can be classified as discouraged work seekers (Stats SA). Within the Ditsobotla LM the situation improves slightly since here, according to the Census 2011, there is a working age population of 104 623. Furthermore the LM has an approximate unemployment rate of 28.4%, while 6.8% of the population are discouraged work seekers.

As expected in the previous section, where it was revealed that the household income levels in Lichtenburg are comparatively, significantly higher than that of the municipalities being studied, and the employment situation in the town is noticeably more positive than that of the DM or LM. In Lichtenburg, where 66% of the population is of working age, unemployment is estimated at 20.5% and discouraged work seekers comprise 3.2% of the town's 17 407 working age population. It follows that Lichtenburg's labour force participation rate is also significantly higher at 61.4%, compared to the 44.3% and 50.7% in the DM and LM.

In the Ditsobotla LM 11.3% of all employment is created by the agriculture sector - more than the 7.7% in the DM created by the same sector. Nationally the agriculture sector creates an even smaller proportion of total employment opportunities – 5.8%. The economy is predominantly, still a service economy, though, with practically 3 quarters of all jobs, in all of the respective study areas, generated by the tertiary sector (Quantec, 2014). More specifically, the tertiary sector created 74.6% of all employment opportunities in the LM. The biggest contributors to this job creation is the wholesale and retail trade sector (38.6%), and the community, social and personal services sector (25.6%) (Quantec, 2014).

5.13.5 Access to Housing and Basic Services

Access to shelter, water, electricity, sanitation, and other services are indicators that assist to determine the standard of living of the people in the area under investigation. Infrastructure and the state of local infrastructure are other indicators to contemplate when considering living standards. The availability of social and economic infrastructure including roads, educational facilities, and health facilities, further indicates the nature of the study area that is valuable in developing a complete profile of the circumstances in which communities are living. These measurements create a baseline against which the potential impacts of the proposed project can be assessed.

- **Housing:** It is estimated that 86.7% of households in Lichtenburg reside in formal brick structures, be it stand-alone houses, complexes, in a block of flats, or as a second building in a yard. A further 12.6% of Lichtenburg's households reside in informal dwellings, with only 0.1% of the town's households living on tribal or traditional land. Within the Ditsobotla LM the proportions vary significantly, with only 74% of the households of this municipality living in formal brick structures. Proportionally more of the DM's population is living on tribal land, in traditional structures such as huts (8%), with 16.8% living in some kind of informal structure. The situation in the Ngaka Modiri Molema DM mirrors that of Lichtenburg

more closely, here 82.7% of households reside in brick structures of some sort, with 12.7% living in informal structures. The number of traditional dwellings is proportionally more however, at 3.5%.

It must be noted that the LM is in the process of implementing a housing programme, specifically in the towns of Tlhabologang and Boikhutso (Ditsobotla Local Municipality, 2011). The objective of the housing programme is to address the sanitation backlog; regardless, the result will be that fewer households will reside in informal settlements in the LM.

- **Access to water**: It is estimated that 91% of all households in Lichtenburg have access to piped water either inside the dwelling or in the yard. The situation is markedly worse in the LM and DM where only 65.9% and 51% of the respective households have access to piped water in the dwelling or yard. This statistic for access to piped water is worse than the national average, where 73% of households have access to piped water in their dwelling or yard. The dire situation in these municipalities is further reflected in the fact that 14% of households in the DM, and 10.9% of households in the LM, have no access to water. According to the Ngaka Modiri Molema DM's IDP, the proportion of households with no access to water have declined from 2000 to 2010. This backlog remains a service delivery issue in the DM however (Ngaka Modiri Molema District Municipality, 2012).

  The 205/2016 revision of the DM's IDP states that the DM was declared a Water Services Authority (WSA) in 2003, giving the district authority to perform water and sanitation services in its jurisdiction. The Department of Water Affairs bulk infrastructure systems operational within the DM, are concentrated in the Mafikeng, Ditsobotla, and Ramotshere Moiloa LMs. Other infrastructure systems in the DM include (Ngaka Modiri Molema District Municipality, 2015):

  - 30 reservoirs,
  - Five pump stations and eight water purification works, and
  - 12 waste water treatment works.

  The revised IDP also states that the surface water in the area is generally insufficient, leading to rural water supply often relying on ground water sources, and that the WSA is in the process of developing a Water Services Development Plan (WSDP) and Water Services Master Plan. The WSDP will provide a backlog study and identify projects than need to be implemented, while the master plan will reconcile the available water sources with the demand for water supply (Ngaka Modiri Molema District Municipality, 2015).

  The Ditsobotla LM's IDP (2011/12 – 2015/16), states that a services backlog study commissioned in 2007 by the Department of Developmental Local Government, revealed that 18 023 households receive water connection services below RDP standards, while a further 20 559 of the municipality's households receive services within the RDP standards. It was estimated that upgrades for these households, to either be within the RDP standards or for yard connection, would require a total budget of R214 million. The IDP furthermore makes mention of the fact that two major bulk water infrastructure projects, aimed at addressing water shortages in Tlhabologang and Itsoseng were being implemented (Ditsobotla Local Municipality, 2011)

As far as water infrastructure is concerned, the IDP states that; the Lichtenburg water treatment plant is more than fifty years old, but well maintained, and the pump station in Itsoseng requires overhaul maintenance. Of the 30 reservoirs within the DM, 16 are located within the LM's boundaries. According to the IDP, the municipal infrastructure audit revealed that 9 of these reservoirs are in good condition, while one is in average condition, and three more in poor condition. The reservoirs in poor condition provide bulk water to Itsoseng and Verdwaal (Ditsobotla Local Municipality, 2011).

- **Access to sanitation**: If not managed and provided adequately, the basic need of sewerage and sanitation can pose serious health and safety risks to the communities not receiving these basic services. In Lichtenburg, 90% of the households had access to a flushing toilet, while almost 2% of the households had no access to toilet facilities. At the same time, 4% of the town's households were using pit latrines while 0.12% were still reliant on the bucket system.

  The situation is markedly worse in the municipalities being studied. In the Ngaka Modiri Molema DM only 38.5% of households had access to a flushing toilet, while 7.5% of the households had no access. The bulk of the households (57%) in the DM were using pit latrine systems, with 1.2% of households using the bucket system. More households had access to a flushing toilet in the LM (47%); however, 4.9% of the Ditsobotla LM's households were still using the bucket system. A situation that is in stark contrast to the government's determination to eradicate all bucket toilet systems by 2007. 35% of households in the LM were using pit latrines while 0.3% had no access to toilet facilities.

  As mentioned in the previous section, the Ngaka Modiri Molema DM has been awarded WSA status. The WSA is in the process of developing the WSDP and master plan, which will provide guidance on addressing these services backlogs with the limited water resources in the DM.

  The findings discussed here can be somewhat verified by the fact that the Ditsobeng LM's IDP states that the largest sanitation backlogs are prevalent in rural areas and urban based informal settlements, explaining the comparatively high level of sanitation in Lichtenburg when compared to the rest of the LM. The IDP estimated that it would cost R80.9 million to upgrade the 10 274 households in the municipality (with sanitation systems below RDP standard), to pit latrine systems. To address the large number of households still making use of the bucket toilet system, the LM has implemented a housing programme involving the construction of low cost houses in Tlhabologang and Boikhutso (Ditsobotla Local Municipality, 2011).

- **Access to electricity:** The indicator "electricity for lighting", was used as a proxy for measuring households' access to electricity. In Lichtenburg 86% of households had access to electricity; this is only slightly more than the national average proportion with access of 84.8%. The situation is somewhat worse in the municipalities studied, with 80.5% and 74% of households in the DM and LM respectively having access to the grid.

The main alternative source for lighting in the study areas was candles; 12% of households in Lichtenberg utilised this lighting method, while 17.7% of households in the DM did the same. In the Ditsobotla LM, nearly a quarter of all households were reliant on candles for lighting. Of interest to this project is the fact that 18 households in Lichtenburg (0.2% of all households), were using solar power for lighting.

According to the Ditsobotla LM's IDP, the LM is licensed to provide electricity to Lichtenburg, Blydeville and Coligny, with the remainder of the LM serviced by Eskom. The IDP furthermore reveals that areas without electricity are mainly located in rural areas such as Grasfontein and Bakerville for example. Based on the IDP, the electrical infrastructure in Lichtenburg is old, requires maintenance, and is in need of upgrades. Moreover, load supply to Lichtenburg needs to be increased to provide for the demand associated with the growing property and business markets in the town. The IDP states that, based on preliminary business plans and estimates, the costs of the new infrastructure is approximately R29 million.

- **Refuse removal service**: It is estimated that 62% of households nationally have their refuse removed by a local authority on a weekly basis. This national estimate is substantially below the number of households in Lichtenburg (87.8%), with regular weekly refuse removal services. At the same time, only slightly more than a third of households in both the LM and DM have regular refuse removal services. It is more common for households in these municipalities to have their own refuse dump, with 54% of homes in the DM, and 48.9% in the LM using this method of waste disposal. Also noteworthy is the fact that the LM has the highest proportion of households within the study areas with no means of refuse disposal (6.6%), compared to the DM (6.1%), and Lichtenburg where 2.7% of households have no access to refuse removal services.

  Based on the findings of the Ditsobotla LM's IDP, the municipality recognises the serious health issues posed by the non-collection and improper disposal of refuse. However, in order for the LM to address these service backlogs it is required that the organisational structure of the LM be reviewed in order to align with the challenges highlighted in the Strategic Environmental Assessment Report (Ditsobotla Local Municipality, 2011).

- **Internet access**: Internet access has become increasingly important for accessing economic opportunities. Although not a definitive measure, it could be argued that a lack of access to the knowledge readily available on the internet could negatively affect an individual's ability to access quality educational and economic opportunities.

  In Lichtenburg 58.6% of households have no internet access. These are fewer households than the national average of 64.5%; regardless, it still excludes more than half of the town's population from the potential that could be associated with internet access. The situation is significantly worse in the studied municipalities, where almost three quarters of all households have no access. For those with access, a cell phone is the most common method of access, followed by home internet access or access at work.

5.13.6 Social and Recreational Infrastructure

The Ditsobotla LM's IDP (2011/12 – 2015/16) contains information on the following social and recreational infrastructure within the LM:

- **Health services** – There are two hospitals and nine clinics within the Ditsobotla jurisdiction.
    - General de la Rey Hospital: located on the Thabo Mbeki Drive. The hospital provides in-patient care and maternity services. The outpatient unit provides emergency care until a patient can be transferred to the Thusong Hospital.
    - Thusong Hospital: situated roughly 25 km from Lichtenburg, on the Mafikeng road at the turn off to Itsoseng. The hospital has the following facilities available: theatres, male and female medical wards, a gynaecology ward, a paediatric ward, a maternity ward, a tuberculosis ward, out-patients, and casualties.
    - Nine community clinics in the following towns: Lichtenburg, Boikhutso, Blydeville, Coligny, Tlhabologang, Itekeng, Bodibe, and Itsoseng.
    - The IDP estimates that about 31 health facilities are required to provide adequately. However, considering the current population (168 904) and the planning norm of one clinic per 5 000 community members, the requirement is more likely to be approximately 20 clinics in the LM.
    - There is one formal old age home located in the LM, the Lichthuis Old Age Home, situated in Lichtenburg.

- **Community facilities and services (sport fields etc.)**
    - Most of the existing community facilities, including sports grounds, are located in urban areas, excluding most of the LM's rural population.
    - Facilities located in rural areas are of poor standards compared to the facilities available in Lichtenburg.
    - The challenge facing the LM in this regard is therefore, considered to be not only access to existing facilities, but also ensuring that available facilities are tailored to the social circumstances and conditions of the communities they target.
    - According to the IDP, the sport fields in Ga-Motlatla, Verdwaal, and Bodibe are in various stages of completion. Projects were initiated to finalise them for handover to the respective communities for utilisation.

- **Cemeteries**
    - Additional land for cemeteries is required in the communities of Itekeng, Coligny, and Itsoseng.

- Maintenance of cemetery yards in all areas of the LM remains a challenge. There is also a need for all cemeteries to be fenced, and ablution facilities to be constructed at all cemeteries in the LM.
- The IDP believes that the challenges with regards to the provision of adequate cemeteries will rely on a focus on the following aspects:
  - Providing cemeteries that meet sustainable, technical, and environmental criteria.
  - Accommodating diverse cultural requirements and the function of cemeteries as public spaces in each to ensure a dignified municipality.
  - Fostering civil and private sector partnerships in cemetery development and management.
  - Special attention must be given to those in need, respecting the bereaved at burial. It is also important to protect and properly maintain cemeteries as public property and create a safe working space for cemetery employees.

- **Community halls**
  - All community halls within the LM require renovation. The towns in which these renovations will take place are: Lichtenburg, Boikhutso, Itekeng, Itsoseng, Sonop, and Tlhabologang.
  - Bakerville, Grasfontein, Bodibe, and Verdwaal are all areas that require new community hall facilities.

- **Traffic and licensing services**
  - Generally, traffic law enforcement is concentrated in urban areas such as Lichtenburg and Coligny.
  - This is mainly due to a lack of human resources as well as below par traffic infrastructure in rural or former township areas.

- **Disaster management**
  - An Emergency Services Unit exist within the Ditsobotla LM for fire and rescue services as well as disaster management.
  - The unit is functional; however, it is not up to standard and under-resourced, with only temporary employees and insufficient equipment.
  - The Ngaka Modiri Molema DM commissioned the drafting of a Disaster Management Framework and Disaster Risk Management Plan. The Draft Gap Analysis Report found that the LM does not conform to legislative requirements. The DM will address these gaps through a comprehensive disaster management plan incorporating the needs of category-B municipalities.
  - Moreover, the provision of services in the LM is hampered by problems surrounding powers and functions. According to the IDP, the LM has not yet entered into a service level agreement with the DM for provision of these services.

5.14 Geotechnical

The Geotechnical Impact Assessment was conducted by Colin Dalton and Thanduxolo Msengana of Geopractica. The full report is included in **Appendix 6H**.

5.14.1 Database and Literary Review

This literary review was conducted on data obtained from the following sources:

- Previous investigations in the area undertaken by Geopractica (Pty) Ltd and Geostrategies c.c.
- Previous published investigations in the area undertaken by other consultants.
- The 1:250 000 geological map, "No 2626 West Rand" was consulted in order to determine the regional geology in the vicinity of the site.
- The 1:50,000 topo-cadastral map "2626 AA Lichtenburg" was assessed for topography and drainage of the site.
- Google Earth imagery both current and historical.
- Seismic hazard map of South Africa.
- Internet.

5.14.2 Climate and Weather Conditions

According to the Climatic N value map of South Africa compiled by Weinert, Lichtenburg falls into the transition zone between Sub Humid and Sub Arid having an N value marginally greater than 5.

This would indicate that the most likely method of weathering of the bedrock would be due to mechanical disintegration, as opposed to chemical weathering in the areas of the country having a higher annual rainfall.

The weathering profile in these more arid regions of the country, should therefore favour the generation of a thinner residual soil horizon, than would be the case in the more humid, wetter coastal regions.

The average annual rainfall in this area is between 566mm and 620mm, most of which occurs in heavy isolated falls between November and March.

The average maximum summer temperature of approximately 28.0°C occurs in January with an average maximum of 18°C in June. Frost in winter is relatively common.

5.14.3 Local Geology

From available literature, it is evident that the site is underlain by dolomite belonging to the Malmani Subgroup within the Transvaal Sequence.

This blue/grey, hard rock dolomite is typically interbedded with very hard, grey chert, and the upper surface usually weathers insitu to form a dark brown, silty sand with abundant, close packed gravels, cobbles and boulders of both fresh and leached chert and dolomite (residuum).

The bedrock profile within the dolomites is highly variable with hard, steep, dolomite pinnacles with deeply weathered slots (grykes) in between. These hard rock dolomite pinnacle can occur close to surface or at a significant depth, and can be widely separated or closely spaced. These features are due to the fact that dolomites can be easily dissolved by slightly acid ground water, percolating downward from surface, into the underlying formation.

Typically these slots can be filled with wad (a very soft, silt and clay derived from the insitu decomposition of dolomite) and other alluvial debris (dolomite residuum). The collapse of these cavities can result in the formation of sinkholes or doline depressions at the surface.

On the West Rand, most sinkhole and doline formation was related to the drawdown of the local watertable, due to underground mining operations. Human development could also be the triggering mechanism for the formation of sinkholes and dolines, due to the ingress of surface water into the underlying formation due to leaking sewers, water storage ponds, water taps, stormwater drains as well as water services to residential and commercial buildings.

The Malmani Subgroup is subdivided into the Oaktree (lower), Monte Christo (lower middle), Lytleton (upper middle) and Eccles (upper) formations. The Oaktree and Lytleton are chert poor while the Monte Christo and Eccles are generally chert rich. According to the geological map, the site is located within the lower middle Monte Christo (chert rich) Formation.

Typically the chert rich formations tend to be less problematic as the insoluble chert lenses within the dolomite bedrock tend to provide stability to the surrounding soluble dolomite.

A further factor which reduces the risk profile of dolomite terrains, is the presence of a thick and non-erodible blanketing soil layer, over the underlying dolomite formation.

The Malmani Subgroup is in turn overlain by quaternary sandy gravel and pedogenic soils in the form of calcrete.

A site geological map is shown in **Figure 21** below.

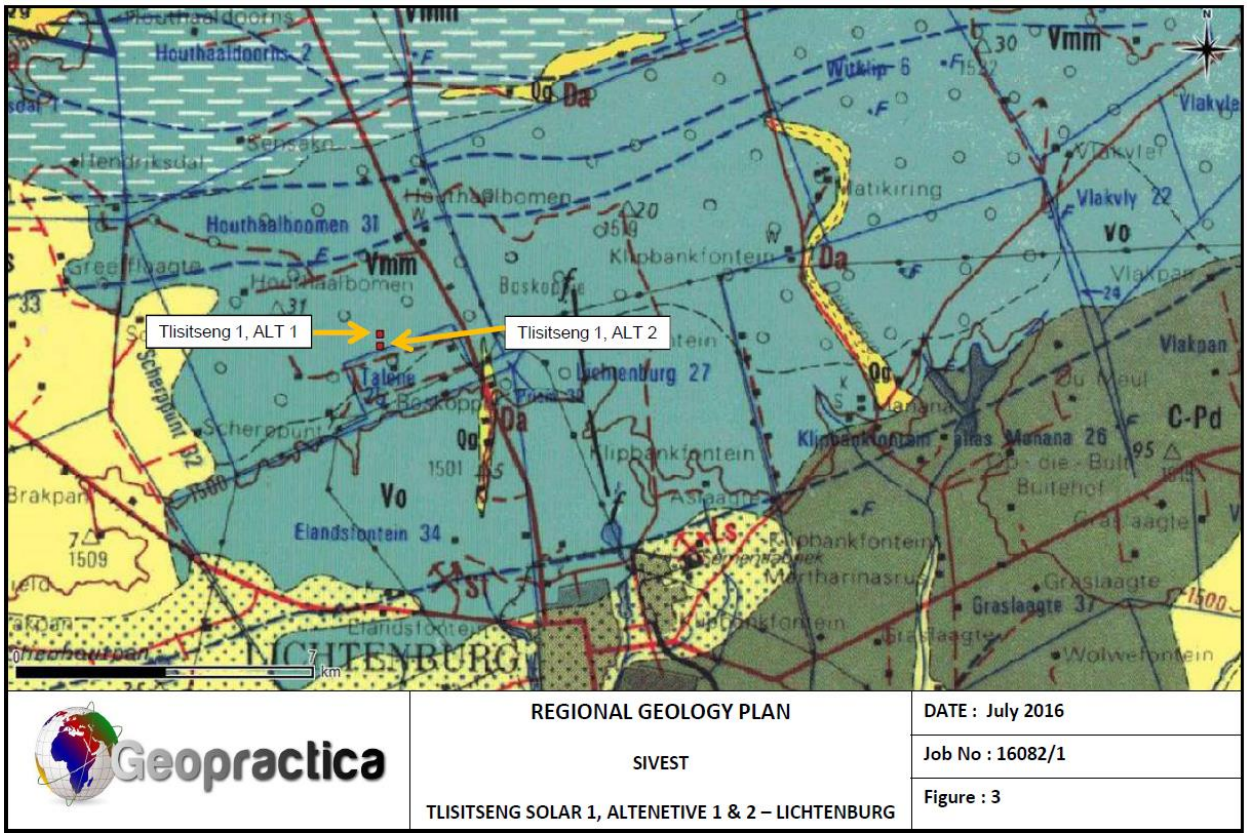

Figure 21: Site Geological Map

5.14.4 Topography and Drainage

- **Proposed Substation Alternative 1:**

This site generally slopes gently towards the north and east at a gradient of between 0.7% and 1%, which should be sufficient for stormwater runoff, in the form of sheet wash towards the north and east, after periods of heavy prolonged rainfall. With the site being overlain by a relatively thin horizon of permeable sandy hillwash it is likely that downward percolation of precipitation (under normal conditions) is likely. However Google Earth imagery suggests that this site may be underlain by well developed, shallow, undulating calcrete horizon, which is typically impermeable and thus stormwater ponding could be an issue in this area, particularly after heavy or prolong rainfall.

- **Proposed Substation Alternative 2:**

Substation site “alternative 2" generally slopes gently towards the north and west at a gradient of between 1% and 2%, which should be sufficient for stormwater runoff, in the form of sheet wash towards the north and west, after periods of heavy prolonged rainfall. With the site being overlain by a relatively thin horizon of permeable sandy hillwash it is likely that downward percolation of precipitation (under normal conditions)

is likely. However Google Earth imagery suggests that this site may be underlain by well developed, shallow, undulating calcrete horizon, which is typically impermeable and thus stormwater ponding could be an issue in this area, particularly after heavy or prolong rainfall.

5.14.5 Seismicity

According to the seismic hazard map of South Africa, the site is situated in the area where peak ground acceleration with a 10% probability of being exceeded in a 50 year period falls between 0.12g and 0.16g as seen on the seismic hazard map of South Africa (**Figure 22**).

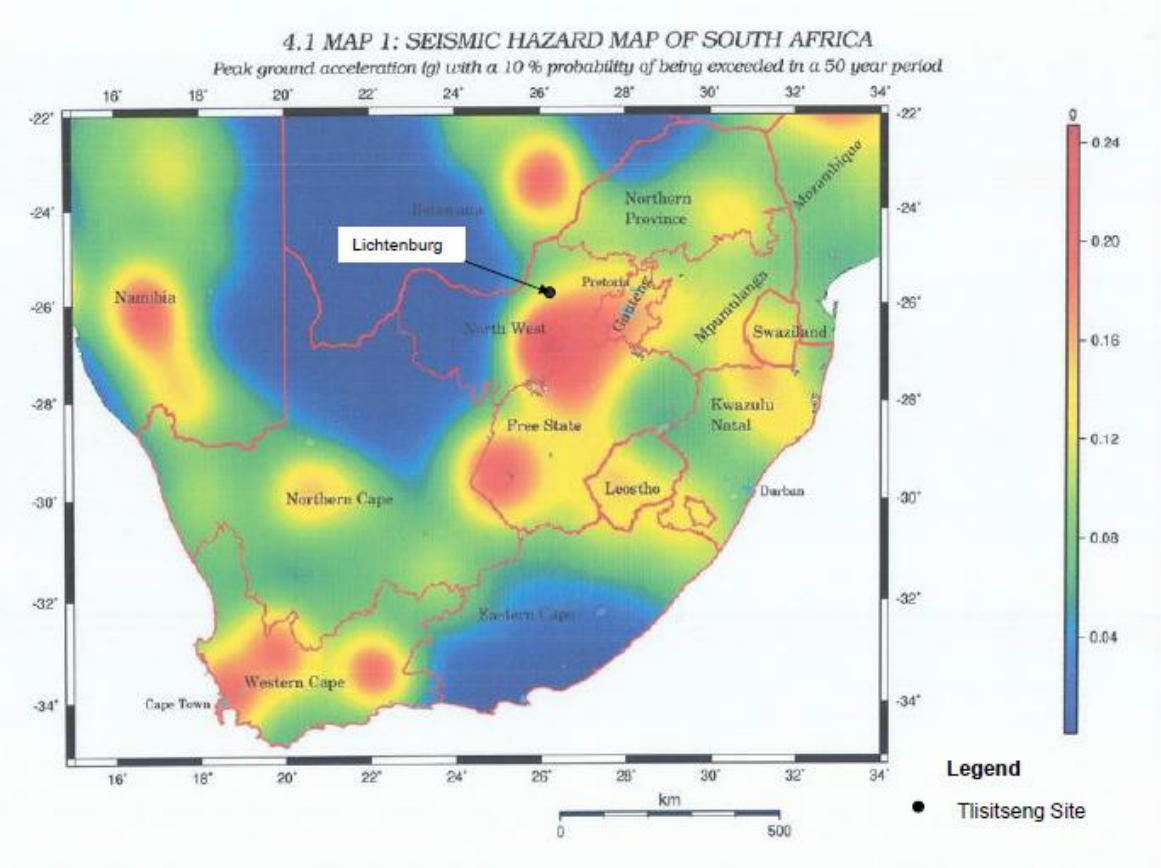

Figure 22: Seismic hazard Map

5.14.6 Anticipated Soil Profile

Each typical soil type will be discussed below, considering the potential problems which can be generally anticipated, as well as possible geotechnical solution.

- **Recently Transported Soil types**

It can be anticipated that the entire site will have a surface cover of recently transported soils. The thickness of this cover can be expected to vary, according to the recent geological depositional processes that were active at the time. Main critical factors will be the general topography of the areas at the time of the sedimentation cycle as well as the presence of large rivers and lakes. As these transported sediments were laid down in recent geological times, they will not have undergone any significant consolidation. They can therefore be considered to be of a loose consistency, and could experience settlement under applied foundation loading.

Most structures in this area are therefore typically founded at the base of these recently transported materials, on the more competent pedogenic or residual soil horizons.

Alternatively, these loose, potentially collapsible and consolidating soils are removed down to a specified depth, and replaced with well compacted, inert, granular fill materials, which provide a competent base for the proposed structures.

- *Wind Blown Aeolian Sands*
  These soils have been transported under the action of wind. They usually form relatively deep horizons, and at surface display characteristic undulating sand dune features. Due to their method of deposition, these sandy soils are generally of low cohesion and consistency, and can be expected to settle under foundation loading. Where this sandy surface horizons is thick, the most appropriate geotechnical solution would be to excavate to a specified depth, and re-compact the removed soils back up to foundation level. This solution is referred to as constructing an engineered soil mattress. If the horizon is thin, structures could be founded on competent underlying pedogenic (calcrete) or residual soil horizons. This material is also popular used as plaster sand in building constructions.

- *Water Transported Hillwash*
  These hillwash soils have been transported by water, generally over fairly short distances, from higher ground down to lower lying areas. They usually form more cohesive soils than the aeolian sands, but are also of generally low consistency. A further characteristic of these soils is that over time, downward percolating of rain water carrying dissolved cementing solutions, can create bridges between the individual soil particles. On saturation and loading of these soils, the soil bridges can break down, resulting in collapse settlement. The geotechnical solution to founding in such soils is to place the foundation on an engineered soil mattress.

- *Water Transported Alluvium*
  Alluvium are sediments that have been deposited from rivers, either after overflowing their banks in periods of flooding, or as alluvial fans entering lakes and lagoons, as well as bottom sediments dropped as the velocity of the river was impeded and reduced. These

sediments can include boulders, gravels and sands, as well as fine silts and clays. The coarse gravel and sandy soils are often suitable as a founding medium, provided they are not immediately underlain by very soft silt or clayey soils. The alluvial clays can however be problematic, as they could exhibit settlement or expansive behaviour. Where materials of high plasticity are present at founding elevation, it is recommended that they be excavated out, and replaced with well compacted, inert, granular materials.

- **Pedogenic Formations**
  - *Ferricrete and Calcrete*

    Where a fluctuating perched water table occurs, the near surface permeable soils can become cemented by iron or lime (calcium) rich solutions, to form well cemented ferricrete or calcrete horizons. Due to the increase consistency and competence of these soils, they provide a potentially good founding medium for light to medium loaded structures, depending upon the thickness and degree of cementation. This material may be intersected in both alternative substation sites.

- **Monte Christo Formation (Residual Soils and Bedrock Geology)**
  - *Dolomites*

    These rocks are formed due to biological synthesis and inorganic precipitation, in an ancient inland sea. As these rocks are highly soluble by slightly acidic ground waters, under these conditions the possibility exists for the formation of sinkholes and doline depressions. These features generally only occur where static or flowing water is present, such as human settlements, dams, commercial farming using intensive irrigation and poor stormwater facilitation. Large scale dewatering processes also escalates the formation of these features. Where none of these are present, the risk of sinkholes are considerably reduced. The sandy and gravelly composition of soils derived from the weathering of dolomite and chert, are typically suitable as a founding medium for light to medium loaded structures. Only if the area has been classified as a suitably stable dolomite environment.

5.14.7 Comments

The comments made below are general, and based on anticipated geological and geotechnical conditions. In terms of SANS 1936:2012 parts 1 to 4 “Development on Dolomite Land” a two phase (feasibility and design level) geotechnical and dolomite stability investigation will be needed to be undertaken on the chosen site.

- **General Anticipated Founding Solutions**
  - *Proposed Alternative 1 and Alternative 2 of Tlisitseng Solar 1*

Is possibly underlain by shallow dense pedogenic material or chert residuum. These material are likely to be suitable as founding medium for lightly to medium loaded structures.

- **General**

Due to fact that this entire site is underlain at depth by dolomite, it is a legal requirement that a Dolomite Stability Investigation (DSI) be undertaken in accordance with the South African National Standards SANS 1936-Parts 1 to 4 Development of Dolomitic Land. For the substation, as indicated in the layout, this DSI will comprise a gravity survey and the drilling of a minimum of 3 boreholes for a feasibility level (Phase 1) investigation. It is also evident from the Topographical maps and Google Images that water boreholes are present near both the Alternative 1 and 2 sites. These boreholes are probably used for irrigation purpose and as mentioned above, dewatering has a significant effect on the underlying dolomite stability.

- **Construction Problems**

The removal of large hard rock chert boulders and or hardpan calcretre, could be problematic, on both sites, when undertaking the bulk excavation or deep trenches for the installation of services.

- **Construction Materials**

It is likely that relatively competent construction materials will be available on both sites (calcrete gravels), whilst a dolomite aggregate quarry is located some 5km south of the sites.

- **Geotechnical Site Classification**
    - Proposed Alternative 1 and Alternative 2 of Tlisitseng Solar 1

The site is likely to be allocated a Geotechnical Site Classification Designation of P/R, in terms of the NHBRC requirements.

Based upon the assessment of the data gathered during this literary review, it is our opinion that both alternative sites exhibit the same geotechnical suitability.

5.15 Traffic

The Traffic Impact Assessment was conducted by Hermanus Steyn of Aurecon. The full report is included in **Appendix 6I**. The environmental baseline from a traffic perspective is presented below.

5.15.1 General Freight Requirements

- **Legislation**

The general limitations on road freight transport are currently:

- Axle load limitation of 7,7t on front axle, 9,0t on single rear axles.
- Axle unit limitations are 18t for dual axle unit and 24t for 3 axle unit.
- Bridge formula requirements to limit concentration of loads and to regulate load distribution on the vehicle.
- Gross vehicle mass of 56t. This means a typical payload of about 30t.
- Maximum vehicle length of 22m for interlinks, 18,5m for horse and trailer and 13,5m for a single unit.
- Width limit of 2,6m.
- Height limit 4,3m.

Abnormal permits are required for vehicles exceeding these limits.

- **Solar Facility Freight**

Materials and equipment transported to the site comprise of:

- Building materials (concrete aggregates, cement and gravel).
- Construction equipment such as piling rigs and cranes.
- Solar panels (panels and frames).
- Transformers and cables.
- Inverters possibly containerised.

The following is anticipated:

(a) Building materials comprising of concrete materials for strip footings or steel piles will be transported using conventional trucks which should adhere to legal loading limits.
(b) Solar Panels and frames will probably be transported in containers using conventional heavy vehicles within the legal limits from nearest South African port. The number of loads will be a function of the capacity of the solar farm and the extent of the frames.
(c) Transformers will most probably be transported by abnormal vehicles from the nearest South African port.

5.15.2 Traffic Statement

It is estimated from experience on other similar projects that the number of heavy vehicles per 1MW installation would be between 15 and 20 heavy vehicle trips depending on the site condition and foundation requirements. The total trips for the 75 MW plant would be between 1100 and 1500 heavy vehicle trips. These trips would be made over an estimated period of 12 months.

In the worst case the number of heavy vehicle trips per day would be in the order of 5 to 10 trips. The impact of this on the general traffic would therefore be negligible as the additional peak hour traffic would be at most 2 trips.

Personnel during construction is estimated to be 400 and will most likely reside in Lichtenburg or Bakerville as the closest community or alternatively a compound on site or close by. It is recommended that the majority of construction personnel is transported to and from site by means of buses and some by private vehicles.

Assuming that busses with an average of 20 passengers will be used to transport personnel, the personnel transport will contribute to approximately 15 to 25 daily trips of which 50% is assumed to be within the traffic peak hour.

The additional peak hour trips during construction would therefore be in the order of 10 to 15 vehicles (2 transporting equipment and 12 transporting construction personnel).

After construction, the generated site traffic would be limited to operational and maintenance support, with only a few light vehicles per day.

Access to the site will be from the R505. No traffic data is available for the roads in the area around the proposed site. However it can be assumed that traffic on the R505 to be reasonably low (<1500 AADT, <200 Veh/h). These assumptions are based on the current road cross section and the general associated road class characteristics as well as data interpolated from SANRAL traffic counts in the greater Lichtenburg area for similar class regional roads.

It can therefore be stated that the construction traffic of less than 20 vehicles during the peak hour and the post construction traffic of less than 5 vehicles per day would have almost no noticeable impact on the existing traffic service levels.

5.15.3 Tlisitseng Solar PV Energy Facilities - Access Route

- **Preferred Route from Port**

The route for transportation of imported equipment is either from Port Elizabeth/Coega or Durban with the latter having a significant shorter travelling distance of only 765 km. The preferred route follows National Roads for a significant distance and due to the good condition of these National Roads and the fact that the route avoids busy towns, it served as enough justification to be chosen as the preferred route.

An alternative route from the port, indicated in red in **Figure 23** below, can also be utilised if the preferred route is unavailable due to maintenance or any other reason. The two routes are similar in length, where the alternative route passes through Bethlehem, Kroonstad and Klerksdorp.

It should be noted that the Ports Authority also has preferences on freight import, which should be considered.

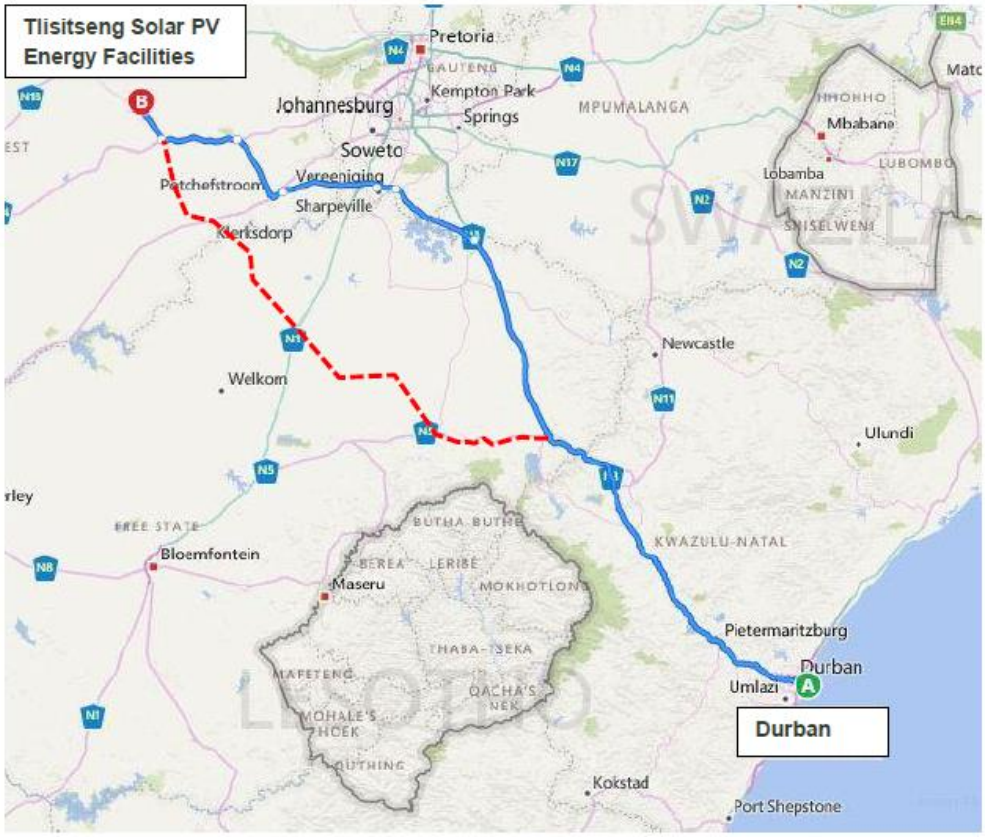

Figure 23: Preferred Route from Port

The Preferred Route's elements are shown in the Traffic Specialist Report.

- **Route from Alternative Port**

Should the preferred port not be available for any reason then the Port Elizabeth/Coega Port could be used as alternative. The route from Port Elizabeth (a distance of 1035km) is shown in **Figure 24**.

Figure 24: Alternative Port Route

- **Route for Construction Materials**

Material sources for road building and concrete works is available in Lichtenburg and all material will most likely be transported from these and possibly other surrounding towns on the National and Provincial roads. If not it will have to be transported from larger manufacturing centres discussed below.

- **Route from other Larger Manufacturing Centres**

The other main manufacturing centres include:

- Greater Johannesburg area (Modderfontein, Edenvale, Nigel, Germiston, Brakpan, Elandsfontein) for inverters and support structures.
- Cape Town – greater metropolitan area for some of the components.

The routes to the site from these centres are predominantly on Provincial and National roads. There are no limitations on normal freight within the legal limits on these routes.

- **Authority and Permit Requirements**

The following is noted:

a. Toll fees are required on the routes from the port. On the routes from the other manufacturing centres certain portions of the national routes are also tolled which will require toll fees. Toll fees are estimated at approximately R650 per heavy vehicle with 5+ axles for a single one-way trip. If the alternative route as indicated in **Figure 24** is used, the total toll fees will be reduced by approximately R60.
b. Abnormal permit(s) will be required for the transport of the transformer by the logistics contractor for each province as these are issued by each Provincial Authority. The estimated total permit value will be a function of the actual vehicle configuration as well as the convoy requirements, but is estimated at R9000 – R15000 per trip. This application process would take approximately a month to complete and should be applied for once the project has reached financial close.

- **Route Limitations of the Preferred Route from the Port**

The identified routes have possible limitations that will require more detailed investigations to determine the level of upgrading that will be required (if any) to accommodate the abnormal loads. All the possible limitations will potentially be encountered on the gravel roads from the R505 intersection to the prospective site, even though the length to be travelled on these roads are minimal. Other possible limitations might include: overhead power and telecommunication lines with an insufficient ground clearance, substandard geometry and drainage issues.

- **Site Access Road**

- Access to Road Network

The access to the site is proposed off the Regional Road - R505. The access position for Tlisitseng 1 Solar PV Energy Facilities could be at one of two positions, which should be allowed by the SANRAL as sufficient sight distances (stopping and shoulder) are present. The proposed access positions are as follows:

- Tlisitseng 1 Access Road Option 1: Off the R505 at the most southern point of Tlisitseng 1 Solar PV Energy Facilities. There is no existing road present at this access point and consequently a

new road will have to be constructed of approximately 1.1 km in length. The location of the access to the newly proposed road is shown in **Figure 25** below.

Figure 25: Tlisitseng Solar PV Energy Facilities – Access Option 1

- Tlisitseng 1 Access Road Option 2: Off the R505 at the most Northern part of Tlisitseng 1 Solar PV Energy Facilities. This access will make use of an existing road, but the possible widening of a cattle grid and/or gate will be required. The access road is approximately 500m in length before it reaches the site. The proposed access can be seen in **Figure 26** below.

Figure 26: Tlisitseng 1 Solar PV Energy Facilities – Access Option 2

The internal access roads will be confirmed once the final positioning of the solar panels are available and a more detailed design is required. These roads will obviously have to be constructed before any components are delivered to site.

- **Preferred Access Route**

Both of the access options illustrated above are considered to be viable from environmental and technical viewpoints, however access road Option 2 is preferred for Tlisitseng 1. This option will be beneficial for Phase 2.1 of the proposed development, seeing that minimal road upgrades will be required for this specific phase. In both cases, the additional road length that has to be constructed is minimal. These alternatives must be investigated in further detail at a later stage.

The access road should be upgraded to at least a 5m width (preferable 6m with sufficient shoulders) and finished with a gravel wearing course layer.

- **Structures and Services**

Existing structures and services such as drainage structures and pipelines will be evaluated at crossings and suitably strengthened if required.

The site drains to the west. Suitable drainage elements will be provided on the access road to ensure minimal disturbance of the existing drainage patterns.

- **Accommodation of Traffic during Construction**

During construction of the access, traffic will have to be accommodated as per SADC Road Traffic Signs Manual requirements. The following typical minimum signage requirements will have to be implemented to ensure safety if the road needs closure during construction on the public road.

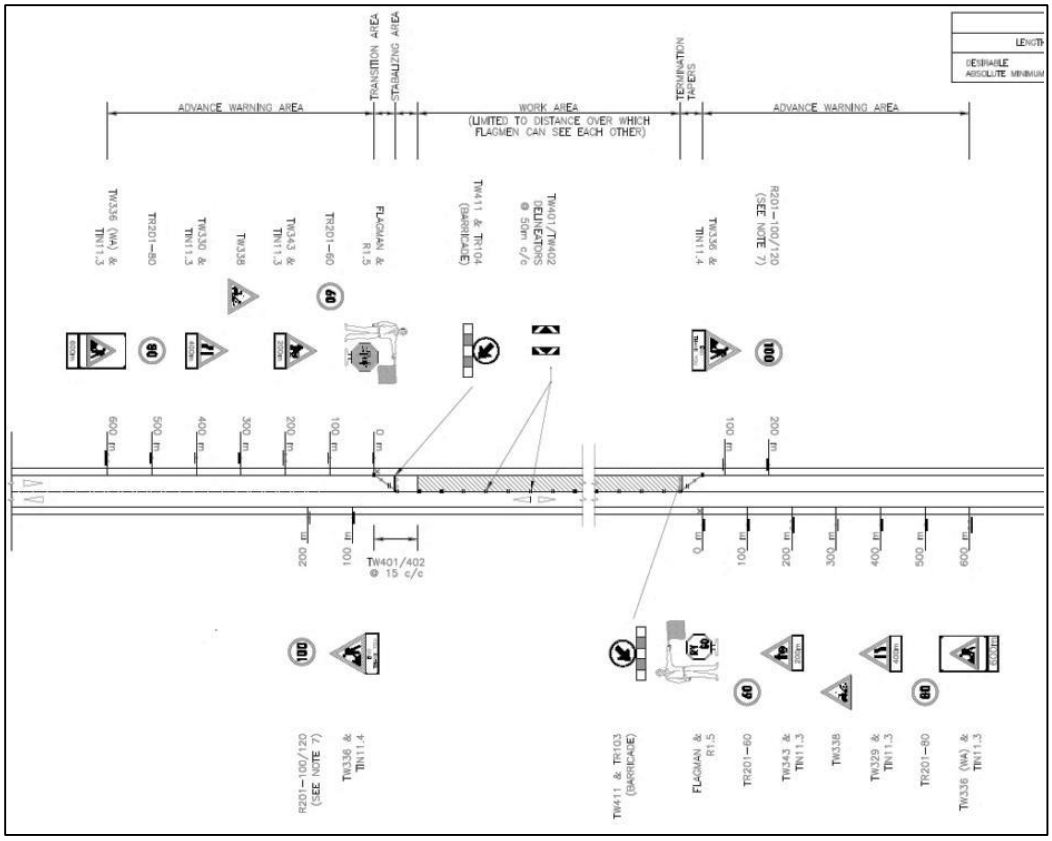

Figure 27: Accommodation of Traffic – Typical Layout

6 ENVIRONMENTAL ISSUES, POTENTIAL AND CUMULATIVE IMPACTS

6.1 Identification of Potential Impacts

The proposed development is likely to result in a variety of positive and negative impacts. Moreover, the proposed development could potentially result in collective and long term impacts more commonly known as cumulative impacts. A cumulative impact is 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.

The Scoping report assists in the identification of these potential and cumulative impacts, which will then be assessed at a more detailed level during the EIA stage.

Moreover, further details associated with the construction and operation of the various activities (as listed in the Project Description) in light of the above types of impacts that become available later in the EIA process will be discussed in detail in the EIA Phase.

The impacts that have been identified as being potentially significant are elaborated on in the sub-sections below.

6.1.1 Biodiversity Impacts

The following potential impacts have been identified for the proposed solar energy facility development and will be further investigated in the EIA phase of the biodiversity assessment.

Table 19: Impacts on indigenous natural vegetation

ISSUE	**Impacts on indigenous natural vegetation**
DISCUSSION	Losses would be suffered where areas need to be cleared of natural vegetation.
EXISTING IMPACT	Limited loss of natural vegetation in the study area and beyond and limited degradation of vegetation.
PREDICTED IMPACT	Moderate as some natural vegetation will be lost and the loss will be permanent.
EIA INVESTIGATION REQUIRED	Yes (a formal impact assessment is required)
CUMULATIVE EFFECT	Predicted to be low to moderate as there is some loss of habitat in the surrounding areas.

Table 20: Impacts on listed plant species

ISSUE	**Impacts on listed plant species**
DISCUSSION	There are four listed plant species that could potentially occur on site.
EXISTING IMPACT	None known.
PREDICTED IMPACT	Moderate to Low as natural vegetation will be lost, but not sure whether species occur on site or not.
EIA INVESTIGATION REQUIRED	Yes (field investigation required to determine whether plant species occurs on site or not)
CUMULATIVE EFFECT	Populations of species of concern, if they occur on site, will probably not be affected or can be avoided.

Table 21: Impacts on protected plant species

ISSUE	**Impacts on protected plant species**
DISCUSSION	There is one protected plant species that could potentially occur on site.
EXISTING IMPACT	None known on site.
PREDICTED IMPACT	Moderate to Low as natural vegetation will be lost, but not sure whether species occur on site or not.

ISSUE	Impacts on protected plant species
EIA INVESTIGATION REQUIRED	Yes (field investigation required to determine whether nationally protected plant species occurs on site or not).
CUMULATIVE EFFECT	Populations of protected species may have already been affected by nearby agricultural activities, but this is impossible to determine.

Table 22: Loss of individuals of protected trees

ISSUE	Loss of individuals of protected trees
DISCUSSION	There are three protected tree species that could occur on site, but it is unknown whether they occur there or not.
EXISTING IMPACT	None known.
PREDICTED IMPACT	Moderate to Low due to fact that low numbers probably occur on site.
EIA INVESTIGATION REQUIRED	Yes (field investigation required to determine whether species occurs on site or not)
CUMULATIVE EFFECT	Predicted to be low due to low number of individuals likely to be affected.

Table 23: Impacts on pan depressions

ISSUE	Impacts on pan depressions
DISCUSSION	Losses would be suffered where areas need to be cleared of natural vegetation.
EXISTING IMPACT	Limited loss of natural habitat in the study area and beyond and limited degradation of pans due to domestic livestock.
PREDICTED IMPACT	Moderate as some habitat will be lost and the loss will be permanent.
EIA INVESTIGATION REQUIRED	Yes (a formal impact assessment is required)
CUMULATIVE EFFECT	Predicted to be moderate as there is probably some degradation of habitat in surrounding areas.

Table 24: Impacts on sedentary fauna

ISSUE	Impacts on sedentary fauna
DISCUSSION	For species resident on site, loss of habitat would lead to local extinction of populations currently on site. For all other species listed, the loss of habitat would be unlikely to have any significant effect, since the species are mobile and would utilize other adjacent habitat.
EXISTING IMPACT	Limited loss of natural habitat in the study area and beyond.
PREDICTED IMPACT	Moderate as some habitat will be lost and the loss will be permanent.
EIA INVESTIGATION REQUIRED	Yes (presence or potential presence of three species vulnerable to the impact, Southern African Hedgehog, White-tailed Rat and the Giant Bullfrog, needs to be established)
CUMULATIVE EFFECT	Predicted to be low because there is adequate habitat in surrounding areas to support displaced populations.

Table 25: Impact of displacement of mobile fauna

ISSUE	**Displacement of mobile fauna**
DISCUSSION	Fauna may be displaced due to noise and habitat disturbances on site, as well as general activities on site.
EXISTING IMPACT	None known
PREDICTED IMPACT	Low as some individuals may be locally displaced, but it is unlikely to have any significant effect on any of the listed species.
EIA INVESTIGATION REQUIRED	No
CUMULATIVE EFFECT	Predicted to be low as populations will return to surrounding habitats after construction activities have been completed.

Table 26: Impact summary table for the mortality of birds by collision with power lines

ISSUE	**Mortality of birds by collision with power lines**
DISCUSSION	Vertical infrastructure may affect flying animals due to collisions. Some Red List species may be especially vulnerable to this impact.
EXISTING IMPACT	There are existing power lines in the study area, all of significantly greater length than the proposed power lines.
PREDICTED IMPACT	Low as most species will avoid vertical infrastructure.
EIA INVESTIGATION REQUIRED	Yes (presence of species vulnerable to the impact to be determined in the field)
CUMULATIVE EFFECT	Predicted to be low due to the existing presence of power lines that are of far greater length than the proposed power lines.

Table 27: Impact summary table for the establishment and spread of declared weeds

ISSUE	**Establishment and spread of declared weeds**
DISCUSSION	There is a moderate possibility that alien plants could be introduced to areas within the footprint of the proposed infrastructure from surrounding areas in the absence of control measures.
EXISTING IMPACT	Unknown to what extent alien invasive species currently occur on site, but existing transformation and disturbance on site has probably created conditions slightly favourable for these species.
PREDICTED IMPACT	Moderate due to increased disturbance associated with construction activities, especially due to vegetation clearing. Impact can be easily managed with control measures.
EIA INVESTIGATION REQUIRED	Yes (presence of alien plants on site and in surrounding areas to be investigated)
CUMULATIVE EFFECT	Predicted to be low due to existing impacts on site and high ability to control any additional impact.

6.1.1 Avifauna Impacts

The following potential impacts have been identified for the proposed solar energy facility development and will be further investigated in the EIA phase of the avifaunal assessment.

Table 28: Impacts associated with mortality of priority species due to collisions with the PV panels.

ISSUE	Mortality of priority species due to collisions with the PV panels.
DISCUSSION	A total of 47 priority species could potentially be susceptible to this impact.
EXISTING IMPACT	Given the extensive farming practices which are currently used in the region, it can be surmised that the existing anthropogenic impacts on priority species are low.
PREDICTED IMPACT	Minor negative, but could be moderate negative if mortality levels of priority species turn out to be high.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Moderate to Low

Table 29: Impacts associated with the displacement of priority species due to habitat transformation and disturbance.

ISSUE	Displacement of priority species due to habitat transformation and disturbance.
DISCUSSION	A total of 43 priority species could potentially be susceptible to this impact.
EXISTING IMPACT	Given the extensive farming practices which are currently used in the region, it can be surmised that the existing anthropogenic impacts on avifauna are low.
PREDICTED IMPACT	Moderate negative.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	High at a local level and moderate to low within a regional level.

Table 30: Impacts associated with the disturbance of breeding raptors on the existing high voltage lines.

ISSUE	Disturbance of breeding raptors and roosting vultures on the existing high voltage lines.
DISCUSSION	6 species could potentially be susceptible to this impact.
EXISTING IMPACT	It is unknown if any raptors are breeding on the existing high voltage lines in the study area, but if there are any; it is likely that they are not regularly disturbed. The vultures roosting on the existing high voltage are likewise not subject to high levels of disturbance.
PREDICTED IMPACT	Moderate to low, depending on the number of species and the number of nests.

ISSUE	Disturbance of breeding raptors and roosting vultures on the existing high voltage lines.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Moderate to low at a regional level, depending on the number of species and the number of nests.

6.1.2 Surface Water Impacts

The following potential impacts have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the surface water assessment.

Table 31: Impacts associated with the construction lay-down area directly in the surface water resource(s)

ISSUE	**Impacts associated with the construction lay-down area directly in the surface water resources**
DISCUSSION	Where the placement of the construction lay-down area for the proposed development of the PV facilities extends into a surface water resource, the excavation of soils could potentially result.
EXISTING IMPACT	No existing impacts are present in terms of construction lay-down areas.
PREDICTED IMPACT	Low predicted impact due to the high degree of available land to place the construction lay-down area outside of any sensitive surface water resources. If the construction lay-down area will be placed within close proximity to surface water resources, a moderate impact is predicted.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Moderate predicted cumulative effect given that the size of the construction lay-down area may be significant and might need to be placed partially in or near the surface water resources close to where construction areas are located.

Table 32: Impacts associated with establishing the foundations of the proposed development

ISSUE	**Impacts associated with establishing the foundations of the proposed PV facilities**
DISCUSSION	Where the placement of the foundations of the proposed PV facilities extend into the surface water resource areas, the excavation of potential hydric soils are likely to be affected.
EXISTING IMPACT	A moderate to high impact is predicted as a few structures/buildings, as well as several existing agricultural cultivation activities, have been identified that are within very close proximity to surface water resources.

ISSUE	**Impacts associated with establishing the foundations of the proposed PV facilities**
PREDICTED IMPACT	Moderate to high impact is predicted due to the instability of wetland soils. It is likely that the foundations of the various buildings and structures will be placed in the wetland areas or within close proximity (buffer zones included).
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect given the various PV panels, buildings and structures that might need to be placed in or near the identified surface water resources.

Table 33: Impacts associated with the clearing of vegetation for proposed development

ISSUE	**Impacts associated with the clearing of vegetation for proposed development of the PV facilities**
DISCUSSION	Vegetation within the proposed development site will have be removed for the construction phase to take place.
EXISTING IMPACT	Moderate impacts currently present. Clearing of vegetation has taken place for the location of dirt roads, agricultural cultivations and for the construction of a few buildings/structures.
PREDICTED IMPACT	Moderate predicted impact due to the need for vegetation to be removed which is expected to be wetland or riparian vegetation.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect given that the proposed development is expected to occupy a very large area (approximately 1000 hectares). The buildable area is, however, expected to be smaller than this and will be determined by sensitive areas identified during the Scoping Phase of the EIA. The cumulative effect could therefore increase or decrease, depending on the size of the study area which will be occupied or cleared within sensitive areas.

Table 34: Impacts associated with abnormal/heavy vehicle access into surface water resources

ISSUE	**Impacts associated with abnormal/heavy vehicle access into surface water resources**
DISCUSSION	During the construction phase, vehicles of variable size will need to access the site. Such vehicles may include conventional construction vehicles in addition to abnormal heavy vehicles that will need to transport the component parts of the PV facilities. Where these vehicles need to cross surface water resources, degradation can be caused to these sensitive environments.
EXISTING IMPACT	Minor impacts associated with access roads currently crossing surface water resources evident from a desktop level.

ISSUE	**Impacts associated with abnormal/heavy vehicle access into surface water resources**
PREDICTED IMPACT	Minor to moderate predicted impact due to the need for the various components to reach all areas of the study site in order to transport materials required for the construction of the PV facilities.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect as several dirt roads were found to pass within very close proximity to potential surface water resources. Newly constructed access and internal roads which need to cross any surface water resources will therefore add to this existing impact.

Table 35: Impacts associated with general access near or in surface water resource area

ISSUE	**Impacts associated with general access near or in surface water resource area**
DISCUSSION	General access into surface water resources refers to activities such as physical destruction of surface water resources caused by humans, excavation and degradation of surface water resources by construction machinery, use of surface water resources for sanitary facilities and ablutions and lastly, dumping of materials, waste and litter into surface water resources. This specifically relates to any construction areas that take place in or near surface water resources.
EXISTING IMPACT	From a desktop level, a low to moderate impact is provisionally identified as a few structures, as well as several agricultural cultivations, were found to be in close proximity to identified surface water resources.
PREDICTED IMPACT	Moderate predicted impact due to the need for construction activities to take place in most areas of the study site.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect as several structures and agricultural cultivations were found to be in close proximity to potential surface water resources. These existing impacts, in combination with the potential impacts associated with general access near or in surface water resources are expected to add to the cumulative effect.

Table 36: Impacts associated with improper stormwater management effects on nearby surface water resources

ISSUE	**Impacts associated with improper stormwater management effects on nearby surface water resources**
DISCUSSION	Where the location of the PV panels, buildings, internal roads, access roads, car park, the switching station and the construction lay down area are to be

ISSUE	**Impacts associated with improper stormwater management effects on nearby surface water resources**
	situated near surface water resources, increased run-off caused by rainfall events can produce potential erosion and sedimentation impacts to nearby surface water resources.
EXISTING IMPACT	From a desktop level, slight signs of erosion are evident within the study area.
PREDICTED IMPACT	Moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate predicted cumulative effect due to the presence of erosion in the study area, as well as the likelihood of this impact occurring as a result of the construction of the PV facilities.

Table 37: Impacts associated with the oil, fuels and other soluble substances from construction activities, vehicles and machinery into nearby surface water resources

ISSUE	**Impacts associated with the oil, fuels and other soluble substances from construction activities, vehicles and machinery into nearby surface water resources**
DISCUSSION	Construction activities make use of fuels, oils, and other soluble substances (cement mix). These pose a pollution risk to nearby surface water resources where spillage or leakage occurs.
EXISTING IMPACT	From a desktop level no such pollution impacts could be identified.
PREDICTED IMPACT	Minor to moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect.

Table 38: Impacts associated with the 132kV power line installation into/over nearby surface water resources

ISSUE	**Impacts associated with the 132kV power line installation into/over nearby surface water resources**
DISCUSSION	It is anticipated that the 132kV power lines will relay the generated energy to the switching station and subsequently to the power grid. It is also envisaged that the overhead power lines and underground cables may need to through surface water resources where absolutely necessary.
EXISTING IMPACT	From a desktop level no power line impacts could be identified.
PREDICTED IMPACT	Minor to moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.

ISSUE	**Impacts associated with the 132kV power line installation into/over nearby surface water resources**
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect.

Table 39: Impacts associated with service roads through surface water resources

ISSUE	**Impacts associated with service and access roads through surface water resources**
DISCUSSION	Service and access roads will be required, and may need to cross identified surface water resources.
EXISTING IMPACT	Moderate impact as existing roads cross surface water resources or pass within close proximity. It must also be noted that the R505 runs from north to south through the study area and also passes within close proximity to several potential surface water resources.
PREDICTED IMPACT	Moderate to high predicted impact due to the likelihood of this impact occurring, the associated permanent nature of the activity and lastly, the fact that several existing roads pass through or near the desktop identified surface water resources.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect due to the fact that several existing roads which pass through or near desktop identified surface water resources. The establishment of new/additional service or access roads will therefore add to this impact.

Table 40: Stormwater run-off associated with the PV facility and associated infrastructure

ISSUE	**Stormwater run-off from the PV facility and associated infrastructure**
DISCUSSION	The impact of stormwater run-off is primarily related to the types of structures and surfaces that will need to be established for the proposed PV facilities. Hard impermeable surfaces and foundations are to be laid over the extent of the proposed development. Flat and hard surfaces aid with the acceleration and generation of run-off which can impact on nearby wetlands through the onset of erosion at the interface between the proposed development and the surface water resources.
EXISTING IMPACT	From a desktop level, slight signs of erosion were apparent throughout the study area.
PREDICTED IMPACT	Moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect.

Table 41: Oil leakages from switching stations

ISSUE	**Oil leakages from switching stations**
DISCUSSION	The main potential impact that may result from the operation phase of the switching station is the potential spillage of oil from the transducers that are to be housed. If oil were to spill from the switching station, it could be transported via storm water run-off into the adjacent surface water resources, thereby polluting not only the water but the soils as well causing possible groundwater and soil contamination.
EXISTING IMPACT	Pollution impacts were not identifiable from a desktop level.
PREDICTED IMPACT	Minor predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Minor to moderate predicted cumulative effect.

6.1.3 Soils and Agricultural Potential Impacts

The following potential impacts have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the soils and agricultural potential assessment.

Table 42: Summary of potential impacts from the Solar PV Energy Facility

ISSUE	Loss of agricultural potential
DISCUSSION	Soil would be impacted by the establishment of infrastructure.
EXISTING IMPACT	Some irrigated cultivation practised at present.
PREDICTED IMPACT	Low to high, depending on the soils occurring, which vary from shallow soils with low potential, to deeper, high potential arable soils.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Predicted to be low as the loss of soil will not be significant once the infrastructure is in place and post-project rehabilitation should be possible.

6.1.4 Visual Impacts

The following potential impacts have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the visual assessment.

Table 43: Visual Impact Summary

ISSUE	**Visual Impact of the proposed solar PV energy facility**
DISCUSSION	Solar power facilities have an extensive spatial coverage and can be visually intrusive especially when located in untransformed natural settings.

	Much of the surrounding area has a natural rural visual character due to the uninhabited nature of the area. However, several solar energy facilities are proposed within relatively close proximity to the proposed development. These facilities and their associated infrastructure, typically consist of very large structures which are highly visible. As such, these facilities will significantly alter the visual character and baseline in the study area if constructed and make it appear to have a more industrial-type visual character. Eighty-seven (87) potentially sensitive receptors were identified within 5km from the proposed PV development areas.
EXISTING IMPACT	There is a relatively low level of existing visual impact within the surrounding landscape. The most visually prominent visual impacts or degrading features include; the R505 national route, high voltage 132kV power lines, Watershed MTS and other linear elements such as a railway line, gravel access roads, telephone poles, communication poles and farm boundary fences.
PREDICTED IMPACT	▪ The natural visual character of the surrounding area could be altered. ▪ The facility would likely be highly visible for great distances, thus altering the relatively untransformed rural sense of place within the surrounding area. ▪ The proposed development could adversely affect farmsteads / homesteads within the visual assessment zone, motorists on the R505 and visitors to the Lichtenburg Game Breeding Centre. ▪ Vehicles and trucks travelling to and from the proposed site would increase dust emissions during both the construction and operational phases. The dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. ▪ Surface disturbance during construction would expose bare soil which could visually contrast with the surrounding environment. In addition, temporarily stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact. ▪ Security and operational lighting at the PV energy facility could result in light pollution and glare, which could be an annoyance to surrounding viewers. ▪ Potential visual impacts as a result of the infrastructure associated with the proposed PV energy facility.
EIA INVESTIGATION REQUIRED	Yes

CUMULATIVE EFFECT	Other solar energy facilities are proposed within relatively close proximity to the proposed PV energy facility. These pending developments and their potential for large scale visual impacts could significantly alter the sense of place and visual character in the study area, if constructed.

6.1.5 Heritage Impacts

The following potential impacts have been identified for the proposed solar energy facility development and will be further investigated in the EIA phase of the heritage assessment.

Table 44: Impact on archaeological sites.

ISSUE	**Impact on archaeological sites**
DISCUSSION	No indication of archaeological finds have been found during the desktop assessment. However this cannot exclude the possibility of archaeological finds.
EXISTING IMPACT	None known
PREDICTED IMPACT	Unidentified archaeological sites and the discovery of such sites during construction can seriously hamper construction timelines. Fieldwork can thus provide valuable information on such site in the study area and provide timeous management of such site through realignment of development or mitigation of such sites where needed.
EIA INVESTIGATION REQUIRED	Archaeological walk down of impact areas
CUMULATIVE EFFECT	None foreseen at this stage.

Table 45: Impact on palaeontological sites.

ISSUE	**Impact on palaeontological sites**
DISCUSSION	The palaeontological potential of the area has been confirmed as being very high by the palaeontological desktop assessment
EXISTING IMPACT	Site impacted by existing developments such as transmission lines and road networks.
PREDICTED IMPACT	Due to the known occurrence of stromatolites within the dolomite of the Monte Christo Formation, as well as the possibility of Cave Breccias being present, a very high Palaeontological sensitivity rating is given to the study area.
EIA INVESTIGATION REQUIRED	A full Palaeontological impact assessment will be required
CUMULATIVE EFFECT	None foreseen at this stage.

Table 46: Impact on historical sites.

ISSUE	**Impact on historical sites**
DISCUSSION	The archival research has shown that the historical activities in the area was wide spread during the South African War as well as the diamond rush of the1920's. The position of Bakerville just 10 km to the north, show the possibility of finding historical remains within the study area.
EXISTING IMPACT	None known
PREDICTED IMPACT	Unidentified historical structure and the discovery of such structures during construction can seriously hamper construction timelines. Fieldwork can thus provide valuable information on such site in the study area and provide timeous management of such site through realignment of development or mitigation of such sites where needed.
EIA INVESTIGATION REQUIRED	Archaeological walk down of impact areas will identify possible impacted sites
CUMULATIVE EFFECT	None foreseen at this stage.

6.1.6 Socio-economic Impacts

The following potential impacts have been identified for the proposed solar PV facility and will be further investigated in the EIA phase of the socio-economic assessment.

Table 47: Impact of the increase in production and GDP-R of the national and local economies due to project capital expenditure

ISSUE	**Increase in production and GDP-R of the national and local economies due to project capital expenditure**
DISCUSSION	The impact takes place due to the investment on the project that will be spent in the country. Besides the direct impact, it involves the indirect and induced effects that are created when either suppliers of goods and services to the project experience an increase in demand, or when businesses servicing households experience an increase in demand for their products.
EXISTING IMPACT	The local economy has a relatively undiversified economy, with emphasis on the services sector.
PREDICTED IMPACT	High Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 48: Impact of the creation of temporary employment in the local communities and elsewhere in the country

ISSUE	**Creation of temporary employment in the local communities and elsewhere in the country**
DISCUSSION	The impact is generated through capital expenditure that shocks the economy. It involves the creation of direct new job opportunities related to the construction of the proposed solar PV and employment opportunities that will be indirectly created through the increased expenditure in sectors supplying goods and services to the construction activity, and in sectors benefiting from the increase of consumer expenditure.
EXISTING IMPACT	The local and national economies have high unemployment rates and government set a target to create 11 million jobs by 2030. More employment opportunities exist within Lichtenburg than in the Ditsobotla LM.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 49: Impact of skills development due to the creation of new employment opportunities

ISSUE	**Skills development due to the creation of new employment opportunities**
DISCUSSION	The impact takes place during construction and will last beneficiaries for an entire lifetime.
EXISTING IMPACT	The local municipality has a very limited skills base and low educational levels.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 50: Impact of improved standard of living of households directly or indirectly benefiting from created employment opportunities

ISSUE	**Improved standard of living of households directly or indirectly benefiting from created employment opportunities**
DISCUSSION	The impact takes place during construction as a result of jobs created through direct, indirect, and induced impacts.
EXISTING IMPACT	The households in the local municipality are on average worse off than in the country in general. Households in Lichtenburg are significantly better off, though.

PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 51: Impact of the increase in government revenue due to investment

ISSUE	**Increase in government revenue due to investment**
DISCUSSION	The impact will take place as a result of domestic spending on construction activities and will be acquired by government through indirect and direct taxes on the project's activity.
EXISTING IMPACT	Due to limited economic base and low income levels, the local municipality's revenue base is limited, which in turn negatively impacts on its ability to provide services to its residents.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 52: Impact of the potential sterilisation of agricultural land

ISSUE	**Potential sterilisation of agricultural land**
DISCUSSION	The footprint of the proposed project will sterilise the land from potential use for agricultural activities.
EXISTING IMPACT	Based on Google Earth images some irrigated farming activities take place on the farm where the proposed project is to be located. Initial interaction with the impacted farmer reveals that the 86 ha under maize will not be impacted. Grazing land for his cattle will however be diminished.
PREDICTED IMPACT	Low Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	The agricultural sector creates 11.3% of employment opportunities in the LM. Loss of agricultural land could lead to individuals with a limited skills base being left jobless. Over time, and as more productive land is lost, unemployment in the LM could become a severe development constraint.

Table 53: Impact of a negative financial and social impact associated with the relocation of affected households

ISSUE	**Negative financial and social impact associated with the relocation of affected households**
DISCUSSION	The construction of the PV energy facility and associated infrastructure may result in affected households having to relocate, which is associated with negative financial and social implications.
EXISTING IMPACT	Four employees reside permanently on the farm in two houses, it is believed that these families will have to be relocated
PREDICTED IMPACT	Low Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 54: Impact of a change in demographics of the area due to influx of workers and job seekers

ISSUE	**Change in demographics of the area due to influx of workers and job seekers**
DISCUSSION	The construction activities will attract job seekers and will involve the migration of construction workers to the site.
EXISTING IMPACT	The local area is not sufficiently diversified to provide all skills necessary during construction.
PREDICTED IMPACT	Moderate Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 55: Impact of an increase in social pathologies associated with influx of migrant labourers and job seekers to the area (health, crime, prostitution, xenophobia, etc.)

ISSUE	**Increase in social pathologies associated with influx of migrant labourers and job seekers to the area (health, crime, prostitution, xenophobia, etc.)**
DISCUSSION	The construction activities may attract job seekers and may involve the migration of construction workers to the site. The increase in the number of job seekers and migrants in the municipality could cause an increase in social pathologies.
EXISTING IMPACT	The local area is not sufficiently diversified to provide all skills and workers necessary during construction.
PREDICTED IMPACT	Moderate Negative
EIA INVESTIGATION REQUIRED	Yes

ISSUE	**Increase in social pathologies associated with influx of migrant labourers and job seekers to the area (health, crime, prostitution, xenophobia, etc.)**
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 56: Impact of added pressure on basic services and social and economic infrastructure

ISSUE	**Added pressure on basic services and social and economic infrastructure**
DISCUSSION	If the project attracts a great number of workers and job seekers, this could put further pressure on the LM as it will increase the demand for basic services, and social and economic infrastructure.
EXISTING IMPACT	Within Lichtenburg access to services seem to be well managed; however, rural or informal settlement areas are characterised by lower levels of service delivery.
PREDICTED IMPACT	Low Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 57: Impact of the increase in generation capacity in the province as well as the advancement of the RE sector in achieving long term, sustainable supply

ISSUE	**Increase in generation capacity in the province as well as the advancement of the RE sector in achieving long term, sustainable supply**
DISCUSSION	The impact will take place as a result of the PV energy facility being established and becoming operational.
EXISTING IMPACT	The Province is the fourth biggest electricity user in the country and relies primarily on coal generated electricity. Informal and rural households with no electricity make use of wood or gas, adding to the Province's harmful emissions.
PREDICTED IMPACT	High Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 58: Impact of the sustainable increase in production and GDP-R of the national and local economies through operation and maintenance activities

ISSUE	**Sustainable increase in production and GDP-R of the national and local economies through operation and maintenance activities**
DISCUSSION	The impact will take place as a result of operational expenditure on the solar PV farm, which will also create sustainable multiplier effects.
EXISTING IMPACT	The local economy has a large reliance on service industries, and the need to diversify the economy is dire.
PREDICTED IMPACT	Moderate to High Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 59: Impact of the creation of long-term employment in local and national economies through operation and maintenance activities

ISSUE	**Creation of long-term employment in local and national economies through operation and maintenance activities**
DISCUSSION	The impact will take place as a result of operational expenditure on the solar PV farm, which will also create sustainable multiplier effects.
EXISTING IMPACT	The local economy has a high unemployment rate, which means that the area is in need for investment that would create new sustainable employment opportunities.
PREDICTED IMPACT	Low to Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 60: Impact of skills development due to the creation of new sustainable employment opportunities

ISSUE	**Skills development due to the creation of new sustainable employment opportunities**
DISCUSSION	The impact takes place during operations of the solar PV farm and occurs due to on-job training.
EXISTING IMPACT	The local municipality has a very limited skills base and poor educational levels.
PREDICTED IMPACT	Low Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 61: Impact of improved standard of living of households directly or indirectly benefiting from created employment opportunities

ISSUE	**Improved standard of living of households directly or indirectly benefiting from created employment opportunities**
DISCUSSION	The impact takes place as a result of jobs created through direct, indirect and induced impacts.
EXISTING IMPACT	The households in the local municipality are on average worse off than in the country in general. Households in Lichtenburg fare considerably better though.
PREDICTED IMPACT	Low to Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 62: Impact of an increase in government revenue stream

ISSUE	**Increase in government revenue stream**
DISCUSSION	The project, through its operations, will contribute to government revenue through payments of income taxes and payroll taxes.
EXISTING IMPACT	The local tax base is small, which limits the ability of the municipalities to provide quality services.
PREDICTED IMPACT	Moderate Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 63: Impact of investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan

ISSUE	**Investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan**
DISCUSSION	The project will form part of the Independent Power Producer Procurement Programme that implies that the operating company allocates a certain percentage of the project's revenue towards community development.
EXISTING IMPACT	Compared to the LM, Lichtenburg has a community with better skills levels and more economic opportunities. Settlements slightly further away from the project such as Boikhutso, Itsoseng, and Bakerville could benefit from these development initiatives.

ISSUE	**Investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan**
PREDICTED IMPACT	Moderate to High Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 64: Impact of an altered sense of place

ISSUE	**Altered sense of place**
DISCUSSION	The project is expected to have a notable visual impact, which will alter the landscape and ultimately affect the sense of place developed by local residents and visitors.
EXISTING IMPACT	The desktop study revealed that the area is sparsely populated. Policy documents state that mining and quarrying activities are prevalent. The Watershed MTS is also present in close proximity, which already changes the visual landscape from farming community to industrial.
PREDICTED IMPACT	Low Negative
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general.

Table 65: Impact on commercial property and land values in the surrounding area

ISSUE	**Impact on commercial property and land values in the surrounding area**
DISCUSSION	The development of the solar facility could lead to changes in the property values in the area, which could either be positive or negative. It could either increase the demand for properties in the area considering the accessibility to transmission infrastructure and resource potential, or reduce the property value due to the change in the sense of place.
EXISTING IMPACT	Google Earth images indicate that farms surrounding the proposed project site is used for irrigated agricultural activities. The site visit to be undertaken in the EIA phase will enable a clear land use profile.
PREDICTED IMPACT	Low Negative and/or Low Positive
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Could be high considering the potential for solar projects in the DM and the North West Province in general, particularly if they are built in the vicinity or on route to the site.

6.1.7 Geotechnical Impacts

The following potential impacts have been identified for the proposed solar energy facility development. No further investigation will be required in the EIA phase as the Geotechnical assessment was undertaken to an acceptable EIA phase standard and will be incorporated into the EIA report.

Table 66: Impact on the drainage within the study site as a result of stormwater runoff

ISSUE	**Impact on the drainage within the study site as a result of stormwater runoff**
DISCUSSION	Google Earth imagery suggests that this site may be underlain by well developed, shallow, undulating calcrete horizon, which is typically impermeable and thus stormwater ponding could be an issue in this area, particularly after heavy or prolong rainfall.
EXISTING IMPACT	The gradient of the site should be sufficient for stormwater runoff in the form of sheet wash after periods of heavy prolonged rainfall. With the site being overlain by a relatively thin horizon of permeable sandy hillwash it is likely that downward percolation of precipitation (under normal conditions) is likely.
PREDICTED IMPACT	Moderate to High negative
EIA INVESTIGATION REQUIRED	No – the report was undertaken to an acceptable EIA phase standard and will be incorporated into the EIA report.
CUMULATIVE EFFECT	Moderate to high considering the fact that two (2) solar PV energy facilities are being proposed within the application site.

Table 67: Impact on surface cover of study site as a result of foundation loading

ISSUE	**Impact on surface cover of study site as a result of foundation loading**
DISCUSSION	It can be anticipated that the entire site will have a surface cover of recently transported soils. The thickness of this cover can be expected to vary, according to the recent geological depositional processes that were active at the time. As these transported sediments were laid down in recent geological times, they will not have undergone any significant consolidation. They can therefore be considered to be of a loose consistency, and could experience settlement under applied foundation loading.
EXISTING IMPACT	Wind-blown Aeolian Sands, Water Transported Hillwash and Water Transported Alluvium soil types are all expected to be found within the surface cover of the study site.
PREDICTED IMPACT	Moderate negative
EIA INVESTIGATION REQUIRED	No – the report was undertaken to an acceptable EIA phase standard and will be incorporated into the EIA report.

ISSUE	**Impact on surface cover of study site as a result of foundation loading**
CUMULATIVE EFFECT	Moderate to high considering the fact that two (2) solar PV energy facilities are being proposed within the application site.

Table 68: Impact on dolomite stability as a result of intensive irrigation and dewatering

ISSUE	**Impact on dolomite stability as a result of intensive irrigation and dewatering**
DISCUSSION	Dolomite rocks are highly soluble by slightly acidic ground waters. Under these conditions the possibility exists for the formation of sinkholes and doline depressions. These features generally only occur where static or flowing water is present, such as human settlements, dams, commercial farming using intensive irrigation and poor stormwater facilitation. Large scale dewatering processes also escalates the formation of these features.
EXISTING IMPACT	It is evident from the Topographical maps and Google Images that a water boreholes are present near the both Alternative 1 and 2 - sites. These borehole are probably used for irrigation purposes. As mentioned above, intensive irrigation and dewatering has a significant effect on the underlying dolomite stability.
PREDICTED IMPACT	Moderate negative
EIA INVESTIGATION REQUIRED	No – the report was undertaken to an acceptable EIA phase standard and will be incorporated into the EIA report.
CUMULATIVE EFFECT	Predicted to be moderate to high due to existing intensive irrigation which can be found on site

6.1.8 Traffic Impacts

The following potential impacts have been identified for the proposed solar energy facility development. No further investigation will be required in the EIA phase as the Traffic assessment was undertaken to an acceptable EIA phase standard and will be incorporated into the EIA report.

Table 69: Impact on existing and future traffic in the surrounding area during construction and operation

ISSUE	**Impact on existing and future traffic in the surrounding area during construction and operation**
DISCUSSION	The traffic during construction and during operation is expected to have some form of impact on existing and future traffic in the surrounding area.
EXISTING IMPACT	No traffic data is available for the roads in the area around the proposed site. However it can be assumed that traffic on the R505 to be reasonably low (<1500 AADT, <200 Veh/h).
PREDICTED IMPACT	Negligible

ISSUE	**Impact on existing and future traffic in the surrounding area during construction and operation**
EIA INVESTIGATION REQUIRED	No – the report was undertaken to an acceptable EIA phase standard and will be incorporated into the EIA report.
CUMULATIVE EFFECT	Predicted to be moderate considering the potential for solar projects in the DM and the North West Province in general.

Table 70: Delays for normal routine maintenance works (repairs and reseals)

ISSUE	**Delays for normal routine maintenance works (repairs and reseals)**
DISCUSSION	There is a possibility of limited risk of delays for normal routine maintenance works (repairs and reseals) depending of the time of transport and scheduling of roads contracts.
EXISTING IMPACT	None known
PREDICTED IMPACT	Low to Moderate negative
EIA INVESTIGATION REQUIRED	No – the report was undertaken to an acceptable EIA phase standard and will be incorporated into the EIA report.
CUMULATIVE EFFECT	Predicted to be moderate considering the potential for solar projects in the DM and the North West Province in general.

Table 71: Impact on traffic in the surrounding area as a result of road upgrades to accommodate abnormal loads

ISSUE	**Impact on traffic in the surrounding area as a result of road upgrades to accommodate abnormal loads**
DISCUSSION	All the possible limitations will potentially be encountered on the gravel roads from the R505 intersection to the prospective site, even though the length to be travelled on these roads are minimal.
EXISTING IMPACT	Currently there are no road upgrades taking place within close proximity of the proposed development site
PREDICTED IMPACT	Low to Moderate negative
EIA INVESTIGATION REQUIRED	No – the report was undertaken to an acceptable EIA phase standard and will be incorporated into the EIA report.
CUMULATIVE EFFECT	Predicted to be moderate considering the potential for solar projects in the DM and the North West Province in general.

Table 72: Impact on existing drainages patterns of the access road as a result of construction and operational traffic

ISSUE	**Impact on existing drainages patterns of the access roads as a result of construction and operational traffic**
DISCUSSION	The existing drainage patterns of the preferred access route could be disturbed as a result of the significant amount of construction and operational traffic which will need to make use of this route.

ISSUE	**Impact on existing drainages patterns of the access roads as a result of construction and operational traffic**
EXISTING IMPACT	Currently there is minimal traffic making use of the preferred access road and thus the impact on the drainages structures on this road are expected to be minimal.
PREDICTED IMPACT	Low negative - drainage elements will be provided on the access road to ensure minimal disturbance of the existing drainage patterns.
EIA INVESTIGATION REQUIRED	No – the report was undertaken to an acceptable EIA phase standard and will be incorporated into the EIA report.
CUMULATIVE EFFECT	Low considering drainage elements will be provided.

6.2 Identification of Mitigation Measures

Biodiversity

- Avoid patches of indigenous vegetation if possible, or place infrastructure as close as possible to boundaries.
- Vegetation clearing should take place in a phased manner, only clearing areas that will be constructed on immediately. Vegetation clearing must not take place in areas where construction will only take place in the distant future.
- Visibility devices could be placed on overhead power lines. This will reduce the probability of avifaunal collisions slightly.
- Construction activity should be restricted to the immediate footprint of the infrastructure.

Avifauna

- Avifaunal monitoring should take place before, during and after construction.
- The detailed protocol to be followed for the inspections will be compiled by the avifaunal specialist prior to the first inspection.

Surface Water

- An appropriate storm water management plan formulated by a suitably qualified professional must accompany the proposed development to deal with increased run-off in the designated construction areas.
- Avoid wetland systems, where possible, by spanning them completely.
- Any identified surface water resources and the associated buffer zones are to be designated as “highly sensitive areas”. No vehicles are to be allowed in the highly sensitive areas unless authorised.
- No water is to be extracted unless a water use license is granted for specific quantities for a specific water resource.
- No hazardous or building materials are to be stored or brought into the highly sensitive areas. Should a designated storage area be required, the storage area must be placed at the furthest location from the highly sensitive areas. Appropriate safety measures as stipulated above must be implemented.

Visual

- Carefully plan to reduce the construction period.
- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
- Maintain a neat construction site by removing rubble and waste materials regularly.
- Make use of existing gravel access roads where possible.
- Ensure that dust suppression techniques are implemented on all access roads.

Heritage

- In the event that a possible heritage find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
- If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.
- If during the initial survey sites of cultural significance are discovered, it will be necessary to develop a management plan for the preservation, documentation or destruction of such a site. Such a program must include an archaeological/palaeontological monitoring programme, timeframe and agreed upon schedule of actions between the company and the archaeologist.
- In the event that human remains are uncovered, or previously unknown graves are discovered, a qualified archaeologist needs to be contacted and an evaluation of the finds made. If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA need to be followed. This includes an extensive social consultation process.

Social

- It is recommended that the project owner develops practical SED and ED programmes throughout the project's lifespan. The plan should be developed in consultation with local authorities and existing strategy documents to identify community projects that would result in the greatest social benefits. With regard to ED initiatives, focus should be on developing plans to support and create sustainable, self-sufficient enterprises. It is important that these plans be reviewed annually and where possible updated.

Geotechnical

- Where the sandy surface horizon is thick, the most appropriate geotechnical solution would be to excavate to a specified depth, and re-compact the removed soils back up to foundation level. This solution is referred to as constructing an engineered soil mattress.
- If the horizon is thin, structures could be founded on competent underlying pedogenic (calcrete) or residual soil horizons.
- Place foundations on an engineered soil mattress in order to avoid collapse settlement.
- Due to fact that this entire site is underlain at depth by dolomite, it is a legal requirement that a DSI be undertaken in accordance with the South African National Standards SANS 1936-Parts 1 to 4 Development of Dolomitic Land.
- For the substation, as indicated in the layout, this DSI will comprise a gravity survey and the drilling of a minimum of 3 boreholes for a feasibility level (Phase 1) investigation.

Traffic

- The access road should be upgraded to at least a 5m wide (preferably 6m with sufficient shoulders) and finished with a gravel wearing course layer.
- Suitable drainage elements must be provided on the access road to ensure minimal disturbance of the existing drainage patterns.
- Typical minimum signage requirements need to be implemented to ensure safety if the road needs closure during construction on the public road.
- It is recommended that the majority of construction personnel be transported to and from site by means of buses and some by private vehicles.

Recommended mitigation measures will be refined after the detailed fieldwork has been completed.

6.3 Assessment of Cumulative Impacts

The area has seen a notable interest from developers of various renewable energy projects, which could be associated with the solar energy resource potential found in the region, proximity to the existing sub-station and its evacuation capacity, as well as other factors. Such developments, whether already approved or only proposed, need to be considered as they have the potential to create numerous cumulative impacts, whether positive or negative, if implemented. **Table 73** lists the projects that will need to be considered when examining the cumulative impacts; their location relative to the project under review is illustrated in **Figure 28**. The specialists have identified specific cumulative impacts and these are outlined below.

Table 73: Proposed renewable energy projects in the area

Proposed Development	DEA Reference Number	Current Status of EIA	Proponent	Proposed Capacity	Farm Details
Tlisitseng 2	14/12/16/3/3/2/890	EIA ongoing	BioTherm Energy	75MW	Portion 25 of the Farm Houthaalboomen No 31
Matrigenix Renewable Energy Project	14/12/16/3/3/3/270	Scoping and EIA processes underway	Matrigenix (Pty) Ltd	70MW	A portion of portion 10 of the Farm Lichtenburg Town and Townlands 27
Watershed Solar Energy Facility	14/12/16/3/3/2/557	Scoping and EIA processes underway.	FVR Energy South Africa (Pty) Ltd	75MW	Portions 1, 9, 10 and 18 of the Farm Houthaalboomen 31
Hibernia PV Solar Energy Facility	14/12/16/3/3/2/1062	Project has received environmental authorisation	South Africa Mainstream Renewable Power Developments (Pty) Ltd	**UNKNOWN**	Portions 9 and 31 of the Farm Hibernia 52

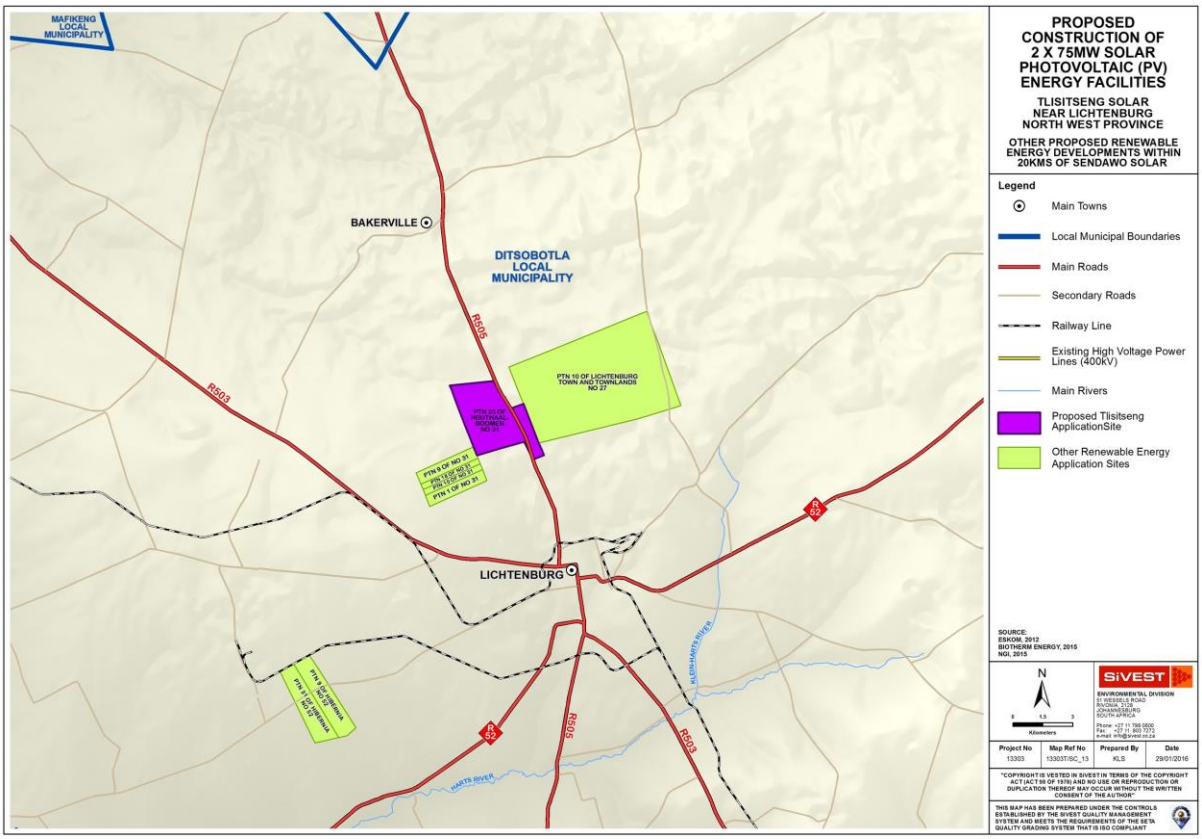

Figure 28: Location of other renewable energy projects (proposed and approved) in the area

6.3.1 Biodiversity Impacts

Cumulative impacts on indigenous natural vegetation

The regional terrestrial vegetation type in the broad study area is Carletonville Dolomite Grassland, listed as Vulnerable. This is the same vegetation type that will be affected by many of the other proposed projects (Table 13). Loss of habitat will definitely occur, but this will be a small area in comparison to the total area of the vegetation type concerned. The vegetation type occupies an area in excess of 8 800 km2, of which just less than 25% has been altered. The total loss of habitat due to all the projects together will be greater than for any single project, so a cumulative effect will occur. However, the area lost in total will be small compared to the total area of the vegetation type and will not result in a change in the conservation status of the vegetation type. The cumulative effect will therefore be low.

Cumulative impacts on listed plant species

There are four species that may occur in the study area, the bulb, Boophone disticha, listed as Declining, the bulb, Crinum macowanii, listed as Declining, the succulent herb, Brachystelma incanum, listed as Vulnerable, and the herb, Cleome conrathii, listed as Near Threatened. Three of the species are relatively

widespread, whereas the species listed as Vulnerable is known from a general area that includes the study area. An increased number of projects increases the likelihood of one of the populations being affected, but unless a population is directly affected, there is no cumulative effect.

Cumulative impacts on protected plant species

There is one species protected according to the National Environmental Management: Biodiversity Act, Harpagophytum procumbens, that may potentially occur on site. There are also a number of plant species protected according to Provincial legislation. An increased number of projects will increase the likelihood of protected species being affected as well as the number of individuals likely to be affected. There is therefore a cumulative effect, but this is considered to be low.

Cumulative impacts on protected trees

There are three protected tree species that could occur on site, Acacia erioloba, Combretum imberbe and Boscia albitrunca. With each additional project that is constructed there will be an increasing likelihood of individuals being affected and the number of individuals affected will increase. There is therefore a cumulative effect. The significance of this effect is, however, likely to be low due to the high number of individuals of each of these species that occurs over their entire geographical range.

Cumulative impacts on pan depressions

There are a number of small pan depressions occurring on site and probably at the sites of the other proposed projects. With each project that is constructed, the number of pan depressions affected will increase. There is therefore a cumulative effect. Due to the fact that many of these depressions have already been affected by existing land-uses, there is a possibility that the significance of the cumulative effect could potentially be of moderate significance.

Cumulative impacts on populations of sedentary fauna

There are three species of sedentary fauna likely to be impacted by the current project, the Southern African Hedgehog, the White-tailed Rat and the Giant Bullfrog. All three have a relatively wide geographical distribution and loss of some habitat in part of their range will have a minimal effect on the species. The combination of a number of projects will have a cumulative effect, but this is likely to be of low significance.

Cumulative impacts on mobile fauna

Construction activities, loss of habitat, noise, dust and general activity associated with the construction phase of the project are likely to cause all mobile species to move away from the site. This effect will be increased if there are a number of projects being constructed at the same time or in quick succession, so the effect is likely to be cumulative. However, the geographical ranges of the species of concern is wide and it is considered that the significance of the effect will be low.

Cumulative impacts on birds by collision with vertical infrastructure

During operation, flying species could potentially suffer mortality by collisions with vertical infrastructure, especially infrastructure with low visibility, such as power lines. The more projects with overhead power lines, the greater the effect will be. There will therefore be a cumulative effect. The proposed overhead

power lines for the current project are relatively short and also located in an area with existing power lines. The cumulative effect will therefore be low.

Cumulative impacts due to spread of declared weeds and alien invader plants

There is a moderate possibility that alien plants could be introduced to areas within the footprint of the proposed infrastructure from surrounding areas in the absence of control measures. The greater the number of projects, the more likely this effect will happen, therefore the effect is cumulative. For the current site, the impact is predicted to be low due to existing impacts on site and the high ability to control any additional impact. The significance will therefore be low, especially if control measures are implemented.

6.3.2 Avifauna Impacts

The total surface area in a 20km radius around the proposed development amounts to approximately 126 120ha. The combined area taken up by the proposed renewable energy developments, including the Tlisitseng PV 1 and 2 projects, amounts to approximately 5 789ha. This is approximately 4.5% of the total amount of habitat available. The potential cumulative impact of the Tlisitseng PV 1 and 2 projects on priority species is therefore rated as low. This rating might have to be reviewed based on the outcome of the pre-construction programme.

6.3.3 Surface Water Impacts

The key factor to consider when evaluating surface water impacts from a cumulative perspective is downstream impacts. Where a development takes place upstream, should impacts occur these are likely to have an effect downstream to some extent.

In the context of the proposed development, similar developments (solar facilities) are located directly to the south west and east. Several more are located much further (approximately 10km away) to the north and north east which will not have any effect on the proposed development, nor will the proposed development have an effect on these developments.

General drainage in the local catchment appears to flow from a south west to easterly direction. Whilst there are no linear surface water resources that connect the proposed development site with the proposed Watershed Solar Energy Facility (Portions 1, 9, 10 and 18 of the Farm Houthaalboomen 31) to the south west, general surface water run-off impacts may occur on the proposed development site during construction when vast areas of land are cleared and rainfall takes place. Increase run-off, sedimentation and consequent erosion impacts are the main concern in this regard. Conversely, the proposed development site may similarly inflict similar impacts on the adjacent properties to the east (Portion 10 of the Farm Lichtenburg Town and Townlands 27) where the proposed Matrigenix Renewable Energy Project is planned. Overall, cumulative impacts are not expected to be significant and will be fairly localized within

the particular catchment. With the implementation of mitigation measures (generic and specific), downstream impacts can be significantly reduced.

6.3.4 Soils and Agricultural Potential Impacts

The main cumulative impact would be as a result of the fact that several solar power generation projects are planned in the vicinity of Lichtenburg. The soils on each site would not have an impact on any other site, but there would be a potential of increased dust production as a result of construction activities, especially in the drier months, when wind can cause soil particles to become detached from the bare soil surface. The main mitigation measures would include ensuring that the topsoil remains moist if possible, and that the construction footprint is as small as possible, with minimum soil surface disturbance due to construction activities.

Due to the potential occurrence of deep, high potential soils, coupled with the fact that the climate is not unfavourable for rain-fed cultivation, it will be necessary to map out areas of better soils, in order to minimize the impacts. It can therefore be anticipated that a more detailed soil survey will be required.

6.3.5 Visual Impacts

As previously mentioned, a 5km radius was used when determining the cumulative visual impact experienced by each visual receptor location. The cumulative impact assessment therefore investigated the number of proposed developments within a 5km radius from each respective receptor location. The number of proposed developments that each receptor would be visually exposed to (i.e. the cumulative impact experienced at each location) is indicated in the visual specialist report. It should be noted that the impact on each receptor location is indicative of the 'worst case' scenario which assumes that all of the proposed facilities would be developed.

The greatest cumulative impact will be experienced from the Lichtenburg Game Breeding Centre and the R505 main road. This is due to the fact that they could be visually exposed to two additional proposed renewable energy developments should they both be constructed. It must also be noted that the Lichtenburg Game Breeding Centre is operated by the National Zoological Gardens of South Africa with the aim of augmenting the National Zoo's endangered species breeding program and providing animals for local and international zoos. This unique reserve provides nature based tourism facilities with a good road network for game drives and some self-catering accommodation and is therefore expected to experience the greatest visual impact if the two additional proposed PV energy facilities are both constructed. In addition, the R505 main road is considered to be a visually sensitive road as is the main access road between Lichtenburg and the N18 national route to the north. This road can be used to access tourism attractions to the north of the study area such as the diamond diggings at Bakerville and the Wondergat

sinkhole. The relatively high volumes of motorists travelling along this road could therefore also be visually exposed to the two additional proposed renewable energy developments should they both be constructed.

Several scattered farmsteads / homesteads, which are used to house the local farmers as well as their farm workers, were identified within the study area and are also regarded as potentially sensitive visual receptor locations. It was noted that some of these dwellings are located within a 5km radius from the additional proposed renewable energy developments and are therefore expected to experience a visual impact if they are both constructed. However, it must be noted that these dwellings will need to be investigated further during the EIA phase once fieldwork is undertaken and more detailed information becomes available.

6.3.6 Heritage Impacts

An evaluation of the possible cumulative impacts from the combined solar projects in the area on heritage resources has shown that the biggest envisaged impact could be on the palaeontological heritage of the area with the Watershed Solar Energy facility just northwest of this proposed development increasing the possibility of impacts on the breccias that could occur in the area.

Though with the implementation of mitigation measures these impacts could be transformed into a positive impact through the discovery of previously unknown fossils and the subsequent study of such fossil finds adding to the academic knowledge of the palaeontological resources of the study area.

6.3.7 Socio-Economic Impacts

Cumulative impacts can be defined as changes to the environment that are caused by an action in combination with other past, present, and future human actions, however, in practice the assessment of cumulative impacts as on a single-project basis relates to one concept: the specific consideration of effects due to other projects. It follows that in general, the expected impacts that may ensue from the project being evaluated is similar to the cumulative impacts that may be observed.

Various reasons exist for the projects listed above not all becoming operational:

- Limitations to the capacity of the existing national grid.
- Not all environmental authorisation applications will be successful.
- All requirements from applicants in the bidding process may not be met.
- Financial support may not be readily available to all of the project proponents, even if the bidding process and environmental authorisation application is successful.
- Appeals and objections to the process by various stakeholders could potentially delay implementation and operation of the various projects.

Regardless, following a conservative approach, in order to assess the full potential cumulative effect of the development of the RE industry in the study area it is assumed that the applications listed above will be successful and become operational during the operational lifespan of the proposed Tlisitseng energy plants. In this instance, the following cumulative effects can be expected:

- The development of solar energy projects in the area will considerably increase the demand for goods and services required for the construction of these facilities. Depending on the timing of these listed solar PV facilities, it could extend the demand for these goods and services for a longer period than the construction phase of one project, which would be more beneficial than if all projects were to be built over the same timeframe. Since the development of the majority of solar PV projects at the moment follows a bid process, it is likely that some developments will also follow one after another. Coupled with projects developed in other parts of the province, this could provide sufficient economies of scale and thus open opportunities for the establishment of supporting industries, leading to a growth of the economy and sustainable job creation.
- Aside from positive cumulative impacts, the development of solar energy projects in the area at the same time or one after another, will also increase the negative cumulative impacts during construction periods of these projects. The magnitude of these impacts will be dependent on whether the construction of solar PV projects in the area is done within the same period of time or whether they are distributed over a longer period. The more projects are built during the same period, the greater the cumulative impact will be as the local economy and communities in and around Lichtenburg have a small economic base and are not capable to absorb the demand for additional services and goods, while their social and economic infrastructure (i.e. affordable housing, water, sanitation, roads, etc.) might not be able to deal with sharp increase in demand for these amenities that would be stimulated from an increase in construction workers and job seekers in the area. The increase in the number of construction workers and generally job seekers in the area could have a detrimental impact on the ability of the local authorities to service their residents, which could further translate into growing un-satisfaction with performance of local government and create unrest in the areas. Significant change in demographics, i.e. sharp increase in male population as observed in mining areas, growth of informal settlements, and increase in social pathologies (health issues, crime, prostitution, xenophobia, etc.) could also become bigger problems in the local community.

7 LAYOUT ALTERNATIVES

One of the aims of the Scoping Report is to identify alternatives to carry through to the EIA phase of the investigation for detailed assessment (as was discussed in **Chapter 2**). The selection of alternatives during the scoping phase of the project usually helps to focus future investigations, both in terms of the environmental investigations required and the scope of the public participation process.

7.1 Methodology for Assessing Layouts

Various specialists identified preliminary site specific sensitive areas during the scoping phase of the EIA that may need to be precluded from the buildable area. These include the avifaunal, heritage, palaeontological, biodiversity and surface water specialists. The sensitive areas identified by these specialists were used to assess the impacts of each of the proposed alternatives on the environment.

The Impact Assessment Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

7.1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 92**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

7.1.2 Impact Rating System

Impact assessment must take into account the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental).

- Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each alternative the following criteria (including an allocated point system) is used:

Table 74: Description of terms

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		

This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		

1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

Significance

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	**Impact Significance Rating**	**Description**
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.

29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

7.2 Layout Alternatives

As previously mentioned, layout alternatives have been considered during the Scoping phase. Due to constraints in terms of the available area, only one (1) alternative was considered for the PV array area. However, two (2) alternative locations for the 132kV onsite substation, O&M building and laydown area were considered. Each of these alternatives have been comparatively assessed in terms of the findings from the specialist studies conducted during the scoping phase of the EIA.

The Tlisitseng 1 layout alternatives are presented in **Figure 29** below.

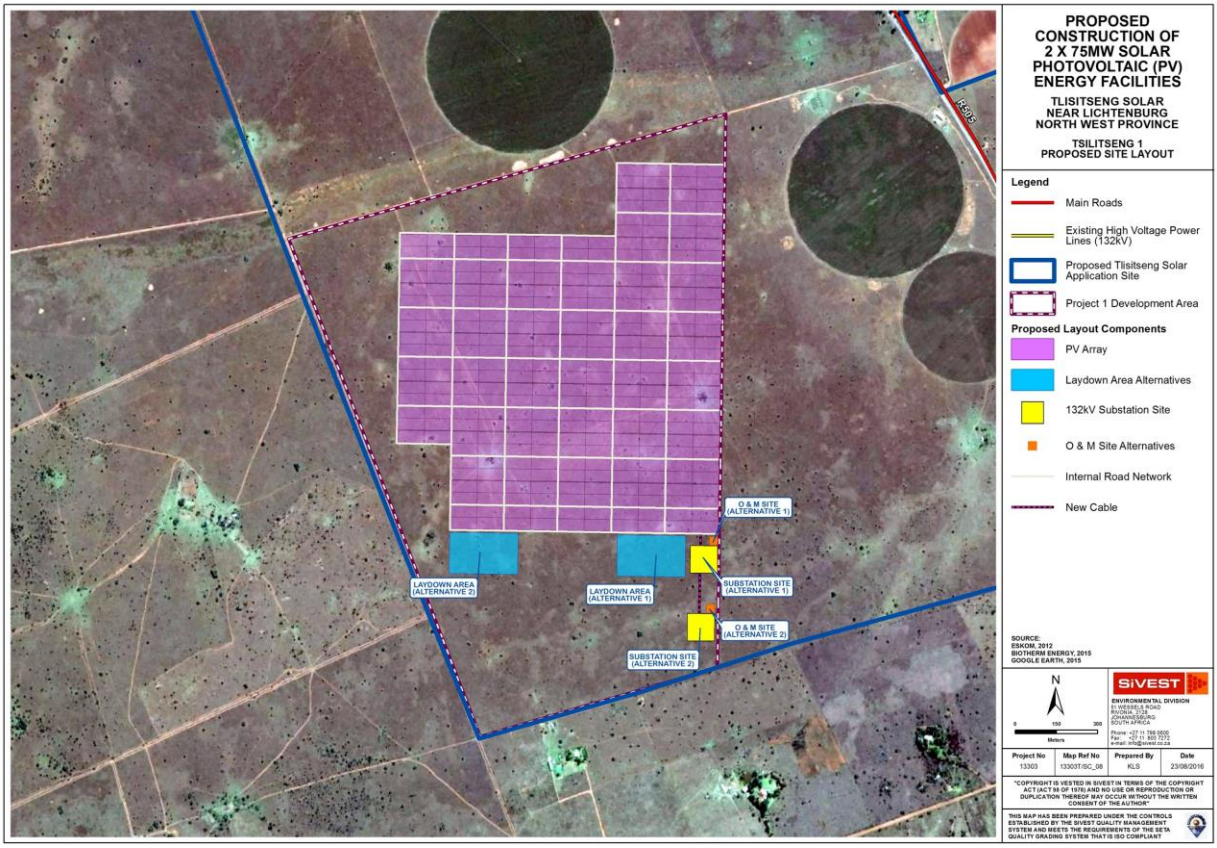

Figure 29: Proposed Layout Alternatives

In order to provide a preliminary assessment of alternatives, the proposed layout alternatives were overlaid onto the sensitive areas identified by specialists, the combined map is shown below in **Figure 30.**

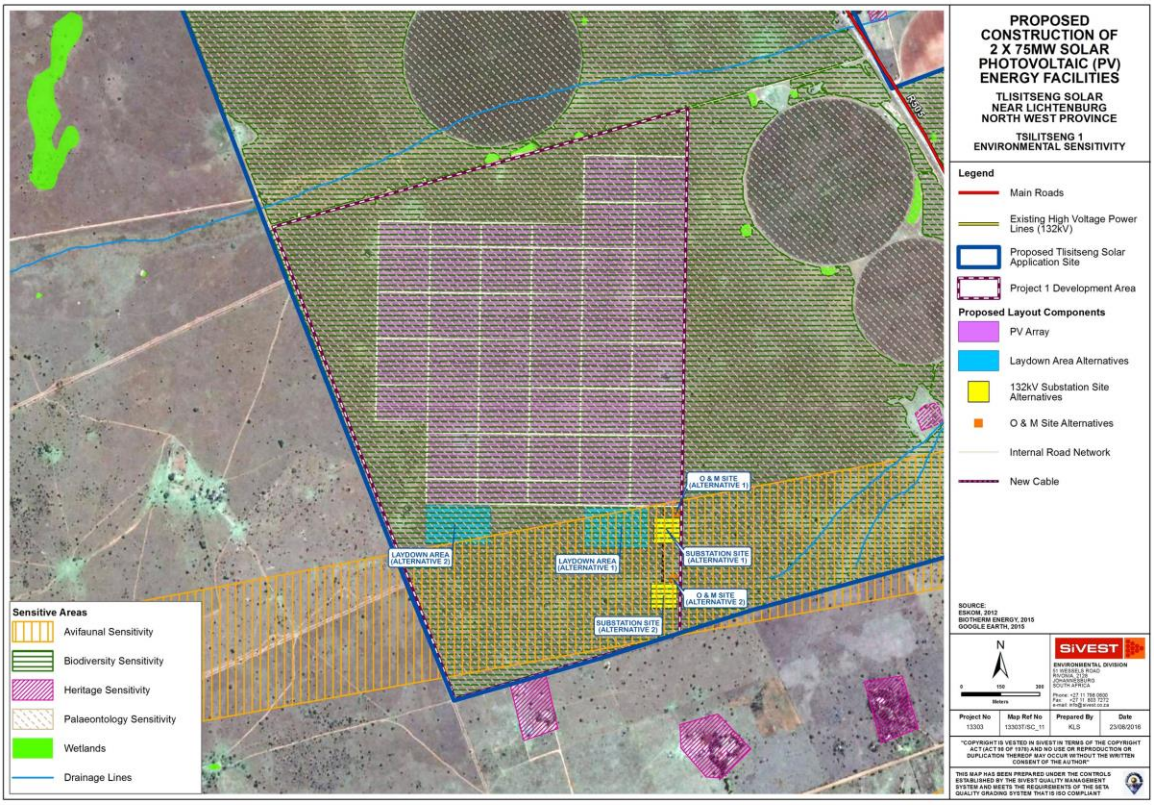

Figure 30: Proposed Layout Alternatives and sensitive areas

During the EIA phase the proposed layouts will be further refined (if required) to avoid the sensitive areas identified by the specialists on the proposed development site.

Key

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
NOT PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Table 75: Tlisitseng 1 Alternatives Assessment summarising the impacts, highlighting issues/concerns and indicating the preference associated with each alternative

ALTERNATIVE	PREFERENCE	CONCERNS / IMPACT SUMMARY
SUBSTATION SITE		
Proposed Substation Site Alternative 1	Preferred	This alternative is found within avifaunal, biodiversity and palaeontological sensitive areas which have been identified within the proposed

		Tlisitseng PV application site. This alternative is however situated further from the farms / properties which are located adjacent to the proposed Tlisitseng PV application site (i.e. further from the Talene farms / properties) and is therefore expected to result in less significant visual impacts. As such, Alternative 1 is the environmentally preferred alternative. It is also likely that the impacts on avifaunal, biodiversity and palaeontology can be adequately mitigated against. This will be further assessed in the EIA phase.
Proposed Substation Site Alternative 2	Favourable	This alternative is found within avifaunal, biodiversity and palaeontological sensitive areas which have been identified within the proposed Tlisitseng PV application site. This alternative is however situated within close proximity to most of the farms / properties which are located adjacent to the proposed Tlisitseng PV application site (i.e. closer to the Talene farms / properties) and is therefore expected to result in significant visual impacts. Despite this, Alternative 2 is still considered to be a favourable alternative from an environmental perspective as that the impacts on avifaunal, biodiversity and palaeontology can be adequately mitigated against. This will be further assessed in the EIA phase.
LAYDOWN AREA		
Proposed Laydown Area Alternative 1	Favourable	This alternative can be found within biodiversity and palaeontological sensitive areas which have been identified within the proposed Tlisitseng PV application site. In addition, majority of this laydown area alternative can be found within an avifaunal sensitive area. However this alternative is still considered to be a favourable option from an environmental perspective as that the impacts on avifaunal, biodiversity and palaeontology can be adequately mitigated against. This will be further assessed in the EIA phase..
Proposed Laydown Area Alternative 2	Preferred	This alternative can be found within biodiversity and palaeontological sensitive areas which have been identified within the proposed Tlisitseng PV

		application site. Only a small section of this laydown area alternative can be found within an avifaunal sensitive area. As such, Alternative 2 is the environmentally preferred alternative as it traverses a smaller area of the avifaunal sensitive area than Alternative 1. In addition, this alternative is situated further from the farms / properties which are located adjacent to the proposed Tlisitseng PV application site (i.e. further from the Talene farms / properties) and is therefore expected to result in less significant visual impacts. It is likely that the impacts on biodiversity and palaeontology can be mitigated against. This will be further assessed in the EIA phase.
O&M BUILDING		
Proposed O&M Buildings Alternative 1	Preferred	This alternative is found within avifaunal, biodiversity and palaeontological sensitive areas which have been identified within the proposed Tlisitseng PV application site. This alternative is however situated further from the farms / properties which are located adjacent to the proposed Tlisitseng PV application site (i.e. further from the Talene farms / properties) and is therefore expected to result in less significant visual impacts. As such, Alternative 1 is the environmentally preferred alternative. It is also likely that the impacts on avifaunal, biodiversity and palaeontology can be adequately mitigated against. This will be further assessed in the EIA phase.
Proposed O&M Buildings Alternative 2	Favourable	This alternative is found within avifaunal, biodiversity and palaeontological sensitive areas which have been identified within the proposed Tlisitseng PV application site. This alternative is however situated within closer proximity to most of the farms / properties which are located adjacent to the proposed Tlisitseng PV application site (i.e. closer to the Talene farms / properties) and is therefore expected to result in significant visual impacts. Despite this, Alternative 2 is still considered to be a favourable alternative from an environmental perspective as that the impacts on avifaunal,

		biodiversity and palaeontology can be adequately mitigated against. This will be further assessed in the EIA phase.

As previously mentioned, due to constraints in terms of the available area, only one (1) alternative was considered for the PV array area. Based on the preferences above, it is recommended that detailed studies be done on all the proposed alternatives for the associated infrastructure during the EIA phase, including specialist fieldwork. The potential significance of the negative environmental impacts that may need to be mitigated are summarised below. These will be further assessed in the EIA Phase.

Table 76: Rating of impacts of the PV Array on environmentally sensitive areas

IMPACT TABLE FORMAT	
Environmental Parameter	Avifauna, Biodiversity, Heritage, Wetlands, Drainage Lines, Visual, Agriculture and Palaeontology
Issue/Impact/Environmental Effect/Nature	The proposed PV array area could impact indigenous natural vegetation, listed or protected plant and tree species, natural vegetation in pan depressions, or displace fauna or avifauna. The PV array area could also result in excessive run-off if the stormwater is not managed appropriately. Impacts on heritage and palaeontology could result if archaeological sites are uncovered during construction and the PV arrays could impact negatively on agricultural activities. The proposed PV arrays could expose potentially sensitive receptors to visual impacts.
Extent	Region/district (2)
Probability	Possible (2)
Reversibility	Partly reversible (2)
Irreplaceable loss of resources	Marginal loss (2)
Duration	Long term (3)
Cumulative effect	Medium (3)
Intensity/magnitude	High (3)
Significance Rating	Medium negative impact
	Pre-mitigation impact rating
Extent	2
Probability	2

IMPACT TABLE FORMAT	
Reversibility	2
Irreplaceable loss	2
Duration	3
Cumulative effect	3
Intensity/magnitude	3
Significance rating	-42 (medium negative)

Table 77: Rating of impacts of Substation Alternative 1 on environmentally sensitive areas

IMPACT TABLE FORMAT	
Environmental Parameter	Avifauna, Biodiversity, Heritage, Wetlands, and Palaeontology
Issue/Impact/Environmental Effect/Nature	The proposed substation could impact indigenous natural vegetation, listed or protected plant and tree species, natural vegetation in pan depressions, or displace fauna or avifauna. The substation could also result in excessive run-off if the stormwater is not managed appropriately. Impacts on heritage and palaeontology could result if archaeological sites are uncovered during construction. The proposed substation could expose potentially sensitive receptors to visual impacts.
Extent	Site (1)
Probability	Possible (2)
Reversibility	Partly reversible (2)
Irreplaceable loss of resources	Marginal loss (2)
Duration	Medium term (2)
Cumulative effect	Medium (3)
Intensity/magnitude	Medium (2)
Significance Rating	Low negative impact
	Pre-mitigation impact rating
Extent	1
Probability	2
Reversibility	2
Irreplaceable loss	2
Duration	2

IMPACT TABLE FORMAT	
Cumulative effect	3
Intensity/magnitude	2
Significance rating	-24 (low negative)

Table 78: Rating of impacts of Substation Alternative 2 on environmentally sensitive areas

IMPACT TABLE FORMAT	
Environmental Parameter	Avifauna, Biodiversity, Heritage, Wetlands, and Palaeontology
Issue/Impact/Environmental Effect/Nature	The proposed substation could impact indigenous natural vegetation, listed or protected plant and tree species, natural vegetation in pan depressions, or displace fauna or avifauna. The substation could also result in excessive run-off if the stormwater is not managed appropriately. Impacts on heritage and palaeontology could result if archaeological sites are uncovered during construction. The proposed substation could expose potentially sensitive receptors to visual impacts.
Extent	Site (1)
Probability	Possible (2)
Reversibility	Partly reversible (2)
Irreplaceable loss of resources	Significant loss (3)
Duration	Medium term (2)
Cumulative effect	Medium (3)
Intensity/magnitude	Medium (2)
Significance Rating	Low negative impact
	Pre-mitigation impact rating
Extent	1
Probability	2
Reversibility	2
Irreplaceable loss	3
Duration	2
Cumulative effect	3
Intensity/magnitude	2
Significance rating	-26 (low negative)

Table 79: Rating of impacts of Laydown Area Alternative 1 on environmentally sensitive areas

IMPACT TABLE FORMAT	
Environmental Parameter	Avifauna, Biodiversity, Heritage, Wetlands, and Palaeontology
Issue/Impact/Environmental Effect/Nature	The proposed Laydown Area could impact indigenous natural vegetation, listed or protected plant and tree species, natural vegetation in pan depressions, or displace fauna or avifauna. The substation could also result in excessive run-off if the stormwater is not managed appropriately. Impacts on heritage and palaeontology could result if archaeological sites are uncovered during construction. The proposed Laydown Area could expose potentially sensitive receptors to visual impacts.
Extent	Site (1)
Probability	Possible (2)
Reversibility	Partly reversible (2)
Irreplaceable loss of resources	Significant loss (3)
Duration	Medium term (2)
Cumulative effect	Medium (3)
Intensity/magnitude	Medium (2)
Significance Rating	Low negative impact
	Pre-mitigation impact rating
Extent	1
Probability	2
Reversibility	2
Irreplaceable loss	3
Duration	2
Cumulative effect	3
Intensity/magnitude	2
Significance rating	-26 (low negative)

Table 80: Rating of impacts of Laydown Area Alternative 2 on environmentally sensitive areas

IMPACT TABLE FORMAT	
Environmental Parameter	Avifauna, Biodiversity, Heritage, Wetlands, and Palaeontology
Issue/Impact/Environmental Effect/Nature	The proposed Laydown Area could impact indigenous natural vegetation, listed or protected plant and tree species, natural vegetation in pan depressions, or displace fauna or avifauna. The substation could also result in excessive run-off if the stormwater is not managed appropriately. Impacts on heritage and palaeontology could result if archaeological sites are uncovered during construction. The proposed Laydown Area could expose potentially sensitive receptors to visual impacts.
Extent	Site (1)
Probability	Possible (2)
Reversibility	Partly reversible (2)
Irreplaceable loss of resources	Marginal loss (2)
Duration	Medium term (2)
Cumulative effect	Medium (3)
Intensity/magnitude	Medium (2)
Significance Rating	Low negative impact
	Pre-mitigation impact rating
Extent	1
Probability	2
Reversibility	2
Irreplaceable loss	2
Duration	2
Cumulative effect	3
Intensity/magnitude	2
Significance rating	-24 (low negative)

Table 81: Rating of impacts of O&M Building Alternative 1 on environmentally sensitive areas

IMPACT TABLE FORMAT	
Environmental Parameter	Avifauna, Biodiversity, Heritage, Wetlands, and Palaeontology
Issue/Impact/Environmental Effect/Nature	The proposed O&M Building could impact indigenous natural vegetation, listed or protected plant and tree species, natural vegetation in pan depressions, or displace fauna or avifauna. The substation could also result in excessive run-off if the stormwater is not managed appropriately. Impacts on heritage and palaeontology could result if archaeological sites are uncovered during construction. The proposed O&M Building could expose potentially sensitive receptors to visual impacts.
Extent	Site (1)
Probability	Possible (2)
Reversibility	Partly reversible (2)
Irreplaceable loss of resources	Marginal loss (2)
Duration	Medium term (2)
Cumulative effect	Medium (3)
Intensity/magnitude	Medium (2)
Significance Rating	Low negative impact
	Pre-mitigation impact rating
Extent	1
Probability	2
Reversibility	2
Irreplaceable loss	2
Duration	2
Cumulative effect	3
Intensity/magnitude	2
Significance rating	-24 (low negative)

Table 82: Rating of impacts of O&M Building Alternative 2 on environmentally sensitive areas

IMPACT TABLE FORMAT	
Environmental Parameter	Avifauna, Biodiversity, Heritage, Wetlands, and Palaeontology
Issue/Impact/Environmental Effect/Nature	The proposed O&M Building could impact indigenous natural vegetation, listed or protected plant and tree species, natural vegetation in pan depressions, or displace fauna or avifauna. The substation could also result in excessive run-off if the stormwater is not managed appropriately. Impacts on heritage and palaeontology could result if archaeological sites are uncovered during construction. The proposed O&M Building could expose potentially sensitive receptors to visual impacts.
Extent	Site (1)
Probability	Possible (2)
Reversibility	Partly reversible (2)
Irreplaceable loss of resources	Significant loss (3)
Duration	Medium term (2)
Cumulative effect	Medium (3)
Intensity/magnitude	Medium (2)
Significance Rating	Low negative impact
	Pre-mitigation impact rating
Extent	1
Probability	2
Reversibility	2
Irreplaceable loss	3
Duration	2
Cumulative effect	3
Intensity/magnitude	2
Significance rating	-26 (low negative)

8 PUBLIC PARTICIPATION PROCESS

Public participation is the cornerstone of any EIA. The principles of NEMA as well as the EIA Regulations govern the EIA process, including public participation. These include provision of sufficient and transparent information on an ongoing basis to stakeholders to allow them to comment, and ensuring the participation of previously disadvantaged people, women and the youth.

The public participation process is primarily based on two factors; firstly, ongoing interaction with the environmental specialists and the technical teams in order to achieve integration of technical assessment and public participation throughout. Secondly, to obtain the bulk of the issues to be addressed early on in the process, with the latter half of the process designed to provide environmental and technical evaluation of these issues. These findings are presented to stakeholders for verification that their issues have been captured and for further comment.

Input into the public participation process by members of the public and stakeholders can be given at various stages of the EIA process. Registration on the project can take place at any time during the EIA process up until the final EIA report is submitted to DEA. There are however set periods in which comments are required from Interested and / or Affected Parties (I&APs) in order to ensure that these are captured in time for the submission of the various reports. The comment periods during the scoping phase were implemented according to NEMA EIA Regulations. The comment periods during the scoping phase (as set out by EIA Regulations 2014) are as follows:

- Comment period for the Draft Scoping Report (DSR): 4 Calendar weeks (30 days).
- Any public participation process must be conducted for a period of at least 30 days.

The EIA regulations emphasise the importance of public participation. In terms of the EIA regulations, registered interested and/or affected parties –

- may participate in the application process;
- may comment on any written communication submitted to the competent authority by the applicant or environmental consultant;
- must comment within the timeframes as stipulated by the EIA Regulations;
- must send a copy of any comments to the applicant or Environmental Assessment Practitioner (EAP) if the comments were submitted directly to the competent authority; and
- must disclose any direct business, financial, personal or other interests that the person has in the application being granted or refused.

Further, in terms of the EIA regulations, the EAP:

- manages the application process;
- must be independent;

- must undertake the work objectively – even if this results in views and findings that are not favourable to the applicant;
- must disclose material information that may influence the decision; and
- must conduct a public participation process.

The following actions were taken upon receiving comments/queries/issues:

- The contact details provided were entered into the project database for use in future notifications.
- Confirmation of receipt of comments.
- Addressed comments in the Comments and Response Report.

8.1 Objectives of Public Participation

An understanding of what the public participation is, and is what it is not, needs to be explored and must be clarified.

- Public Participation is:
    - A communication mechanism to inform I&APs regarding a proposed project.
    - A communication mechanism to record comments and/or concerns raised during the relevant phase of the EIA by I&APs regarding a proposed project.
- What Public Participation is not:
    - A marketing exercise.
    - A process to address grievances but rather to record comments raised.
    - One-on-one consultation with each I&AP during the EIA process (not relevant to possibly affected landowners identified).

The primary aims of the PPP are:

- To inform interested and affected parties (I&APs) and key stakeholders of the proposed development.
- To initiate meaningful and timeous participation of I&APs.
- To identify issues and concerns of key stakeholders and I&APs with regards to the proposed development
- To promote transparency and an understanding of the proposed project and its potential environmental impacts.
- To provide information used for decision-making.
- To provide a structure for liaison and communication with I&APs and key stakeholders.
- To assist in identifying potential environmental impacts associated with the proposed development.

- To ensure inclusivity (the views, needs, interests and values of I&APs must be considered in the decision-making process).
- To focus on issues relevant to the project and issues considered important by I&APs and key stakeholders.
- To provide responses to I&AP queries.
- To encourage co-regulation, shared responsibility and a sense of ownership.

In addition to the guidance of the PPP in the EIA Regulations, every effort was also made to conform to the requirements of the Promotion of Administrative Justice Act 2000 (Act 3 of 2000).

8.2 Overview of the Public Participation Process to date

As previously mentioned, this is the second version of the DSR which will be submitted to the DEA and made available for public comment for the proposed Tlisitseng 1 Solar PV energy facility. On the 18th of January 2016 an application for environmental authorisation (EA) and the DSR for the proposed Tlisitseng 1 Solar PV energy facility were received by the DEA and a reference number was allocated to the proposed development (**DEA reference number: 14/12/16/3/3/2/889**). The public participation process for the original EIA process was initiated in early December 2015 with the issuing of the BID and initial landowner consultation. Site notices (as per regulations) were put up during a site visit that took place on the 1st and 2nd of December 2015. The EIA process advert was publicised on the 15th of January 2016 in the Noordwester newspaper. The original DSR comment period ran from the 11th of January 2016 to the 9th of February 2016 and I&APs were notified at the start of the comment period. The original FSR was then submitted to the DEA on the 19th of February 2016, and I&APs were notified on the same day. Prior to the release of the DEIAr, public meetings and focus group meetings were held on the 14th of March 2016. Following the acceptance of the original FSR and Plan of Study for EIA, the public was notified of the DEA's decision through the EIA Newsletter which was sent out on the 23rd of May 2016. Due to a change in the layout during the EIA phase of the proposed Tlisitseng 1 Solar PV energy facility, the DEIAr was not released for public comment and SiVEST was not able to submit the Final EIA Report within the legislated timeframes. On the 20th of June 2016, SiVEST sent the DEA a letter requesting a sixty (60) day extension in terms of Regulation 3 (7) of the EIA Regulations, 2014, in order to provide the specialists with the opportunity to update their specialist reports in-line with the revised layouts. On the 20th of July 2016, the DEA issued a letter refusing the extension request. For this reason the application for EA lapsed in accordance with Regulation 45 of the EIA Regulations, 2014 and the departmental file was closed for the project.

As mentioned above, BioTherm has appointed SiVEST to recommence with the EIA process. All comments received by Interested and Affected Parties (I&APs) during the Public Participation Process (PPP) which was undertaken for the original EIA process (including those received during meetings) will form part of this EIA process. The public participation process will be re-conducted in accordance with the EIA Regulations,

2014 and all I&APs, Stakeholders and Organs of State will be afforded extra opportunities to review the DSR and to provide comments.

The stages that typically form part of the public participation process during the EIA are reflected in **Figure 31** below.

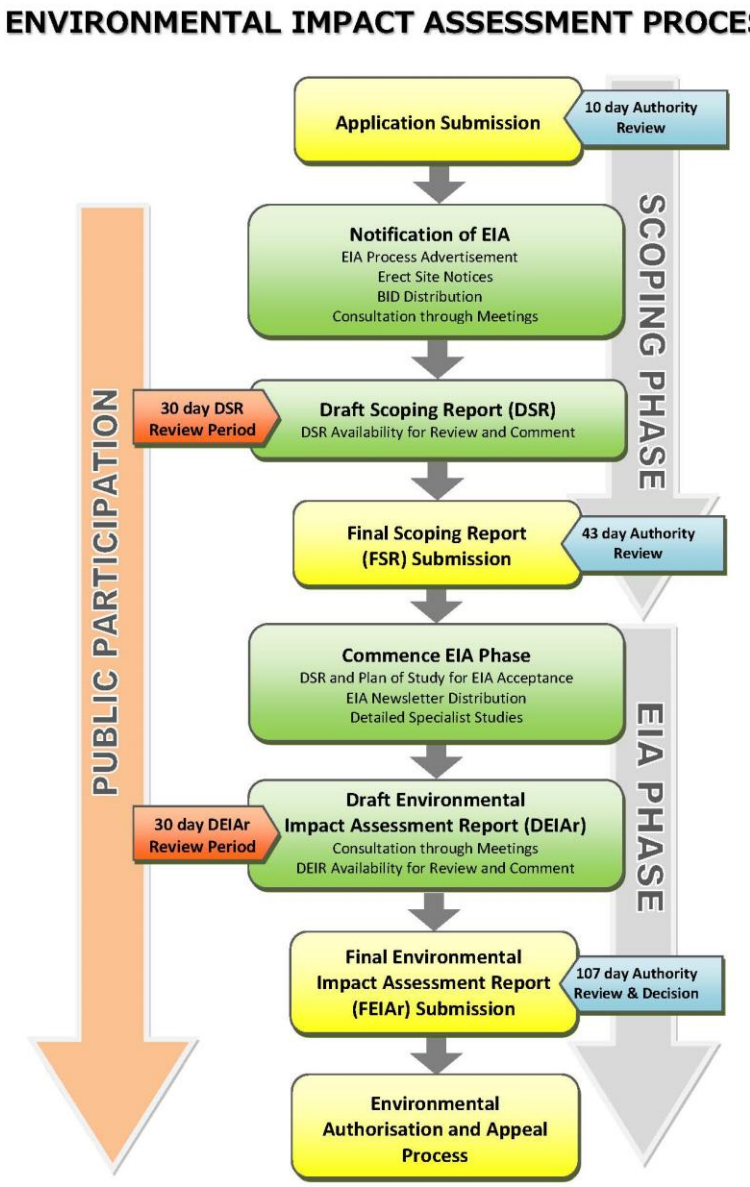

Figure 31: EIA and Public Participation Process

Members of the public who wished to be registered on the database as an I&AP were able to do so via telephone, fax, email, mail or SiVEST's website (www.sivest.co.za).

On-going consultation with key stakeholders (e.g. provincial, district and local authorities, relevant government departments, local business etc.) and identified I&APs ensured that I&APs were kept informed regarding the EIA process. Networking with I&APs will effectively continue throughout the scoping phase of the project until the Final Scoping Report and EIA Plan of Study are submitted to DEA. Where required, stakeholders and I&APs were engaged on an individual basis.

During the environmental studies, consultations were held with individuals, businesses, institutions and organisations, and the following sectors of society have been identified and were afforded the opportunity to comment (the full stakeholder database list is included in **Appendix 7F**):

- National Authorities;
- Provincial Authorities;
- Ditsobotla LM;
- Ngaka Modiri Molema DM;
- Government Structures such as SAHRA, SANRAL, Telkom, etc.;
- Agriculture Associations;
- Regional and local media (advertisements and public documents e.g. BID);
- Business and commerce;
- Environmental bodies / NGOs;
- Community representatives, CBOs, development bodies;
- Landowners; and
- Civil Aviation Authority (CAA).

As mentioned above, all comments received by Interested and Affected Parties (I&APs) during the Public Participation Process (PPP) which was undertaken for the original EIA process (including those received during meetings) will form part of this EIA process. The public participation process which will subsequently be undertaken for the new EIA process will include updating and resubmitting the BID, replacing the adverts and releasing the new DSR for public review again. No further public or focus group meetings will however be held as the meetings which have already been undertaken for the original EIA process have been deemed sufficient. The minutes of all the meetings which have already taken place for the original EIA process will be included in this process and all comments received for the original DSR will be incorporated into this DSR. In addition, all I&APs, Stakeholders and Organs of State will be afforded extra opportunity to review this DSR which will be made available for comment.

8.3 Consultation and Public Involvement

Through the consultation process, issues for inclusion within the DSR were identified and confirmed. Telephonic discussions and one-on-one consultation were undertaken where relevant. As previously mentioned, meetings with landowners took place after the release of the original FSR (prior to the release of the DEIAr) in order to identify key issues, needs and priorities for input into the proposed project. Special attention was paid to the consultation with possibly affected landowners and communities within the study area to try and address their main concerns.

8.4 Stakeholders and I&APs

In order to identify possible I&APs, use will be made of:

- print media – EIA process advertisements
    - The Noordwester newspaper
- site notices throughout the study area (Proofs included in **Appendix 7A**)
- referrals
- requesting databases and/or contact information from NGOs / CBOs and other organisations

A full database list of registered I&APs was compiled and is included in **Appendix 7F**.

8.5 Comments Received during the original EIA

Prior to the release of the original DEIAr, public and focus group meetings were held on the 14th of March 2016 for the original EIA process. As previously mentioned, the public participation process which was undertaken for the original EIA process will form part of this EIA process. As such, all comments and recommendations made by stakeholders and I&APs during the original scoping phase and submitted as part of the original FSR have been taken into consideration when preparing this DSR. No more public or focus group meetings will however be held as the meetings which have already been undertaken for the original EIA process have been deemed sufficient. The minutes of all the meetings which have already taken place for the original EIA process will be included in this new process and all comments received for the original DSR will be incorporated into this DSR. In addition, all I&APs, Stakeholders and Organs of State will be afforded an extra opportunity to review this DSR which will be made available for comment.

All comments received during the original scoping phase, including at public and focus group meetings, are addressed and included in **Appendix 7G**.

8.6 Announcing the Opportunity to Participate

The opportunities for stakeholders to participate in the EIA were as follows:

- EIA process advert.
- I&APs with e-mail addresses and fax numbers were sent copy of the BID.
- BIDs were delivered to various locations within the study area:

The letter of invitation to participate as well as the Registration and Comment Form accompanied the BID.

8.7 Notification of the Potential Interested and Affected Parties

Communication with I&APs were conducted by means of telephone, faxes and email in order to obtain the necessary background information to compile this report. The advertising process was followed in terms of regulation 41 of the EIA Regulations published in R982 in Government Gazette No. 38282 of 4 December 2015, as amended.

An advertisement will be placed in the Noordwester newspaperon the 30th of September 2016.

As stakeholders respond to theadvertisement, they will be registered on the project database and sent letters of invitation to participate as well as the BID.

8.8 Proof of Notification

Appendix 7 includes all proof of notification of Interested and Affected Parties. More specifically, the types of proofs are as follows:

- Site notice text (**Appendix 7A**)
- Photographs of site notices (**Appendix 7A**)
- Proof of advertisements in the newspapers (**Appendix 7C**)
- Background Information Document (**Appendix 7B**)
- Correspondence to registered I&APs and key stakeholders (**Appendix 7D and 7J**)

8.9 Focus Group Meetings

FGMs are smaller meetings with specific groups or organisations who have similar interests in or concerns about the project.

Informal Focus Group Meetings (FGMs) were originally held with affected and surrounding landowners from the 1st to the 2nd of December 2015. Additional FGMs were also held with Local Municipality officials and councillors as well as community leaders on Tuesday the 1st of December 2015 and Wednesday the 2nd of December 2015.

As previously mentioned, focus group meetings were held on the 14th of March 2016 as indicated in **Table 83** below.

Table 83: Focus Group Meetings that have taken place as part of the original EIA process

Venue	Interested Parties	Date	Time
Rafters Bushpub & Sports Bar	Landowners	Monday, 14 March 2016	11h00
Auditorium of the Ditsobotla Local Municipality Library, Civic Centre, Cnr Nelson Mandela and Transvaal Streets, Lichtenburg	Councillors and Officials	Monday, 14 March 2016	14h00

As previously mentioned, no additional focus group meetings will be held for this EIA process as the meetings which have already been undertaken for the original EIA process have been deemed sufficient. All comments and recommendations made by stakeholders and I&APs during the original scoping phase and submitted as part of the original FSR have been taken into consideration when preparing this new version of the DSR. The minutes of all the meetings which have already taken place for the original EIA process will be included in this EIA process and all comments received for the original DSR will be incorporated into this DSR.

Minutes of the FGMs were compiled and forwarded to all attendees for their review and comment. The primary aim of these meetings was to:

- disseminate information regarding the proposed development to I&APs
- provide I&APs with an opportunity to interact with the EIA team and the BioTherm representatives present.
- supply more information regarding the EIA process;
- answer questions regarding the project and the EIA process;
- receive input regarding the public participation process and the proposed development.

Minutes of the meetings that have taken place as part of the original EIA process are included in **Appendix 7G**.

8.10 Public Meeting

A Public Meeting was originally held prior to the review of the original DEIAr.

Invitation letters were sent out via post and e-mail to all registered I&APs on the project's database.
A public meeting was held on the 14th of March 2016 as indicated in **Table 84Table 83** below.

Table 84: Public Meeting which took place as part of the original EIA process

Venue	Interested Parties	Date	Time
Lichtenburg Town Hall / Soepee Hall, on Nelson Mandela Drive, Lichtenburg	I&APs	Monday, 14 March 2016	18h00

The Public Meeting was held in order to provide I&APs with information regarding the proposed development, present the EIA phase environmental findings and invite I&APs to raise any further comments and/or concerns that they may have.

Except for the representatives from SiVEST, Zitholele and BioTherm Energy, no one attended the public meeting. The meeting feedback document is included in **Appendix 7G**.

As previously mentioned, no additional public meetings will be held for the new EIA process as the public meeting which have already been undertaken for the original EIA process is deemed sufficient. All comments and recommendations made by stakeholders and I&APs during the original scoping phase and submitted as part of the original FSR have been taken into consideration when preparing this DSR. The minutes of the public meeting which has already taken place for the original EIA process will be included in this EIA process and all comments received for the original DSR will be incorporated into this DSR.

8.11 One-on-One Consultation

Where possible, potentially directly affected landowners were consulted on a one-on-one basis and informed about the proposed project. Any comments and/or concerns received during the original EIA process were noted and included in the Comments and Responses Report.

This consultation process is seen as one of the important aspects of the EIA and Public Participation process. Should the proposed project be granted an Environmental Authorisation, these particular stakeholders will be directly affected and their properties impacted upon. The consultation process will also ensure that as many uncertainties and concerns as possible are raised upfront and channelled to BioTherm to ensure that the stakeholders and the applicant are informed about these issues throughout the process.

8.12 Comments and Response Report

Issues, comments and concerns raised during the public participation process undertaken for the original EIA process were captured in the Comments and Response Report (C&RR) included as **Appendix 7E**. This C&RR provides a summary of the issues raised, as well as responses which were provided to I&APs. This information will be used to feed into the evaluation of social impacts. All comments received during the review period of this DSR have been included in a separate C&RR

8.13 Comments on Draft Scoping Report

The original Draft Scoping Report was made available for public review after submission to DEA, the competent authority.

The report was out for public review and comment for a period of 30 calendar days, from the 11th of January 2016 to the 9th of February 2016. Written notice was given to all registered I&APs as well as all key stakeholders on the database that the DSR was available for public review.

Electronic copies (CD) of the report were also made available and were distributed on written request.

However, since a new EIA process is being undertaken, a new version of the DSR will subsequently be made available to the public again for a period of 30 calendar days. Written notice of this will be given to all registered I&APs as well as all key stakeholders on the database that the new DSR is available for public review.

8.14 Authority Review of the Draft Scoping Report

In terms of section 40 (2) of the EIA Regulations (as amended), under Government Notices No R982, public participation must include consultation with all organs of state which have jurisdiction in respect of the activity to which the application relates.

Table 85 below includes all the organs of state who will be e-mailed this DSR and sent electronic copies (on CD) of the full report including all appendices. Telephonic follow-up with stakeholders will be undertaken in order to solicit comments, where possible.

Table 85: Authorities follow-up consultation

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED DEVELOPMENT OF THE TWO TLISITSENG 75MW SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITIES NEAR LICHTENBURG, NORTH WEST PROVINCE					
DISTRIBUTION OF THE DRAFT SCOPING REPORT (DSR) TO ORGANS OF STATE FOR COMMENT					
TITLE	**SURNAME**	**NAME**	**POSITION**	**POSTAL ADDRESS**	**EMAIL ADDRESS**
DITSOBOTLA LOCAL MUNICIPALITY					
Mr	Molefe	J	Municipal Manager	PO Box 7 LICHTENBURG 2740	digoamajel@ditsobotla.co.za
Ms	Zandamela	KRJ	Environmental Health Practitioner	PO Box 7 LICHTENBURG 2740	info@ditsobotla.gov.za
NGAKA MODIRI MOLEMA DISTRICT MUNICIPALITY					
Ms	Dince	Nono	Municipal Manager	Private Bag X2165 MAHIKENG 2765	municipalmanager@nmmdm.gov.za
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9 ASSESSMENT IN TERMS OF EQUATOR PRINCIPLES

The Equator Principles are a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing. A number of banks, exchanges and organisations worldwide have adopted the Principles as requirements to be undertaken for project funding on application and approval. Furthermore, certain funding institutions have not formally adopted the Principles, but require clients to be compliant with them in order to qualify for loans. The Equator Principles are summarised below:

Principle 1: Review and Categorisation

When a project is proposed for financing, the Equator Principles Funding Institution ("EPFI") will, as part of its internal environmental and social review and due diligence, categorise it based on the magnitude of its potential environmental and social risks and impacts. Such screening is based on the environmental and social categorisation process of the Internal Finance Corporation (IFC).

Principle 2: Environmental and Social Assessment

For each project assessed as being either Category A or Category B, the client / borrower must conduct a Social and Environmental Assessment ("Assessment") process to address the relevant impacts and risks

of the proposed project. The Assessment should also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project.

Principle 3: Applicable Environmental and Social Standards

The Assessment will refer to the applicable IFC Performance Standards and applicable Industry Specific Environmental, Health, and Safety (EHS) Guidelines.

Principle 4: Environmental and Social Management System and Equator Principles Action Plan

The client / borrower must prepare an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) must be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree to an Equator Principles Action Plan to outline gaps and commitments.

Principle 5: Stakeholder Engagement

For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups.

Principle 6: Grievance Mechanism

The EPFI will require the client, as part of the ESMS, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user. It will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies.

Principle 7: Independent Review

For all Category A projects and, as appropriate, for Category B projects, an independent social or environmental expert not directly associated with the borrower must review the Assessment, AP and consultation process documentations in order to assist the EPFIs due diligence, and assess Equator Principles compliance.

Principle 8: Covenants

An important strength of the Principles is the incorporation of covenants linked to compliance. For all Projects, the client will covenant in the financing documentation to comply with all relevant host country

environmental and social laws, regulations and permits in all material respects. For Category A and B projects, the client / borrower will covenant in financing documentation:

- To comply with the ESMPs and Equator Principles AP (where applicable) during the construction and operation of the Project in all material respects; and

- To provide periodic reports in a format agreed with the EPFI (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third party experts, that i) document compliance with the ESMPs and Equator Principles AP (where applicable), and ii) provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; and

- To decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.

Principle 9: Independent Monitoring and Reporting

To ensure ongoing monitoring and reporting over the life of the loan, EPFIs will, for all Category A projects, and as appropriate, for Category B projects, require appointment of an independent environmental and/or social expert, or require that the borrower to retain qualified and experienced external experts to verify its monitoring information, which would be shared with EPFIs.

Principle 10: Reporting and Transparency

For all Category A and, as appropriate, Category B Projects:

- The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online.

- The client will publicly report GHG emission levels (combined Scope 1 and Scope 2 Emissions) during the operational phase for Projects emitting over 100,000 tonnes of CO_2 equivalent annually.

Although this report is not written in terms of the Equator Principles (EPs), it fully acknowledges that EPs will need to be complied with should funding for the project be required. In general, the following documentation will need to be considered in that regard:

- The “Equator Principles” 2013
- International Finance Corporations Performance Standards on Social and Environment, IFC, January, 2012 namely:
    - Performance Standard 1: Social and Environmental Assessment and Management Systems
    - Performance Standard 2: Labour and Working Conditions
    - Performance Standard 3: Pollution Prevention and Abatement
    - Performance Standard 4: Community Health, Safety and Security
    - Performance Standard 5: Land Acquisition and Involuntary Resettlement

- Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage

- International Finance Corporation – World Bank Guidelines, General EHS Guidelines 2007.

EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. These EHS Guidelines are applied as required by the World Bank's respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors.

- The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

9.1 Assessment Results

This section details the current compliance level with which the solar PV energy facility projects meets with the Equator Principles and the related Performance Standards which are outlined below.

Table 86: Solar PV energy facility Compliance Level in terms of Equator Principles and Related Performance Standards.

The coding key is as follows:

Compliance Level			
Clear			
Not assessed/ determined	Not compliant	Partially compliant	Compliant

Principles	**Compliance Level**	**Reference**
General, Performance Standard 1 Environmental and Social Reporting		
1. Baseline Information		Refer to **Chapter 2** – Technical Details and **Chapter 5** – Description of the receiving environment
2. Alternatives (Assessment of alternatives)		Refer to **Chapter 7**

Principles	Compliance Level	Reference
3. Impacts and risks		Refer to **Chapter 6**
4. Global impacts		N/A
5. Legal requirements		Refer to **Chapter 3**
6. Transboundary		N/A
7. Disadvantaged / vulnerable groups		Partly addressed in **5.13** and will be addressed as part of the EMPr during the EIA phase
8. Third party		Refer to **section 1.1.**
9. Mitigation measures		Partly addressed in **section 6.2** and will be addressed as part of the EMPr during the EIA phase
10. Documentation process		Refer to **Chapter 1**, **Chapter 3 Sections 3.1.1** and **3.1.2** and **Chapter 7**
11. Action Plans		To be addressed during the EIA phase
12. Organisational capacity		To be addressed as part of the EMPr during the EIA phase
13. Training		To be addressed as part of the EMPr during the EIA phase
14. Grievance mechanism		To be addressed during the EIA phase
15. Report content		To be addressed as part of the EMPr during the EIA phase
Performance Standard 2, Labour and Working Conditions		
1. Human Resource Policy		To be addressed as part of the EMPr during the EIA phase
2. Working relationship		To be addressed as part of the EMPr during the EIA phase
3. Working conditions with and terms of employment		To be addressed as part of the EMPr during the EIA phase
4. Workers organisation		To be addressed as part of the EMPr during the EIA phase

Principles	Compliance Level	Reference
5. Non-discrimination and equal opportunities		Refer to **Chapter 2**, **section 2.15**. This issue will also be addressed as part of the EMPr during the EIA phase
6. Grievance mechanism		To be addressed as part of the EMPr during the EIA phase
7. Occupational Health and Safety		To be addressed as part of the EMPr during the EIA phase
8. Non-employee workers		To be addressed as part of the EMPr during the EIA phase
9. Supply Chain		To be addressed as part of the EMPr during the EIA phase
10. Labour Assessment Component of a Social and Environmental Assessment		To be addressed as part of the EMPr during the EIA phase
Performance Standard 3, Pollution		
1. Pollution Prevention, Resource Conservation and Energy Efficiency		To be addressed as part of the EMPr during the EIA phase
2. Wastes		To be addressed as part of the EMPr during the EIA phase
3. Hazardous material		To be addressed as part of the EMPr during the EIA phase
4. Dangerous substances		To be addressed as part of the EMPr during the EIA phase
5. Emergence preparedness and response		To be addressed as part of the EMPr during the EIA phase
6. Technical guidance – ambient considerations		To be addressed as part of the EMPr during the EIA phase
7. Greenhouse gas emissions		N/A
Performance Standard 4, Health and Safety		
1. Hazardous materials safety		To be addressed as part of the EMPr during the EIA phase
2. Environmental and natural resource issues		Refer to **Chapter 6**

Principles	Compliance Level	Reference
3. Emergency preparedness and response		To be addressed in the EMPr during the EIA phase
Performance Standard 5, Land Acquisition		Refer to **Chapter 4**
Performance Standard 6, Biodiversity		Refer to **Chapter 5**, **section 5.7** and **Chapter 6**, **section 6.1.1**
Performance Standard 7, Indigenous People		Refer to **Chapter 8**
Performance Standard 8, Cultural Heritage		Refer to **Chapter 5**, **section 5.12** and Chapter **6**, **section 6.1.6**

It is important to note that, most of the issues listed per performance standard in the table above will only be addressed during the EIA phase. Therefore at this stage (scoping phase), most of the issues are categorised as "not assessed/ to be determined". Full compliance with the EPs will only be realised following EIA assessments.

10 CONCLUSIONS AND RECOMMENDATIONS

The above report provides a broad introduction to the issues that are pertinent to the proposed Tlisitseng solar PV energy facility, and highlights important issues to be investigated during the EIA Phase of the project. The EIA Phase will draw on the above information and make use of the recommended specialist studies to reach an objective decision on the overall impact of the proposed development.

The EIA Phase will culminate in the compilation of detailed mitigation measures to reduce impacts, the identification of least impactful locations for the solar PV arrays, the identification of least impactful locations for associated infrastructure and the identification of sensitive areas within the site which may require more specific management measures. The EIA Phase will also aim to optimise and improve potential positive impacts that may result from the proposed development.

10.1 Conclusions

No specialist study conducted during the Scoping phase for the proposed development has identified any fatal flaws for the proposed Tlisitseng project site.

However, a number of potentially significant (positive and negative) environmental impacts have been identified and will need to be evaluated during the detailed EIA phase of the project. In addition, the EIA Phase will provide a more detailed comparative analysis of these potential impacts against the "no-go" alternative.

Detailed mitigation and management measures will be developed during the Environmental Management Programme (EMPr) phase of the project, in response to the detailed assessment, and will be run towards the end of EIA phase of the project. Should this project receive a positive environmental authorisation, the EMPr will guide the project proponent and appointed contractor(s) through the final design, construction and operational phases of the proposed project.

10.1.1 Summary of Findings

A summary of the findings for each identified environmental impact evaluated in the context of the proposed development (both biophysical and social) is provided in the table below.

Table 87: Summary of environmental issues identified in Specialist Studies.

Aspect	Potential impacts
Biodiversity	▪ Loss of indigenous natural vegetation during construction; ▪ Impacts on listed plant species; ▪ Impacts on a protected plant species; ▪ Impacts on protected tree species; ▪ Impacts on pan depressions; ▪ Mortality of populations of sedentary species during construction (terrestrial and aquatic); ▪ Displacement of populations of mobile species (terrestrial); ▪ Mortality of bird species of concern due to secondary factors, such as collisions with overhead power lines; ▪ Introduction and/or spread of declared weeds and alien invasive plants in terrestrial habitats.
Avifauna	▪ Mortality of priority species due to collisions with the PV panels. ▪ Displacement of priority species due to habitat transformation and disturbance. ▪ Disturbance of breeding raptors and roosting vultures on the existing high voltage lines.
Surface Water	▪ Impacts associated with the construction lay-down area directly in surface water resources ▪ Impacts associated with establishing the foundations of the proposed PV facilities; ▪ Impacts associated with the clearing of vegetation for the proposed development of the PV facilities;

Aspect	Potential impacts
	▪ Impacts associated with the abnormal/heavy vehicle access into surface water resource areas; ▪ Impacts associated with the general construction access near or in surface water resource areas; ▪ Impacts associated with improper stormwater management effects on nearby surface water resources; ▪ Impacts associated with the oil, fuel and other soluble substances from construction activities, vehicles and machinery into nearby surface water resources; and ▪ Impacts associated with the 132kV power line installation into/over nearby surface water resources. ▪ Impacts associated with power line service roads through surface water resources; ▪ Stormwater run-off associated with the PV facility and associated infrastructure; and ▪ Oil leakages from the switching station.
Soils and Agricultural Potential	▪ Loss of agricultural potential because soil would be impacted by the establishment of infrastructure
Visual	▪ The natural visual character of the surrounding area could be altered. ▪ The facility would likely be highly visible for great distances, thus altering the relatively untransformed rural sense of place within the surrounding area. ▪ The proposed development could adversely affect farmsteads / homesteads within the visual assessment zone. ▪ Vehicles and trucks travelling to and from the proposed site would increase dust emissions during both the construction and operational phases. The dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. ▪ Surface disturbance during construction would expose bare soil which could visually contrast with the surrounding environment. In addition, temporarily stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact. ▪ Security and operational lighting at the PV energy facility could result in light pollution and glare, which could be an annoyance to surrounding viewers. ▪ Potential visual impacts as a result of the infrastructure associated with the proposed PV energy facility.
Heritage	▪ Impact on archaeological sites ▪ Impact on palaeontological sites ▪ Impact on historical sites

Aspect	Potential impacts
Socio-economic	▪ Impact of the increase in production and GDP-R of the national and local economies due to project capital expenditure ▪ Impact of the creation of temporary employment in the local communities and elsewhere in the country ▪ Impact of skills development due to the creation of new employment opportunities ▪ Impact of improved standard of living of households directly or indirectly benefiting from created employment opportunities ▪ Impact of the increase in government revenue due to investment ▪ Impact of the potential sterilisation of agricultural land ▪ Impact of a negative financial and social impact associated with the relocation of affected households ▪ Impact of a change in demographics of the area due to influx of workers and job seekers ▪ Impact of an increase in social pathologies associated with influx of migrant labourers and job seekers to the area (health, crime, prostitution, xenophobia, etc.) ▪ Impact of added pressure on basic services and social and economic infrastructure ▪ Impact of the increase in generation capacity in the province as well as the advancement of the RE sector in achieving long term, sustainable supply ▪ Impact of the sustainable increase in production and GDP-R of the national and local economies through operation and maintenance activities ▪ Impact of the creation of long-term employment in local and national economies through operation and maintenance activities ▪ Impact of skills development due to the creation of new sustainable employment opportunities ▪ Impact of improved standard of living of households directly or indirectly benefiting from created employment opportunities ▪ Impact of an increase in government revenue stream ▪ Impact of investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan ▪ Impact of an altered sense of place ▪ Impact on commercial property and land values in the surrounding area
Traffic	▪ Impact on existing and future traffic in the surrounding area during construction and operation ▪ Delays for normal routine maintenance works (repairs and reseals) depending on the time transport and scheduling or road contracts

Aspect	Potential impacts
	▪ Impact on traffic in the surrounding area as a result of road upgrades to accommodate abnormal loads ▪ Impact on existing draining patterns of the access roads as a result of construction and operational traffic
Geotechnical	▪ Impact on the drainage within the study site as a result of stormwater runoff ▪ Impact on surface cover of study site as a result of foundation loading ▪ Impact on dolomite stability as a result of intensive irrigation and dewatering

Based on the specialist studies, the following conclusions can be reached for each environmental parameter assessed.

Table 88: Conclusions of Specialist Studies.

Biodiversity	There are some issues related to the ecology of the site that could result in potentially significant ecological impacts. The seriousness of many of these impacts can be determined during the field investigation of the site. Some impacts require permits to be issued, either by National or Provincial authorities and field data is required for the permit applications.
Avifauna	The proposed project is located in the endemic region with the fourth highest number of endemics in southern Africa. With 20% of all southern African endemics or near endemics potentially occurring at the core study area and immediate surroundings, the application site and immediate surroundings as a whole should be regarded as moderately sensitive from an avifaunal perspective. Within the core study area, potential high sensitive areas are surface water (boreholes) and high voltage lines. Within the immediate surroundings, high voltage lines, a vulture restaurant, and wetlands and dams are potential high sensitive areas, as all of these micro-habitats are potential focal points of bird activity. The wetlands and dams may be an aggravating factor in that birds commuting to and from them could mistake the solar panels for surface water and attempt to land on them, thereby exposing themselves to the risk of collision. Boreholes could potentially be declassified as high sensitivity should it be confirmed that they will be removed and therefore cease to function as potential focal points for bird activity after the construction of the solar panels. In the case of the existing high voltage lines in the study area, the sensitivity and potential no-go areas will only become apparent once a field inspection has been conducted. Should no priority raptor nests be present, there will be no need for buffer zones. However, if there are nests present, an appropriate buffer zone will be required around the nest, depending on the species.
Surface water	Database findings revealed that one (1) non-NFEPA, unnamed non-perennial river was located within the study area with five (5) segments of this river located within close proximity to the study area to the east. Additionally, the study area was found to span across a CBA 2 area. The study site was, however, not identified to span

	across any Ecological Support Areas (ESAs). The desktop findings supported the presence of the unnamed, non-perennial river observed in the database findings as well as the five (5) additional segments/reaches of this river. This surface water system was, however, observed to be larger in size, and one (1) of the stream segments identified during the database assessment was also found to continue/flow into the study site. The desktop assessment additionally revealed a second river which passes within very close proximity to the northern portion of the study site. It is not certain whether this is a separate river or whether it is part of one (1) of the desktop identified river segments. Three (3) river systems in total were therefore observed at a desktop level. Furthermore, the desktop findings revealed thirty seven (37) additional surface water resources, in the form of potential depression wetlands, located within the study area or within close proximity. It must be noted, however, that from a desktop perspective, some of these systems appeared to be connected as one greater system while others appeared to be separate, isolated systems.
Soils and Agricultural Potential	All of the study area comprises land type Fa11, which is dominated by shallow, calcareous soils with rock. However, there is a significant proportion of deeper, red, structureless soils in the area (probably around 20% of the land type), with depths of 1.2 m or more. These soils have a high potential for agriculture. The rainfall in the area is adequate for rain-fed cultivation, but due to the unreliability of the distribution, irrigation is a viable means of supplementing the rainfall in times of shortage, especially in the areas where deeper soils occur. The Google Earth image of the area shows several centre pivot irrigation fields in and adjacent to the northern half of the study area. The climatic characteristics mean that the grazing capacity of this part of North West Province is relatively low, around 10-12 ha/large stock unit. The predicted impact is therefore low to high, depending on the soils occurring, which vary from shallow soils with low potential, to deeper, high potential arable soils.
Visual	A scoping-level visual study has been conducted to identify the potential visual impact and issues related to the development of three solar PV energy facilities near Lichtenburg in the North West Province. The study area has a rural visual character with a low to moderate visual sensitivity. However, several solar energy facilities are proposed within relatively close proximity to the proposed PV energy facility. These facilities and their associated infrastructure, will significantly alter the visual character and baseline in the study area if constructed and make it appear to have a more industrial-type visual character. The proposed PV energy facility development is likely to visually influence eighty-seven receptors identified within the visual assessment zone, seventy-seven of which are considered to be potentially sensitive visual receptor locations. The sensitivity of the receptor locations will need to be confirmed through further assessment in the next phase of the study. The nature of the visual impacts associated with a development of this size on the receptors in the assessment zone could be significant.

Heritage	The proposed Tlisitseng Solar project may have heritage resources present on the property. This has been confirmed through archival research and evaluation of aerial photography of the sites. Through the analysis of the aerial photographs and available maps of the study area no obvious heritage sensitive areas were identified inside the study area. The only possible sensitivities identified is related to farmsteads situated outside the study area but within close proximity to the proposed development area. These farmsteads' experience of the rural cultural landscape could possibly be impacted on by the development. A single small farmstead was also identified inside the study area and will require assessment during the fieldwork component of the HIA. The study area is underlain by Vaalian aged dolomite of the Monte Christo Formation, Chuniespoort Group. Stromatolites are known to occur within these deposits and more modern fossiliferous Caenozoic cave breccias have been recorded associated with carst formation in the dolomite. A full Palaeontological impact assessment will be required.
Socio-economic	No fatal flaws or contraventions from a socio-economic policy perspective exist for the implementation of the proposed project. The national, provincial, and to some extent local, governments do prioritise the development of renewable energy projects to reduce carbon emissions, create new jobs, increase economic growth and achieve security of electricity supply. However, it is very clear that these developments need to be undertaken in a sustainable manner and should not jeopardise the growth of the other sectors that are considered to be economic drivers in the local area where the project is to be developed.
Traffic	The general freight for the solar farms comprise of building materials, solar panels and frames and an 80MVA transformer(s). The imported freight will be transported from South African ports to the site. Building materials will be transported from sources in surrounding towns while certain elements will be transported from various manufacturing centres in South Africa. The preferred import origin of the imported elements to the proposed Tlisitseng 1 Solar PV Energy Facilities will be from the Durban Port. The distance of 765 km comprises of surfaced roads the full way. However, should the Durban Port not be available for handling the freight, the Port Elizabeth/Coega Port could be used as an alternative port. The transport distance in this case is 1035 km. Toll fees are required on the route from the preferred port. Abnormal Permits will be required for transport of the transformer in any event. The traffic during construction and during operation will have negligible impact on existing and future traffic. The route is predominantly on National or Provincial Roads with suitable standards for transport of container freight. It is also suitable for abnormal loads with permits. There is a possibility of limited risk of delays for normal routine maintenance works (repairs and reseals) depending of the time of transport and scheduling of roads contracts. The transport of elements from manufacturing centres within South Africa is predominantly on National and Provincial roads, which presents

	no limitations for normal freight. The proposed preferred access roads from the R505 to the site is situated close to the site and requires minimal upgrades. The access is at an acceptable safe point with sufficient sight distance which would be acceptable to SANRAL. In general, no obvious problems are expected with freight transport along the proposed routes to the site necessary for the construction and maintenance of the site.
Geotechnical	Substation Alternative 1 and 2 are possibly underlain by shallow dense pedogenic material or chert residuum. These material are likely to be suitable as founding medium for lightly to medium loaded structures. Due to fact that this entire site is underlain at depth by dolomite, it is a legal requirement that a DSI be undertaken in accordance with the South African National Standards SANS 1936-Parts 1 to 4 Development of Dolomitic Land. For the substation, as indicated in the layout, this DSI will comprise a gravity survey and the drilling of a minimum of 3 boreholes for a feasibility level (Phase 1) investigation. It is also evident from the Topographical maps and Google Images that a water borehole is present near both Alternative 1 and 2 site. This borehole is probably used for irrigation purposes, dewatering has a significant effect on the underlying dolomite stability.

10.2 Recommendations

Table 89: Outcomes and Recommendations of Specialist Studies

Aspect	Fatal flaws	Site refinement / Recommendations	Further EIA phase Investigations
Biodiversity	None	The displacement of mobile fauna is considered to be unlikely to be important for this site and project. All other potential impacts should be investigated in the EIA phase or should be assessed using formal methodology.	Yes
Avifauna	None	It is recommended that further data collection is performed entailing at least three site visits over six months to assess the abundance and diversity of priority species at the site. The EIA phase should include a full assessment of the likely impacts and available mitigation options, based on the results of systematic and quantified monitoring.	Yes
Surface water	None	Several potential impacts may affect the surface water resources within the Tlisitseng Solar PV	Yes

Aspect	Fatal flaws	Site refinement / Recommendations	Further EIA phase Investigations
		Facilities' study site where the buildings and associated structures encroach on these sensitive environmental features. It is therefore, provisionally recommended that all PV facilities and associated infrastructure be located outside of any surface water resources as well as to avoid and minimise potential impacts adequately. Detailed studies in the impact phase will however be required to investigate and verify the desktop findings of this report.	
Agricultural potential	None	Due to the potential occurrence of deep, high potential soils, coupled with the fact that the climate is not unfavourable for rain-fed cultivation, it will be necessary to map out areas of better soils, in order to minimize the impacts. It can therefore be anticipated that a detailed soil survey will be required.	Yes, these will be going ahead despite the low likelihood of impacts.
Visual	None	Further assessment will be required in the EIA-phase to investigate the sensitivity of the receptor locations to visual impacts associated with the proposed development and to quantify the impacts that would result.	Yes
Heritage	None	The heritage findings provide the basis for the recommendation of further field truthing through an archaeological walk down and palaeontological desktop study covering the site. The aim of this will be to compile a comprehensive database of heritage sites in the study areas, with the aim of developing a heritage management plan for inclusion in the Environmental Management Plan as derived from the EIA. To be able to compile a heritage management plan to be incorporated into the Environmental Management Plan the following further work will be required for the EIA.	Yes, including a full palaeontological impact assessment

Aspect	Fatal flaws	Site refinement / Recommendations	Further EIA phase Investigations
		▪ Archaeological walk through of the areas where the project will be impacting; ▪ Full Palaeontological Impact Assessment, which entails fieldwork and assessment of the potential impacts of the findings of such fieldwork.	
Socio-economic	None	The previously listed potential impacts will need to be investigated in the EIA phase in greater detail.	Yes
Traffic	None	It is recommended that the majority of construction personnel is transported to and from site by means of buses and some by private vehicles.	No – the report was undertaken to an acceptable EIA phase standard and will be incorporated into the EIA report.
Geotechnical	None	Due to fact that this entire site is underlain at depth by dolomite, it is a legal requirement that a Dolomite Stability Investigation (DSI) be undertaken in accordance with the South African National Standards SANS 1936-Parts 1 to 4 Development of Dolomitic Land.	No – the report was undertaken to an acceptable EIA phase standard and will be incorporated into the EIA report.

Following comments by the DEA on the original DSR which was submitted (part of the original EIA process which lapsed), a Traffic Impact Assessment and a Geotechnical Impact Assessment have been undertaken during the Scoping Phase of this EIA process. The findings of the Traffic Impacts Assessment and Geotechnical Impact Assessment have therefore been included in this version of the DSR, but will also be incorporated into the DEIAr.

It is therefore recommended that the following studies be taken through to the EIA Phase:

- Biodiversity (flora and fauna) Assessment (Dr. David Hoare – David Hoare Consulting)
- Avifauna Assessment (Chris van Rooyen - Chris van Rooyen Consulting)
- Surface Water Impact Assessment (Shaun Taylor– SiVEST) – including external peer review by Dr Martin Ferreira – Jeffares and Green

- Soils and Agricultural Potential (D.G. Paterson – ARC Institute for Soil, Climate and Water)
- Visual Impact Assessment (Andrea Gibb – SiVEST) – including external peer review by Keagan Allan – SRK Consulting
- Heritage Assessment (Wouter Fourie – PGS Heritage)
- Palaeontological Assessment (Gideon Groenewald – PGS Heritage)
- Socio-economic Impact Assessment (Mariette Steynberg – Urban-Econ Development Economists)

The proposed scope of work and methodology to assess each of the above impacts has been detailed in the plan of study to undertake an EIA, as per the EIA Regulations. The Plan of Study is included below.

11 PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

Issues identified during the Scoping phase will be investigated further during the EIA phase of the project. Various specialist studies will be conducted during the EIA phase to assess these issues. Mitigation measures will be formulated and these will be included in the Environmental Management Programme (EMPr). The following section confirms the process to be undertaken by the EAP in the EIA Phase of the project.

This information will assist DEA in making an informed decision with regards to the proposed development.

11.1 Aim of the EIA Phase

The aim of the impact assessment phase is to:

- Conduct a detailed impact assessment of the issues identified
- Identify potential mitigation measures to reduce impacts
- Ensure information is disseminated to Interested and / or Affected parties and there is a constant flow of communication

The following tasks will form part of the Environmental Impact Assessment (EIA) Phase:

- A comprehensive Public Participation Process (as above)
- Conduct specialist studies
- Conduct alternatives assessment on the alternative layouts identified in this DSR
- Compilation of an Environmental Impact Assessment Report (EIAr)
- Compilation of an Environmental Management Programme (EMPr)
- Make Final EIAr available for public comment
- Submit Final EIAr to DEA
- Await decision

The following specialist studies will form part of the EIAr:

- Biodiversity (flora and fauna) Assessment (Dr. David Hoare – David Hoare Consulting)
- Avifauna Assessment (Chris van Rooyen - Chris van Rooyen Consulting)
- Surface Water Impact Assessment (Shaun Taylor– SiVEST) – including external peer review by Dr Martin Ferreira – Jeffares and Green
- Soils and Agricultural Potential (D.G. Paterson – ARC Institute for Soil, Climate and Water)
- Visual Impact Assessment (Andrea Gibb – SiVEST) – including external peer review by Keagan Allan – SRK Consulting

- Heritage Assessment (Wouter Fourie – Professional Grave Solutions)
- Palaeontological Assessment (Gideon Groenewald – PGS Heritage)
- Socio-economic Impact Assessment (Mariette Steynberg – Urban-Econ Development Economists)
- Traffic Impact Assessment (HJ Steyn - Aurecon)
- Geotechnical Impact Assessment (Colin Dalton and Thanduxolo Msengana - Geopractica)

The terms of reference for these studies involve assessing the potential impacts that have been identified in the Scoping Report in addition to any new issues that are identified during the detailed assessments. The qualifications of these specialists are included in their CV's which are included in **Appendix 2**.

11.2 Authority Consultation

The stages at which the competent authority will be consulted are as follows:

- Submission of draft Environmental Impact Assessment Report for comment;
- Submission of final Environmental Impact Assessment Report with comments; and
- Response from competent authority regarding acceptance of final Environmental Impact Assessment Report.

Additional consultation may occur with the DEA during the EIA process should the need arise.

11.3 Proposed Method of Assessing Environmental Issues

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

A brief Terms of Reference for each specialist study is included below:

11.3.1 Biodiversity Assessment

The scoping study provided a general assessment of potential impacts on flora, vertebrate fauna and ecology by the proposed project. The ecological impact assessment will aim to determine potential impacts of the proposed project on the ecological receiving environment.

The general approach that will be adopted for this study will be to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically focus on red flags and/or potential fatal flaws. Biodiversity issues will be assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. The assessment will be based on a combination of desktop studies, field-based studies and detailed mapping from aerial photographs.

During the scoping study a description and characterisation of the broad study area was undertaken. A description of the receiving environment was provided and any major sensitivities within the study area were identified. Potential impacts on biodiversity, sensitive habitats and ecosystem function were listed and described.

During the EIA phase the study area will be visited and assessed in order to confirm patterns identified from the desktop assessment. Specific features of potential concern will be investigated in the field, including the following:

- General vegetation status;
- Presence of habitats of conservation concern;
- Presence of protected trees; and
- Potential presence of species of concern.

The EIA phase will also consider an assessment of alternatives and the cumulative impacts associated with other renewable energy projects in the area.

Impacts identified from the Scoping (Desktop) Phase will be assessed according to standard criteria (nature, extent, duration, magnitude, probability, significance, status as well as the degree to which impacts can be reversed, the degree to which impacts will cause irreplaceable loss of resources and the degree to which impacts can be mitigated).

11.3.2 Avifauna Assessment

For purposes of the EIA phase of the study, the following methods will be employed:

- The study area will be inspected and the avifaunal habitat classes will be recorded and described.
- Transect counts will be conducted to establish the abundance and variety of priority avifauna at the site to supplement the existing SABAP2 data.
- The existing high-voltage power lines in the study area will be inspected for breeding raptors.
- The potential impacts will be assessed according to the prescribed assessment methods and mitigation measures will be proposed.

The Birds and Renewable Energy Specialist Group (BARESG), convened by BirdLife South Africa and the Wildlife and Energy Programme of the Endangered Wildlife Trust, proposes the following guidelines and monitoring protocols for evaluating utility-scale solar energy development proposals:

- Initial screening or scoping – an initial assessment of the likely avifauna and possible impacts, preferably informed by a brief site visit and by desk-top collation of available data; also including the design of a site-specific survey and monitoring project should this be deemed necessary. This was done during the scoping phase, see avifaunal specialist report in Appendix 6B.
- Data collection – further accumulation and consolidation of the relevant avian data, possibly including the execution of baseline data collection work as specified by the scoping study, intended to inform the avian impact study. In this instance, it is recommended that further data collection is performed entailing at least three site visits over six months to assess the abundance and diversity of priority species at the site.
- Impact assessment - a full assessment of the likely impacts and available mitigation options, based on the results of systematic and quantified monitoring if this was deemed a requisite at scoping. This will form part of the final bird impact assessment report.
- Monitoring and mitigation – repetition of baseline data collection, plus the collection of mortality data. This helps to develop a complete before and after picture of impacts, and to determine if proposed mitigation measures are implemented and are effective, or require further refinement. The extent of the post-construction monitoring will be informed by the results of the pre-construction monitoring.

Avifaunal monitoring of the Tlisitseng site has already started and will continue into the EIA phase. The results of the monitoring will be included in the DEIAr.

11.3.3 Surface Water Impact Assessment

The surface water assessment during the EIA phase would primarily entail more detailed field investigation of surface water bodies (identified during the scoping phase) within the project site.

The fieldwork would be focused on:

- Larger wetland and drainage systems;
- Those wetland systems identified as sensitive or as having a high functionality; and
- Riparian zones of larger river systems.

The primary aim of the EIA-level assessment would be to determine the boundaries of the relevant wetland / riparian systems so that the solar PV energy facility can be placed outside of the wetlands / riparian areas. The wetland / riparian area boundary delineation would be undertaken using the DWAF guideline 'A practical field procedure for the identification and delineation of wetlands and riparian areas'.

The surface water analysis would propose measures to mitigate any identified potential negative impacts associated with the solar PV energy facility, and these would inform the EMPr phase. Mitigation measures would possibly entail slight changes to the proposed locations and extent of the solar PV energy facility to avoid impacts on surface water bodies, where significant or likely impacts have been predicted.

Input will be given to the proposed layout and buffers recommended.

The study will culminate in the compilation of a Surface Water Impact Assessment as well as mitigation measures which will feed into the Environmental Management Programme (EMPr).

The Surface Water Impact Assessment Report will be peer reviewed by an external surface water specialist and the report will be updated based on the peer reviewers' comments prior to finalisation.

11.3.4 Soils and Agricultural Potential Assessment

A full agricultural assessment during the EIA Phase will encompass the following:

- More detailed assessment of soil conditions

  The EIA phase assessment will include a field investigation of soils and agricultural conditions across the site. This field investigation will be aimed at ground proofing the existing land type information and understanding the specific soil and agricultural conditions on site. It will not be based on a grid spacing of test pits but will comprise a reconnaissance type of soil mapping exercise based on an assessment of surface conditions, topography, and hand augered samples in strategic places, if necessary. Such a soil investigation is considered adequate for the purposes of this study. A more detailed soil investigation is not considered likely to add anything significant to the assessment of agricultural soil suitability for the purposes of determining the impact of the development on agricultural resources and productivity.

- Assessment of erosion and erosion potential on site

  The field investigation will involve a visual assessment of existing erosion and erosion potential on site, taking into account the proposed development layout.

- Assessment of the impacts of specific construction activities and layout on soil conditions

  The EIA phase will include an assessment of the specifics of construction activities and the proposed development layout on potential loss of topsoil.

- Assessment of specific on-site agricultural activities

The EIA phase will gather more detail on agricultural activity on the site and identify any locally important soil and agricultural issues.

The study will culminate in the compilation of an Agricultural Impact Assessment as well as mitigation measures which will feed into the Environmental Management Programme (EMPr).

11.3.5 Visual Impact Assessment

The focus of the EIA phase VIA will be to undertake a more detailed GIS-based assessment, to quantify the magnitude and significance of the visual impacts of the proposed development in both a day-time and night-time context.

This assessment will focus on areas where potential sensitive receptors are located. Should data be available, digital terrain models and viewsheds will be generated for the areas of focus. This analysis will be conducted using the ArcView 10, Spatial Analyst and 3D Analyst extensions where necessary. The assessment will rely on site visits to each potentially sensitive receptor location to identify the extent of visual impact of the proposed PV facility from these locations. A further assessment of the intensity of potential visual impact, expressed in terms of bands of differing visual significance will be undertaken. The fieldwork will also allow for the correction and refinement of the baseline information.

The overall significance of visual impacts associated with the proposed PV facility will be assessed through a rating matrix. Once this has been undertaken, measures to mitigate potential visual impacts will be identified, and if practical, layout alternatives within the application site will be considered and suggested to minimise visual impact of the proposed development.

A separate rating matrix will be used to assess the visual impact of the proposed development on the sensitive receptor locations, as identified. This matrix is based on the distance of a receptor from the proposed development, the primary focus / orientation of the receptor, the presence of screening factors, the visual character and sensitivity of the area and the visual contrast of the development with the typical elements and forms in the landscape.

Thereafter, the alternatives will be comparatively assessed, in order to ascertain the preferred alternative from a visual perspective.

Interested and Affected Parties will be consulted through the public participation process being undertaken as part of the EIA process, in order to establish how the proposed PV facility will be perceived from the various receptor locations and the degree to which this impact will be regarded as negative.

It is envisaged that the main deliverable of the study would be the generation of a spatial databases / maps indicating the zones of visual impact, as well as a detailed report indicating the findings of the study.

The Visual Impact Assessment Report will be peer reviewed by an external visual specialist and the report will be updated based on the peer reviewers' comments prior to finalisation.

11.3.6 Heritage Assessment

The Heritage Impact Assessment (HIA) report to be compiled by PGS Heritage (PGS) for the proposed Tlisitseng Solar project will assess the heritage resources found on site. This report will contain the applicable maps, tables and figures as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consists of three steps:

- Step I – Literature Review: The background information to the field survey leans greatly on the Heritage Scoping Report completed by PGS for this site.

- Step II – Physical Survey: A physical survey will be conducted on foot through the proposed project area by qualified archaeologists, aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

- Step III – The final step involves the recording and documentation of relevant archaeological resources, as well as the assessment of resources in terms of the heritage impact assessment criteria and report writing, as well as mapping and constructive recommendations

The significance of heritage sites is based on four main criteria:

- **site integrity** (i.e. primary vs. secondary context),
- **amount of deposit, range of features** (e.g., stonewalling, stone tools and enclosures),
    - Density of scatter (dispersed scatter)
        - Low - <10/50m^2
        - Medium - 10-50/50m^2
        - High - >50/50m^2
- **uniqueness** and
- **potential** to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;
B - Mapping of the site and controlled sampling required;

C - No-go or relocate pylon position
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site

Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report.

Table 90: Site significance classification standards as prescribed by SAHRA

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	Grade 4C	Low Significance	Destruction

11.3.7 Socio-economic Impact Assessment

A socio-economic impact assessment will be conducted during the EIA phase in order to:

- Delineate the zone of influence that stretches beyond the directly affected sites following the discussions with other specialists on the team
- Collect primary socio-economic data (through personal or telephonic interviews) of the communities and economic activities that will be directly or indirectly affected (positively or negatively) by the proposed developments (per project and its components)
- Quantify the potential positive and negative effects of the proposed project and its alternatives (if applicable) on the socio-economic environment in the delineated study area;
- Evaluate the change in the size and composition of the local and regional economies that will be stimulated by the proposed development, as well as the state of local communities

- Evaluate the potential positive and negative impacts following the environmental specialist's methodology
- Assess cumulative impacts
- Develop a management and mitigation plan by proposing mitigation measures for negative effects and enhancement measures for positive impacts, supported by methods for the implementation, timeframes, costs and responsibilities information

The following methods will be employed in undertaking the study.

- Surveys and interviews

  Surveying is one of the fastest ways to obtain primary information. Surveys can be conducted over the telephone, internet, e-mail, or personal interviews. The latter is relatively expensive but since it involves one person interviewing another, it is a way to get in-depth and comprehensive information. The use of surveys and interviews is particular applicable for collecting primary data of the community that could potentially be affected by the project or collecting specific data from an identified official or stakeholder.

  The following data will be sourced using surveys and interviews:
    - Land use information and type of economic activity on properties within the affected environment
    - Economic profiles of the activities within the affected environment
    - Demographic and social characteristics of the local environment (population, income levels, crime levels, etc.)

- Mapping

  Land use mapping technique would be used to illustrate and analyse the land uses in the affected area. The map will be created based on the information collected during the surveys and include the following data:
    - Types and location of tourism facilities in the area
    - Land uses in the area surrounding the facility (defined by the visual impact)

- Economic modelling and impact assessment

  Assessment of economic impacts will be done using economic models developed for the South African economy and the North West Province. The former will be used to assess the impacts on the country's economy, whilst the latter will be used to estimate the impact on the provincial and local economies.

  Economic models are compiled on the basis of Social Accounting Matrices that illustrate the linkages between various economic agents. The use of economic models allows identifying the industry-specific multipliers on production, capital formation, Gross Domestic Product (GDP), employment, and income. Such multipliers can also be broken in terms of various effects that can be observed as a result of an

exogenous change introduced into the economy, be it capital investment or operating expenditure. Three types of effects are distinguished, inter alia:

- Direct – these represent the original purchases for the project's establishment or operations
- Indirect – these are effects that spill over the industries that supply goods and services required for the implementation of the project or for its operation, whether directly to the contractor or operator, or through their suppliers
- Induced – these are the effects that are stimulated by the change in income levels of households that would directly or indirectly be affected by the project and businesses.

11.3.8 Traffic Impact Assessment

A Traffic Impact Assessment was undertaken by HJ Steyn from Aurecon and the findings have been included in this DSR. The Traffic Impact Assessment will subsequently be incorporated into the Draft Environmental Impact Assessment Report (DEIAr) and will be updated as required. The Traffic Impact Assessment was undertaken in order to:

- Assess the impact of the proposed project on traffic and roads
- Determine the specific traffic needs during the different phases of implementation.

The scope of the Transport Management Assessment includes inter alia:

- Determine the access freight routes between points of delivery and departure for the components.
- Confirm the associated clearances required for the necessary equipment to be transported from the point of delivery to the various sites.
- Confirm freight requirements.
- Propose origins and destinations of equipment and personnel
- Determine (Abnormal) Permit requirements if any.
- Propose traffic accommodation measures during potential upgrading of the access on the National Road.

The following data was sourced for the completion of the Traffic Impact Assessment:

- Details of the proposed development
- Details of the components estimated origins
- List of possible identified abnormal items and loads
- And additional information, correspondence, photo's related to the access road

As mentioned above, the Traffic Impact Assessment which undertaken as part of the Scoping Phase will be incorporated into the Draft Environmental Impact Assessment Report (DEIAr) and will be updated as required.

11.3.9 Geotechnical Impact Assessment

A Geotechnical Impact Assessment was conducted by Colin Dalton and Thanduxolo Msengana from Geopractica and the findings have been incorporated into this DSR. The Geotechnical Impact Assessment will subsequently be incorporated into the Draft Environmental Impact Assessment Report (DEIAr) and will be updated as required. The Geotechnical Impact Assessment was undertaken in order to:

- Assess the impact of geotechnical conditions the proposed project.

A report was prepared for the site which gave an indication of possible soils and the geology underlying the site. This included:

- Regional Geology
- Site Description
- Site Topography and Drainage
- General Soil Profile
- Geotechnical Site Classification

As mentioned above, the Geotechnical Impact Assessment which was undertaken as part of the Scoping Phase will subsequently be incorporated into the Draft Environmental Impact Assessment Report (DEIAr) and will be updated as required.

11.4 Cumulative Impact Assessment

The potential cumulative impact of the proposed solar facility in combination with other renewable energy facilities in the area will be identified and assessed per environmental aspect and mitigation measures will be identified to address the cumulative impact, where possible. Cumulative impacts will also be rated as part of the impact rating system and used to determine the significance of the impacts.

11.5 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 92**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

11.6 Impact Rating System

Impact assessment will take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact will also be assessed according to the project stages:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact will be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

11.6.1 Rating System Used To Classify Impacts

The rating system will be applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts will be consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 91: Description of terms.

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	International and National	Will affect the entire country
2	Province/region	Will affect the entire province or region
3	Local/district	Will affect the local area or district

4	Site	The impact will only affect the site
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Irreversible	The impact is irreversible and no mitigation measures exist.
2	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
3	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
4	Completely reversible	The impact is reversible with implementation of minor mitigation measures
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		

1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).

3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.

51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

The table below is to be represented in the Impact Assessment section of the report.

Table 92: Rating of impacts.

IMPACT TABLE		
Environmental Parameter	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*	
Issue/Impact/Environmental Effect/Nature	*A brief description of the nature of the impact that is likely to affect the environmental aspect as a result of the proposed activity e.g. alteration of aquatic biota The environmental impact that is likely to positively or negatively affect the environment as a result of the proposed activity e.g. oil spill in surface water*	
Extent	*A brief description indicating the chances of the impact occurring*	
Probability	*A brief description of the ability of the environmental components recovery after a disturbance as a result of the proposed activity*	
Reversibility	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*	
Irreplaceable loss of resources	*A brief description of the degree in which irreplaceable resources are likely to be lost*	
Duration	*A brief description of the amount of time the proposed activity is likely to take to its completion*	
Cumulative effect	*A brief description of whether the impact will be exacerbated as a result of the proposed activity*	
Intensity/magnitude	*A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily*	
Significance Rating	*A brief description of the importance of an impact which in turn dictates the level of mitigation required*	
	Pre-mitigation impact rating	Post mitigation impact rating

IMPACT TABLE		
Extent	4	1
Probability	4	1
Reversibility	4	1
Irreplaceable loss	4	1
Duration	4	1
Cumulative effect	4	1
Intensity/magnitude	4	1
Significance rating	-96 (high negative)	-6 (low negative)
Mitigation measures	*Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. Describe how the mitigation measures have reduced/enhanced the impact with relevance to the impact criteria used in analysing the significance. These measures will be detailed in the EMPR.*	

11.7 Environmental Management Programme (EMPr)

In accordance with the EIA Regulations, 2014 a draft Environmental Management Programme (EMPr) will be included within the Environmental Impact Assessment Report. The EMPr will include the mitigation measures formulated by the various specialists.

11.8 Alternative Assessment

In accordance with the EIA Regulations, 2014 and as discussed in **Chapter 7** of this report, all the layout alternatives for the associated infrastructure identified within this DSR will be described and comparatively assessed in the EIA phase. These will be adjusted based on more detailed specialist studies. These layouts are presented in **Figure 32** and **Figure 33**, and they include the following:

- Two (2) alternative sites for the substation
- Two (2) alternative sites for the O&M buildings
- Two (2) alternative sites for the laydown areas

As previously mentioned, due to constraints in terms of the available area, only one (1) alternative was considered for the PV array area,

As previously stated, the sensitive areas used to assess the layouts were based on desktop studies. Specialist studies in the EIA phase will provide a more detailed assessment of sensitive areas. If necessary, the layout will be amended at this stage to more accurately avoid highly sensitive or no-go areas.

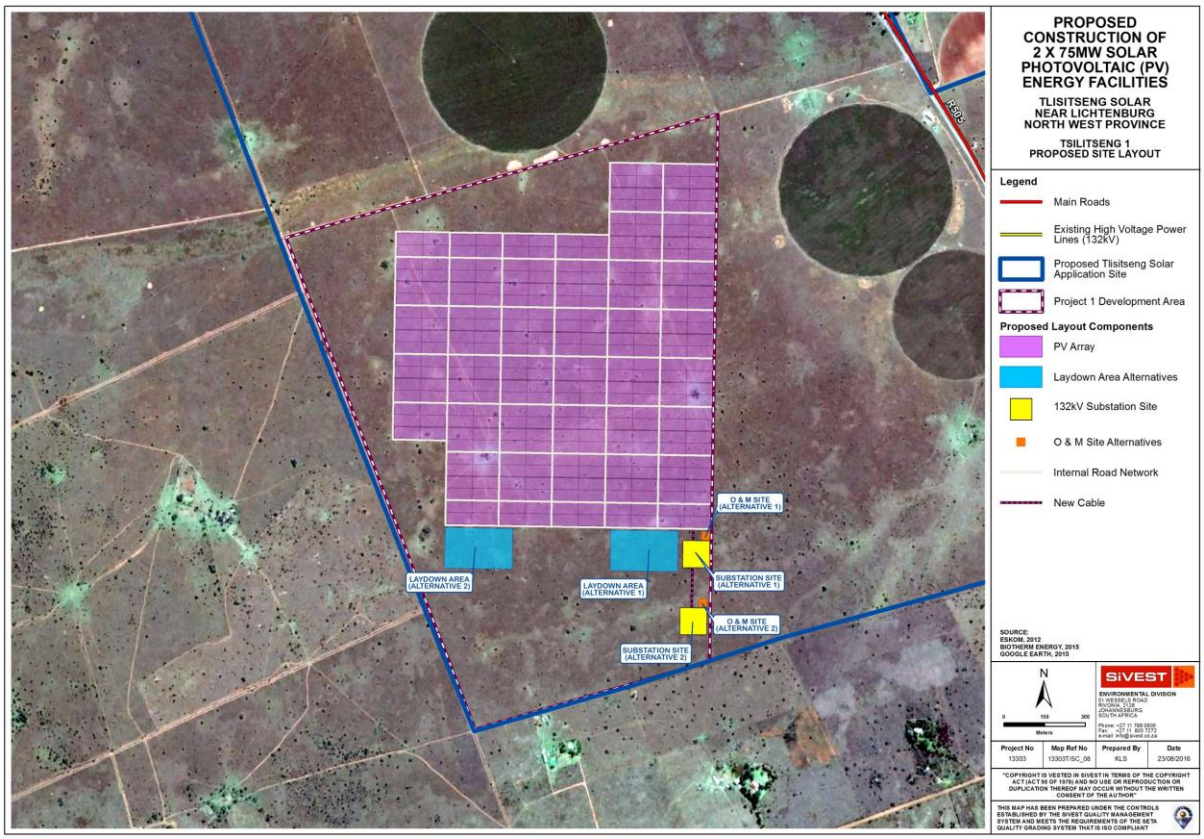

Figure 32: Proposed Layout Alternatives

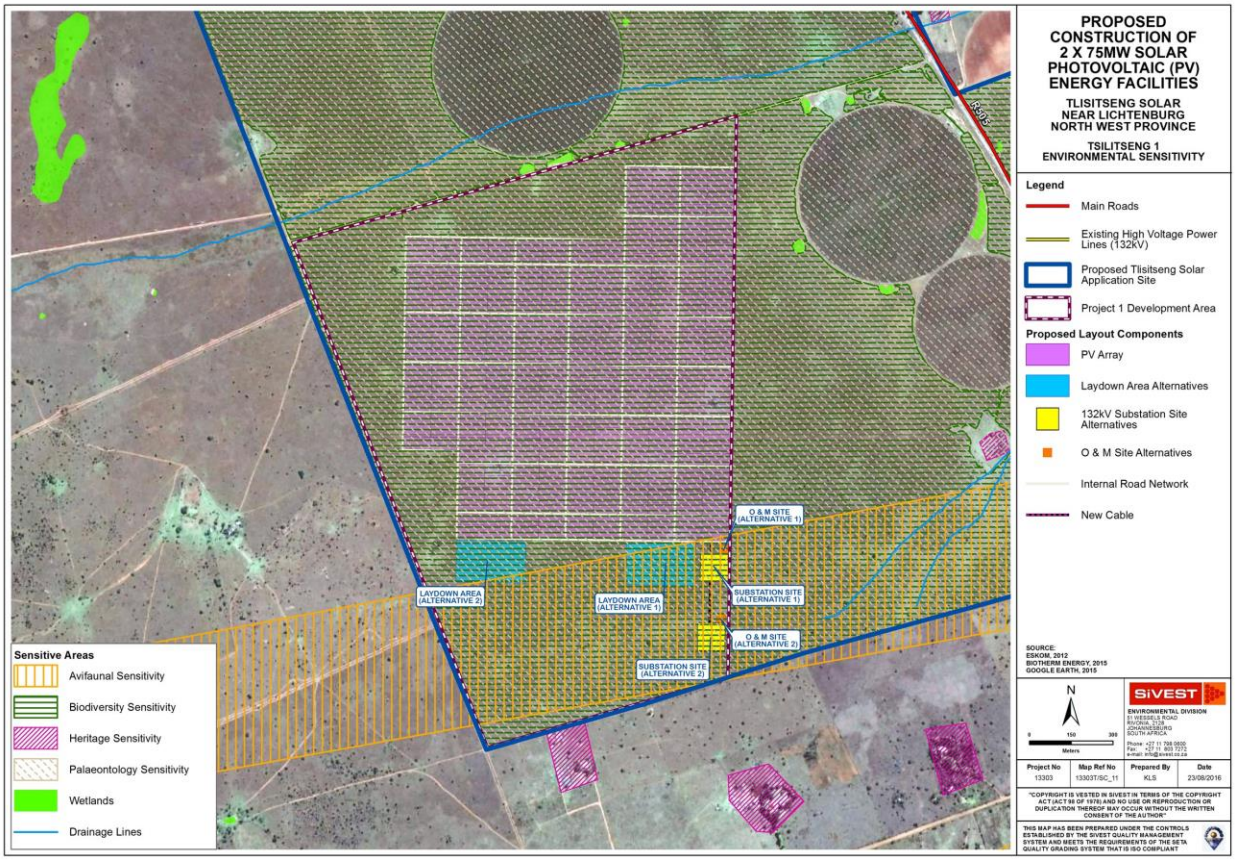

Figure 33: Proposed Layout Alternatives in relation to the Sensitive Areas

11.9 Recommendations

It is recommended that the specialist studies pertaining to certain aspects be carried forward into the EIA Phase, namely, those studies mentioned above. Various issues and concerns have been identified which require detailed assessment and thus it is recommended that the EIA phase be allowed to continue in order to assess these and the impacts associated.

11.10 Public Participation

The Public Participation during the EIA Phase will involve the following:

Table 93: Public Participation activities still to take place.

ACTIVITY	FUNCTION
Prepare and distribute EIA newsletter	Notify registered I&APs of outcome of the Scoping Phase (including timeframes and when their input is required).
Public comment period	Notification of I&APs of the availability of the EIAr reports for public comment.
Notification of granting or refusal of Environmental Authorisation	Informing of all registered I&APs of the EA
Environmental Authorisation appeal period	Receive any appeals and forward to DEA

11.11 Proposed Project Schedule going forward

The table below represents the proposed schedule of events for the project till closure upon DEA's decision.

Table 94: Proposed Project Schedule

	September 2016	November 2016	January 2016	February 2016	May 2015
Start of DSR Comment period	Dates to be confirmed in the impact phase				
Submission of FSR to DEA		Dates to be confirmed in the impact phase			
DEA Decision on FSR			Dates to be confirmed in the impact phase		
Distribution of EIA Newsletter			Dates to be confirmed in the impact phase		
DEIR Comment period			Dates to be confirmed in the impact phase		
Submission of FEIR to DEA				Dates to be confirmed in the impact phase	
DEA Decision					Dates to be confirmed in the impact phase

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