# ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
# FINAL SCOPING REPORT
# PROPOSED CONSTRUCTION OF PHASE 2 AND PHASE 3 OF THE UPINGTON SOLAR THERMAL PLANT, NORTHERN CAPE PROVINCE
# DEA REFERENCE NUMBERS: 14/12/16/3/3/3/98 & 14/12/16/3/3/3/99

FINAL REPORT

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## *PROJECT DETAILS*

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|---|---|---|
| **DEA Reference Numbers** | : | 14/12/16/3/3/3/98 (Upington Solar Thermal Plant Two)<br>14/12/16/3/3/3/99 (Upington Solar Thermal Plant Three) |
| **Title** | : | Environmental Impact Assessment Process<br>Final Scoping Report: Proposed Construction of Phase 2 and Phase 3 of the Upington Solar Thermal Plant, Northern Cape Province |
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| **Client** | : | Abengoa Solar Power South Africa (Pty) Ltd |
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## *PURPOSE OF THE SCOPING REPORT*

Abengoa Solar Power South Africa (Pty) Ltd is proposing the establishment of two commercial solar thermal electricity generating facilities and associated infrastructure near Upington. The project names are as follows:

» Proposed Upington Solar Thermal Plant Two, Northern Cape Province
» Proposed Upington Solar Thermal Plant Three, Northern Cape Province

Abengoa Solar Power South Africa (Pty) Ltd has appointed Savannah Environmental as the independent environmental consultants to undertake the Environmental Impact Assessment (EIA) for the proposed solar thermal plants. The EIA process is being undertaken in accordance with the requirements of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

This Final Scoping Report represents the findings of the Scoping Phase of the EIA process and contains the following sections:

» **Chapter 1** introduces the reader to the proposed project, including information regarding the projects, the rationale/motivation for the proposed projects and the requirements for an EIA according to NEMA.
» **Chapter 2** provides an overview of the project including alternatives, a description of solar energy as an electricity generation option and the steps within the construction, operational and decommissioning phases.
» **Chapter 3** outlines the approach to undertaking the Scoping Phase which includes the objectives, the legal context, the methodology used and the public participation process.
» **Chapter 4** provides a description of the receiving environment in terms of the regional setting, the climatic conditions, the biophysical characteristics and the social characteristics.
» **Chapter 5** evaluates the potential issues associated with the proposed projects by summarising the nature and extent of potential issues as well as "No-Go" areas within the broader site as well as gaps in knowledge and recommendations for studies within the EIA Phase.
» **Chapter 6** presents the conclusions of the Scoping Phase with respect to the identified potential impacts.
» **Chapter 7** describes the Plan of Study for the EIA which includes the aims of this phase, the nature of the authority consultation, the consideration of alternatives, the conduction of the public participation process and the key milestones with the EIA Phase.

## *PUBLIC REVIEW PERIOD FOR THE DRAFT SCOPING REPORT AND OPPORTUNITY TO COMMENT ON THE FINAL SCOPING REPORT*

The **Draft Scoping Report** has been made available for public review from 30 October 2013 – 28 November 2013 at the following locations:

» Khara Hais Public Library, Market Street, Upington
» Keimoes Public Library, Main Street, Keimoes

The report was also available for download from www.savannahsa.com. In accordance with the EIA Regulations, the primary purpose of the Draft Scoping Report is to provide stakeholders with an opportunity to verify that the issues raised have been captured and considered within the study and to provide the opportunity to raise any additional issues for consideration. Comments were requested to be submitted to Savannah Environmental by 28 November 2013 as written submission via fax, post or e-mail. In order to facilitate comments on the Draft Scoping Report, a public meeting (and stakeholder meetings) were during the review period as follows:

» **Date:** 11 November 2013
» **Time:** 18h00
» **Venue:** Keimoes Hotel, 46 Main Street, Keimoes

The aim of the public meeting was to provide feedback of the findings of the scoping study and to consult with the public on the proposed project and draft Scoping report.

This **Final Scoping Report** incorporated all the issues and responses received from stakeholders prior to submission to the National Department of Environmental Affairs (DEA), the decision-making authority for the project. I&APs were informed in writing (prior to the submission of the report to DEA) that the Final Scoping Report is available for public review and comment if required/ desired by I&APs. Any comments received from the public on the Final Scoping Report will be included in the EIA Report and submitted to DEA. The Final Scoping Report is aaviaable on required from Savannah Environmental and can be downloaded from www.savannahsa.com.

# EXECUTIVE SUMMARY

## Background and Project Overview

Abengoa Solar Power South Africa (Pty) Ltd is proposing the establishment of two commercial solar thermal electricity generating facilities and associated infrastructure near Upington. The project names are as follows:

» Proposed Upington Solar Thermal Plant Two, Northern Cape Province
» Proposed Upington Solar Thermal Plant Three, Northern Cape Province

Each project will be located on a different area within Portion 3 of the Farm McTaggarts Camp 453, which lies ~20 km west of the town of Upington in the Northern Cape. Each project will be located on a different area within Portion 3 of the Farm McTaggarts Camp 453, which lies ~20 km west of the town of Upington in the Northern Cape. The proposed Upington Solar Thermal Plant Two will consist of heliostats and a Power Tower system with a generation capacity of ~125MW. The proposed Upington Solar Thermal Plant Three will consist of Parabolic Trough technology using heat transfer fluid (HTF), with a generation capacity of ~125MW. Each Concentrated Solar Power (CSP) facility will include the following associated infrastructure: power island with steam turbine generator, access roads, plant substation, power line, water abstraction point on the Gariep River and supply pipeline, water storage tanks, packaged water treatment plant, lined evaporation ponds, salt or direct steam storage vessels, auxiliary fossil fuel boilers and workshop and office buildings. Both CSP facilities will be located on a different area within Portion 3 of the Farm McTaggarts Camp 453.

The Scoping Report for the proposed project has been undertaken in accordance with the Environmental Impact Assessment (EIA) Regulations published in Government Notice 28753 of 21 April 2006, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). This Scoping Report is aimed at detailing the nature and extent of this facility, identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders (including relevant government authorities) and interested and affected parties (I&APs). In accordance with the requirements of the EIA Regulations, feasible project-specific alternatives (including the "do nothing" option) have been identified for consideration within the EIA process.

The conclusions and recommendations of this Scoping Report are the result of desk-top evaluations, on-site inspections of impacts identified by

specialists, and the parallel process of public participation. The public consultation process is extensive and every effort is being made to include representatives of all stakeholder groupings in the study area and the Province.

The nature and extent of this facility, as well as potential environmental impacts associated with the construction of a facility of this nature is explored in more detail in this Scoping Report.

### Environmental Impact Assessment

The Scoping Phase for the proposed projects has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010 as amended, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). In accordance with these Regulations, this scoping process aimed at identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project involving desk-top specialist studies , as well as a consultation process with key stakeholders (including relevant government authorities) and interested and affected parties (I&APs).

As this is an **energy generation** project the National Department of Environmental Affairs (DEA) is the competent authority for this application. As the project falls within the Northern Cape Department of Environmental and Nature Conservation (DENC) acts as a commenting authority for the project. The two solar thermal plants are subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998). In terms of Government Notice 718 published in terms of the NEM: Waste Act No. 59 of 2008, a waste licence is also required for the temporary storage of general waste. Therefore, an integrated environmental authorisation process is being undertaken for the projects. Two applications for authorisation and waste licencing have been accepted by DEA under the following application reference numbers:

» 14/12/16/3/3/3/98 (Upington Solar Thermal Plant Two)
» 14/12/16/3/3/3/99 (Upington Solar Thermal Plant Three).

The Scoping Phase has been undertaken in accordance with the EIA Regulations published in terms of NEMA in Government Notice 33306 of 18 June 2010 as amended.. Key tasks undertaken within the scoping phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Submission of two application forms (one for each phase of the proposed development) for

integrated environmental authorisation and waste management licencing in terms of Regulation 12 and 26 of Government Notice No R543 of 2010 and the Waste Act (Act No 59 of 2008 to the competent authority (DEA).

» Undertaking a public involvement process throughout the Scoping process in accordance with Chapter 6 of Government Notice No R543 of 2010 in order to identify issues and concerns associated with the proposed project.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of Government Notice No R543 of 2010). This Comments and Response Report will be included in the Final Scoping Report.
» Undertaking of independent specialist studies in accordance with Regulation 32 of Government Notice No R543 of 2010.
» Preparation of a Draft Scoping Report and Plan of Study for EIA in accordance with the requirements of the Regulation 28 Government Notice No R543 of 2010.

## Evaluation of the Proposed Project

Due to the relatively homogenous nature of the study area within which the broader facility is proposed to be located, issues associated with Phase 2 and Phase 3 of the Upington Solar Thermal Plant are expected to be similar. The impacts associated with both solar thermal plants are largely similar, apart from visual impacts. Where specific issues have been identified for a specific phase of the development, these have been highlighted. Therefore the conclusions of the scoping report for Phase 2 and Phase 3 of the Upington Solar Thermal Plant have not been separated in this scoping report. During the EIA phase there will be separate evaluation and conclusion chapters that deals with each phase of the project.

This scoping study has identified areas of higher sensitivity on the larger site to assist in focussing the location of the development footprint for Phase 2 and Phase 3 of the Upington Solar Thermal Plant to minimise the potential for environmental impact. Issues identified through this scoping study as being potentially associated with the proposed solar thermal plants include:

» Impacts on biodiversity and ecological processes, including habitat alteration and impacts to wildlife;
» Impacts on heritage sites;
» Impacts on soil and land-use.
» Avian mortality resulting from collisions with infrastructure components (including power lines);
» Visual impacts; and
» Positive and negative impacts on the social environment.

The potential impacts identified to be associated with the construction and operations of the proposed facilities are anticipated to be local to regional in extent. No environmental fatal flaws were identified to be associated with the site. The 'no-go' areas that were identified for the larger site include:

» The mined out areas (~25 hectares) on the north-western corner of the site (currently being rehabilitated under the Khi Solar One project due to safety risk associate with open excavations/ depressions).
» The development footprint of the Khi Solar One CSP Facility (which is currently under construction) and the development footprint for the other authorised phases of this project (~600 hectares) total of 2200 ha).

The mined out areas and Khi Solar One project areas are shown in the combined environmental sensitivity map which is shown Figure 6.1.

The potentially significant issues related to the **construction** of Phase 2 and Phase 3 of the Upington Solar Thermal Plant includes:

» Biodiversity and habitat loss and impacts on flora and fauna resulting from activities such as site clearance and levelling for installation of the facility components and associated infrastructure. The development of two 125MW CSP facilities will result in a total loss of ~900 hectares, as these facilities are assumed to ultimately be devoid of vegetation and consist of hardened and/or impervious surfaces.
» Soil erosion, loss or degradation due to site clearance and levelling for installation of the facility components and associated infrastructure and due to the construction on internal access roads.
» Impact on heritage and paleontological resources through construction activities.
» Visual impacts on the landscape related to the construction site and possible scarring of the landscape resulting from the clearance of vegetation.
» Noise, traffic and dust resulting from construction activities such as movement of vehicles and heavy machinery. This will be temporary in nature and will be localised.
» Socio-economic impacts, both positive and negative (job creation and business opportunities, impacts associated with construction workers in the area).

The potentially significant issues related to the **operation** of Phase 2 and Phase 3 of the Upington Solar Thermal Plant includes:

» Change in land use from agriculture to solar thermal plants.
» Direct impacts on the on-site water resources, i.e. indirect

impacts on water resources, i.e. ephemeral drainage lines and seasonal pans and potential changes in water quantity within the Gariep River due to abstraction of water required for the CSP Plants.
» Soil contamination, erosion, loss or degradation related to construction and the evaporation ponds required for the site.
» Visual impacts and impacts on 'sense of place' where the facility and/or associated infrastructure is viewed as visually obtrusive.
» Positive social and economic impacts through job creation and economic benefits;
» Increased use of clean, renewable energy (positive).

**Conclusions drawn from the Evaluation of the Potential Issues associated with Waste Licencing for the Evaporation Ponds**

Up to 6 evaporation ponds in total will be required for both CSP plants. The purpose of the evaporation ponds is to receive and store the wastewater (brine) generated from the electricity generation process. The quantity of brine within the evaporation ponds will exceed $100m^3$ at any given time; therefore a waste licence in terms of the NEM: Waste Act is required. The proposed facility will be operated as a Zero Liquid Effluent Discharge (ZLED) facility; therefore no wastewater from the evaporation ponds will be permitted to be released into the environment or into any water bodies. The evaporation ponds could have negative environmental impacts including soil contamination, surface water and/or ground water pollution if any large amounts of wastewater are released or accidently released into the environment. Design level mitigation measures to prevent pollution must be considered by the applicant and will be considered in the EIA phase. The proposed locations of the evaporation ponds will also be considered in the EIA phase, to look at appropriate siting of the ponds. The principles of pollution prevention, then mitigation and remediation will be considered.

**Sensitivity Analysis for the Study Site**

The **potentially sensitive areas** which have been identified through the environmental scoping study are listed below and shown in Figure 6.1. These potentially sensitive areas will, therefore, be further investigated and assessed through detailed specialist studies (including field surveys) during the EIA phase of the process (refer to Chapter 7 for more details). Potentially sensitive areas already identified through the scoping study include:

» *Areas along ephemeral drainage lines and seasonal pans – water resources*
» *Tributaries of the Heldbrandkloofspruit*
» *Areas previously disturbed through mining activities:*
» *Sensitive Vegetation*

With an understanding of which areas of the site would be impacted by the development of Phase 2 and Phase 3 of the Upington Solar Thermal Plant, Abengoa Solar Power South Africa (Pty) Ltd can prepare the detailed infrastructure layouts for consideration within the EIA Phase. During this phase more detailed environmental and social studies will be conducted in line with the Plan of Study contained in Chapter 7 of this report.

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## *APPENDICES*

# *DEFINITIONS AND TERMINOLOGY*

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

**Ambient sound level**: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

**Concentrating Solar Power:** Solar Generating Facilities use the energy from the sun to generate electricity. Concentrating Solar Power facilities collect the incoming solar radiation and concentrate it (by focusing or combining it) onto a single point, thereby increasing the potential electricity generation.

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

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

**Disturbing noise**: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

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

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

**Endemic:** An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place.

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

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

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

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

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

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

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

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

**Natural properties of an ecosystem (*sensu* Convention on Wetlands):** Defined in Handbook 1 as the "…physical, biological or chemical components, such as soil, water, plants, animals and nutrients, and the interactions between them". (Ramsar

Convention Secretariat. 2004. Ramsar handbooks for the wise use of wetlands. 2nd Edition. Handbook 1. Ramsar Convention Secretariat, Gland, Switzerland.) (see http://www.ramsar.org/)

**Power Tower:** A Power Tower forms part of the central receiver type solar electricity generating technology. The purpose of the tower, which may be up to 160 m high, is to structurally support the receiver. The receiver, consisting of metal tubes which transfer the heat from the solar radiation reflected on it by mirror fields, is used for generating the steam.

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

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

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

# *ABBREVIATIONS AND ACRONYMS*

| | |
|---|---|
| BID | Background Information Document |
| $CO_2$ | Carbon dioxide |
| CSP | Concentrated Solar Plant |
| DE&NC | Department of Environment & Nature Conservation |
| DEA | National Department of Environmental Affairs |
| DoE | Department of Energy |
| DWA | Department of Water Affairs |
| EAP | Environmental Assessment Practitioner |
| EIA | Environmental Impact Assessment |
| EMPr | Environmental Management Programme |
| FIT | Feed-in Tariffs |
| GDP | Gross Domestic Profit |
| GIS | Geographical Information Systems |
| GG | Government Gazette |
| GN | Government Notice |
| GHG | Green House Gases |
| GWh | Giga Watt Hour |
| I&AP | Interested and Affected Party |
| IDP | Integrated Development Plan |
| IPP | Independent Power Producer |
| $km^2$ | Square kilometres |
| km/hr | Kilometres per hour |
| kV | Kilovolt |
| LUPO | Rezoning and Subdivision in terms of Land Use Planning Ordinance, Ordinance 15 of 1985 |
| MAR | Mean Annual Rainfall |
| $m^2$ | Square meters |
| m/s | Meters per second |
| MW | Mega Watt |
| NEMA | National Environmental Management Act (Act No. 107 of 1998) |
| NERSA | National Energy Regulator of South Africa |
| NHRA | National Heritage Resources Act (Act No. 25 of 1999) |
| NGOs | Non-Governmental Organisations |
| NWA | National Water Act (Act No. 36 of 1998) |
| REFIT | Renewable Energy Feed-in Tariffs |
| SAHRA | South African Heritage Resources Agency |
| SANBI | South African National Biodiversity Institute |
| SANRAL | South African National Roads Agency Limited |
| SDF | Spatial Development Framework |

# INTRODUCTION CHAPTER 1

Abengoa Solar Power South Africa (Pty) Ltd is proposing the construction of two commercial solar thermal electricity generating facilities and associated infrastructure near Upington. The project names are as follows:

» Proposed Upington Solar Thermal Plant Two, Northern Cape Province
» Proposed Upington Solar Thermal Plant Three, Northern Cape Province

Each project will be located on a different area within Portion 3 of the Farm McTaggarts Camp 453, which lies ~20 km west of the town of Upington in the Northern Cape. It is the developer's intention to bid each CSP Facility under the Department of Energy's (DoE) Renewable Energy Independent Power Producer Programme (REIPPP). The power generated from the CSP Facilities will be sold to Eskom and will feed into the national electricity grid. Ultimately, the projects are intended to be a part of the renewable energy projects portfolio for South Africa. The nature and extent of this facility, as well as potential environmental impacts associated with the construction, operation and decommissioning phases of each project are explored in more detail in this Final Scoping Report.

## 1.1. Summary of the Proposed Projects

Solar Generating Facilities use the energy from the sun to generate electricity. Concentrating Solar Power (CSP) goes one step further by collecting the incoming solar radiation and concentrating it (focusing or combining it) on a single point, thereby increasing the potential electricity generation.

A locality map showing the proposed locations of the two projects on Portion 3 of the Farm McTaggarts Camp 453 is shown in Figure 1.1. The site falls within Ward 8 of the Kai !Garib Local Municipality. The proposed Upington Solar Thermal Plant Two will consist of heliostats and a Power Tower CSP system with a generation capacity of ~125MW. The proposed Upington Solar Thermal Plant Three will utilise parabolic trough technology with a generation capacity of ~125MW.

Each facility would include the following associated infrastructure: access roads, plant substation, power line, water abstraction point on the Gariep River and supply pipeline to the facility, water storage tanks, packaged water treatment plant, lined evaporation ponds, salt storage tanks, auxiliary fossil fuel boilers and workshop and office buildings.

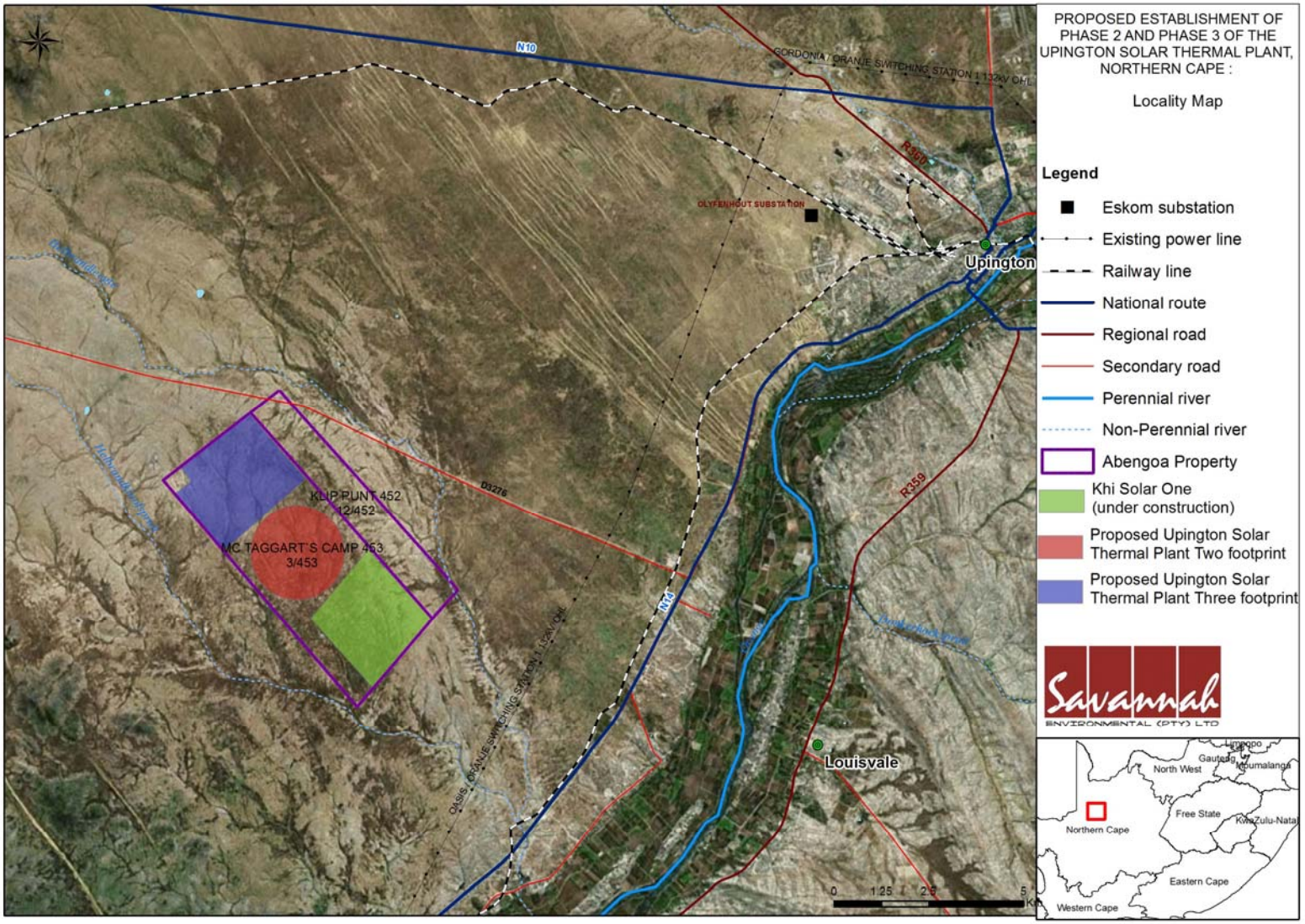


**Figure 1.1:** Locality map showing the proposed site for the construction of the Upington Solar Thermal Plant Two and Three

The scope of the proposed Upington Solar Thermal Plant Two and Three, including details of all elements of the project (for the design/planning, construction, operation and decommissioning phases) is discussed in more detail in Chapter 2.

## 1.2. The Applicant – Abengoa Solar Power South Africa

Abengoa Solar Power South Africa (Pty) Ltd is a company that was created for the implementation of various phases of the Upington Solar Thermal Plant. The first Phase of the Upington Solar Thermal Plant, known as the Khi Solar One project, is currently under construction on a section of the broader farm portion (Portion 3 of the Farm McTaggarts Camp 453), as shown in Figure 1.1. Abengoa Solar Power South Africa (Pty) Ltd will manage the development of the Upington Solar Thermal Plant Two and Three, complete all the activities needed to obtain the required permits and licenses and will be responsible for the financing required to construct each project. Abengoa Solar Power South Africa (Pty) Ltd intends to bid both CSP facilities to the Department of Energy (DoE) under the Renewable Energy Independent Power Producer Programme (REIPPP). Once the solar thermal plant is constructed, the facility owner and operator will take over the facility.

## 1.3. Rationale for the proposed Upington Solar Thermal Plant

Due to the successful development and construction of the Khi Solar One project on the same site (Portion 3 of the Farm McTaggarts Camp 45); Abengoa Solar Power South Africa (Pty) Ltd is proposing two additional 125MW CSP projects on the site. In addition, land is available on Portion 3 of the Farm McTaggarts Camp 453 and is owned by the project developer. This makes the site (Portion 3 of the Farm McTaggarts Camp 453) technically desirable and ready to utilise for two new CSP projects.

The area in and around Upington in Northern Cape is becoming the hub of South Africa's emerging solar energy industry. Apart from the Khi Solar One CSP project, Eskom also intends on developing a CSP plant adjacent to the site on the Farm Olyvenhouts Drift. Furthermore the site for the proposed Upington Solar Thermal Plant Two and Three falls within the solar development corridor ear-marked within the Northern Cape Provincial Spatial Development Framework (2011). Therefore the location of the site is aligned with development planning in the region.

The predominant rationale for the proposed Upington Solar Thermal Plant Two and Three is the contribution to the growth of the renewable energy sector in South Africa. South Africa’s electricity supply remains heavily dominated by coal-based power generation and has an extremely low market share of renewable energy generation. The diverse gains which a renewable energy industry offers have been

recognised by the South African government. The country's significant renewable energy potential is being realised as wind and solar projects are currently under construction country-wide.

### *1.3.1. Renewable Energy Targets*

Renewable energy is internationally recognised as a major contributor in protecting our climate, our natural resources and the environment as well as providing a wide range of environmental, economic and social benefits that will contribute towards long-term global sustainability. Grid connected renewable energy is one of the fastest growing sector in the global energy market.

Targets for the promotion of renewable energy now exist in more than 58 countries, of which 13 are developing countries. The South African Government has recognised the country's high potential for renewable energy and coupled with the prevalent electricity shortages, the need to develop supplementary, environmentally friendly and sustainable sources of energy was identified. The development of renewable energy in South Africa is supported by a policy framework provided by the White Paper on Renewable Energy (November 2003. In order to meet the long-term goal of a sustainable renewable energy industry and to diversify the energy-generation mix in South Africa, a goal of 17,8GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~42% of all new power generation being derived from renewable energy forms by 2030. Therefore the two proposed CSP plants can contribute to the renewable energy targets set by the South African government.

### *1.3.2. Department of Energy Process for Independent Power Producers (IPP)*

The DoE IPP Procurement Programme is currently underway. IPPs undergo a bidding process in which the Department of Energy will determine preferred bidders. A Preferred Bidder will be held to compliance with the price and economic development proposals in its bid, with regular reporting to demonstrate compliance during the life of the project. During 2012, the government signed contracts for a number of IPP projects, which include wind, solar and small hydro technologies to be developed in the Eastern Cape, Western Cape, Northern Cape and Free State provinces. The first IPP Bid submission (Round 1) was in November 2011, the second bid submission (Round 2) in March 2012. The third bid submission (Round 3) in August 2013. The applicant intends bidding the project to the DoE in Round 4 in 2014.

### *1.3.3. Project-related Benefits*

Due to the exploitation of and large scale reliance on non-renewable resources (such as coal) and the potential subsequent impacts on climate, there is increasing pressure globally to increase the share of renewable energy generation. South Africa currently depends on fossil fuels for the supply of approximately 90% of its primary energy needs.

The current electricity imbalances in South Africa highlight the significant role that renewable energy can play in terms of power supplementation. Given that renewables can generally be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.

With economic development over the next several decades resulting in an ever increasing demand for energy, there is some uncertainty as to the availability of economically extractable coal reserves for future use. Furthermore, several of South Africa's power stations are nearing the end of their economic life, require refurbishment, or have been recently returned to service (re-commissioned) at great expense (i.e. the Camden, Komati, and Grootvlei Power Stations).

The long-term benefits for communities and/or society in general can be realised should the site prove acceptable (from a technical and environmental perspective) for the construction of two additional solar thermal plants. Each solar facility will contribute to the economic and social development of surrounding local communities. Furthermore it will serve to strengthen the national electricity grid and will contribute towards achieving both the renewable energy target and the goal of a 30% share of all new power generation being derived from Independent Power Producers (IPP). From national, regional and local perspectives, investment in renewable energy initiatives, such as the proposed solar thermal plants, is supported.

## 1.4. Requirement for an Environmental Impact Assessment Process

The two solar thermal plants are subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998). In terms of Government Notice 718 published in terms of the NEM: Waste Act No. 59 of 2008, a waste licence is also required for the temporary storage of general waste. Therefore, an integrated environmental authorisation process is being undertaken for the project. This section provides a brief overview of the EIA Regulations and their application to the projects.

NEMA is the national legislation that provides for the authorisation of 'listed activities'. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project, the National Department of Environmental Affairs (DEA) is the competent authority and the Northern Cape Department of Environment and Nature Conservation (DENC) will act as a commenting authority. Two applications for authorisation and waste licencing have been accepted by DEA under the following application reference numbers:

» 14/12/16/3/3/3/98 (Upington Solar Thermal Plant Two)
» 14/12/16/3/3/3/99 (Upington Solar Thermal Plant Three).

The need to comply with the requirements of the EIA Regulations ensures that decision-makers are provided the opportunity to consider the potential environmental impacts of a project early in the project development process and to assess if potential environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. Savannah Environmental (Pty) Ltd was appointed as the independent Environmental Assessment Practitioner (EAP) to conduct the EIA process for the proposed projects.

An EIA is also an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the opportunity for the developer to be forewarned of potential environmental issues, and allows for resolution of the issues reported on in the Scoping and EIA Reports as well as dialogue with interested and affected parties (I&APs).

The EIA process comprises two phases – i.e. Scoping and Impact Assessment - and involves the identification and assessment of environmental impacts though specialist studies, as well as public participation. As this process is required to be followed for both applications, one EIA process will be undertaken while considering both Upington Two and Upington Three as separate project components. The intention is for the applicant to obtain separate authorisations for two stand-alone solar projects, as would be required by DoE under the REIPPP programme.

In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations of GNR543; GNR544; GNR545; and GNR546 as amended in December 2010 the 'listed activities' triggered by each 125MW CSP project are provided in Table 1.1.

**Table 1.1**: Summary of the GN 544, 545 and 546, **listed activities** number and short description of the activities that require authorisation **under NEMA**

| Number and date of the relevant notice | Activity No (in terms of the relevant notice) | Description of listed activity |
|---|---|---|
| GN 544, 18 June 2010 | 9 | The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water -<br>(i) with an internal diameter of 0,36 metres or more; or<br>(ii) with a peak throughput of 120 litres per second or more, excluding where:<br><br>a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or<br>b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.<br><br>***Ancillary infrastructure includes the construction of a water supply pipeline to the facility from the abstraction point at the Gariep (Orange) River.*** |
| GN 544, 18 June 2010 | 10 | The construction of facilities or infrastructure for the transmission and distribution of electricity –<br>i. Outside urban areas or industrial complexes with a capacity of more than 33kv but less than 275kv<br><br>***The proposed facility will be required to evacuate electricity into the national grid and include the construction of a distribution line of less than 275kV.*** |
| GN 544, 18 June 2010 | 11 | The construction of:÷<br>(iii) bridges;<br>(x) buildings exceeding 50 square metres in size; or<br>(xi) infrastructure or structures covering 50 square metres or more<br><br>Where such construction occurs within a watercourse or within 32 metres of a watercourse, measures from the edge of a watercourse , excluding where such construction will occur behind the development setback line<br><br>***Bridges and/or buildings exceeding 50 $m^2$ may be required to be constructed with 32 m of a watercourse.*** |

| Number and date of the relevant notice | Activity No (in terms of the relevant notice) | Description of listed activity |
|---|---|---|
| GN 544, 18 June 2010 | 12 | The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010.<br><br>***Ancillary infrastructure includes water storage reservoir/s on the site and evaporation ponds (for wastewater from the generation process and water treatment plant).*** |
| GN 544, 18 June 2010 | 18 | The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock or more than 5 cubic metres from:<br>i. A watercourse.<br><br>***The construction of the facility and/or associated infrastructure may require the excavation, removal or moving of soil from a watercourse.*** |
| GNR 544, 18 June 2010 | 39 (iii) & (v) | The expansion of<br>(iii) bridges;<br>(v) bulk storm water outlet structures<br><br>within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint but excluding where such expansion will occur behind the development setback line.<br><br>***Bridges and/or bulk storm water outlet structures may be required to be constructed with 32 m of a watercourse.*** |
| GNR 544, 18 June 2010 | 47 (iii) | The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre<br><br>(i) where the existing reserve is wider than 13,5 meters; or<br>(ii) where no reserve exists, where the existing road is wider than 8 metres – excluding widening or lengthening occurring inside urban areas.<br><br>***The development of the facility may require the widening or lengthening of a road.*** |
| GN 545, 18 June 2010 | 1 | The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more.<br><br>» ***The Upington Solar Thermal Plant Two will consist of a power tower and heliostats with a generation capacity of ~ 125MW.***<br>» ***The Upington Solar Thermal Plant Three will utilise*** |

| Number and date of the relevant notice | Activity No (in terms of the relevant notice) | Description of listed activity |
|---|---|---|
| | | ***parabolic troughs CSP technology (consisting of several loops of parabolic troughs) with a generation capacity of ~ 125MW.*** |
| GN 545, 18 June 2010 | 3 | The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.<br><br>***The auxiliary steam boiler will be used to provide process steam to the facility (i.e. to supplement generation). The fuel (i.e. diesel or liquid petroleum gas (LPG) for the boiler will be required to be stored at the facility and will have a storage capacity of more than 500 cubic metres.*** |
| GN 545, 18 June 2010 | 15 | Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for:<br>(i) linear development activities; or<br>(ii) agriculture or afforestation where activity 16 in this Schedule will apply.<br><br>***The total area to be transformed will be more than 20 hectares.*** |
| GN 546, 18 June 2010 | 2 (a) ii | The construction of reservoirs for bulk water supply with a capacity of more than 250 cubic metres in the Northern Cape in the Northern Cape outside urban areas in (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority<br><br>***Ancillary infrastructure includes water storage reservoir/s on the site in a sensitive area as identified in the Siyanda District Municipality's[1] environmental management framework (EMF). The EMF identifies the area the site is located within as an area of high conservation priority and the site is also demarcated as occurring in Zone 2 in the EMF – i.e. potentially high vegetation conservation areas.*** |
| GN 546, 18 June 2010 | 4(a) ii | The construction of a road wider than 4 metres with a reserve less than 13,5 metres in the Northern Cape outside urban areas in (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority |

[1] Note that the name of the Siyanda District Municipality has been changed to the ZF Mgcawu District Municipality

| Number and date of the relevant notice | Activity No (in terms of the relevant notice) | Description of listed activity |
|---|---|---|
| | | ***A road wider than 4 m may need to be constructed in a sensitive area as identified in the Siyanda District Municipality's environmental management framework (EMF). The EMF identifies the area the site is located within as an area of high conservation priority and the site is also demarcated as occurring in Zone 2 in the EMF – i.e. potentially high vegetation conservation areas.*** |
| GN 546, 18 June 2010 | 10 (a) ii | The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres in the Northern Cape, outside urban areas in (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority.<br><br>***Fuel to be used during construction will need to be stored on-site in a sensitive area as identified in the Siyanda District Municipality's environmental management framework (EMF). The EMF identifies the area the site is located within as an area of high conservation priority and the site is also demarcated as occurring in Zone 2 in the EMF – i.e. potentially high vegetation conservation areas.*** |
| GN 546, 18 June 2010 | 13(c) ii | The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation in the Northern Cape, outside urban areas in (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority.<br><br>***An area of 1 ha or more of indigenous vegetation cover may need to be cleared in a sensitive area as identified in the Siyanda District Municipality's environmental management framework (EMF). The EMF identifies the area the site is located within as an area of high conservation priority and the site is also demarcated as occurring in Zone 2 in the EMF – i.e. potentially high vegetation conservation areas.*** |
| GN 546, 18 June 2010 | 14 (a) i | The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation in the Northern Cape, outside urban areas.<br><br>***An area of 5 ha or more of indigenous vegetation cover will need to be cleared.*** |
| GN 546, 18 June | 16(iii) & (iv) | The construction of (iii) buildings with a footprint exceeding |

| Number and date of the relevant notice | Activity No (in terms of the relevant notice) | Description of listed activity |
|---|---|---|
| 2010 | | 10 square metres in size or (iv) infrastructure covering 10 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line. (a) In the Northern Cape, outside urban areas in (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority.<br><br>***Buildings larger than 10 $m^2$ which occur within 32 m of a watercourse may be required to be built.*** |

In terms of Government Notice 718 published in terms of the National Environmental Management Waste Act No. 59 of 2008, a waste license is required for the activities listed in Table 1.2.

**Table 1.2:** Summary of the GN 718, **listed activities** number and short description of the waste activities that requires **authorisation under the National Environmental Management Waste Act** No. 59 of 2008.

| Number and date of the relevant notice | Activity No (in terms of the List of Waste Management Activities) | Description of listed activity |
|---|---|---|
| GG32368 of July 2009 | Category A, Activity 1 | The storage, including the temporary storage, of general waste at a facility that has the capacity to store in excess of $100m^3$ of general waste at any one time, excluding the storage of waste in lagoons.<br><br>**The CSP facility will require the temporary storage of waste in excess of $100m^3$ at any one time.** |
| GG32368 of July 2009 | Category A, Activity 3 | The storage including the temporary storage of general waste in lagoons.<br><br>**The CSP facility will require the temporary storage of waste in lagoons (evaporation ponds).** |

This scoping study forms part of the EIA process and was conducted in accordance with the requirements of the EIA Regulations of June 2010 and in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998), in support of the NEMA and waste licence applications for the proposed projects.

## 1.5. Details of the Environmental Assessment Practitioner

Savannah Environmental was contracted as the independent EAP to undertake both Scoping and EIA Phases for the proposed project. Neither Savannah Environmental nor any of its specialist sub-consultants on this project are subsidiaries of or are affiliated to Abengoa Solar Power South Africa (Pty) Ltd in any way. Furthermore, Savannah Environmental does not have any interests in secondary developments that could arise out of the authorisation of the proposed projects.

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

The Savannah Environmental team have considerable experience in environmental impact assessments and environmental management, and have been actively involved in undertaking environmental studies, for a wide variety of projects throughout South Africa, including those associated with electricity generation.

» *Ravisha Ajodhapersadh*, principle author of this report, holds an Honours Bachelor of Science degree in Environmental Management and has 6 years experience in environmental management. She has undertaken EIAs for various proposed solar energy facilities in South Africa and has been involved in other projects in this area.
» *Karen Jodas* is a registered Professional Natural Scientist and holds a Master of Science degree and is the registered EAP on the proposed project. She has 16 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country.

In order to adequately identify and assess potential environmental impacts associated with the proposed project, the following specialist sub-consultants have provided input into this scoping report:

» Ecology – Marianne Strohbach

» Soils and Agricultural Potential – Johann Lanz
» Heritage – David Morris

Refer to Appendix A for the curricula vitae for the EAPs and specialist sub-consultants.

# OVERVIEW OF THE PROPOSED PROJECT CHAPTER 2

The following chapter provides an overview of the Upington Solar Thermal Plant Two and Upington Solar Plant Three and details the project scope which includes the planning/design, construction, operation and decommissioning activities. This chapter also explores site and technology alternatives as well as the 'do nothing' option. Lastly, it explores solar energy facilities as a means for power generation.

The proposed Upington Solar Thermal Plant Two will consist of heliostats and a Power Tower system with a generation capacity of ~125MW. The proposed Upington Solar Thermal Plant Three will consist of Parabolic Trough technology using heat transfer fluid (HTF), with a generation capacity of ~125MW. Each Concentrated Solar Power (CSP) facility will include the following associated infrastructure: power island with steam turbine generator, access roads, plant substation, power line, water abstraction point on the Gariep River and supply pipeline, water storage tanks, packaged water treatment plant, lined evaporation ponds, salt or direct steam storage vessels, auxiliary fossil fuel boilers and workshop and office buildings. Both CSP facilities will be located on a different area within Portion 3 of the Farm McTaggarts Camp 453. A layout map showing the infrastructure required for each facility is shown in Figure 2.1.

## 2.1. Site Alternatives

No site alternatives are proposed for this project as the placement of the two CSP facilities is strongly dependent on several factors including climatic conditions, topography, grid connection, water supply, the extent of the site, etc. This site has been identified by Abengoa Solar Power South Africa (Pty) Ltd as being highly desirable for development of solar thermal plants due to the following site characteristics:

- **Climatic Conditions**: The economic viability of a solar facility is directly dependent on the annual direct solar irradiation values. The Northern Cape receives the highest average daily direct normal irradiation in South Africa.
- **Water availability**: CSP facilities require water as the heat transfer medium for the generation of high temperature steam which is used to drive a conventional turbine and generator. It is envisioned that the water will be extracted from the Gariep River (a suitable abstraction point will be investigated during the EIA Phase).
- **Topography**: A surface area with favourable topography facilitates the work involved in construction and maintenance of the solar thermal facility (parabolic troughs for example require a level surface preferably with a slope of less than 1%).

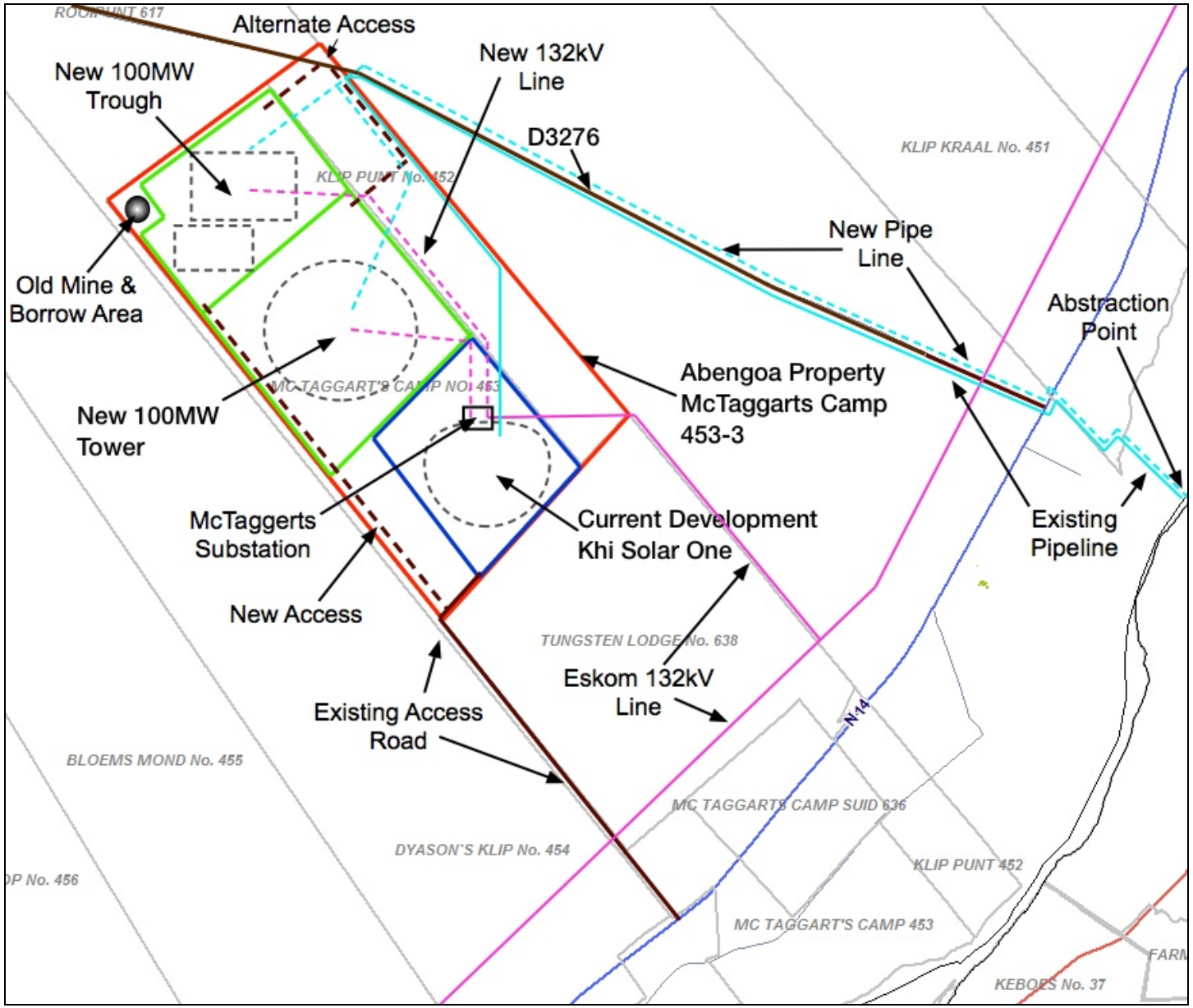


**Figure 2.1:** Preliminary Layout for the Proposed Upington Solar Thermal Plant Two and Plant Three

» **Extent of site:** Space is a restraining factor, for example a 125 MW parabolic trough system requires 300 – 400 ha, and a 125 MW power tower system will require 400 - 500 ha. The proposed site is approximately 22 $km^2$ in extent, which will be sufficient for the installation of the facility on a single site.
» **Power transmission considerations:** A substation is being built on the site for the Khi Solar One CSP project and the two proposed projects are intended to connect directly into this new McTaggarts Substation.
» **Site access**: the site can be accessed via the D3276, or via the N14 national road.

In addition, due to the successful development and construction of the Khi Solar One project on the same site (Portion 3 of the Farm McTaggarts Camp 453); Abengoa Solar Power South Africa (Pty) Ltd is proposing two additional 125MW CSP projects on the farm portion. Land is available on Portion 3 of the Farm McTaggarts Camp 453 which is already owned by Abengoa Solar Power South Africa (Pty) Ltd. Based on these considerations, Abengoa Solar Power South Africa (Pty) Ltd considers the proposed site as *highly preferred* in terms of the development of two additional 125MW CSP projects (Upington Solar Thermal Plant Two and Three) and drawing on synergies.

### *2.1.1. Layout Design Alternatives*

The 125 MW power tower plant will have a development footprint of 400 - 500 ha, and the 125 MW parabolic trough plant will have a development footprint of 300 – 400 ha, to be placed within a broader site of ~2200 ha. Therefore the facility and its associated infrastructure (i.e. powerlines, water supply pipelines and internal roads etc.) can be appropriately located within the broader site (Portion 3 of the Farm McTaggarts Camp 453).

During the Scoping Phase potentially environmentally sensitive areas are being identified for consideration in detail (through site-specific specialist studies) during the EIA Phase. Layout design alternatives are to be planned considering constraining environmental and technical factors. The environmental sensitivity identification process will inform the possible layout design alternatives for the facility, avoiding sensitive areas, as far as possible.

Specific layout alternatives will include *inter alia* different routes for the power line corridor, internal access roads and the water supply pipeline. The layout alternatives will be considered in further detail in the EIA Phase.

### *2.1.2. The 'Do-Nothing' Alternative*

The 'do-nothing' alternative is the option of not constructing the two 125MW CSP projects. However, should this alternative be selected then the benefits of this renewable energy facility will not be realised even though the generation of electricity from renewable energy resources offers a range of socio-economic and environmental benefits for South Africa. These benefits are explored in further detail in the South Africa REFIT Regulatory Guideline published by NERSA (March 2009), and include:

- **Increased energy security:** The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of power supplementation and specifically CSP as it uses conventional steam generation coupled to storage which enhances despatchability i.e. being capable of supplying energy during the peak demand periods when it is most needed. In addition, given that renewables can often be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.
- **Exploitation of our significant renewable energy resource:** At present, valuable national resources including biomass by-products, solar radiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio.
- **Pollution reduction:** The releases of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation.
- **Climate friendly development:** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be responsible for ~1% of global GHG emissions and is currently ranked 9$^{th}$ worldwide in terms of per capita $CO_2$ emissions.
- **Support for international agreements:** The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol, and for cementing its status as a leading player within the international community.
- **Employment creation:** The sale, development, installation, maintenance and management of renewable energy facilities have significant potential for job creation in South Africa.
- **Acceptability to society:** Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.

» **Support to a new industry sector:** The development of renewable energy offers the opportunity to establish a new industry within the South African economy.
» **Protecting the natural foundations of life for future generations:** Actions to reduce our disproportionate carbon footprint can play an important part in ensuring our role in preventing dangerous anthropogenic climate change, thereby securing the natural foundations of life for generations to come.

### *2.1.3. Technology Alternatives*

Abengoa Solar Power South Africa (Pty) Ltd is considering two CSP technology types in order to maximise the capacity and land available on the site, namely: **heliostats and a power tower system (for Plant Two) and parabolic trough technology (for Plant Three).**

Both CSP technologies are based on the operating principle that the power gained from the sun can be maximised if the radiant energy of the sun is gathered and concentrated on a single point. By concentrating the sun's rays, CSP technologies maximise the amount of sunlight that can be converted into electricity, thereby reducing wastage and increasing output.

Technological similarities between power tower and parabolic trough plants include:
» Both technologies operate on a steam turbine system to generate electricity.
» The energy can be stored to enhance despatchability for both technologies.

Technological differences between power tower and parabolic trough plants include:
» Parabolic troughs are typically 5m to 10m in height and a heat transfer fluid is heated within the trough receiver tubes.
» Heliostats are mirrors which reflect the sunlight onto one central receiver – located on top of the power tower which is up to 300m in height.

The Renewable Energy Independent Power Producer Procurement Program selection process (details of which are not yet finalised for future bidding rounds), IRP from Government, and the economics of the solar facility will be key in determining the final technology combination and the schedule of implementation for the facility. At this stage, heliostats and a power tower system (for Plant Two) and parabolic trough technology (for Plant Three) are the only CSP technologies which are technically preferred for the site. Therefore, only these two CSP technologies will be considered in the EIA phase.

## 2.2. Renewable Energy from the Sun is considered a 'Clean Source of Energy'

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

Environmental pollution and the emission of $CO_2$ from the combustion of fossil fuels constitute a threat to the environment. The use of fossil fuels is reportedly responsible for approximately 70% of greenhouse gas emissions worldwide. The climate change challenge needs to include a shift in the way that energy is generated and consumed. Worldwide, many solutions and approaches are being developed to reduce emissions. However, it is important to acknowledge that the more cost effective solution in the short-term is not necessarily the least expensive long-term solution. This holds true not only for direct project cost, but also indirect project cost such as impacts on the environment. Renewable energy is considered a 'clean source of energy' with the potential to contribute greatly to a more ecologically, socially and economically sustainable future. The challenge now is ensuring solar energy projects are able to meet all economic, social and environmental sustainability criteria.

Solar energy has the attractive attribute that the fuel is free. The economics of a solar energy project depend on the solar resource at the site. Detailed and reliable information about this resource is vital when considering the installation of a solar plant. Several technologies exist including Concentrating Solar Power (CSP) plants. The options that are being considered by the applicant are explained in further detail below. The economics of the construction and operation of the solar facility will be key in determining the final technology combination for the total facility.

## 2.3. Technology Descriptions

Solar power generating facilities use the energy from the sun to generate electricity. Concentrating Solar Power (CSP) goes one step further by collecting the incoming solar radiation and concentrating it (focusing or combining it), on a single point, thereby increasing the potential electricity generation.

### *2.3.1 Heliostats and Power Tower Technology proposed for the Upington Solar Thermal Plant Two*

The proposed Upington Solar Thermal Plant Two will consist of heliostats and a Power Tower system with a generation capacity of ~125MW. Infrastructure associated with the CSP Plant includes:

» Power Plant: Power tower with central receiver and heliostat technology including direct steam or salt storage with dry cooling.
» Associated infrastructure: power island with steam turbine generator, access roads, on-site substation, power line, water abstraction point and supply pipe line, water storage tanks, packaged waste treatment plant, lined evaporation ponds, salt or direct steam storage vessels, auxiliary fossil fuel boilers and workshop and office buildings.

A power tower system comprises of a heat collection system and a conventional generating plant portion. The heat collection system consists of **heliostats** (movable, flat reflective mirrors roughly 140 $m^2$ which are oriented according to the sun's position in order to capture and reflect the solar radiation) and a **receiver** (consisting of metal tubes which transfer the heat from the solar radiation to water or molten salt with the purpose of generating steam). The receiver is mounted on a 200m to 300m high **power tower** that provides elevation and structurally supports the receiver. In the generating portion the steam drives a turbine which is connected to a generator (in order to produce electricity).

A conceptual illustration showing the power tower operating system is shown in Figure 2.2.

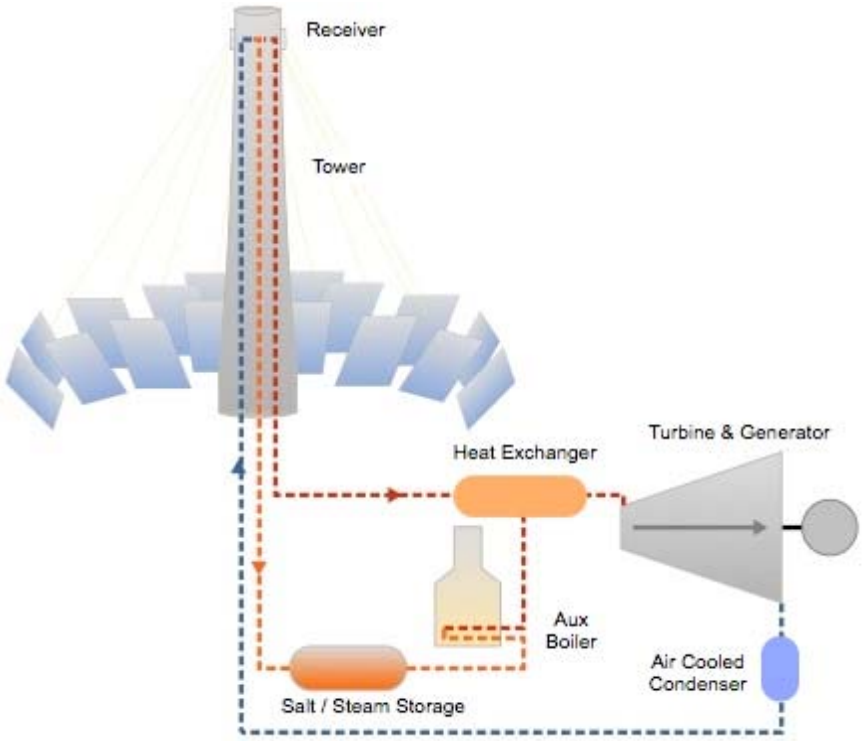


**Figure 2.2:** Illustration of the power tower solar thermal system

Power tower plants must be large to be economical. The heliostat field and the receiver are sized depending on the needs of the utility. A 125MW power tower plant requires an area of 400-500 hectares.

In a typical installation, solar energy collection occurs at a rate that exceeds the maximum required to provide steam to the turbine. The thermal storage system can, therefore, be charged at the same time that the plant is producing power at full capacity. The ratio of the thermal power provided by the heliostat field and receiver to the peak thermal power required by the turbine generator is called the solar multiple. A power tower could potentially operate for 40% - 65% of the year (as from such storage, the system could provide energy, even in cloudy conditions or at night) without the need for a back-up fuel source. However, without energy storage, solar technologies are limited to annual capacity factors near 25% - 30%. Today, the most used solution is the usage of steam or molten salt storage vessels that store the energy to then be distributed when required. Determining the optimum storage size to meet power-dispatch requirements is an important part of the system design process. Storage vessels can be designed with sufficient capacity to power a turbine for up to 6 to 8 hours economically.

The Power tower plant will operate as a Zero Effluent Discharge (ZED) facility, with lined evaporation ponds for the power plant discard stream (boiler blow down and packaged waste treatment plant discard streams). The sand filter backwash stream at the abstraction point is proposed on private property next to the river, which will be used to irrigate adjacent existing crops. Material will be borrowed from the spoils heaps of a worked out tungsten mine in the north-west corner of the property. The plant will connect to the existing Eskom McTaggarts substation on the property. Critical staff will be housed on site during the construction phase.

**Figure 2.3:** CSP power tower plant, courtesy of Abengoa Solar S.A.

### *2.3.2 Parabolic Trough Technology proposed for the Upington Solar Thermal Plant Three*

The proposed Upington Solar Thermal Plant Three will consist of parabolic trough technology with a heat transfer fluid (HTF), and a generation capacity of ~ 125MW. Infrastructure associated with the CPS Plant includes:

» Power Plant: Parabolic troughs utilising a heat transfer fluid (HTF), dry cooling and molten salt storage.
» Associated infrastructure: power island with steam turbine generator, access roads, plant substation, power line, water abstraction point and supply pipe line, water storage tanks, packaged water treatment plant, lined evaporation ponds, salt storage vessels, auxiliary fossil fuel boilers and work shop & office buildings.

A parabolic trough system is comprised of two component groups, firstly a heat collection system and secondly a conventional generating plant portion. The heat collection system is comprised of **parabolic collectors** (i.e. trough-shaped reflectors which focus the solar radiation onto a receiver at its focal point), a **receiver tube / heat collection element** (i.e. a metal absorber containing the heat transfer fluid surrounded by a glass envelope (maintaining a vacuum), which absorbs the solar energy received from the parabolic trough), a **sun-tracking system** (i.e. an electronic control system and associated mechanical drive system used to focus the reflector onto the sun), and support structure (i.e. holds the parabolic trough in accurate alignment with incoming solar radiation while resisting the effects of the wind). The collected energy in the heat transfer fluid is used to generate steam through a conventional heat exchanger system that is in turn used for electricity generation in a conventional steam turbine and generator.

A conceptual illustration showing the power tower operating system is shown in Figure 2.4.

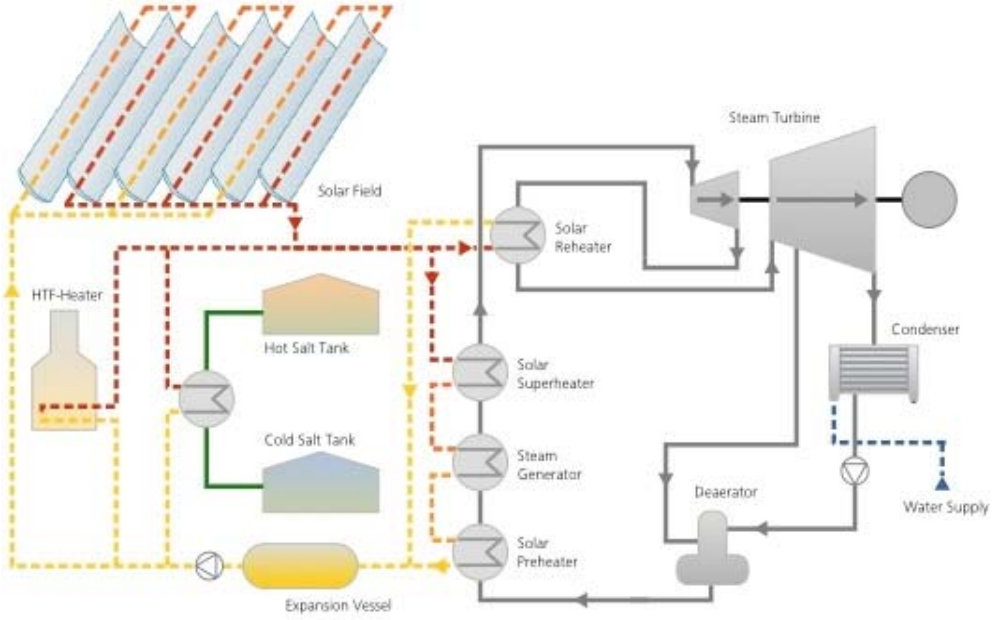


**Figure 2.4:** Illustration of the parabolic trough solar thermal system

The parabolic trough system requires an area of 300-400 hectares. The CSP plant will operate as a Zero Effluent Discharge (ZED) facility, with lined evaporation ponds for the power plant discard stream (boiler blow down and packaged water treatment plant discard streams). The sand filter backwash stream at the abstraction point is proposed on private property next to the river, which will be used to irrigate adjacent existing crops. Material will be borrowed from the spoils heaps of a worked out tungsten mine in the north-west corner of the property. The plant will connect to the existing Eskom McTaggarts substation on the property. Critical staff will be housed on site during the construction phase.

**Figure 2.5:** CSP parabolic troughs, courtesy of Abengoa Solar S.A.

### *2.3.3 Functioning of CSP Facilities*

The following stages form part of the operating function of the CSP systems.

**Stage 1:** the water is pumped from low to high pressure and steam is extracted from the steam turbine generator and is used to pre-heat the water prior to entering the steam generator system (i.e. this increases overall cycle efficiency).

**Stage 2:** the high pressure working fluid enters the steam generator system where it is heated by the heat transfer fluid or receiver to become super-heated steam.

**Stage 3:** The super-heated steam expands through the high pressure section of the steam turbine turning the generator to produce electricity. This steam is then reheated in a re-heater that is part of the steam generator system and sent to the low pressure steam turbine. All sections of the steam turbine generator decrease the temperature and pressure of the steam with the low pressure section extracting the last available energy until the steam is operating under vacuum pressure.

**Stage 4:** the wet steam from the low pressure section of the steam turbine then enters the condenser where it is condensed back into a saturated liquid which is returned to stage 1. The solar field provides the heat input into stage 2 and for the re-heater in stage 3. As the heat transfer fluid or water is circulated through the solar field / power tower receiver, light from the sun reflects off the solar collectors (i.e. parabolic troughs / heliostats) and is concentrated on the heat collection elements located at the focal point of the parabolic troughs/receiver. Fluid flowing through these elements absorbs the heat and provides a high-temperature energy source for the entire cycle.

Low quality waste heat is rejected at stage 4. As the turbine exhaust is condensed, the heat is transferred to the dry cooling tower or air cooled condenser.

## 2.4. Construction Phase

In order to construct each solar thermal plant and associated infrastructure, a series of activities will need to be undertaken. The construction process is discussed in more detail below and applies to both CSP technologies (i.e. heliostats and a power tower system (for Plant Two) and parabolic trough technology (for Plant Three).

### *2.4.1 Conduct Surveys*

Prior to initiating construction, a number of surveys will be required including, but not limited to, a geotechnical survey, a site survey and confirmation of the micro-

siting footprint, survey of substation site/s and survey of power line, water supply and road servitudes.

### *2.4.2 Establishment of Access Roads to the Site*

The broader site can be accessed via a secondary road (i.e. D3276) which connects with the N14. Within the site itself, access will be required from this existing secondary road to the individual facility components for construction purposes (and later limited access for maintenance). The amount of earthworks and compaction required in the establishment of the access roads will be established through the detailed geotechnical study to be conducted for the site.

Depending on the technology choices there will be one internal surfaced access road of approximately 6m in width which will lead directly to the power island. Between the heliostats/troughs/photovoltaic panels there will be a stabilised gravel track that would be used for maintenance purposes during the operational phase. The final layout of the access roads will be determined following the identification of site related sensitivities.

### *2.4.3 Undertake Site Preparation*

Site preparation activities will include clearance of vegetation at the footprint of each component and the establishment of internal access roads. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.

### *2.4.4 Transport of Components and Equipment to Site*

The components for the proposed facility will be transported to site in sections by road. Some of the power station components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[2] by virtue of the dimensional limitations (i.e. length and weight). Components of various specialised construction and lifting equipment are required (e.g. for the power tower) and will need to be transported to site. In addition to the specialised lifting equipment/cranes, the typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the establishment of the substation and power line.

The equipment will be transported to the site using appropriate National, Provincial and local roads, and then the dedicated access/haul road to the site itself. In some instances, the dimensional requirements of the loads to be transported during the

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

construction phase (length/height) may require alterations to the existing road infrastructure (e.g. widening on corners), and protection of road-related structures (i.e. bridges, culverts, etc) as a result of abnormal loading.

### *2.4.5 Establishment of Laydown Areas on Site*

Laydown and storage areas will be required for the typical construction equipment which will be required on site. Hardstanding areas will also need to be established for operation of any cranes used on site.

### *2.4.6 Construct Power Island and Substation*

A steam turbine and generator will be housed within a 2-storey building (power island). A generator transformer and a small substation will be established outside the building. The position of the power island and substation within the site footprint will be informed by the final positioning of the solar generating components.

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

### *2.4.7 Establishment of Ancillary Infrastructure*

Ancillary infrastructure includes a water supply pipeline/s to the facility from the extraction point on the Gariep River, a de-gritting and basic filtration facility at the abstraction point, a water treatment plant and water storage facilities on the site, and a blow down or evaporation pond (for wastewater from the generation process). A workshop, storage areas as well as a contractor's equipment camp may also be required.

The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required.

### *2.4.8 Connect Substation to Power Grid*

An overhead power line will feed into the McTaggarts Substation which is on the same property as the proposed facilities (constructed for the Khi Solar One project). A substation is being built on the site for the Khi Solar One CSP project and the two

proposed CSP projects are intended to connect into this new McTaggarts Substation via two 132 kV overhead power lines (each ~5-8 km in length).

### *2.4.9 Undertake Site Remediation*

Once construction is completed and once all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operational phase must be closed and prepared for rehabilitation.

## 2.5. Operation Phase

The operations phase is discussed in more detail below. A simplified flow chart of the general operation of a Solar Thermal Plant showing inputs and outputs of the process is shown in the table below.

**Table: 2.1:** Process Flow For A Solar Thermal Plant – Operational Phase Only

| INPUT | PROCESS | OUTPUT |
|---|---|---|
| Solar energy | **Solar thermal energy generation process** | *Positive outputs:* Energy / electricity |
| Water | | *Negative outputs:* Waste water |
| Fossil fuel to start up | | *Negative outputs:* Exhaust fumes / $Co^2$ |
| Dosing chemicals for water treatment plant | | *Negative outputs:* Waste water / brine stream to evaporation ponds |

### *2.5.1 Sourcing of water for the CSP components*

The CSP technologies function through the generation of steam to drive a conventional steam turbine and generator. Therefore, suitable and sufficient water resources will be required. The water will be sourced through an extraction point on the Gariep River. Water supply pipelines will be constructed and the required volume of water treated and pumped to the facility. Potable water will also be required for on-site staff.

### *2.5.2 Water supply, use, and treatment – Phase 2 and Phase 3*

Two water treatment works will be required, as well as blow down brine handling. The water treatment works will include a primary treatment or basic sand filtration plant at the supply source, as well as a reverse osmosis and deionisation packaged water treatment plant at the site. A water supply pipeline will be established from

the extraction point on the Gariep River to the site. Abstracted water will be pumped to a holding reservoir for supply buffering. A second storage reservoir will be located on the identified site itself. The water use of the facility for one 125MW CSP Plant will include (refer to Table 2.2):

» Makeup water for the steam generator
» Water for mirror washing
» Service water
» Potable water
» Fire protection water

**Table 2.2:** Estimated water consumption for One 125MW CSP Plant

| Description | Approximate annual use ($m^3$/year) |
|---|---|
| Raw water consumption | 300,000 |
| Mirror washing | 80,000 |
| Boiler makeup | 60,000 |
| Evaporation ponds discard stream | 85,000 |

In order to reduce the overall water consumption and the requisite sizing of the evaporation ponds, service water will first be used as makeup. Water conditioning chemicals may be fed into the makeup water to minimise corrosion and to inhibit mineral scale formation. The blow down from the circulating water will be continually treated by lime-softening clarification and filtration processes and then delivered to a clear well where the water will be treated by reverse osmosis prior to being used for other plant requirements. Prior to the reverse osmosis process, ion-exchange softeners will be used to remove any dissolved hardness minerals that remain after the clarifier. The discard brine stream will be delivered to the evaporation ponds.

### *2.5.3 Waste Management Activities – Evaporation Ponds*

#### a. How does the Waste Water Treatment System work?

The effluent from the CSP Plant will discharge into the packaged water treatment plant. The packaged water treatment plant will be utilised for each CSP Plant to treat waste water. During the treatment of the waste water, the brine stream is separated. The rejected water (brine stream) will be discharged into the evaporation ponds. The water treatment plant will link to the evaporation ponds by means of a waste discharge pipeline from the waste tank. The residual solids will remain in the evaporation pond for the duration of the plant life. The evaporation pond is the final discharge point for brine.

### b. Technical Information about the evaporation ponds

Up to 6 evaporation ponds in total will be required for both CSP plants. The purpose of the evaporation ponds are to receive the water discard stream from the generation process which mainly consist of the brine stream from cleansing and regenerating the ion exchange filters (resins) in the water treatment plant. The quantity of brine within the evaporation ponds will exceed $100m^3$ at any given time; therefore a waste licence in terms of the NEM: Waste Act is required. The evaporation ponds will be located on the site and within the development footprint. The proposed facility will be operated as a Zero Liquid Effluent Discharge (ZLED) facility; therefore no wastewater from the evaporation ponds will be permitted to be released into the environment/ any water bodies. Each pond will have a surface area of approximately 1ha and be 1.5m deep including free board. A picture of a typical evaporation pond required for a CSP Plant is shown in Figure 2.5.

**Figure 2.5:** Picture of a typical Evaporation Pond utilised for a CSP Plant

### c. Evaporation Pond Management

The plant waste discard stream will be piped from the power island wastewater tank at ambient temperature to onsite dual lined surface evaporation ponds for de-watering. The ponds will be designed so that the residual solids will not require removal for the duration of the Project's operating life. If solids removal is necessary for pond maintenance reasons, the removed solids will be shipped to an appropriate offsite disposal facility.

Multiple ponds are planned for each CSP Plant to allow plant operations to continue in the event that a pond needs to be taken out of service for maintenance purposes

etc. Each pond will have enough surface area so that the evaporation rate exceeds the blow-down rate at maximum design conditions and at annual average climatic conditions. The planned pond depth (capacity) is therefore intended to avoid the need for residual solids removal during the life of the Project. While the waste constituents in the liquid waste stream are not classified as hazardous. The ponds will be designed in accordance with international and local SANS (1526:2003 - Thermoplastics sheeting for use as a Geomembrane and installation guidelines; 10409:2004 - Design, selection and installation of Geomembranes), requirements and will incorporate 1.5mm HDPE liners with a leachate (leak detection system), to ensure no ground contamination.

The evaporation ponds will have leak detection and ground water monitoring programs. Typical evaporation ponds discard streams will have a total dissolved solids (TDS) of 60,000 ppm at a temperature of 40ºC and be roughly 85 000 cubes per annum - obviously production or solar resource dependant. Should a leak be detected, will the leaking pond in question immediately be drained into adjacent ponds and all solid waste removed. Non-hazardous solid wastes (maintenance-derived wastes) will be recycled to the extent practical. Those maintenance-derived wastes that cannot be recycled will be transported for disposal at a Class III landfill. In the case of a catastrophic failure of one of the ponds or overflow (however unlikely it is to occur), the contaminated topsoil layer will be removed and treated in a remedial soil treatment area and disposed of at an appropriate offsite disposal facility.

The remaining residue within the evaporation ponds will be stored in the pond, until the end of the CSP Plants life span, where the residue will be removed, and the evaporation pond sites will be remediated and rehabilitated.

### *2.5.4 Site Operation and Maintenance*

It is anticipated that a full-time security, maintenance and control room staff will be required on site. Each component within the solar thermal plant will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions or maintenance activities.

## 2.6. Decommissioning Phase

The solar thermal plant is expected to have a design lifespan of approximately 35 years (extendable with appropriate refurbishment), and the power plant infrastructure would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility discussed in this EIA would comprise the disassembly and

replacement of the individual components with more appropriate technology/infrastructure available at that time.

The following decommissioning activities will form part of the project scope.

### *2.6.1. Site Preparation*

Site preparation activities will include confirming the integrity of the access to the site to accommodate the required equipment (e.g. lay down areas, construction platform) and the mobilisation of decommissioning equipment.

### *2.6.2. Disassemble and Replace Existing Components*

The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

# APPROACH TO UNDERTAKING THE SCOPING PHASE CHAPTER 3

An Environmental Impact Assessment (EIA) process refers to that process (in line with the EIA Regulations) which involves the identification of and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project/ activity. The EIA process comprises two main phases: i.e. **Scoping Phase** and **EIA Phase**. The EIA process culminates in the submission of an EIA Report (including an Environmental Management Programme (EMPr)) to the competent authority for decision-making. The EIA process is illustrated below:


**Figure 3.1:** The Phases of an EIA Process

Abengoa Solar Power South Africa (Pty) Ltd is proposing the construction of two 125MW commercial solar thermal electricity generating facilities and associated infrastructure on different areas within Portion 3 of the Farm McTaggarts Camp 453, near Upington. This scoping report is applicable to the Upington Solar Thermal Plant Two and Upington Solar Thermal Plant Three. The Scoping Phase for the proposed projects has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010 as amended, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). In accordance with these Regulations, this scoping process aimed at identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project involving desk-top specialist studies , as well as a consultation process with key stakeholders (including relevant government authorities) and interested and affected parties (I&APs). This chapter serves to outline the process which was followed during the Scoping Phase of the EIA process.

## 3.2. Objectives of the Scoping Phase

This Scoping Phase aimed to:

» Identify and evaluate potential environmental (biophysical and social) impacts and benefits of all phases of the proposed development (including design, construction, operation and decommissioning) within the broader study area through a desk-top review of existing baseline data and specialist input (where relevant).
» Identify potentially sensitive environmental features and areas on the site to inform the preliminary design process of the facility.
» Define the scope of studies to be undertaken within the EIA process.
» Provide the authorities with sufficient information in order to make a decision regarding the scope of issues to be addressed in the EIA process, as well as regarding the scope and extent of specialist studies that will be required to be undertaken as part of the EIA Phase of the process.

Within this context, the objectives of this Scoping Phase are to:

» Clarify the scope and nature of the proposed activities.
» Clarify the reasonable and feasible project-specific alternatives to be considered through the EIA process, including the "do nothing" option.
» Identify and evaluate key environmental issues/impacts associated with the proposed project, and through a process of broad-based consultation with stakeholders and desk-top specialist studies, identify those issues to be addressed in more detail in the Impact Assessment Phase of the EIA process, as well as potentially sensitive environmental features and areas which should be considered in the preliminary design phase.
» Conduct an open, participatory, and transparent public involvement process and facilitate the inclusion of stakeholders concerns regarding the proposed project into the decision-making process.

## 3.2. Overview of the Scoping Phase

The Scoping Phase has been undertaken in accordance with the EIA Regulations published in terms of NEMA in Government Notice 33306 of 18 June 2010 as amended. Key tasks undertaken within the scoping phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Submission of two application forms (one for each phase of the proposed development) for integrated environmental authorisation and waste management licencing in terms of Regulation 12 and 26 of Government Notice No R543 of 2010 and the Waste Act (Act No 59 of 2008 to the competent authority (DEA).

- Undertaking a public involvement process throughout the Scoping process in accordance with Chapter 6 of Government Notice No R543 of 2010 in order to identify issues and concerns associated with the proposed project.
- Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of Government Notice No R543 of 2010). This Comments and Response Report will be included in the Final Scoping Report.
- Undertaking of independent specialist studies in accordance with Regulation 32 of Government Notice No R543 of 2010.
- Preparation of a Draft Scoping Report and Plan of Study for EIA in accordance with the requirements of the Regulation 28 Government Notice No R543 of 2010.

The tasks are discussed in detail below.

### *3.2.1. Authority Consultation and Application for Authorisation in terms of GNR543 of 2010*

As this is an **energy generation** project the National Department of Environmental Affairs (DEA) is the competent authority for this application. As the project falls within the Northern Cape Department of Environmental and Nature Conservation (DENC) acts as a commenting authority for the project. Consultation with these authorities has been undertaken throughout the Scoping process. This consultation has included the following:

- Submission two application forms for integrated environmental authorisation and waste management licencing DEA. Authorisation to continue with the Scoping Phase of the project was granted as the applications were accepted by DEA under the following reference numbers allocated by DEA:
    - 14/12/16/3/3/3/98 - Upington Solar Thermal Plant Two
    - 14/12/16/3/3/3/99 - Upington Solar Thermal Plant Three

A record of all authority consultation undertaken prior to and within the Scoping Phase is included within Appendix B.

### *3.2.2. I&AP Identification, Registration and the Creation of an Electronic Database*

The first step in the public involvement process was to identify relevant stakeholders and interested and affected parties (I&APs). This process was undertaken through existing contacts and databases, recording responses to site notices and newspaper advertisements, as well as through the process of networking. Stakeholder groups identified include:

» Provincial and local government departments (including DEA, DENC, SAHRA, PHRA, Department of Water Affairs, Department of Agriculture and Land Reform; SANRAL, etc)
» Government Structures (including the Provincial Roads Authority, municipal planning departments, etc)
» Kai !Garib Local Municipality and ZF Mgcawu (*previously Siyand*a) District Municipality
» Potentially affected and neighbouring landowners and tenants
» Conservation authorities
» Industry and business; and
» CBOs and other NGOs

All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to Appendix C for a listing of recorded parties). While I&APs have been encouraged to register their interest in the project from the start of the process, the identification and registration of I&APs will be on-going for the duration of the EIA process. The project database will be updated on an on-going basis throughout the project process, and will act as a record of the parties involved in the public involvement process.

### *3.2.3. Notification of the EIA Process*

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

» The Volksblad (30 October 2013)
» Gemsbok (30 October 2013)

The same newspaper adverts advertised the draft scoping report for public review and the public meeting. Site advertisements were placed on the site (fence and/boundaries) and in public places in accordance with the requirements of the EIA Regulations. Refer to Appendix D for site notices and adverts.

In addition to the above advertisements and notices, key stakeholders and registered I&APs were notified in writing of the commencement of the EIA process. These parties included, inter alia:

» Relevant parties from Municipalities potentially affected (directly or indirectly) by the proposed project
» Communities affected landowners and adjacent landowners (within 100m of the boundary of the site).

» Organ of state having jurisdiction in respect of any aspect of the activity, including:
  * Northern Cape Department of Environmental and Nature Conservation (DENC)
  * Northern Cape - Agriculture and Rural Development
  * Northern Cape - Public Works, Roads and Transport
  * Northern Cape – Department of Water Affairs
  * South African Heritage Resources Agency
  * Northern Cape Provincial Heritage Resources Authority (Ngwao-Boswa Jwa Kapa Bokone)
  * SANRAL
  * Kai !Garib Local Municipality
  * ZF Mgcawu District Municipality
  * Eskom
  * Department of Energy
  * National Department of Agriculture, Forestry and Fisheries

Copies of all the advertisements placed and notices distributed are contained in Appendix D and Appendix E of this report.

### *3.2.4. Public Involvement and Consultation*

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

» All potential stakeholders and I&APs are identified and consulted with;
» Information containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs;
» Participation by potential I&APs is facilitated in such a manner that all potential stakeholders and I&APs are provided with a reasonable opportunity to comment on the application; and
» Comment received from stakeholders and I&APs is recorded.

In order to provide information regarding the proposed project and the EIA process, a background information document (BID) which provided information pertaining to both projects was compiled for distribution (refer to Appendix E). The BID was distributed to identified stakeholders and I&APs, and additional copies were made available at public venues within the broader study area.

Through consultation with key stakeholders and I&APs, issues for inclusion within the issues-based scoping study were identified and confirmed. In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their views, issues and concerns regarding the project, various opportunities have been and will continue to be provided for I&APs to have their

issues noted after the release of the Draft Scoping Report for public review, as follows:

» **Public meeting** in the study area (open meeting advertised in the local press)
» **Focus group meetings** (pre-arranged and stakeholders invited to attend)
» One-on-one **consultation meetings** (for example with directly affected or surrounding landowners)
» **Telephonic** consultation sessions
» Written, faxed or e-mail **correspondence**

Networking with I&APs will continue throughout the duration of the EIA process.

### *3.2.5. Identification and Recording of Issues and Concerns*

All comments received from stakeholders and I&APs on the proposed project will be included in the Final Scoping Report. A Comments and Response Report will be compiled to include all comments received during the scoping phase of the process, including those received in the public review period of the draft Scoping Report.

### *3.2.6. Evaluation of Issues Identified through the Scoping Process*

Issues (both direct and indirect environmental impacts) associated with the proposed project identified within the scoping process have been evaluated through desk-top studies. A Scoping Process was undertaken by Savannah Environmental in 2010 for Phase 1 of the Upington Solar Thermal Plant (DEA Ref. No: 12/12/20/1831) for the same developer[3]. The Scoping Report covered the entire extent of Portion 3 of Farm McTaggarts Camp 453 and included the following specialist studies:

| Specialist Study Undertaken | Specialist |
|---|---|
| Ecology, flora and fauna scoping study | David Hoare Consulting cc |
| Avifauna scoping study | Birdlife South Africa |
| Soils and Agricultural potential scoping study | Agricultural Research Council: Institute for Soil, Climate and Water |
| Water Resources scoping study | Scherman, Colloty and Associates |
| Heritage scoping study | The McGregor Museum |
| Visual scoping study | MetroGIS |
| Noise scoping study | MENCO (M2 Environmental Connections |

[3] Savannah Environmental (2010) Final Scoping Report: Proposed Upington Solar Thermal Plant, Northern Cape

| | |
|---|---|
| | cc) |
| Social scoping study | Tony Barbour Consulting and Research |
| Geology scoping study | Outeniqua Geotechnical Services |

Therefore, the information contained in the Scoping Report for Phase 1 of the Upington Solar Thermal Plant has been considered and used to inform this scoping, and additional studies have also been undertaken to fill any gaps in knowledge and to provide relevant and updated information to commenting authorities including the following:

| Specialist | Area of Expertise | Refer Appendix |
|---|---|---|
| Marianne Strohbach (Savannah Environmental) | Ecology | Appendix F |
| Johann Lanz | Soil and Agricultural Potential | Appendix G |
| David Morris (McGregor Museum) | Heritage | Appendix H |

In order to evaluate issues and assign an order of priority, it was necessary to identify the characteristics of each potential issue/impact:

» *the nature*, which includes a description of what causes the effect, what will be affected and how it will be affected
» *the extent*, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional

The evaluation of the issues resulted in a statement regarding the potential significance of the identified issues, as well as recommendations regarding further studies required within an EIA. Specialist Scoping Reports are contained within Appendices F – I.

### *3.2.7. Public Review of Draft Scoping Report and Feedback Meeting*

This is the **final stage** of the Scoping Phase. The Draft Scoping Report has been made available for public review from 29 October 2013 – 28 November 2013 at the following locations:

» Khara Hais Public Library, Market Street, Upington
» Keimoes Public Library, Main Street, Keimoes
» The report is also available for download from www.savannahsa.com

In order to facilitate comments on the Draft Scoping Report, a public meeting was held during the review period for the Draft Scoping Report as follows:

» **Date:** 11 November 2013

» **Time:** 18h00
» **Venue:** Keimoes Hotel, 46 Main Street, Keimoes

The public review process and details of the public meeting were advertised in regional and local newspapers (Volksblad and Gemsbok on 30 October 2013). In addition, all registered I&APs were notified of the availability of the report and public meeting by letter (refer to Appendix E).

#### *3.2.8. Final Scoping Report*

This final stage in the Scoping Phase entailed the capturing of responses from stakeholders and I&APs on the Draft Scoping Report in order to refine this report. It is this final report upon which the decision-making environmental Authorities provide comment, recommendations, and acceptance to undertake the EIA Phase of the process.

### 3.3 Regulatory and Legal Context

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. As solar energy development is a multi-sectoral issue (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process for solar energy facility project and the related statutory environmental assessment process.

#### *3.3.1. Regulatory Hierarchy*

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

» *Department of Energy:* This Department is responsible for policy relating to all energy forms, including renewable energy, and is responsible for forming and approving the IRP (Integrated Resource Plan for Electricity).
» *National Energy Regulator of South Africa (NERSA):* This body is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses for solar energy developments to generate electricity.
» *Department of Environmental Affairs (DEA):* This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
» *The South African Heritage Resources Agency (SAHRA):* The National Heritage Resources Act (Act No 25 of 1999) and the associated provincial regulations

provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes.

» *National Department of Agriculture, Forestry, and Fisheries (DAFF):* This Department is responsible for activities pertaining to subdivision and rezoning of agricultural land. The forestry section is responsible for the protection of tree species under the National Forests Act (Act No 84 of 1998).
» *South African National Roads Agency (SANRAL):* This Agency is responsible for the regulation and maintenance of all national routes.
» *National Department of Water Affairs:* This Department is responsible for water resource protection, water use licensing and permits. Water use in this area of the Northern Cape cannot be generally authorised, and so all water uses are required to be authorised at the National level via a licence application.
» *Eskom:* Commenting authority regarding Eskom infrastructure and grid connection.

At **Provincial Level**, the main regulatory agency is:

» Northern Cape Department of Environmental and Nature Conservation (DENC). This department is the commenting authority for this project.
» *Department of Transport and Public Works:* This Department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on Provincial public roads.
» *Provincial Department of Water Affairs:* This Department is responsible for water resource protection, water use licensing and permits.
» *Ngwao Boswa ya Kapa Bokone (Northern Cape Heritage Authority):* This body is responsible for commenting on heritage related issues in the Northern Cape Province.
» *Northern Cape Department of Agriculture, Land Reform and Rural Development:* This Department is responsible for all matters which affect agricultural land.
» *Northern Cape Department of Mineral Resources (DMR):* Approval from the may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that might occur on site.

At **Local Level** the local and municipal authorities are the principal regulatory authorities responsible for planning, land use, and the environment. i.e. the Kai !Garib Local Municipality and the ZF Mgcawu District Municipality.

» The Kai !Garib Local Municipality is located within the ZF Mgcawu District Municipality.

- In terms of the Municipal Systems Act (Act No 32 of 2000) it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.
- Spatial Development Frameworks (such as the ZF Mgcawu District Municipality SDF).
- By-laws and policies have been formulated by local authorities to protect visual and aesthetic resources relating to urban edge lines, scenic drives, special areas, signage, communication masts, etc.

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

### *3.3.2 Legislation and Guidelines that have informed the preparation of this Scoping Report*

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

- National Environmental Management Act (Act No 107 of 1998)
- EIA Regulations, published under Chapter 5 of the NEMA (GNR R545, GNR 546 in Government Gazette 33306 of 18 June 2010) as amended
- Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010)
  - Public Participation in the EIA Process (DEA, 2010)
- International guidelines – the Equator Principles and the International Finance Corporation and World Bank Environmental, Health, and Safety Guidelines for Wind Energy (2007).
- Astronomy Geographic Advantage Act (Act No. 21 of 2007)

Several other Acts, standards or guidelines have also informed the project process and the scope of issues evaluated in the scoping report, and to be addressed in the EIA. A listing of relevant legislation identified at this stage of the process is provided in Table 3.1. A more detailed review of legislative requirements applicable to the proposed project will be included in the EIA phase.

**Table 3.1:** Initial review of relevant policies, legislation, guidelines, and standards applicable to the proposed Sirius Solar PV project

| Legislation | Applicable Sections |
|---|---|

| ***National Legislation*** | |
|---|---|
| Constitution of the Republic of South Africa (Act No 108 of 1996) | » Bill of Rights (S2)<br>» Environmental Rights (S24) – i.e. the right to an environment which is not harmful to health and well-being<br>» Rights to freedom of movement and residence (S22)<br>» Property rights (S25)<br>» Access to information (S32)<br>» Right to just administrative action (S33) |
| National Environmental Management Act (Act No 107 of 1998) | » National environmental principles (S2), providing strategic environmental management goals and objectives of the government applicable throughout the Republic to the actions of all organs of state that may significantly affect the environment<br>» NEMA EIA Regulations (GN R544, 545 & 546 of 18 June 2010) The requirement for potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority (S24 – Environmental Authorisations)<br>» Duty of Care (S28) requiring that reasonable measures are taken to prevent pollution or degradation from occurring, continuing or recurring, or, where this is not possible, to minimise & rectify pollution or degradation of the environment<br>» Procedures to be followed in the event of an emergency incident which may impact on the environment (S30) |
| Environment Conservation Act (Act No 73 of 1989) | » National Noise Control Regulations (GN R154 dated 10 January 1992) |
| National Heritage Resources Act (Act No 25 of 1999) | » Stipulates assessment criteria and categories of heritage resources according to their significance (S7)<br>» Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35)<br>» Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36)<br>» Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development (S38)<br>» Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44) |

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| National Environmental Management: Biodiversity Act (Act No 10 of 2004) | » Provides for the MEC/Minister to list ecosystems which are threatened and in need of protection (S52) – none have as yet been published<br>» Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) - none have as yet been published<br>» A list of threatened & protected species has been published in terms of S 56(1) - Government Gazette 29657.<br>» Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations).<br>» This Act also regulates alien and invader species.<br>» Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species. |
| National Environmental Management: Air Quality Act (Act No 39 of 2004) | » Measures in respect of dust control (S32) – no regulations promulgated as yet<br>» Measures to control noise (S34) - no regulations promulgated as yet |
| Conservation of Agricultural Resources Act (Act No 43 of 1983) | » Prohibition of the spreading of weeds (S5)<br>» Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) and restrictions in terms of where these species may occur<br>» Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048)<br>» Soil protection/conservation, and erosion control |
| National Water Act (Act No 36 of 1998) | » National Government is the public trustee of the Nation's water resources (S3)<br>» Entitlement to use water (S4) – entitles a person to use water in or from a water resource for purposes such as reasonable domestic use, domestic gardening, animal watering, fire fighting and recreational use, as set out in Schedule 1. General Authorisation Government Gazette No. 20526 8 October 1999 is of relevance.<br>» Duty of Care to prevent and remedy the effects of pollution to water resources (S19)<br>» Procedures to be followed in the event of an emergency incident which may impact on a water resource (S20) |

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| | » Definition of water use and requirement for water use licenses for certain activities (S21)<br>» Requirements for registration of water use (S26 and S34)<br>» Definition of offences in terms of the Act (S151) |
| National Environmental Management: Waste Act (Act No 59 of 2008) | » The purpose of this Act is to reform the law regulating waste management in order to protect health and the environment by providing for the licensing and control of waste management activities.<br>» The Act provides listed activities requiring a waste license, which is being applied for these projects. |
| National Forests Act (Act No 84 of 1998) | » Protected trees: According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.<br>» Forests: The Act prohibits the destruction of indigenous trees in any natural forest without a licence. |
| Minerals and Petroleum Resources Development Act (Act No 28 of 2002) | A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act.<br><br>Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.<br><br>S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that might occur on site |
| Hazardous Substances Act (Act No 15 of 1973) | This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic |

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| | products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. |
| Development Facilitation Act (Act No 67 of 1995) | Provides for the overall framework and administrative structures for planning throughout the Republic.<br><br>S(2-4) provide general principles for land development and conflict resolution |
| Subdivision of Agricultural Land Act (Act No 70 of 1970) | Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the Province |
| National Road Traffic Act (Act No 93 of 1996) | An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width). |
| Promotion of Access to Information Act (Act No 2 of 2000) | All requests for access to information held by state or private body are provided for in the Act under S11. |
| Promotion of Administrative Justice Act (Act No 3 of 2000) | In terms of S3 the government is required to act lawfully and take procedurally fair, reasonable, and rational decisions.<br><br>Interested and affected parties have a right to be heard. |
| National Veld and Forest Fire Act (Act No 101 of 1998) | » Formation of fire protection associations (S3)<br>» Registration of fire protection associations (S4)<br>» Duty to prepare and maintain firebreaks (S12)<br>» Requirements for firebreaks (S13)<br>» Readiness for fire fighting (S17)<br>» Penalties (S24) and Offences (S25) |
| Astronomy Geographic Advantage Act (Act No. 21 of 2007) | » In terms of section 7(1) and 7(2) of this Act, the Minister declared core astronomy advantage areas on 20 August 2010 under Regulation No. 723 of Government Notice No. 33462. in this regard, all land within a 3 kilometres radius of the centre of the Southern African large Telescope dome falls under the Sutherland Core Astronomy Advantage Area. The declaration also applies to the core astronomy |

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| | advantage area containing the MeerKAT radio telescope and the core of the planned Square Kilometre Array (SKA) radio telescope. The study area does not fall within the 3 km radius of SALT or within an area which could affect the MeerKAT and SKA developments.<br><br>» Under Section 22(1) of the Act the Minister has the authority to protect the radio frequency spectrum for astronomy observations within a core or central astronomy advantage area. As such, the Minister may still under section 23(1) of the Act, declare that no person may undertake certain activities within a core or central astronomy advantage area. These activities include the construction, expansion or operation of any fixed radio frequency interference source, facilities for the generation, transmission or distribution of electricity, or any activity capable of causing radio frequency interference or which may detrimentally influence the astronomy and scientific endeavour |
| ***Provincial Legislation*** | |
| Northern Cape Nature Conservation Act, Act No. 9 of 2009 | This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:<br>» Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property;<br>» Aquatic habitats may not be destroyed or damaged;<br>» The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species.<br>» The Act provides lists of protected species for the Province. |
| ***Guideline Documents*** | |
| Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads | » Outlines the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits |

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| Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa | » Provision of a guideline and approach to conducting avifaunal specialist studies at the desktop, EIA and post-construction monitoring stages. |
| Northern Cape Provincial Spatial Development Framework (2012) | » The PSDF notes that renewable energy has been identified in the Draft 4 PGDS (2011) as a mechanism to diversify the economy and thereby promote a green economy in the province.<br>» According to the PGDS, greening the economy is characterised by substantially increased investments in economic sectors (NCPG; 2011: F.1.4.1). Volume 2 of the PSDF indicates that the promotion of job creation in the green jobs industries (e.g. manufacturing of solar water heaters, maintenance of wind generators and solar energy infrastructure) would be promoted in the forthcoming spatial directives and strategies reports (Volumes 3-4).<br>» The PSDF notes that the NCP has considerable potential for renewable energy generation, including solar energy. |
| ***Policies and White Papers / Planning Documents*** | |
| The White Paper on the Energy Policy of the Republic of South Africa (December 1998) | » Investment in renewable energy initiatives, such as the proposed solar energy facility, is supported by this white Paper. |
| The White Paper on Renewable Energy (November 2003) | » This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. |
| ZF Mgcawu District Municipality's Environmental Management Framework (2008) | » The purpose of the EMF is to ensure that future development in the ZF Mgcawu DM area occurs in a manner that is appropriate to the unique features and character of the area. |
| The Department of Agriculture, Forestry and Fisheries (DAFF) | » This report states that 'it is important to conduct land use in a way that it optimally adheres to the potential of the land. Consequently, it is imperative that all available land with the potential for producing sustained high crop yields, thus land with a high agricultural production potential, as well as land with a potential carrying capacity for livestock, be effectively utilized and protected for agricultural use.<br>» Agricultural production or the use of land for any other purpose should nevertheless not be conducted in a way that it could result in the degradation or loss of the available natural resources. This especially has reference in ensuring that high |

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| | potential and unique agricultural land is preserved for current and future production thereby ensuring sustainable utilization of the country's natural resource base and adhering to food security.'' |

# DESCRIPTION OF THE RECEIVING ENVIRONMENT CHAPTER 4

This section of the Scoping Report provides a description of the environment that may be affected by the proposed Upington Solar Thermal Plant Two and Three. This information is provided in order to assist the reader in understanding the receiving environment within which the proposed facility is situated. Features of the biophysical, social and economic environment that could directly or indirectly be affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area, the Scoping and EIA Report for the Upington Solar Thermal Plant (known as the Khi Solar One Project, which is currently under construction), as well as collected field data, and aims to provide the context within which this EIA is being conducted.

## 4.1 Regional Setting: Location of the Study Area

The study site is proposed on Portion 3 of the farm McTaggarts Camp 453, which is located approximately 20 km south west of Upington. Portion 3 of the Farm McTaggarts Camp 453 has a total surface area of approximately 2200 ha (which includes the Khi Solar One development footprint), which is much larger than the development footprint required for the two 125MW CSP plants. The first Phase of the Upington Solar Thermal Plant referred to as the Khi Solar One project, is currently under construction and has a footprint of ~470 hectares and is located on the northern section of Portion 3 of the Farm McTaggarts Camp 453. The Upington Solar Thermal Plant Two (a 125 MW power tower plant) will have a development footprint of 400 – 500 ha, and the Upington Solar Thermal Plant Three (a 125 MW parabolic trough plant) will have a development footprint of 300 - 400 ha, to be placed within a broader site of ~2200 ha (which includes the Khi Solar One development footprint).

The proposed site falls within Ward 8 of the Kai !Garib Local Municipality which has its administrative centre at Kakamas. This local municipality is one of 8 local municipalities that fall within the greater ZF Mgcawu (formerly Siyanda) District Municipality. The site can be accessed via the N14 and an existing farm road (D3276).

This area of the Northern Cape consists primarily of farms used as rangeland for commercial livestock production. These regions have been commercially farmed as stock ranches for close to 100 years. Degradation of vegetation has been attributed to high stocking rates of domestic livestock in commercial farming areas.

## 4.2 Climatic Conditions

The study area is characterised by an arid climate with summer rainfall. The long-term average annual rainfall in this region of the Northern Cape is only 175 mm, of which 142 mm, or 81%, falls from November to April. Rainfall events are erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices. The average evaporation is 2 375 mm per year, peaking at 11.2 mm per day in December. Temperatures vary from an average monthly maximum and minimum of 35.0ºC and 18.7ºC for January to 20.8ºC and 3.3ºC for July respectively. Frost occurs most years on 6 days on average between mid-June and mid-August.

## 4.3. Biophysical Characteristics of the Study Area

### *4.3.1 Topographical Profile*

The 22 $km^2$ study area (including the Khi Solar One development footprint) is situated on the plains located to the north of the Gariep River. The study area has a flat to very gently sloping topography which ranges in altitude from 870 m in the north to 820 m amsl in the south, a gradient of approximately 1:150. Numerous ephemeral tributaries of the Helbrandkloofspruit drain the study site in a southerly direction towards the Gariep River.

### *4.3.2 Geological Profile*

The study area is located within the Namaqualand Metamorphic Belt which comprises very old and very highly deformed sedimentary and igneous rocks of the Mokolian Erathem (2100 - 1200Ma) that form part of the Southern African Basement Complex. The rocks of this complex have undergone both regional and contact metamorphism and the culminating deformation phase has been dated at about 1000 Ma.

The bedrock geology of the study area is covered by Quaternary red-brown wind-blown sands of the Gordonia Formation. Localised outcrops of Dyasons Klip gneisses of Mokolian age protrude through the sand cover in the southern portion of the study area. Other metamorphic rocks of Mokolian age in the near vicinity of the study area include Louisvale granite and Bethseda gneiss. A calcrete capping of Tertiary age also occurs in the southern portion of the study area. Rocky outcrops are likely to be very sparse and the majority of the study area is covered in Quaternary unconsolidated sands.

Inactive opencast mining operations in the study area include tungsten, tin, arsenic and fluoride. Fairly extensive diggings appear to have been carried out in the north-western portion of the study area.

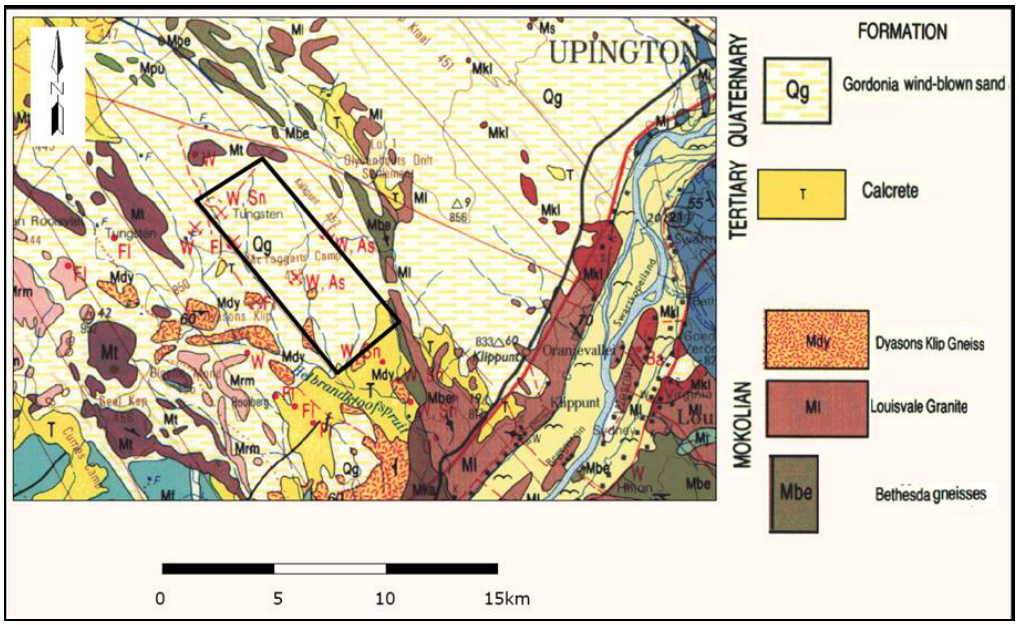


**Figure 4.1:** Geology of the study area

### *4.3.3 Soils and Agricultural Potential*

The information on soils and agricultural potential in this report has been obtained from the AGIS online database, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated). The soils are also shallow, sandy soils predominantly on rock, with more rock outcrops on the surface. The land type classification is a nation-wide survey that groups areas of similar soil and terrain conditions into different land types. There are two land types across the site.

The Ae10 land type occupies the majority of the proposed site of the new development. The soils of this land type are shallow to moderately deep, sandy soils on underlying hardpan carbonate or rock. The Ag1 land type occupies the southern part of the site where the existing project is located.

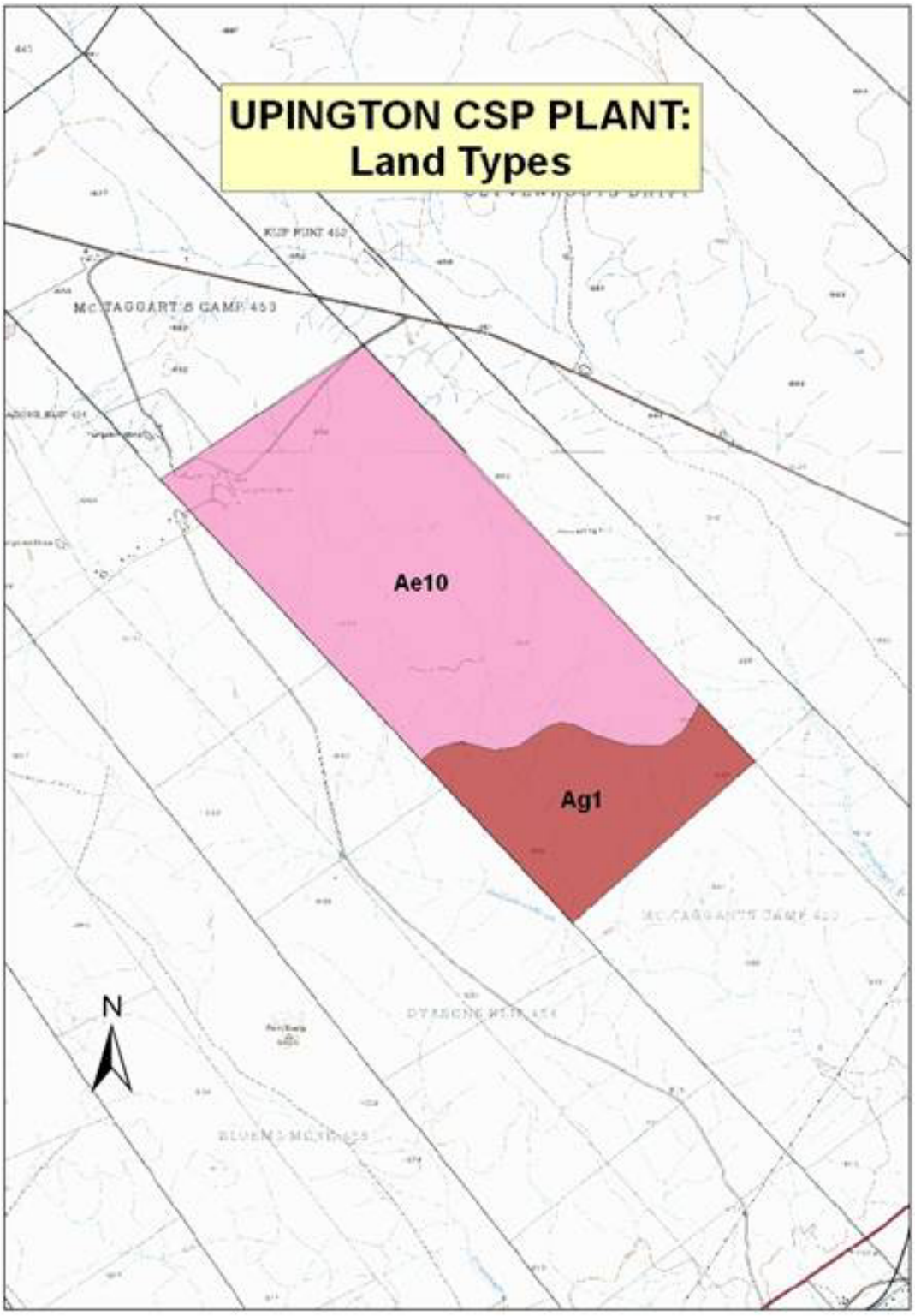


**Figure 4.2:** Land types within the proposed study area

Land capability is the combination of soil suitability and climate factors. The entire site has a land capability classification, on the 8 category scale, of Class 7 – i.e. non-arable, low potential grazing land. The land has a low to moderate water

erosion hazard (Class 5). The susceptibility to wind erosion of most of the site is high due to the sandy texture of the soil.

Predominantly because of the aridity constraints, but also because of poor soils, agricultural land use is restricted to low intensity grazing only. The site is within a sheep farming agricultural region. The natural grazing capacity is low, 31-40 hectares per animal unit across the site. Agricultural potential is fairly uniform across the site. The very low rainfall in the area means that the only means of cultivation would be by irrigation and aerial images show no signs of any agricultural infrastructure and none of irrigation.

### *4.3.4 Ecological Profile*

**a. Vegetation**

The study area is situated in the Nama-Karoo biome. The vegetation types dominating the study area are Bushmanland Arid Grassland (NKb 3) and Kalahari Karroid Shrubland (NKb 5). Both vegetation types are regarded as least threatened. The Lower Gariep Alluvial Vegetation (AZa 3) occurs about 11-15 km beyond the main study area along the Gariep River and is the only vegetation type that has been listed as an endangered (Mucina & Rutherford 2006). This alluvial vegetation type will be minimally impacted by the pipeline construction of the proposed development.

The Bushmanland Arid Grassland landscapes consist of extensive or broken plains on a slightly sloping plateau. Vegetation density can vary annually from relatively sparse to higher densities, dominated by grasses of the genus *Stipagrostis (*Figure 3). Other prominent grass genera include *Enneapogon, Eragrostis,* and *Schmidtia*. A variable density of high shrubs can be found, dominated by *Acacia mellifera, Rhigozum trichotomum,* and *Boscia foetida* subsp *foetida*. Dwarf karroid shrubs are common, especially of the genera *Pentzia, Aptosimum, Pteronia,* and *Salsola*.

The Bushmanland Arid Grassland vegetation is considered least threatened. A target of 21% has been earmarked for conservation, of which only a small portion is already protected in the Augrabies National Park. Overall, very little of the vegetation has been transformed, but extensive areas may be in various states of degradation due to grazing pressure.

**Figure 4.3:** Bushmanland Arid Grassland during the growing season on McTaggarts Camp.

Within the study area, the Bushmanland Arid Grassland merges to some degree into mosaics of the Kalahari Karroid Shrubland. This shrubland vegetation typically occurs in narrow or restricted belts on calcrete outcrops or along gravelly scarps of intermittent rivers. It consists of a low karroid shrub layer, and grasses and shrubs more related to the sandy region of the Kalahari region. Small trees and tall shrubs are dominated by *Acacia mellifera, Rhigozum trichotomum*, *Parkinsonia africana,* and *Boscia foetida* subsp *foetida*. Dominant genera within the low shrub layer include *Hermannia, Aptosimum, Leucosphaera,* and *Monechma*. The grass layer is variable, consisting mostly of *Stipagrostis, Enneapogon, Eragrostis,* and *Schmidtia* specie.

The Kalahari Karroid Shrubland vegetation is considered as least threatened. Of the 21% target for conservation, up to date only a small portion is protected in the Augrabies National Park. Many of the belts of this vegetation type have, in the past, been preferred for road construction, which has led to the introduction of several alien invasive species.

The Lower Gariep Alluvial Vegetation is situated on flat alluvial terraces and riverine islands along the lower Gariep River. The vegetation structure ranges from riparian thickets to reed beds or grasslands. Both reed beds and grasslands are subject to high levels of disturbance during periods of high flood. The riparian thickets are dominated by *Acacia karroo*, *Asparagus laricinus, Diospyros lycioides, Euclea*

*pseudebenus*, *Gymnosporia linearis*, *Searsia lancea*, *Salix mucronata*, *Schotia afra*, *Tamarix usneoides*, and *Ziziphus mucronata*. Several more tree species can be found here, many having grown to immense sizes. Lower-lying terraces and islands, which get flooded more often, are covered with grasses or reeds that can regrow very rapidly after floods.

This vegetation type is most impacted by human disturbance. The usually narrow band of permanent woodland that is the major physical barrier to human movement into the floodplain, is often removed to improve access. It is also severely affected by regular burning of reed beds and thus highly susceptible to invasion by alien plants (ZF Mgcawu EMF). The construction of major dams upstream in the Gariep River has buffered the extent of seasonal floods, resulting in large expanses of this riparian vegetation to be cleared to gain access to the fertile soils for agricultural purposes. The lower Gariep Alluvial Vegetation is been listed as an endangered ecosystem, and all remaining intact sections of vegetation should not be disturbed further.

The vegetation types in relation to the study area are shown in Figure 4.4.

**b. Red Data Species (Flora)**

Protected and red data species that may potentially occur on the study area as summarised above are listed in Table 4.1.

**Table 4.1:** Plant species of conservation concern that could be expected in the study area:

| Species | Status |
|---|---|
| **Succulents** | |
| *Adenium oleifolium* | 2 |
| *Aloe claviflora* | 2 |
| *Aloe hereroensis* | 2 |
| *Asclepias stellifera* | 2 |
| *Avonia albissima* | 2 |
| ***Cotyledon orbiculata* var. *dactylopsis*** | **2, end** |
| *Cotyledon orbiculata* var. *orbiculata* | 2 |
| *Crassula muscosa* | 2 |
| ***Dinteranthus wilmotianus*** | **NT, 2** |
| *Euphorbia avasmontana* | 2 |
| *Euphorbia gariepina* subsp. *gariepina* | 2 |
| *Euphorbia mauritanica* | 2 |
| *Euphorbia rudis* | 2 |
| *Euphorbia spinea* | 2 |
| *Haworthia venosa* subsp. *tessellata* | 2 |
| ***Hoodia gordonii*** | **DDD, NEMA: BA, 1** |
| ***Hoodia officinalis* subsp. *officinalis*** | **NT, 1** |
| *Larryleachia marlothii* | 2 |
| *Mesembryanthemum crystallinum* | 2 |
| *Mesembryanthemum guerichianum* | 2 |
| *Orbea lutea* subsp. *lutea* | 2 |
| ***Pelargonium anethifolium*** | **1, end** |
| *Prenia tetragona* | 2 |
| *Psilocaulon articulatum* | 2 |
| *Psilocaulon coriarium* | 2 |
| *Psilocaulon subnodosum* | 2 |
| *Ruschia canonotata* | 2 |
| *Ruschia hamata* | 2 |
| *Ruschia spinosa* | 2 |
| ***Ruschia ruralis*** | **2, end** |
| *Sarcostemma viminale* | 2 |
| *Tavaresia barklyi* | 2 |
| | |
| **Low shrubs** | |
| *Jamesbrittenia atropurpurea* subsp. *atropurpurea* | 2 |
| *Jamesbrittenia atropurpurea* subsp. *pubescens* | 2 |
| *Jamesbrittenia canescens* | 2 |
| *Jamesbrittenia integerrima* | 2 |
| ***Lessertia excisa*** | **1, end** |
| *Lessertia pauciflora* | 1 |
| ***Pelargonium inquinans*** | **1, end** |
| ***Peristrophe cernua*** | **2, end** |
| *Sutherlandia frutescens* | 1 |
| *Jamesbrittenia atropurpurea* | 2 |
| | |
| **Herbs and forbs** | |
| *Anacampseros baeseckei* | 2 |
| ***Anacampseros filamentosa* subsp. *filamentosa*** | **2, end** |
| *Anacampseros filamentosa* subsp. *namaquensis* | 2 |
| *Anacampseros filamentosa* subsp. *tomentosa* | 2 |
| *Avonia albissima* | 2 |
| ***Dianthus micropetalus*** | **2, end** |
| *Manulea schaeferi* | 2 |
| ***Senecio monticola*** | **DDT** |
| ***Senecio trachylaenus*** | **DDT, 2, end** |
| | |
| ***Geophytes*** | |
| ***Babiana flabellifolia*** | **2, end** |
| ***Boophone disticha*** | **Declining, 2** |
| ***Crinum bulbispermum*** | **Declining, 2** |
| ***Drimia sanguinea*** | **NT, 2** |
| *Ferraria variabilis* | 2 |
| *Gethyllis* species | 2 |
| *Harpagophytum procumbens* subsp. *procumbens* | NEMA: BA, 1 |
| *Lapeirousia littoralis* subsp. *caudata* | 2 |
| *Lapeirousia littoralis* subsp. *littoralis* | 2 |
| *Nerine laticoma* | 2 |
| ***Oxalis bowiei*** | **2, end** |
| ***Oxalis imbricata*** | **2, end** |
| *Oxalis lawsonii* | 2 |
| ***Tritonia strictifolia*** | **2, end** |
| | |
| **High shrubs and trees** | |
| ***Acacia erioloba*** | **declining,** |

| Species | Status |
|---|---|
| | **NFA** |
| *Boscia albitrunca* | NFA, 2 |
| *Boscia foetida* subsp. *foetida* | 2 |
| *Commiphora gracilifrondosa* | 2 |
| *Gymnosporia linearis* subsp. *lanceolata* | 2 |
| *Nymania capensis* | 2 |

The status of plant species listed above is indicated by the following symbols:
Protected species, indicated according to relevant legislation (see section 1.6):

1: NCNCA Schedule 1
2: NCNCA Schedule 2
NFA
NEMA: BA
end = endemic to South Africa (or green text)
Red data listed species are indicated by their status (red text)

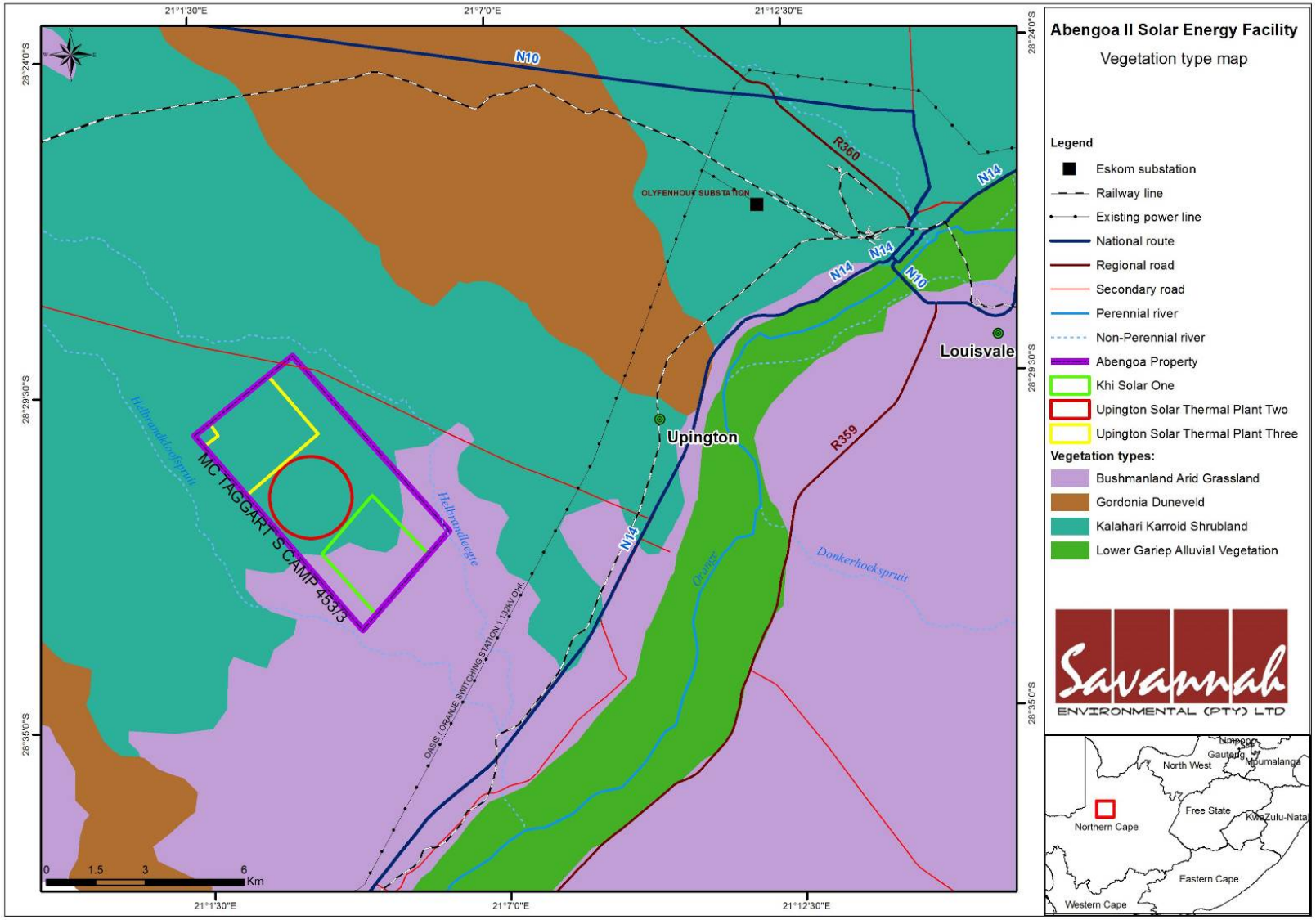


**Figure 4.4:** Vegetation types as mapped by Mucina and Rutherford (2006) for the study area

### c. Protected Trees

There are several tree species protected under the National Forest Act that have a geographical distribution that includes the study area (refer to Appendix F). These species include Camel Thorn, Witgatboom (Shepard's Tree) and the Ebony Tree. Any of these species could occur in any part of the study area, depending on local conditions. The number and occurrence of protected trees on the site will defined during the ecological survey of the site and reported in the EIA phase.

### d. Fauna

A list of protected reptile, amphibian and mammal species that could occur in the study area according to the various databases searched and Apps (2000) is presented in Table 4.2. Protected species, indicated according to relevant legislation include:

- 1: NCNCA Schedule 1
- 2: NCNCA Schedule 2
- NEMA:BA
- end = endemic to South Africa (or green text)
- Red data listed species are indicated by their status (red text)

**Table 4.2:** Amphibians, reptiles, birds and mammals of conservation concern that could occur in the study area

| Common Name | Species Name | Status |
|---|---|---|
| | | |
| **Amphibians** | | |
| Common or Angola River Frog | *Amietia angolensis* | 2 |
| Cape River Frog | *Amietia fuscigula* | 2 |
| Eastern Olive Toad | *Amietophrynus garmani* | 2 |
| Guttural toad | *Amietophrynus gutturalis* | 2 |
| Western Olive Toad | *Amietophrynus poweri* | 2 |
| Kei Road Toad | *Amietophrynus rangeri* | 2 |
| Boettger's Dainty Frog | *Cacosternum boettgeri* | 2 |
| Senegal Running Frog | *Kassina senegalensis* | 2 |
| Tremolo Sand Frog | *Tomopterna cryptotis* | 2 |
| Karoo Toad; Gariep Toad | *Vandijkophrynus gariepensis* | 2 |
| African Clawed Frog | *Xenopus laevis* | 2 |
| | | |
| **Reptiles: Lizards and skinks** | | |
| Karoo Girdled Lizard | *Karusasaurus polyzonus* | 2 |
| Bushveld Lizard | *Heliobolus lugubris* | 2 |
| Spotted Desert Lizard | *Meroles suborbitalis* | 2 |
| Western Sandveld Lizard | *Nucras tessellata* | 2 |
| Plain Sand Lizard | *Pedioplanis inornata* | 2 |
| **Karoo Sand Lizard** | ***Pedioplanis laticeps*** | **2, end** |
| Spotted Sand Lizard | *Pedioplanis lineoocellata* subsp *lineoocellata* | 2 |
| | | |

| Common Name | Species Name | Status |
|---|---|---|
| **Reptiles: Tortoises** | | |
| Serrated Tent Tortoise | *Psammobates oculifer* | 2 |
| Karoo Tent Tortoise | *Psammobates tentorius* subsp *tentorius* | 2 |
| Verrox's Tent Tortoise | *Psammobates tentorius* subsp *verroxii* | 2 |
| | | |
| **Reptiles: Monitors** | | |
| Rock Monitor | *Varanus albigularis* subsp *albigularis* | 2 |
| Water Monitor | *Varanus niloticus* | 2 |
| | | |
| **Serpentes (snakes)** | | |
| Rhombic Egg-eater | *Dasypeltis scabra* | 2 |
| Cape Wolf Snake | *Lycophidion capense* subsp *capense* | 2 |
| Two-striped Shovel-snout | *Prosymna bivittata* | 2 |
| Sundevall's Shovel-snout | *Prosymna sundevallii* | 2 |
| Mole Snake | *Pseudaspis cana* | 2 |
| | | |
| **Aves - Birds** | Note: only NEMA: BA and NCNCA Schedule 1 species are listed | |
| **Kori Bustard** | ***Ardeotis kori*** | **Vulnerable, 1, NEMA:BA** |
| Marsh Owl | *Asio capensis* | 1 |
| Spotted Eagle-Owl | *Bubo africanus* | 1 |
| Jackal Buzzard | *Buteo rufofuscus* | 1 |
| Steppe Buzzard | *Buteo vulpinus* | 1 |
| Rufous-cheeked Nightjar | *Caprimulgus rufigena* | 1 |
| Black Stork | *Ciconia nigra* | 1 |
| Black Harrier | *Circus maurus* | 1 |
| African Marsh-Harrier | *Circus ranivorus* | 1 |
| Lanner Falcon | *Falco biarmicus* | 1 |
| **Lesser Kestrel** | ***Falco naumanni*** | **Vulnerable, 1, NEMA:BA** |
| Rock Kestrel | *Falco rupicolis* | 1 |
| Greater Kestrel | *Falco rupicoloides* | 1 |
| **Bald Ibis** | ***Geronticus calvus*** | **Vulnerable, 1, NEMA:BA** |
| **Cape Vulture** | ***Gyps coprotheres*** | **Endangered, 1, NEMA:BA** |
| African Fish-Eagle | *Haliaeetus vocifer* | 1 |
| Southern Pale Chanting Goshawk | *Melierax canorus* | 1 |
| **Ludwig's Bustard** | ***Neotis ludwigii*** | **Vulnerable, 1, NEMA:BA** |
| Osprey | *Pandion haliaetus* | 1 |
| Greater Flamingo | *Phoenicopterus ruber* | 1 |
| **Martial Eagle** | ***Polemaetus bellicosus*** | **Vulnerable, 1, NEMA:BA** |
| Secretarybird | *Sagittarius serpentarius* | 1 |
| Barn Owl | *Tyto alba* | 1 |
| **African Grass-Owl** | ***Tyto capensis*** | **Vulnerable, 1, NEMA:BA** |
| | | |
| **Chiroptera - Bats** | | |
| Flat-headed free-tailed bat | *Sauromys petrophylus* | 2 |
| Egyptian free-tailed bat | *Tadaria aegyptica* | 2 |
| Common slit-faced bat | *Nycteris thebaica* | 2 |
| Geoffroy's Horseshoe bat | *Rhinolophus clivosus* | 2 |
| Dent's Horseshoe bat | *Rhinolophus denti* | 2 |
| | | |
| **Insectivora - Insectivores** | | |
| Round-eared elephant shrew | *Macroscelides proboscideus* | 2 |
| South African Hedgehog | *Atelerix frontalis* | 1, NEMA:BA |
| | | |
| **Rodentia - rodents** | | |

| Common Name | Species Name | Status |
|---|---|---|
| Brant's whistling rat | *Parotomys brantsii* | 2 |
| Striped mouse | *Rhabdomys pumilio* | 2 |
| Multimammate mouse | *Mastomys coucha* | 2 |
| Tree mouse | *Thallomys paedulcus* | 2 |
| Namaqua rock mouse | *Aethomys namaquensis* | 2 |
| Short-tailed gerbil | *Desmodillus auricularis* | 2 |
| Hairy-footed gerbil | *Gerbillurus paeba* | 2 |
| Bushveld gerbil | *Tatera leucogaster* | 2 |
| Highveld gerbil | *Tatera brantsii* | 2 |
| Pouched mouse | *Saccostomus campestris* | 2 |
| Large-eared mouse | *Malacothrix typica* | 2 |
| Ground squirrel | *Xerus inauris* | 2 |
| Porcupine | *Hystrix africaeaustralis* | 2 |
| Springhare | *Pedetes capensis* | 2 |
| Cape Hare | *Lepus capensis* | 2 |
| Scrub hare | *Lepus saxatilis* | 2 |
| Hewitt's red rock rabbit | *Pronolagus saundersiae* | 2 |
| | | |
| **Artiodactyla – even toed ungulates** | | |
| Common duiker | *Sylvicarpa grimmia* | 2 |
| Klipspringer | *Oreotragus oreotragus* | 2 |
| Steenbok | *Raphicerus campestris* | 2 |
| | | |
| **Carnivora - Carnivores** | | |
| Small-spotted genet | *Genetta genetta* | 2 |
| Suricate | *Suricata suricatta* | 2 |
| Slender mongoose | *Galerella sanguinea* | 2 |
| Black-footed Cat | *Felis nigripes* | 1, NEMA:BA |
| African Wild Cat | *Felis silvestris* | 1 |
| Striped Polecat | *Ictonyx striatus* | 1 |
| Spotted-necked Otter | *Lutra maculicollis* | 1 |
| Bat-eared Fox | *Otocyon megalotis* | 1 |
| Cape Fox | *Vulpes chama* | 1, NEMA:BA |
| | | |
| **Tubilidentata - Aardvark** | | |
| Antbear / Aardvark | *Orycteropus afer* | 1 |

### e. Avifauna Species

Approximately 445 bird species occur within the Northern Cape across a wide range of different biomes and habitat types. Fifty six of these species are endemic to South Africa (meaning that they do not occur outside of South Africa's borders), with a further 42 being classified as near endemics (i.e. their distribution reaches just outside of our borders into neighbouring countries). There are seven species whose distribution range overlaps with the study area; these include Secretarybird (NT), Kori Bustard (VU), Ludwig's Bustard (VU), Lanner Falcon (NT), Peregrine Falcon (NT) and Martial Eagle (VU). While these species may not always be observed on site, it is not inconceivable for them to occur within the study area at some stage. Larger bodied species, such as the Martial Eagle, have extremely large home ranges and could very well be found on occasion within the study area.

### *4.3.5 Hydrological Characteristics*

The study area falls within the Lower Gariep River sub-basin, which comprises the Gariep River from the confluence with the Vaal River to the Gariep River Mouth. The major river systems that contribute to flows in the Gariep River include the Ongers and Sak rivers from the northern Karoo; the Kuruman and Molopo rivers from the Northern Cape Province, north of the Gariep River and the southern part of Botswana; and the Fish River from Namibia. Notably these rivers drain arid and semi arid areas, which are bordered by the Upper Orange-Senqu and the Vaal sub-basins.

The study area site is situated within quaternary catchment D73F and is dominated by highly ephemeral river systems that flow directly into the Gariep River, which bisects this quaternary catchment. An ephemeral drainage line is defined as a drainage line or even larger river that will carry water only for very brief periods of time – as short as one hour to one or two days, and only after a larger rainfall event. It may typically have more below-ground water reserves supporting higher/denser vegetation, but soil does not remain saturated for long enough to support specially adapted flora. Note: Smaller ephemeral drainage lines may be referred to as waterwashes, or upper ephemeral tributaries of waterwashes or drainage lines.

Potential runoff from the site would flow in a south-easterly direction towards the Gariep River. The primary drainage line in close proximity to the site, the Helbrandkloofspruit, typically flows once a year for no more than two days at a time. Water bodies and rivers are of specific importance to a variety of Red Data species in this arid area. The perennial Gariep River is situated 10 - 13 km south-east of the proposed development sites, and the river together with its surrounding vegetation along the river are regarded as Critical Biodiversity Areas, which should have a high conservation priority.

On either side portion 3 of the Farm McTaggarts Camp 453 larger ephemeral drainage lines occur, which merge further south and then flow into the Gariep River. These drainage lines may only flow once every couple of years after sufficient rainfall, but they do collect enough of the runoff from surrounding areas to support much denser and higher vegetation than on the surrounding plains, especially on the farm adjacent to the southern border of McTaggarts Camp. This higher vegetation creates numerous microhabitats.

No classified wetlands, other than the riparian systems found along the Gariep River, are shown on the national wetlands map. However, season pans and

ephemeral waterwashes (also referred to as ephemeral drainage lines) occur on the site and drain into the Gariep River.

### *4.3.6 Conservation Planning*

The ZF Mgcawu (formerly Siyanda) District Municipality has compiled an Environmental Management Framework (EMF), in which environmental concerns and conservation priorities for all landscapes within the municipality are listed and mapped. According to the EMF, Bushmanland Arid Grasslands have a medium conservation priority and the proposed project area does not fall within areas earmarked for conservation.

Similarly, the proposed project area has been mapped as Zone 7 in the EMF Environmental Control Zones, indicating the threat that the area has relatively less sensitivity than other zones and no special protection or environmental management parameters or concerns, except those already implemented or required by law. This implies that there is no specific restriction on development of the area.

The Lower Gariep Alluvial Vegetation (which is located outside the site) on the banks of the Gariep River is regarded as a Critical Biodiversity Area, of which remaining sections have been listed as threatened ecosystems. Although these areas fall outside the proposed development, the intermittent drainage lines on either side of the development site drain directly into the Gariep River.

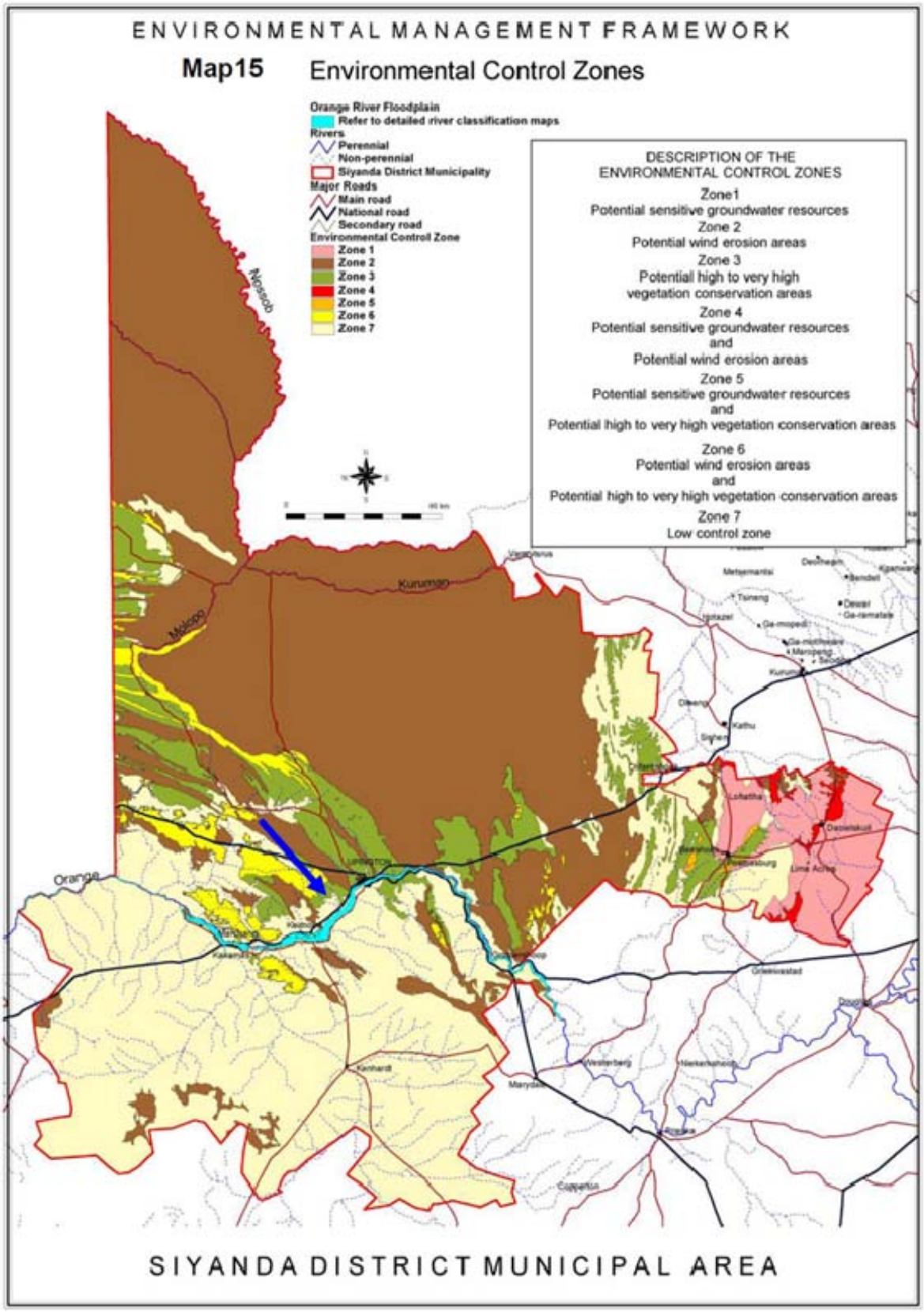


**Figure 4.5:** Map from the ZF Mgcawu (formerly Siyanda) EMF showing the environmental control zones. The proposed development location is indicated by the blue arrow.

## 4.4. Social Characteristics of the Study Area and Surrounds

The proposed site for the two CSP Plants is located within Ward 8 of the Kai !Garib Local Municipality (NC067) within the Northern Cape. This municipality is a category-B municipality[4], which forms part of the greater ZF Mgcawu District Municipality (DC8, category-C municipality), and is located in the north-central portion of the Northern Cape, approximately 428 km west of the provincial capital of Kimberley. The nearest settlements to the site (in order of closest proximity) include: Louisvale, Kiemos, Upington and Kakamas). The majority of the study area is sparsely populated (less than 10 people per $km^2$) and consists of a landscape of wide-open expanses and vast desolation. The scarcity of water and other natural resources has strongly influenced settlement within this region - the population distribution is concentrated along the Gariep River.

This local municipality is largely rural and agricultural with three urban/semi-urban nodes at Kakamas, the designated administrative centre of the municipality Keimoes and Kenhardt. The municipality is approximately 7 445 $km^2$ in size (~7.2% of the ZF Mgcawu District Municipality) and is bordered to the north, south and west by a District Management Area and in the east by the //Khara Hais and !Kheis Local Municipalities. The Khi Solar One CSP Facility is under construction and is shown in Figure 4.1. The infrastructure that is built on the site for the Khi Solar One project includes:

» A **power island** which will include a steam turbine and generator; a generator transformer and substation; an auxiliary steam boiler and associated vessels (i.e. fossil fuel boiler/ generator
» An overhead **power line** feeding into the Eskom electricity network via a 'turn in and turn out' configuration to the existing Eskom Gordonia-Oasis 132 kV distribution line running approximately 4 km south of the site.
» **Water supply** infrastructure including an abstraction point on the Orange River; a suspension reservoir located approximately 0.6 km north-west of the raw water abstraction point; an associated water supply pipeline to the power island; a storage reservoir within the power island footprint; and evaporation ponds.
» **Access roads** including an external access road leading to the site (alternatives either from the N14 or from the existing D3276 secondary road); and internal access roads for construction and maintenance purposes (including an internal asphalt access road which will give direct access to the power island
» **Administrative areas** including a workshop, office and storage areas

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

### *4.6.4. Demographic Profile*

The population the Kai !Garib Local Municipality is estimated at 56 501 (2007), approximately 10% of the total population of the greater ZF Mgcawu District Municipality. The average population growth for the local municipality (2001-2007) is estimated at approximately 1.4%.

The population is 66.5% Coloured, 22.2% Black African, 7.8% White and 0.05% Asian. The dominant language within the municipality is Afrikaans (78.8%) followed by Setswana (20.2%) with the remainder made up of isiXhosa (0.4%), English (0.2%) and other African languages (0.2%).

In terms of education levels, approximately 14.7% of the population has no formal education, while approximately 42% have less than a Grade 7. When these totals are added to figures for people with no formal education they indicate that over half of people in the Kai !Garib Local Municipality (~58%) have less than a Grade 7 qualification. Only 11.1% of the population have a matric qualification, while less than 4% have a tertiary qualification.

### *4.6.5. Economic Profile*

Employment data for Kai !Garib Local Municipality indicates that 57.8% of the population between 15 and 65 is employed in the formal sector and the unemployment rate is 12%. The agricultural sector provides approximately 28% of the formal employment, followed by the community services, wholesale and retail sectors which employ approximately 6% and 2% of the employed population in the area respectively. According to the 2001 Census data, the majority of employment is characterised as 'undetermined' (~62%).

Approximately 48.8% of the population have no formal income and a majority 93.7% of the population earn less than R800 per month (this is the figure used by the South African Government as the official breadline figure). The low-income levels reflect the limited formal employment opportunities highlighted above. Approximately 22% of the population is dependent on social grants, of which 52% are child support grants and a total 2 706 households are subsidised by the services subsidy scheme (Kai !Garib Local Municipality IDP (2009).

## *4.5. Heritage*

The McGregor Museum has carried out a previous study on the farm McTaggarts Camp for the Phase 1 Khi Solar Plant, which is currently under construction (Morris 2010, 2012). The heritage artefacts on the site are well understood.

### *4.6.1. Colonial frontier*

McTaggarts Camp derives its name from events during the Korana War of 1879-1880, when Captain McTaggart set up his military camp here (Van Vreeden 1961:431). It is not known exactly where this encampment was, though it seems most likely that it was close to the river; hence well away from the proposed solar facilities. The ephemeral nature of such an event is unlikely to have left much of a discernible archaeological trace. There was further military activity in the area in the early twentieth century in relation to Jacob Marengo, shot dead on 20 September 1907 near Eensaamheid Pan where, in an incident of "severe overkill", 5000 rounds were fired to exterminate the resistance leader, five other armed Nama and two accompanying women (Masson 1995). Eensaamheid is about 100 km north-west of Upington. Mining took place at the north western-most part of McTaggarts Camp in the 1930s (Morris 2012).

### *4.6.2. Later Stone Age*

Late Holocene Later Stone Age (LSA) sites are frequently noted in surveys south of and south west of the study areas and along the Gariep River (e.g. Morris & Beaumont 1991; Beaumont *et al*. 1995). These are generally short-duration occupations by small groups of hunter-gatherers. In contrast, there are substantial herder encampments along the Gariep River floodplain itself (Morris & Beaumont 1991) and in the hills north of Kakamas (Parsons 2003). In a range of hills north east of Keimoes, on Zovoorby, a rock shelter and specularite working (a sparkling mineral with known cosmetic and ritual use in the precolonial past) has been excavated (Smith 1995). LSA sites are usually focused on a particular feature in the landscape such as a hill or rocky outcrop and in relation to resources like water and associated habitats richer in animals and plant foods (Morris 2011).

### *4.6.3. Pleistocene: Middle and Earlier Stone Age*

A low density surface scatter of Middle Stone Age material was found on McTaggarts Camp (logged at the McGregor Museum as 2821CA003 McTaggarts Camp 1) in 2010, and this was sampled in Phase 2 mitigation (Morris 2012). It was focused around a bedrock exposure where water would be held for a time after good rain.


**Figure 4.5:** Google Earth Image Showing Middle Stone Age material was found on McTaggarts Camp

### *4.6.4. Palaeontology*

The fossil record from Kalahari deposits is very poor with respect to finds of fossil bones of vertebrates. The Kalahari sediments and calcretes have low fossil potential, but possibility of fossils being encountered in diggings cannot be totally excluded. The fossils contexts are those of ephemeral watercourses and aeolian settings, particularly interdune areas where local ponding or pans developed. Most of the fossils in the aeolianites are associated with particular contexts, particularly buried, stable surfaces (palaeosurfaces) where time has permitted bones to accumulate. The common fossils include shells of land snails, fossil tortoises, ostrich incl. egg fragments, sparsely scattered bones etc. "Blowout" erosional palaeosurfaces may carry fossils concentrated by the removal of sand by the wind. Hollows between dunes (interdune areas) are the sites of ponding of water seeping from the dunes, leading to the deposits of seeps and pans/vleis. Being water sources, such may be richly fossiliferous. Most of fossils obtained from the Kalahari deposits have been from pans. Ephemeral watercourse deposits are poorly fossiliferous, but abraded bone fragments and loose teeth may occur sparsely in channel lags.

# SCOPING OF ISSUES ASSOCIATED WITH PHASE TWO AND PHASE THREE OF THE UPINGTON SOLAR THERMAL PLANT CHAPTER 5

This chapter serves to describe and evaluate the identified **potential environmental impacts** associated with the construction and operational phases **of the Upington Solar Thermal Plant Two (125MW) and Upington Solar Thermal Plant Three (125MW)** and to make recommendations for further studies required to be undertaken in the EIA phase. Due to the relatively homogenous nature of the study area within which both facilities are located, issues associated with both CSP Plants are expected to be similar. The proposed Upington Solar Thermal Plant Two will consist of heliostats and a Power Tower system with a generation capacity of ~125MW. The proposed Upington Solar Thermal Plant Three will consist of Parabolic Trough technology with heat transfer fluid (HTF), with a generation capacity of ~125MW. Where specific issues have been identified for a specific project or CSP technology, these have been highlighted. Therefore the potential impacts for both projects have not been separated in this chapter of the Scoping Report. During the EIA phase there will be separate chapters that deals with assessment of environmental impacts of each CSP facility.

The majority of the environmental impacts are expected to occur during the construction phase. Environmental issues associated with **construction and decommissioning** activities of each CSP Plant are similar and include, among others:

» Impact on fauna, flora and ecology.
» Impact on soil and agricultural potential of the site.
» Impact on heritage resources.
» Social impacts (positive and negative).
» Visual Impacts.

Environmental issues specific to the **operation** of each CSP Plant could include, among others:

» Long term loss of endangered / red list / protected species (flora, fauna, trees, mammals).
» Potential soil loss and change in land-use for the footprint of the facility.
» Visual impacts (intrusion, negative viewer perceptions and visibility of the facility).
» Social impacts (positive and negative).

Table 5.1 and Table 5.2 provide a summary of the findings of the desktop scoping study undertaken for the construction (also relevant to decommissioning) and operation phases of the proposed project respectively. Impacts associated with the decommissioning phase are expected to be similar to those associated with

construction and are therefore not repeated, impacts of the proposed facility are evaluated, and recommendations are made regarding further studies required within the EIA phase of the process. Table 5.3 provide a summary of the potential cumulative impacts associated with the proposed development.

## 5.1 Methodology for Impact Assessment during the Scoping Phase

The following methodology was used to determine the main issues and potential impacts of the proposed project during these phases:

» Identify **sensitive environments** and **receptors** that may be impacted on by the proposed facility and the **types of impacts** (i.e. direct, indirect and cumulative[5]) that are most likely to occur.
» Determine the **nature and extent of potential impacts** during the construction and operational phases of the wind energy facility.
» Identify '**No-Go' areas**, if applicable.
» Summarise the potential impacts that will be **considered further** in the EIA Phase through specialist assessments.

### *5.1.1 Sensitive Environments and Receptors*

The proposed facility has the potential to have an impact on the following environmental receptors (prior to the implementation of mitigation measures):

» **Ecology, fauna and flora:** the disturbance associated with the construction phase may result in impacts on ecology, fauna and flora.
» **Impacts on soils and agricultural potential:** Soil erosion, contamination and impacts on agricultural areas and potential, and land capability
» **Impacts on heritage sites and fossils:** disturbance to or destruction of heritage sites and fossils/palaeontology may result during the construction of each plant.
» **Visual quality and aesthetics:** depending on the technology selected, and their location spatially, solar plants have the potential to have a visual impact on the surrounding area.
» **Social:** the construction and operation of the facility may result in employment opportunities and impacts on land use characteristics.
» **Noise impacts:** the construction and operation of the power plant may result in noise impacts on sensitive receptors.

[5] The cumulative impacts are expected to be associated with the scale of the project and any existing impacts affecting the study area. Cumulative effects can only be assessed once the detailed layouts are known. They will then be considered in the detailed specialist studies to be undertaken in the EIA Phase.

### *5.2 Assumptions made during the Evaluation of Potential Impacts*

While evaluating potential impacts associated with each of the two proposed projects, it was assumed that the development footprint (the area that will be affected during the operational phase) will include the footprints for the solar components (i.e. the heliostat field or the parabolic trough field), the power island (i.e. the steam turbine and generator, on-site substation, transformer) and associated infrastructure (i.e. access roads, overhead power lines, blow down pond and water treatment facility). However, during the construction phase, the entire extent of the site required for each facility could suffer some level of disturbance. This is referred to as the construction footprint.

**Table 5.1: Evaluation of potential ecological impacts associated with the Construction Phase for the Upington Solar Thermal Plant Two and Three**

**Impacts on Ecology (Flora, Fauna, Water Resources and Ecosystems)**

The majority of the landscapes on site consist of flat to slightly undulating plains, incised by several ephemeral washes. The tree and shrub layer on the site varies across the plains, but is markedly denser around ephemeral drainage lines and small pans. Tree species occurring within this vegetation unit are *Boscia foetida subsp. foetida*, *Boscia albitrunca*, *Acacia erioloba*, and *A. karroo*. Dominant high shrubs include *Rhigozum trichotomum* and *A. mellifera subsp. detinens*, both of which can be invasive. A moderate diversity of low shrubs, small succulents, and bulbous species occur across the site, of which several are protected. Most of these species are concentrated on rocky plains, whilst the sandier plains have a higher occurrence of grasses. The grass layer is dominated by *Stipagrostis* and *Enneapogon* species, and varies immensely in density, depending on the season's rainfall.

Runoff on the farm, and either side of the proposed development area, is drained via Helbrandskloofspruit into the lower-lying Gariep River which is located ~10-15 km from the site. The low calcrete or other rocky elevations on the study area, which, together with the waterwashes and pans, have a more diverse and/or unique vegetation composition than the surrounding plains.

An ecological sensitivity map is shown in Figure 5.1. The ecological sensitivity map is a preliminary assessment that will to be verified during the EIA phase. The following conclusions can be drawn at this stage:

» The sites for the CSP Plant Two and CSP Plant Three fall into an area of medium ecological sensitivity.
» Areas with surface rockiness may have a higher proportion of unique vegetation, diversity and possibly protected species. The biodiversity value of these areas, being part of the Kalahari Karroid Shrubland, has also been indicated in the EMF for the District Municipality and will be confirmed in the field survey.
» Seasonal pans and waterwashes occur on the site and are considered of to be of medium sensitivity**.** The habitat offered by the seasonal pans and waterwashes serve ecosystem functions such as providing specialised niches for fauna, creating corridors in the landscape, filtering water, catching sedimentation and concentrating water runoff from catchments.
» Tributaries of the Helbrandskloofspruit occur on the site for the CSP Plant Two. Note that the Helbrandskloofspruit occurs outside of the site (Portion 3 of farm McTaggarts Camp); however it is considered a sensitive feature.

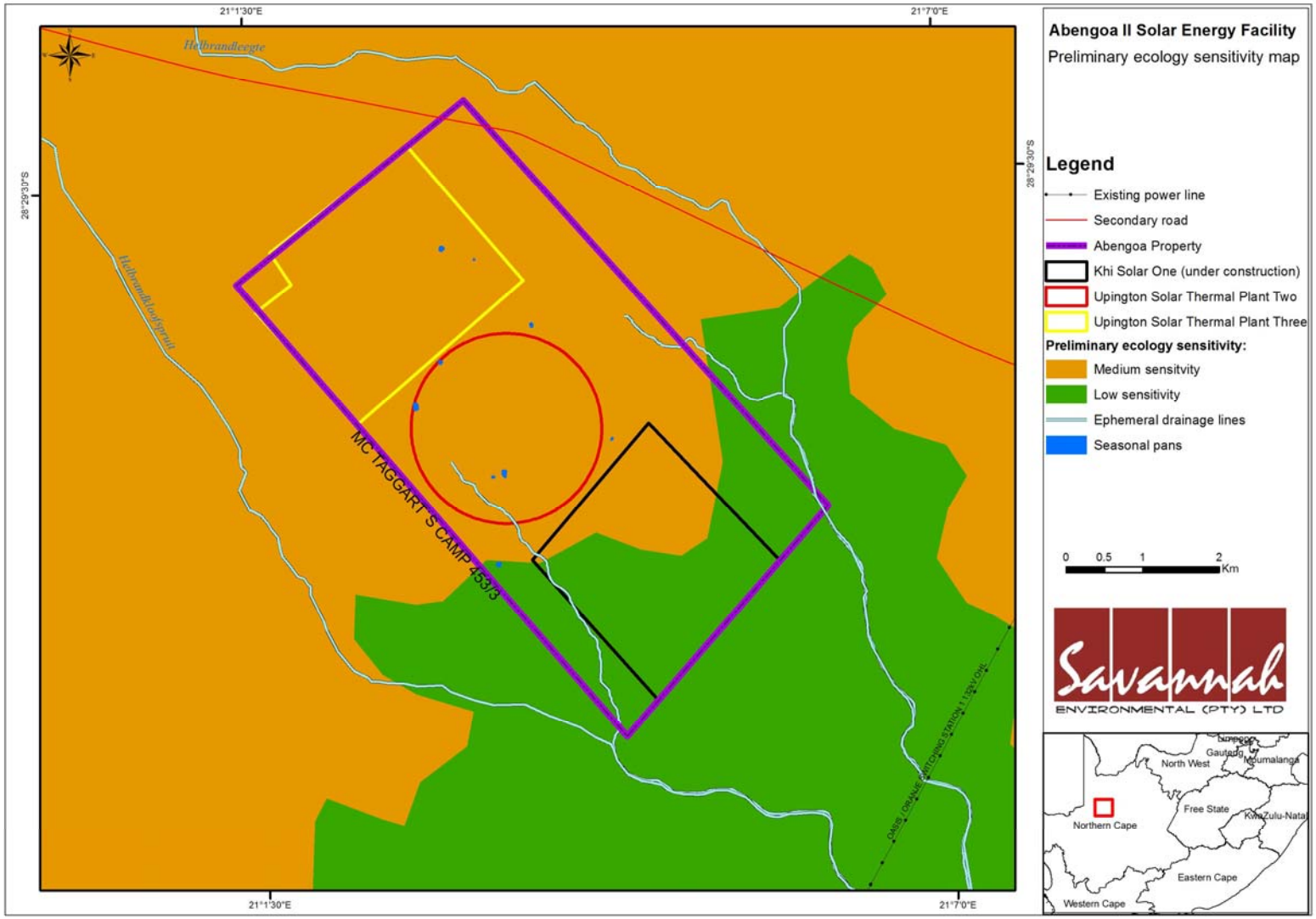


**Figure 4.1:** Scoping Ecological Sensitivity Map for the site proposed for the Upington Solar Thermal Plant Two and Plant Three

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Disturbance to and loss of indigenous natural vegetation due to construction activities. | Construction of infrastructure will lead to direct loss of vegetation. Loss of indigenous natural vegetation may cause:<br>» Increased vulnerability of the site;<br>» Loss of habitat for sensitive species;<br>» Increased fragmentation (depending on location of impact) and associated reduced viability of species populations;<br>» Alteration of the habitat and change in species composition and associated species interactions.<br>» Disturbance to processes maintaining biodiversity and ecosystem goods and services; and<br>» Loss of ecosystem goods and services. | Local |
| Disturbance or loss of threatened / protected plants due to construction activities. | From previous surveys on the site, it is known that red-data plant species occur on the broader farm portion. Flora is affected by overall loss or alteration of habitat and due to its limited ability to extend or change its distribution range. In the case of threatened plant species, a loss of a population or individuals could lead to a direct change in the conservation status of the species, possibly extinction. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations. Consequences may include:<br>» Fragmentation and decline of populations of affected species;<br>» Loss of genetic variation within affected species;<br>» Alteration of the habitat suitable for plant associations by altering surface structure.<br>» Future extinction debt of particular species of flora and fauna. | Local |
| Loss of protected trees due to construction activities. | Protected trees species are known to occur on the site. According to the National Forests Act, no person may cut, disturb, damage or destroy any listed protected tree species. Any of these protected species could occur in any part of the study area, depending on local conditions. A permit is required from the Department of Agriculture, Forestry and Fisheries (DAFF) before any protected trees may be impacted. The loss of protected trees may have wider consequences than losing individuals of species of conservation concern. Large trees in this area are usually | Local |

| | | |
|---|---|---|
| | keystone species. This implies that with the removal of such trees, a host of other fauna and flora species will be affected due to the drastic change or complete obliteration of microhabitats associated with these trees. | |
| Loss of habitat for flora and topsoil due to construction activities. | **Upington Solar Thermal Plant Two (Heliostats and a Power Tower system):**<br>The development will require complete clearing of all vegetation within the development area. Due to maintenance requirements of the heliostat field, the topsoil will be stripped to reduce soil seed banks and prevent future re-vegetation of the heliostat field. Soil below the heliostat field must be stabilised to prevent erosion, but it is expected that the surface will remain permeable and natural drainage lines can be incorporated into the stormwater management plan. Moderate amounts of topsoil will have to be stored permanently in a designated area, and will have to be re-vegetated to prevent its degradation.<br><br>**Upington Solar Thermal Plant Three (Parabolic Troughs):**<br>The development will require levelling and clearing of the area of the trough field. This area will remain clear of vegetation for the duration of the operations phase. Soil below the trough field will need to be stabilised to prevent erosion, but it is expected that the surface will remain permeable to reduce runoff. Natural drainage lines within the footprint will be lost, and therefore possible excessive runoff from higher-lying areas will have to be diverted. | Local |
| Loss of habitat for fauna species of conservation concern due to construction activities. | There are a number of red data species that have been recorded for the wider area within which the study area is located. Their presence and the necessity to keep their habitats intact on the project area need to be confirmed during the ecological survey. Fauna species of conservation concern are indirectly affected primarily by loss of or alteration of habitat and associated resources. Animals are mobile and, in most cases, can move away from a potential threat, unless they are bound to a specific habitat that is also limited and will be impacted by a development. Tithe proposed developments will, however, reduce the extent of habitat available to fauna as the CSP Plants will be fenced.<br><br>Consequences may include:<br>» Loss of populations of affected species; | Local |

| | | |
|---|---|---|
| | » Reduction in area of occupancy of affected species;<br>» Loss of genetic variation within affected species;<br>» Future extinction debt of a particular species. | |
| Disturbance to migration routes and associated impacts to species populations due to construction activities. | Site preparation and construction activities may interfere with current migration routes of especially fauna species. This may lead to:<br>» Reduced ability of species to move between breeding an foraging grounds, reducing breeding success rates;<br>» Increased mortality rates due to fatal collisions with infrastructure, especially of avifauna;<br>» Reduced genetic variation due to reduced ability of smaller fauna to find suitable mating partners. | Local |
| Impacts on ephemeral pans, drainage areas and lower-lying perennial water courses due to construction activities. | The site is in a semi-arid area. There are several small drainage lines traversing the study area, and several smaller pans present as well. According to the National Water Act, these are classified as wetlands or water resources, but may not be large enough or carry enough water volumes to be regarded as a significant water resource that warrants protection. Impacts on water courses may include:<br>» Construction, if it occurred within any drainage lines or wetland areas or immediately surrounding areas, would lead to direct or indirect loss of or damage to some of these areas or changes to the catchment of these areas;<br>» Pollutants or spills from the construction process, if not mitigated immediately, may accidentally end up in drainage lines from where lower-lying wetlands can be significantly impacted<br>» The nature of the site preparation and construction activities for the proposed development will change surface characteristics, rainfall interception patterns and hence runoff characteristics of the project area;<br>» This may affect the geohydrology, susceptibility to erosion and potential erosion rates of the landscape, which may lead to a significant alteration to or loss of habitat for fauna and flora species that depend on riparian and wetland habitats;<br>» A decline in ecosystem functionality of significant smaller drainage lines will impact lower-lying larger wetlands, such as the Gariep River.<br><br>In addition, the construction process will require the abstraction of water from the | Local to regional |

| | | |
|---|---|---|
| | Gariep River. The volumes required need to be approved by the relevant authorities as part of their overall catchment management plan. | |
| Establishment and spread of declared weeds and alien invader plants due to construction activities. | Major factors contributing to invasion by alien invader plants include excessive disturbance to vegetation, creating a window of opportunity for the establishment of alien invasive species. In addition, regenerative material of invasive species may be introduced to the site by machinery traversing through areas with such plants or materials that may contain regenerative materials of such species. Consequences of the establishment and spread of invasive plants include:<br><br>» Loss of indigenous vegetation;<br>» Change in vegetation structure leading to change in or loss of various habitat characteristics;<br>» Change in plant species composition;<br>» Altered and reduced food resources for fauna;<br>» Change in soil chemical properties;<br>» Loss or disturbance to individuals of rare, endangered, endemic and/or protected species;<br>» Fragmentation of sensitive habitats;<br>» Change in flammability of vegetation, depending on alien species;<br>» Hydrological impacts due to increased transpiration and runoff;<br>» Increased production and associated dispersal potential of alien invasive plants, especially to lower-lying wetland areas, and<br>» Impairment of wetland function.<br>The extent to which the site contains alien plants will be determined in the EIA phase. | Local to regional |
| **Gaps in knowledge & recommendations for further study**<br>» An ecological survey will be undertaken during the EIA phase.<br>» The scoping ecological sensitivity map will be verified and refined in the EIA phase.<br>» An assessment of ecological impacts associated with both CSP Plants will be undertaken in the EIA phase.<br>» Site-specific ecological issues in terms of nature, extent, duration, probability, severity and significance will be assessed in the EIA phase.<br>» Mitigation measure to manage the impacts of construction activities on flora and fauna will be provided in the EMPr | | |

**Impacts on Land Use and Agriculture**

The site is within a sheep farming agricultural region. Tungsten was mined on the north-western corner of the site. There is no cultivated land on the site. Land capability is the combination of soil suitability and climate factors. The entire site has a land capability classification of Class 7 – i.e. non-arable, low potential grazing land. Predominantly because of the aridity constraints, but also because of poor, sandy soils, agricultural land use on the site is restricted to low intensity grazing only. The natural grazing capacity is low (31-40 hectares per animal unit across the site). The very low rainfall in the area means that the only means of cultivation would be by irrigation and aerial images show no signs of any agricultural infrastructure and none of irrigation. During construction, livestock farming will be affected due to construction activities, however considering that part of the site is being developed as a CSP Plant, the impact on land use and agricultural potential will not be significant.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Disruption of agricultural activities during construction activities. | Loss of arable agricultural land which is no longer able to be utilised due to construction of infrastructure. | Local |

**Gaps in knowledge & recommendations for further study:**

» The EIA phase assessment will include a field investigation to verify the soils and agricultural conditions across the site.
» The impacts on land-use and agricultural potential will be assessed in the EIA phase.

**Impacts on Geology & Soils**

The study area is located within the Namaqualand Metamorphic Belt which comprises very old and very highly deformed sedimentary and igneous rocks of the Mokolian Erathem (2100 - 1200Ma) that form part of the Southern African Basement Complex. Rocky outcrops are likely to be very sparse and the majority of the study area is covered in Quaternary unconsolidated sands. The thickness of the sands is thought to be approximately 10 - 20m. There are no important or interesting geological phenomena apart from the old mining operations. The parent rock is unlikely to be detrimentally affected by the proposed activity.

Wind erosion, and to a lesser extent water erosion, is deemed to be of importance due to the geology of the area. The site is underlain by potentially sensitive or erodible Quaternary sandy soils but the texture and thickness of the soils, the slope gradients and the vegetation cover are the controlling factors in determining the severity. Interpretation of aerial photos indicates that 10% of the site is underlain by shallow rock, outcrop or hard calcrete capping which will have a positive effect on the erosion potential in these areas.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Soil degradation due to excavation | Damage of soil and associated ecosystems due to excavations arising from construction activities. | Local |
| Soil degradation due to wetting and compaction | Damage of soil and associated ecosystems due to wetting and compaction of soil along roads and around development footprints. | Local |
| Soil degradation due to pollution | Damage of soil and associated ecosystems due to spillage of hazardous chemicals such as fuel on construction sites | Local |
| Soil degradation due to accelerated erosion (water or wind) | Loss of soil and damage to associated ecosystems due to erosion of soil in areas of activity | Local |
| Soil degradation due to siltation downstream | Damage of soil and associated ecosystems due to siltation arising from accelerated erosion associated with construction activity | Regional |

**Gaps in knowledge & recommendations for further study**

» The EIA phase assessment will include a field investigation of soils and agricultural conditions across the site.
» An assessment of erosion and erosion potential on site will be done.
» An assessment of impacts on soils due to the development of both CSP Plants will be undertaken in the EIA phase.
» Site-specific issues in terms of nature, extent, duration, probability, severity and significance will be assessed in the EIA phase.
» Mitigation measures to prevent soil loss and erosion and promote soil conservation will be recommended for the EMPr.

**Heritage Impacts**

The McGregor Museum has carried out a previous study on the farm McTaggarts Camp for Phase 1 of the Abengoa project (the Khi Solar Solar Plant which is currently under construction) (Morris 2010, 2012). A Middle Stone Age site does occur near the Khi Solar One Plant (refer to Figure 4.2), however this is not within the vicinity of the construction footprint for the Upington Solar Thermal Plant Two and Plant Three, and so would not be impacted on. The potential impact on heritage resources would be direct, once-off events occurring during the construction period. In the long-term, the proximity of operations in a given area could result in secondary indirect impacts resulting from the movement of people or vehicles in the immediate or surrounding vicinity.

With respect to the magnitude and extent of potential impacts, it has been noted that the erection of power lines would have a relatively small

impact on Stone Age sites, in light of Sampson's (1985) observations during surveys beneath power lines in the Karoo (actual modification of the landscape tends to be limited to the footprint of each pylon), whereas a road or a water supply pipeline would tend to be far more destructive (modification of the landscape surface would be within a continuous strip), albeit relatively limited in spatial extent, i.e. width (Sampson compares such destruction to the pulling out of a thread from an ancient tapestry).

Based on previous experience on the site the following comments have been made by the heritage specialist:

» The terrain on which the proposed Upington Solar Thermal Plant Two and Three would be located is likely not to be rich in archaeological traces of major significance.
» Should there be local sources of Dwyka tillite, these may have served as raw materials often drawn upon in Pleistocene times. If not, it might be expected that any archaeological traces would be sparse.
» Adjacent terrain surveyed by the McGregor Museum has minimal Stone Age traces comprising widely scattered/isolated stone artefacts mainly based on jaspilite (banded ironstone) sourced from the banks and terraces of the Gariep River.
» There appear to be hills or rocky features which could provide shelters with traces of pre-colonial Stone Age occupation/activity.
» Nineteenth- and twentieth-century cultural history and intangible heritage values attached to places may be difficult to recover owing to the sparse population. It is not thought likely that any significant intangible heritage values would be attached to the particular terrain in question.
» Apart from the remains of a tungsten mine, there appear not to be colonial era built environment features in the areas of proposed CPS Plants.
» The desktop palaeontological report states that the site has low fossil potential.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Disturbance of heritage resources. | Construction activities including *clearance* or excavation activities could alter or destroy the context of heritage resources or the resources themselves in the event of such archaeological materials being present. Without context, archaeological traces are of much reduced significance. It is the contexts as much as the individual items that are protected by the heritage legislation. | Local |
| Impacts on cultural landscape and sense of place. | Conspicuous changes to a altering the feel and atmosphere of a place irrevocably. The degree and nature of the impact is going to depend on how the wind turbines are arranged on the landscape, and the ability of the topography to absorb their presence | Local to Regional |
| Impacts on palaeontology. | Physical disturbance of fossil material itself and its context affecting their significance. | Local to Regional |

**Gaps in knowledge & recommendations for further study**

» A Phase 1 Archaeological Impact Assessment (AIA) in line with SAHRA's requirements and the NHRA will be undertaken in the EIA phase.
» A site visit will be necessary to inspect various parts of the terrain, focusing on areas of expected impact (construction of facility, substation,

and secondary infrastructure such as roads, pipelines and power lines).

» Heritage traces would be evaluated in terms of their archaeological significance.

» The desktop palaeontological report states that no field survey / work is required during the EIA phase and that the EMPr should contain guidelines for potential fossil finds and a reporting/action protocol for when finds are uncovered. SAHRA's requirements will also be considered.

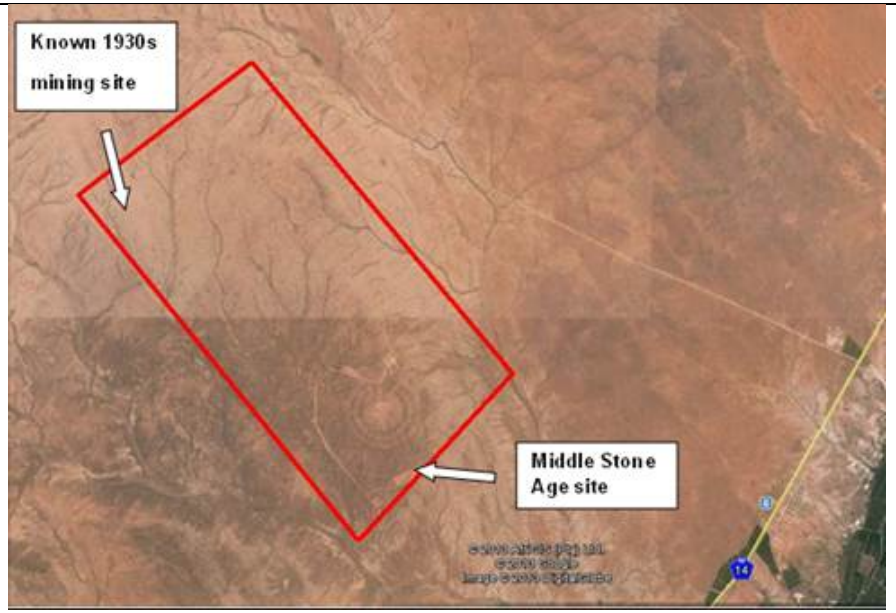


**Figure 4.2:** Known Heritage Site (Middle Stone Age Site) that occurs on the Portion 3 of the Farm McTaggarts Camp

**Visual Impacts During Construction**

Construction of the CSP Plants will cause scarring of the landscape and localised negative visual impacts. Potential visual receptors especially within (but not restricted to) a 16 km buffer zone include *inter alia* observers travelling along major routes in the area (i.e. the N10/N14 roads to Augrabies Falls National Park, Kgalagadi Transfrontier Park and Namibia) as well as the arterial roads (R359 and R360) and major secondary roads. Additional sensitive receptors include people within the larger built-up centres or populated places (i.e. Upington, Oranjevallei, Ses Brugge, Louisvale, Klippunt, Kanoneiland, etc.) but also individual/isolated landowners/homesteads identified within the study area (primarily located along the Gariep River). Individuals within protected areas in the vicinity of the proposed facility (i.e. the Spitskop Nature Reserve) and those utilising water related recreational activities and tourism potential of the Gariep River may also be visually impacted. The visual character of the site is

already altered by the construction of the Khi Solar One CSP Plant and the power tower which is ~200 – 300m in height. The existing Khi Solar One project and these two new phases of the project will change the visual character of the site.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Visual impacts during the construction phase. | The potential visual impact of the construction of ancillary infrastructure (i.e. the substation; associated powerlines and internal access roads) on observers residing in close proximity of the facility. | Local - Regional |

**Gaps in knowledge & recommendations for further study:**

The following activities will be undertaken during the EIA Phase in order to assess the potential visual impact of the proposed facilities:

» Potential sensitive receptors will be identified and the severity of the visual impact assessed in a specialist Visual Impact Assessment Report.
» Additional spatial analyses will be undertaken in order to create a visual impact index that will further aid in determining potential areas of visual impact. This exercise will be undertaken for the core facility as well as the ancillary infrastructure, as these structures (e.g. the substation and power line) are envisaged to have varying levels of visual impact at a more localised scale.
» Site-specific issues and potential sensitive visual receptors will be measured against a visual impact index and should be addressed individually in terms of nature, extent, duration, probability, severity and significance of visual impact.

**Social Impacts related to Construction Activities**

Apart from farm land ownership adjacent to the site, the nearest settlements to the site (in order of closest proximity) include: Louisvale, Kiemos, Upington and Kakamas). The site is located within the Kai !Garib Municipality in the Northern Cape. The closest settlements include Kheimos and Upington. The Kai !Garib Local municipality is largely rural and agricultural with an estimated population of 56 501 (2007). Approximately 57.8% of the population between 15 and 65 is employed in the formal sector and the unemployment rate is 12%. Approximately 48.8% of the population have no formal income and a majority 93.7% of the population earn less than R800 per month (i.e. the official breadline figure). The low-income levels reflect the limited formal employment opportunities highlighted above. Approximately 22% of the population is dependent on social grants, of which 52% are child support grants and a total 2 706 households are subsidised by the services subsidy scheme.

Potential positive and negative social impacts may occur during the construction phase. Negative impacts include nuisances such as traffic congestion on roads, dust, noise from construction machinery, vandalism/ theft on homesteads/ surrounding properties. Positive social impacts during large construction projects typically include job creation (some temporary and others short-term); income into the local economy in local good and services are procured etc. Considering that the Khi Solar One Project is under construction, available skills in the area can be utilised for construction of Phase 2 and Phase Three of the Upington Solar Thermal Plant.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Temporary job | Employment opportunities would be available during the construction phase. Even though the | Local - Regional |

| | | |
|---|---|---|
| creation during construction phase. | area has a low population density and education levels are low, it is still anticipated that there would be sufficient employed individuals that could be sourced as labourers for the unskilled to semi-skilled work required. Skilled positions would probably be filled by outsiders. Existing skills that have been transferred from the construction of the Khi Solar One project could most likely be utilised for the next two phases of the project. | |
| Economic spin-offs to local community. | Due to construction activities, the small workforce will need accommodation and supplies. The economic spin-offs include local procurement of general construction materials and goods (e.g. cement, sand, stone etc.) accommodation and other services. | Local |
| Influx of people into the study areas including members of the construction crews and job seekers. | An increase in people movement could increase the safety and security risk and fire risk in the area. Furthermore, the influx of job seekers to the construction site could lead to some negative impacts (i.e. conflict between individuals seeking work). A flow of workers and the associated construction activities (vehicle movement, noise, dust) could result in temporary intrusion impacts. | Local |
| Skills development | Potential opportunities for skills development and training during the construction phase would result in long-term benefits for those involved. If proper enhancement measures are implemented the positive impacts in this regard could be increased. | Local - Regional |
| Security issues | Even though no construction workers are expected to be accommodated on site, in inflow of workers could, as a worst case scenario also pose some security risks. The negative impacts associated with the inflow of workers could, however, be limited should a local labour force be used. | Local |
| Disturbance of surrounding landowners | Temporary disruptions (related to traffic, noise and dust) in the daily living and movement patterns of neighbouring private property owners could be foreseen although it is anticipated that the negative impacts associated with this aspect would be minimal and could be successfully mitigated. | Local |

**Gaps in knowledge & recommendations for further study**

The demographic data used in the social impact study was largely based on the 2001 Census. While this data does provide useful information on the demographic profile of the affected area, the data are dated and should be treated with care Ward level data from the 2011 Census is not available,, therefore the Census 2001 data therefore remains the most recent community/ ward level data currently available.

A social impact assessment (SIA) will be undertaken in the EIA phase and include:

» Review of existing project information, including the Planning Documents;

- » Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc);
- » Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc;
- » Identification and assessment of the key social issues and opportunities;
- » Preparation of Final Social Impact Assessment (SIA) Report, including identification of mitigation/optimisation and management measures to be implemented.
- » Site-specific issues in terms of nature, extent, duration, probability, severity and significance will be assessed in the EIA

**Noise related impacts during construction**

The study area has a rural character in terms of background noise levels and the primary existing noise source is the movement of traffic on the N14 and the development of the Khi Solar One project on the site. Noise sources during construction will include vehicles utilising roads and operation of construction machinery.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Site establishment | The establishment of the construction site (i.e. site office, workers' accommodation, stores/material depot, workshops, concrete batching plant), may impact on the ambient noise environment during the construction phase. | Local |
| Excavation operations | Excavation activities for foundations for buildings and other infrastructure, trenches for cabling and piping may impact on the ambient noise environment during the construction phase. | Local |
| General construction activities | Construction activities such as concrete mixing, building, steel work, concrete vibration, services installation, finishing as well as the possible establishment, operation and removal of concrete batching plants may impact on the ambient noise environment during the construction phase. | Local |
| General vehicle movement and traffic noise | On-site vehicle movement, delivery of materials and construction equipment as well as additional traffic to and from the site may impact on the ambient noise environment during the construction phase. | Xx? |

**Gaps in knowledge & recommendations for further study**

No specialist Noise Impact Assessment report is required during the EIA phase as the noise generated during construction will not be significant, however noise impacts and mitigation measures will be included in the EIA report and EMPr. Site-specific issues in terms of nature, extent, duration, probability, severity and significance will be assessed in the EIA

**Table 5.2: Evaluation of potential impacts associated with the Operational Phase of the Upington Solar Thermal Plant Two and Three**

**Impacts on Flora and Fauna**

Majority of the impacts on flora and fauna could occur in the construction phase. During the operational life (more than 20 years) of each CSP plant impacts on any remaining vegetation or animals will be limited. The development footprint of each CSP facility will be completely transformed to an industrial CSP plant, devoid of any substantial vegetation cover within the CSP fields. Outside of the CSP field, vegetation cover and animals would remain unaffected. Therefore any impacts on flora or fauna during the operational life of the CSP Plants will be limited, which are listed below.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Establishment and spread of declared weeds and alien invader plants | There is a high likelihood that alien species will spread on site in the absence of control measures. It is likely to be a long-term impact with potentially high magnitude of impact on local ecosystems. | Local |
| Change in runoff and drainage patterns | The development of infrastructure and internal roads can cause local hydrological and erosion effects resulting in major peak-flow and sediment impacts. This may occur in areas where the infiltration rates of the landscape are changed due to an impermeable surface being constructed. Increased runoff may increase the rates/extent of erosion, reduce percolation and aquifer recharge rates, alter channel morphology and increase stream discharge rates. | Local - Regional |

**Gaps in knowledge & recommendations for further study**

» An ecological survey will be undertaken during the EIA phase.
» The scoping ecological sensitivity map will be verified and refined in the EIA phase.
» An assessment of ecological impacts associated with the operational phase of both CSP Plants will be undertaken in the EIA phase.
» Site-specific ecological issues in terms of nature, extent, duration, probability, severity and significance will be assessed in the EIA phase.
» Mitigation measure to manage the impacts of the operation of the CSP Plant on flora and fauna will be provided in the EMPr

**Impacts on Avifauna due to overhead power lines**

A substation is currently under construction on the site for the Khi Solar One CSP project and the two proposed projects are intended to connect into this new McTaggarts Substation via two 132 kV overhead power lines (each ~5-8 km in length). The operational phase could potentially impact on avifauna species predominantly through collision and electrocution events due to power lines. Red Data species would be more vulnerable, such as the Lesser Kestrel, Bald Ibis, Cape Vulture, Ludwig's Bustard, Martial Eagle and the African Grass-Owl could be impacted on. Power lines can cause bird mortality by electrocution / collision due to overhead cables. Cumulative impacts on birds in the area could occur due to current and future power line infrastructure in the area. Potentially sensitive areas on the site related to avifauna habitat include the ephemeral drainage lines and seasonal pans, which (after good rains) act as a draw card for birds during these brief periods of water availability.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Disturbance | Disturbance would occur through ongoing maintenance which may impact on shy and sensitive species especially during the breeding season. | Local |
| Collisions | Bird mortality as a result of collisions with the overhead power line. | Local - Regional |
| Electrocution | Power lines have a range of bird related impacts one of which is electrocution events whereby a bird perches on an electrical structure and causes an electrical short circuit by bridging the gap between live components and or live and earthed components. | Local - Regional |

**Gaps in knowledge & recommendations for further study**

» The following aspects with respect to the potential impacts on avifauna during the construction phase will be further quantified during the EIA Phase:
  * Collision of birds with facilities associated with the development
  * Electrocution of birds on the tower structures

**Impacts on Land Use and Agriculture**

The site is within a sheep farming agricultural region. Tungsten was mined on the north-western corner of the site. There is no cultivated land on the site. The entire site has a land capability classification of Class 7 – i.e. non-arable, low potential grazing land. Predominantly because of the aridity constraints, but also because of poor, sandy soils, agricultural land use on the site is restricted to low intensity grazing only. The natural grazing capacity is low (31-40 hectares per animal unit across the site).

During the operational life (more than 20 years) of each CSP plant, the development footprint of each CSP facility will be completely transformed, devoid of any agricultural activities within the CSP fields (up to 500 ha for Plant Two and up to 500 ha for Plant Three). Considering the low grazing and agricultural potential of the land being, the change in land use and impact on agricultural potential would be acceptable for this site.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Agricultural potential | Loss of arable agricultural land which is no longer able to be utilised due to presence of the CSP Plants. | Local |

**Gaps in knowledge & recommendations for further study:**

» The EIA phase assessment will include a field investigation of soils and agricultural conditions across the site.
» An assessment of impacts on land-use and agricultural potential due to the development of both CSP Plants will be undertaken in the EIA phase.

**Impacts on Soils**

The degradation of the natural soil, in various manners, could occur in the long term due to the operational of the two CSP Facilities. Bare, un-vegetated areas could result in erosion. The use of hazardous substances (such as oil, diesel, petrol and other chemicals) during the operational phase of the CSP Plants could result in soil contamination. Soil contamination risk would be higher for Plant Three due to the parabolic troughs Heat Transfer Fluid (oil). The handling and storage of dangerous goods and prevention of pollution will have to be done in line with the Hazardous Substances Act 15 of 1973 and any requirements of the Waste Licence (when issued by DEA). Should the development footprint of each CSP facility contain impervious surfaces within the solar fields, this could act as a pollution prevention measure. Soil pollution prevention measures will be provided in the EMPr developed in the EIA phase. The use of soil pollution prevention measures during the operational phase of each CSP Plant can limit impacts on soils to acceptable levels.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Soil erosion | Accelerated loss of sediment cover through rainfall or artificially concentrated run-off | Local |

| | | |
|---|---|---|
| | may occur. | |
| Soil Pollution | Soil pollution due to handling and storage of dangerous goods during the operational phase | |

**Gaps in knowledge & recommendations for further study**

» The EIA phase assessment will include a field investigation of soil conditions on the site.
» The present state of erosion, critical areas in terms of erosion and produce a map identifying these areas will be produced in the EIA phase.
» An assessment of impacts on soils due to the development of both CSP Plants will be undertaken in the EIA phase.
» Site-specific issues in terms of nature, extent, duration, probability, severity and significance will be assessed in the EIA.
» Mitigation measures to prevent soil pollution and soil loss will be recommended for the EMPr.

**Impacts on Water Resource**

A map showing the water resources in the study area in shown in Figure 4.3 and are discussed below:

***The Gariep River System:***

The ecology in the Lower Gariep sub-basin is dominated by the presence of dams and irrigation water use along most sections of the Gariep River. Increased populations of invasive alien plant species contribute significantly to land degradation in the sub-basin. Certain unique features such as the Onseepkans Falls and three fish species of conservation concern are found in close proximity to the proposed site in the Gariep River. Abstraction from this resource could then place additional pressures on the Gariep River. The Gariep River system as a whole is relatively poor in indigenous freshwater fish species diversity, presently; eight fish families are represented by 22 species. Five of the six endemic Gariep River fish species occur in this lower river section, of which one is unique to the Gariep River section between Augrabies Falls and the Gariep River Mouth. Three of the five endemic species are Red Data listed. The Gariep River mouth is a Ramsar site, being a wetland of international importance, managed in partnership with Namibia.

***Water Bodies on the Site:***

Seasonal pans and waterwashes occur on the site and are considered of to be of medium sensitivity**.** The habitat offered by the seasonal pans and waterwashes serve ecosystem functions such as providing specialised niches for fauna, creating corridors in the landscape, filtering water, catching sedimentation and concentrating water runoff from catchments. Tributaries of the Helbrandskloofspruit occur on the site for the CSP Plant Two. Note that the Helbrandskloofspruit occurs outside of the site (Portion 3 of farm McTaggarts Camp); however it is also a sensitive feature.

***Impact of a CSP Plant on Water Resources:***

The CSP Plant requires water for:

- The electricity generation process (for steam generation, which drives a turbine to produce electricity),

- Cleaning of mirrors
- Potable water for domestic use (for staff and sanitation facilities)
- Fire protection

Abstraction of water from the Gariep River is proposed and a Water Use Licence Application process will be undertaken, as required by the Department of Water Affairs.

The development of a CSP plant can impact on water resources in two ways:

- Loss of water resources due to transformation of land for the solar fields and associated infrastructure:
  Ephemeral drainage lines and pans occur on the site. These would be completely transformed. The EIA phase will include a delineation of any wetlands/ drainage lines on the site.
- Impact on water resources due to abstraction of water from the Gariep River: Abstraction of water from the Gariep River could result in water quantity and quality impacts on the system. The EIA phase will include a hydrological assessment in this regard in line with DWA requirements in support of a water use licencing application.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Impacts on the physical and biological environment of water bodies | The establishment of the proposed solar facility may impact on the following characteristics of the environment:<br>» The water quality/quantity of the region<br>» Dry riverbeds and localised drainage systems<br>» Riparian systems (form and function)<br>» Riverine and instream habitats | Local - Regional |
| Impacts on seasonal water bodies on the site | These systems are unique to the region and due to their locality within the landscape will also pose a flood risk to the development. | Local - Regional |

**Gaps in knowledge & recommendations for further study:**

The water resources assessment study undertaken during the EIA Phase will look at the potential impacts on:

» Impact on water quality/quantity of the region in terms of physical, biophysical and social impacts
» Impact on water quantity of the region
» Impact on dry riverbeds and localised drainage systems
» Impact on riparian systems (form and function)
» Impact of riverine and instream habitats
» Impact on riparian systems (conservation and biodiversity)
» Site-specific issues in terms of nature, extent, duration, probability, severity and significance will be assessed in the EIA

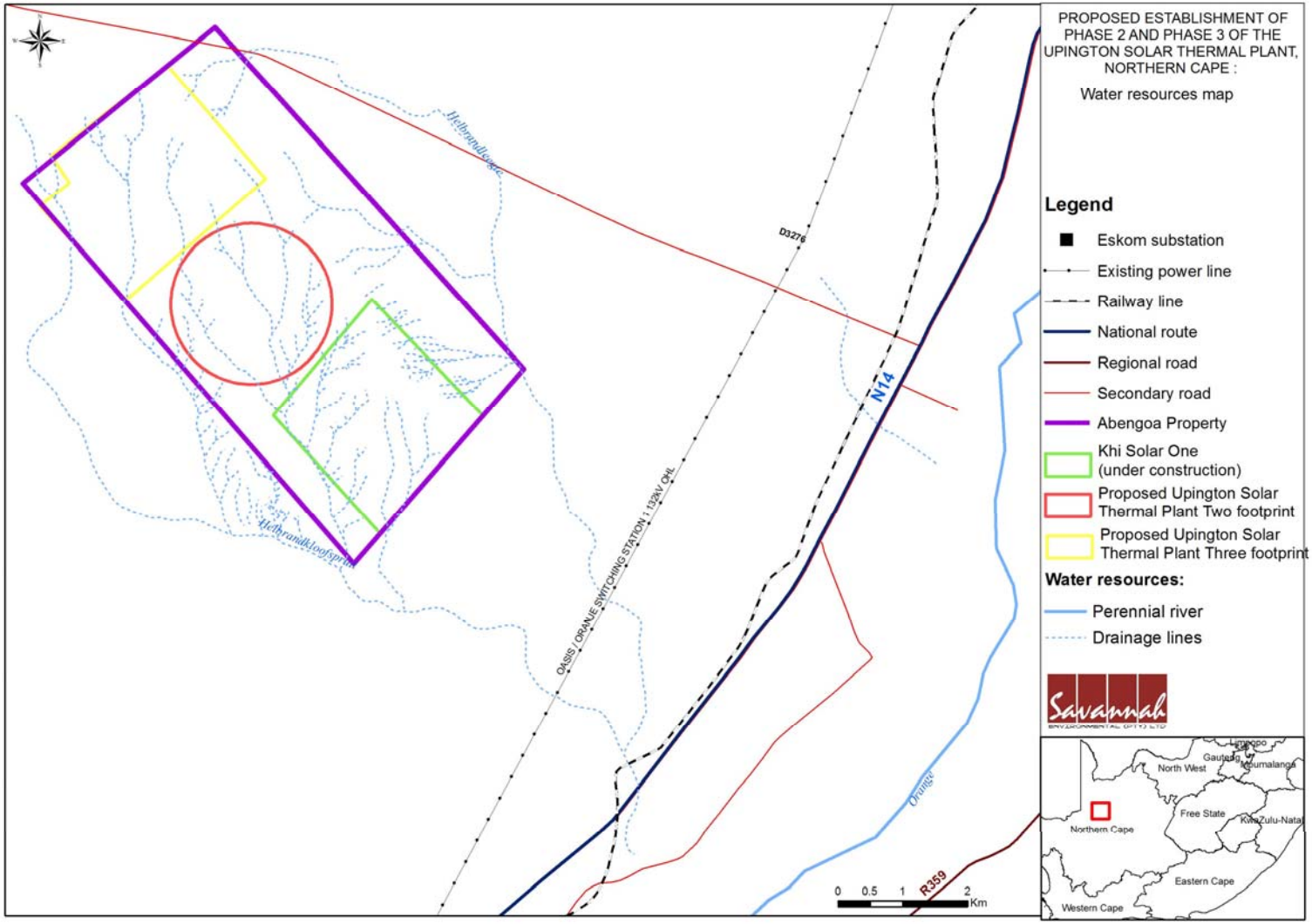


**Figure 4.3:** Map showing hydrological features (including the Gariep River, Helbrandskloofspruit and its tributaries which occur on the Solar Thermal Plant Sites) in the study area

**Impacts Related to Wastewater/ Brine from the Evaporation Ponds**

Up to 6 evaporation ponds will be required for both CSP plants. The purpose of the evaporation ponds is to receive and store the wastewater (brine) generated from the electricity generation process. The quantity of brine within the evaporation ponds will exceed 100m$^3$ at any given time; therefore a waste licence in terms of the NEM: Waste Act is required. The evaporation ponds will be located on the site and within the development footprint. The proposed facility will be operated as a Zero Liquid Effluent Discharge (ZLED) facility; therefore no wastewater from the evaporation ponds will be permitted to be released into the environment/ any water bodies. The remaining residue within the evaporation ponds will be stored in the pond, until the end of the CSP Plants lifespan, where the residue will be removed, and the evaporation pond sites will be remediated and rehabilitated. The evaporation ponds will be designed to prevent pollution or any leakages by lining of the dams. Leak detection technologies will also be utilised. This design level mitigation measures are to prevent pollution, however should there be any leakages of waste water from the evaporation ponds, soil, surface water and ground water pollution could occur.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Soil contamination due to evaporation ponds and pipelines | Leakage / over flow/ spillages of brine/ waste water into the soil from the evaporation ponds and pipeline could contaminate the soil causing high salt content could increase in acidity of the soil would will affect the immediate soil, vegetation cover and organisms in the soil . | Local |
| Surface water pollution due to evaporation ponds | Leakage / over flow/ spillages of brine/ waste water from the evaporation ponds and pipeline could enter surface water bodies such as ephemeral drainage lines and pans causing high salt content could increase in acidity of the water bodies would will affect riparian vegetation and organisms which they support. | Local to Regional |
| Ground water pollution due to evaporation ponds | Brine could seep into the soil and ground water and affect ground water quality. | Local to Regional |

**Gaps in knowledge & recommendations for further study**

» A waste licence is required for the evaporation ponds, which is part of this integrated application for environmental authorisation and waste licencing.
» DWA will be consulted regarding any specific requirements regarding the evaporation ponds.
» The impacts associated with the waste management activities (evaporation ponds) will be assessed in the EIA phase along with the appropriateness of the design level mitigation measures.

**Visual Impacts**

Construction of the CSP Plants will cause scarring of the landscape and localised negative visual impacts. The proposed solar plants are expected to form a stark and noticeable contrast within this predominantly natural region. Potential visual receptors especially within (but not restricted to) a 16 km buffer zone include *inter alia* observers travelling along major routes in the area (i.e. the N10/N14 roads to Augrabies Falls National Park, Kgalagadi Transfrontier Park and Namibia) as well as the arterial roads (R359 and R360) and major secondary roads. Additional sensitive receptors include people within the larger built-up centres or populated places (i.e. Upington, Oranjevallei, Ses Brugge, Louisvale, Klippunt, Kanoneiland, etc.) but also individual/isolated landowners/homesteads identified within the study area (primarily located along the Gariep River). Individuals within protected areas in the vicinity of the proposed facility (i.e. the Spitskop Nature Reserve) and those utilising water related recreational activities and tourism potential of the Gariep River may also be visually impacted.

Visual impact issues related to the proposed solar facilities include:

» The visibility of the facility to, and potential visual impact on, observers travelling along major routes in the area (i.e. the N10/N14 roads to Augrabies Falls National Park, Kgalagadi Transfrontier Park and Namibia) as well as the arterial roads (R359 and R360) and secondary roads within the study area.
» The visibility of the facility to, and visual impact on, not only the larger built-up centres or populated places (the town of Upington, Oranjevallei, Ses Brugge, Louisvale, Klippunt, and Kanon Eiland) but also individual/isolated landowners/homesteads identified within the study area (primarily located along the Gariep River).
» Potential cumulative visual impacts (or alternately, consolidation of visual impacts) with special reference to the possible future Eskom CSP plant located adjacent to the proposed development area.
» The potential visual exposure of the facility to protected areas in the vicinity of the proposed facility (i.e. the Spitskop Nature Reserve).
» The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in close proximity of the facility.
» The visual absorption capacity of the natural vegetation (if applicable).
» Potential visual impacts associated with the construction phase.
» The potential to mitigate visual impacts.

The power tower is the tallest structure related to the Plant Two. The heights of the power tower (200m-300m) and heliostats (12m) represent the largest and potentially the most visibly prominent infrastructure within the both CSP Plants. The overhead power lines will also create a visual impact.
It is possible that the plant (or components of the plant) could be visible over long distances of the site.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Potential visual impact of the power tower and heliostats associated with Phase 2 of the Upington CSP Plant. | The power tower and heliostats will have visual impacts on the landscape. | Local - Regional |
| Potential visual impact of the parabolic troughs associated with Phase 3 of the Upington CSP Plant. | The troughs and ancillary such as access roads, substation and power line will have a visual impact on the landscape. | Local (without mitigation) |
| Change in visual and landscape character from rural to CSP Plants. | The ancillary infrastructure for both plants such as access roads, substation and power line will add to the visual character of the site in combination with the Khi Solar One project. | Local (without mitigation) |
| Introduction of artificial light sources in a rural landscape. | Associated infrastructure of the solar energy facility (i.e. storage area and offices). | Local (without mitigation) |

**Gaps in knowledge & recommendations for further study:**

The following activities will be undertaken during the EIA Phase in order to comprehensively assess the potential visual impact of the proposed facility:

» Potential sensitive receptors will be identified and the severity of the visual impact assessed in a specialist Visual Impact Assessment Report.
» Photo simulations from critical viewpoints will be undertaken in order to aid in the visualisation of the envisaged visual impact of the proposed power tower (central receiver and heliostats) technology.
» Additional spatial analyses will be undertaken in order to create a visual impact index that will further aid in determining potential areas of visual impact.
» The heights of the power tower (200m-300m) will be utilised for the generation of the viewshed, as the tower represent the largest and potentially the most visibly prominent infrastructure associated with Phase 2 of the project.
» The heights of the heliostats (12m) will be utilised for the generation of the viewshed, as these represent the prominent infrastructure associated with Phase 3 of the project.
» Site-specific issues and potential sensitive visual receptors will be measured against a visual impact index and should be addressed individually

in terms of nature, extent, duration, probability, severity and significance of visual impact.

**Social Impacts**

Apart from farm land ownership adjacent to the site, the nearest settlements to the site (in order of closest proximity) include: Louisvale, Kiemos, Upington and Kakamas). Positive and negative social impacts during construction are potentially more significant that during the operational life of the CSP Plants.

The potential positive social impacts during the operational phase include:

» Creation of employment and business opportunities during the operational phase
Given the location of the proposed facility the majority of permanent staff is likely to reside in Upington, Keimoes and Kakama/ Upington. In addition, a percentage of the monthly wage bill earned by permanent staff would be spent in the local economy. The benefits to the local economy will extend over the long term (greater than 20 years) operational lifespan of each CSP Plant.

» The establishment of infrastructure to generate renewable energy and establishment of Clean Development Mechanism (CDM) project
The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the challenges created by climate change, represents a positive High social benefit for society as a whole.

The potential negative social impacts / risks during the operational phase include:

» Visual Impacts: The impact of solar thermal plants on the landscape can be seen as a negative social impact on receptors to whom the CSP Plant is visible to. It is not possible to mitigate this impact.

» Safety Risks associated with thefts and risk of fire. The operational of a CSP Facility does have fire and safety risk associated with it. The risk is high on the plant itself, however fire is an impact can extend to a regional level. The presence of the CSP Plant in the area will result in more people operating on the site, compared to the status qou, which could mean potential risks related to crime and theft. With good site management, the CSP Plants, social impacts can be managed to safe levels and this would be the IPP's responsibility. Emergency Response Plans will be developed for each CSP Plant, relating to any emergency situation including fires and crime.

| Issue | Nature of Impact | Extent of Impact |
|---|---|---|
| Employment opportunities | Individuals will be employed during the operational phase of the project for maintenance of the Plants. Capacity building and skills development throughout the life of the facility could be to the benefit of the employees and could assist them in obtaining transferable skills. During the operational phase, local procurement for general materials, goods and services (e.g. catering and security) could occur. | Local - Regional |
| Safety and security impacts on the site | The presence of the CPS Plants could prompt criminals to enter the site or surrounding properties through the site. Indirectly, possible illegal poaching of game and animals / general | Local |

| | | |
|---|---|---|
| and surrounds. | theft could occur. However, the facility will be fenced and the use of security measures to limit / prevent significant safety / security impacts. | |
| Contribution of clean energy. | On a national scale the project is anticipated to have positive environmental impacts through the "greener" technology that will be used (no use of fossil fuels / no noise / no emissions and so forth). The proposed project could therefore assist in meeting the government's target for renewable energy while contributing to sustainable development in the country. | National |

**Gaps in knowledge & recommendations for further study**

A social impact assessment (SIA) will be undertaken in the EIA phase and include:

» Review of existing project information, including the Planning Documents;
» Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc);
» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc;
» Identification and assessment of the key social issues and opportunities;
» Preparation of Final Social Impact Assessment (SIA) Report, including identification of mitigation/optimisation and management measures to be implemented.

**Table 5.3: Evaluation of potential Cumulative impacts associated with the Upington Solar Thermal Plant Two and Three and Other Solar Projects in the Area**

**Approach to Cumulative Effects Assessment**

Cumulative impacts, in relation to an activity, refer to the impact of an activity that in-itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area. For cumulative effects analysis to help the decision-maker and inform interested parties, it must be limited to effects that can be evaluated meaningfully (DEAT, 2004). Boundaries must be set so analysts are not attempting to measure effects on everything. Therefore, the cumulative impacts associated with the two proposed Upington CSP projects have been viewed from two perspectives within this report:

» Cumulative impacts associated with the scale of the project i.e. two 125 MW CSP plants on the farm portion,

» Cumulative impacts associated with other relevant approved or existing solar developments in the area.

Several projects are being proposed in the area, and authorised projects in a 10km radius include the following:

| Project Name | Location | Project Status |
|---|---|---|
| Eskom CSP Plant | Farm Olyvenhouts Drift | Received Authorisation |
| Khi CSP (Abengoa) facility | Portion 3 of the farm McTaggarts Camp 453 | Construction underway |
| Proposed Solar Reserve project | Farm McTaggarts Camp 453 | Received Authorisation |
| Various Eskom power lines | Various farms | EIAs underway |
| Proposed Sirius Solar Energy Facility (2 X 75MW projects) | Remaining Extent of the Farm Tungsten Lodge | Scoping Phase complete |
| Proposed establishment of the project S-Kol photovoltaic plant near Keimoes | 28 Degrees Energy (Pty) Ltd | Received Authorisation |
| Proposed Sasol Project Solis (CSP Plant) | Sasol New Energy (Pty) Ltd | Received Authorisation |

(These projects were identified using the Department of Environmental Affairs Geographic Information System digital data developed by the CSIR. It must be noted that this secondary product has not yet been verified by DEA). A map showing other relevant solar projects in the study area is

shown in Figure 4.4.

**Potential Cumulative Impacts**

The **cumulative impacts** associated with at a site level are expected to be associated with the scale of the project (i.e. Phase 2 and Phase 3 of the Upington Solar Thermal Plant). Portion 3 of the Farm McTaggarts Camp 453 encompasses a total surface area of approximately 2200 ha which is much larger than the development footprint required for the two 125MW CSP plants. The first Phase of the Upington Solar Thermal Plant referred to as the Khi Solar One project, is currently under construction on a section of the broader farm portion (Portion 3 of the Farm McTaggarts Camp 453). The Upington Solar Thermal Plant Two (a 125 MW parabolic trough plant) will have a development footprint of 300 – 400 ha, and the Upington Solar Thermal Plant Three (a 125 MW power tower plant) will have a development footprint of 400 - 500 ha, to be placed within a broader site of ~2200 ha.

The potential direct cumulative impacts associated with the project are expected to be associated predominantly with the ecology, soil, visual and social environment. These cumulative effects will be assessed utilising the design and for each plant and will be considered in the detailed specialist studies to be undertaken in the EIA phase.

In addition to cumulative impacts at a site level, cumulative impacts could be associated with this proposed development and other similar developments in the area. At this stage, three other solar energy facility's in the area that have been authorised through the EIA process (note that the !Khi CSP Plant is under construction).

Potential cumulative impacts associated with numerous solar energy facility developments within the study area are expected to be associated with:

» *Ecology* – natural vegetation within the study area is impacted by agricultural activities. A solar energy facility generally results in permanent loss of land on a site, any impacts on natural vegetation in this area are considered significant. Therefore, numerous developments (regardless of their nature) within the study area are expected to have an impact on vegetation at a regional level. However, it must be noted that this impact can be effectively avoided through the placement of infrastructure outside of natural vegetation and sensitive habitats. However cumulative habitat loss and fragmentation can be expected.
» *Water Resources* – CSP projects and to a lesser extent PV projects require water during the operational phase. Depending on the water sources, cumulative impacts on the Gariep River or ground water resources could occur.
» *Birds* – The study area is known to support threatened bird species, and could also be associated with important bird flight paths. Therefore, cumulative impact on birds as a result of the development of power lines and other infrastructure within the study area could be significant.

Habitat loss could also be an issue.

» *Visual impacts* – The Khi Solar One CSP project is currently under construction on the site and an Eskom CSP has been authorised which will alter the viewshed of the area. The most significant impact associated with these projects and associated infrastructure is the visual impact on the scenic resources and cultural landscape of this region.

» *Social* – The development of numerous solar energy facilities within the study area will have a cumulative impact on several existing issues within the area, predominately within rural settlements associated with the potential influx of workers and job seekers. With the increased population density, this may lead to a cumulative impact on housing requirements, services (i.e. water, electricity and sanitation), health issues, safety and security. New informal townships are unlikely to have the required infrastructure and services. With the existing rural settlements in the area this will have a cumulative impact on the environment and health (i.e. in terms of ablution facilities). The main social impact, however, will be in terms of visual impacts and associated impacts on sense of place.

» *Positive impacts* - Cumulative positive impacts are, however, also anticipated. Two CPS projects have been authorised; one is under construction this will results in job creation opportunities, business opportunities for local companies, skills development and training. The development of renewable energy facilities will have a positive impact at a national and international level through the generation of "green energy" which would lessen South Africa's dependency on coal generated energy and the impact of such energy sources on the bio-physical environment. The proposed project would fit in with the government's aim to implement renewable energy projects as part of the country's energy generation mix over the next 20 years as detailed in the Integrated Resource Plan (IRP).

Cumulative impacts will be assessed in the EIA phase. It is important to note that the area near Upington is earmarked as a hub for solar energy projects and for solar projects to be clustered in one area. The area in and around Upington in Northern Cape is becoming the hub of South Africa's emerging solar energy industry. Apart from the Khi Solar One CSP project, Eskom also intends on developing a CSP plant adjacent to the site on the Farm Olyvenhouts Drift. Furthermore the site for the proposed Upington Solar Thermal Plant Two and Three falls within the solar development corridor ear-marked within the Northern Cape Provincial Spatial Development Framework (2011). Therefore the location of the site is aligned with development planning in the region.

**Gaps in knowledge & recommendations for further study:**

» Each specialist study will consider and assess the cumulative impacts of approved and authorised renewable projects in the area including:
  * Cumulative ecological impacts
  * Cumulative visual impacts
  * Cumulative social impacts

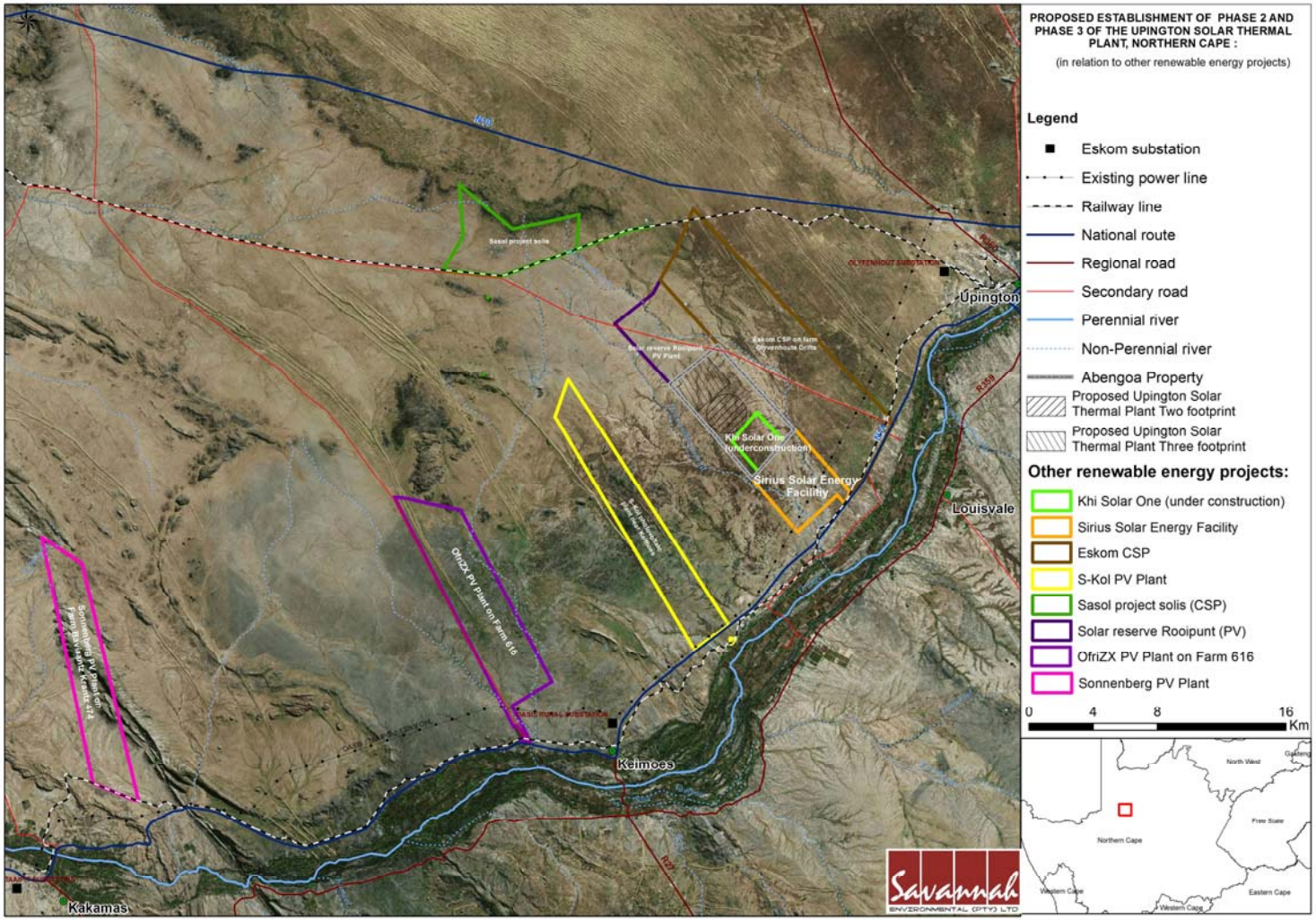


**Figure 4.4:** Map showing other projects in the study area. These projects were identified using the Department of Environmental Affairs Geographic Information System digital data developed by the CSIR.

# CONCLUSIONS CHAPTER 6

Abengoa Solar Power South Africa (Pty) Ltd is proposing the establishment of two commercial solar thermal electricity generating facilities and associated infrastructure near Upington. The project names are as follows:

» Proposed Upington Solar Thermal Plant Two, Northern Cape Province
» Proposed Upington Solar Thermal Plant Three, Northern Cape Province

Each project will be located on a different area within Portion 3 of the Farm McTaggarts Camp 453, which lies ~20 km west of the town of Upington in the Northern Cape. The proposed Upington Solar Thermal Plant Two will consist of heliostats and a Power Tower system with a generation capacity of ~125MW. The proposed Upington Solar Thermal Plant Three will consist of Parabolic Trough technology using heat transfer fluid (HTF), with a generation capacity of ~125MW. Each Concentrated Solar Power (CSP) facility will include the following associated infrastructure: power island with steam turbine generator, access roads, plant substation, power line, water abstraction point on the Gariep River and supply pipeline, water storage tanks, packaged water treatment plant, lined evaporation ponds, salt or direct steam storage vessels, auxiliary fossil fuel boilers and workshop and office buildings. Both CSP facilities will be located on a different area within Portion 3 of the Farm McTaggarts Camp 453.

Due to the relatively homogenous nature of the study area within which the broader facility is proposed to be located, issues associated with Phase 2 and Phase 3 of the Upington Solar Thermal Plant are expected to be similar. The impacts associated with both solar thermal plants are largely similar, apart from visual impacts. Where specific issues have been identified for a specific phase of the development, these have been highlighted. Therefore the conclusions of the scoping report for Phase 2 and Phase 3 of the Upington Solar Thermal Plant have not been separated in this chapter. During the EIA phase there will be separate evaluation and conclusion chapters that deals with each phase of the project.

The Scoping Report for the proposed Phase 2 and Phase 3 of the Upington Solar Thermal Plant has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998).

This Scoping Report is aimed at detailing the nature and extent of this facility, identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and

a consultation process with key stakeholders (including relevant government authorities) and interested and affected parties (I&APs). In accordance with the requirements of the EIA Regulations, feasible project-specific alternatives (including the "do nothing" option) have been identified for consideration within the EIA process.

The conclusions and recommendations of this Scoping Report are the result of desk-top evaluations, on-site inspections of impacts identified by specialists, and the parallel process of public participation. The public consultation process is extensive and every effort is being made to include representatives of all stakeholder groupings in the study area and the Province.

A summary of the main impacts identified in this scoping study for Phase 2 and Phase 3 of the Upington Solar Thermal Plant is provided below. Recommendations regarding investigations required to be undertaken within the EIA are provided within the Plan of Study for EIA, contained within Chapter 7 of this report.

## 6.1. Conclusions drawn from the Evaluation of the Proposed Site for Development of Phase 2 and Phase 3 of the Upington Solar Thermal Plant

The larger site (Portion 3 of the Farm McTaggarts Camp 453) covers an area of approximately 2200 hectares. Approximately 600 hectares has been allocated to Phase 1 of the Upington Solar Thermal Plant (Khi Solar One) which is currently under construction, and is intended to be operational by 2015. Therefore ~1600 hectares is potentially available for development on the site which is owned by the applicant (Abengoa Solar Power South Africa (Pty) Ltd). The available land is much larger than the combined 900 ha area required for Phase 2 and Phase 3 of the Upington Solar Thermal Plant. The facility can therefore be appropriately placed within the larger site.

This scoping study has identified areas of higher sensitivity on the larger site to assist in focussing the location of the development footprint for Phase 2 and Phase 3 of the Upington Solar Thermal Plant to minimise the potential for environmental impact.

Issues identified through this scoping study as being potentially associated with the proposed solar thermal plants include:

» Impacts on biodiversity and ecological processes, including habitat alteration and impacts to wildlife;
» Impacts on heritage sites;
» Impacts on soil and land-use.

» Avian mortality resulting from collisions with infrastructure components (including power lines);
» Visual impacts; and
» Positive and negative impacts on the social environment.

The potential impacts identified to be associated with the construction and operations of the proposed facilities are anticipated to be local to regional in extent. No environmental fatal flaws were identified to be associated with the site. The 'no-go' areas that were identified for the larger site include:

» The mined out areas (~25 hectares) on the north-western corner of the site (currently being rehabilitated under the Khi Solar One project due to safety risk associate with open excavations/ depressions).
» The development footprint of the Khi Solar One CSP Facility (which is currently under construction) and the development footprint for the other authorised phases of this project (~600 hectares) total of 2200 ha).

The mined out areas and Khi Solar One project areas are shown in the combined environmental sensitivity map which is shown Figure 6.1.

The potentially significant issues related to the **construction** of Phase 2 and Phase 3 of the Upington Solar Thermal Plant includes:

» Biodiversity and habitat loss and impacts on flora and fauna resulting from activities such as site clearance and levelling for installation of the facility components and associated infrastructure. The development of two 125MW CSP facilities will result in a total loss of ~900 hectares, as these facilities are assumed to ultimately be devoid of vegetation and consist of hardened and/or impervious surfaces.
» Soil erosion, loss or degradation due to site clearance and levelling for installation of the facility components and associated infrastructure and due to the construction on internal access roads.
» Impact on heritage and paleontological resources through construction activities.
» Visual impacts on the landscape related to the construction site and possible scarring of the landscape resulting from the clearance of vegetation.
» Noise, traffic and dust resulting from construction activities such as movement of vehicles and heavy machinery. This will be temporary in nature and will be localised.
» Socio-economic impacts, both positive and negative (job creation and business opportunities, impacts associated with construction workers in the area).

The potentially significant issues related to the **operation** of Phase 2 and Phase 3 of the Upington Solar Thermal Plant includes:

» Change in land use from agriculture to solar thermal plants.
» Direct impacts on the on-site water resources, i.e. indirect impacts on water resources, i.e. ephemeral drainage lines and seasonal pans and potential changes in water quantity within the Gariep River due to abstraction of water required for the CSP Plants.
» Soil contamination, erosion, loss or degradation related to construction and the evaporation ponds required for the site.
» Visual impacts and impacts on 'sense of place' where the facility and/or associated infrastructure is viewed as visually obtrusive.
» Positive social and economic impacts through job creation and economic benefits;
» Increased use of clean, renewable energy (positive).

## 6.2. Conclusions drawn from the Evaluation of the Potential Issues associated with the proposed Power line

In order to connect the each CSP Plant to the Eskom national grid, two overhead 132 kV distribution line will be required to be constructed. A substation is being built on the site for the Khi Solar One CSP project and the two proposed CSP projects are intended to connect into this new McTaggarts Substation via two 132 kV overhead power lines (each ~5-8 km in length). The operational phase could potentially impact on avifauna species predominantly through collision and electrocution events due to power lines and loss of habitat. The alignment of the power line adjacent/parallel to existing linear infrastructure may partially mitigate the potential for negative impacts from the linear infrastructure. The power line corridor identified will be assessed within the EIA Phase in order to make recommendations regarding alignments and appropriate mitigation measures.

## 6.3. Conclusions drawn from the Evaluation of the Potential Issues associated with Waste Licencing for the Evaporation Ponds

Up to 6 evaporation ponds in total will be required for both CSP plants. The purpose of the evaporation ponds is to receive and store the wastewater (brine) generated from the electricity generation process. The quantity of brine within the evaporation ponds will exceed 100m$^3$ at any given time; therefore a waste licence in terms of the NEM: Waste Act is required. The proposed facility will be operated as a Zero Liquid Effluent Discharge (ZLED) facility; therefore no wastewater from the evaporation ponds will be permitted to be released into the environment or into

any water bodies. The evaporation ponds could have negative environmental impacts including soil contamination, surface water and/or ground water pollution if any large amounts of wastewater is released or accidently released into the environment. Design level mitigation measures to prevent pollution must be considered by the applicant and will be considered in the EIA phase. The proposed locations of the evaporation ponds will also be considered in the EIA phase, to look at appropriate siting of the ponds. The principles of pollution prevention, then mitigation and remediation will be considered.

## 6.4. Sensitivity Analysis for the Study Site

The **potentially sensitive areas** which have been identified through the environmental scoping study are listed below and shown in Figure 6.1. The sensitivity map is a rough scale estimate of sensitivity on the site identified at a desk-top level. These areas will be subject to survey and ground-truthing during the EIA phase of the project. This map represents potentially sensitive areas identified through scoping within which more detailed investigation is required.

These potentially sensitive areas will, therefore, be further investigated and assessed through detailed specialist studies (including field surveys) during the EIA phase of the process (refer to Chapter 7 for more details). The map will be further refined in the EIA phase on the basis of these specialist studies, in order to inform the final design of the facility. In order to assess potential impacts within sensitive areas, the preliminary layout for the solar energy facility will be considered in the EIA phase.

In order to reduce the potential for on-site environmental impacts associated with each facility, these areas should be avoided as far as reasonably possible. This 'funnel-down approach' in the consideration of the larger site focuses the detailed specialist studies in the EIA Phase to the portion of the site with reduced environmental sensitivities. These potentially sensitive areas already identified through the scoping study include:

» *Areas along ephemeral drainage lines and seasonal pans – water resources:* Seasonal pans and waterwashes occur on the site and are considered of to be of medium sensitivity. The habitat offered by the seasonal pans and waterwashes serve ecosystem functions such as providing specialised niches for fauna, creating corridors in the landscape, filtering water, catching sedimentation and concentrating water runoff from catchments.
» *Tributaries of the Heldbrandkloofspruit:* Tributaries of the Helbrandskloofspruit occur on the site for the Upington Solar Thermal Plant Two. Note that the Helbrandskloofspruit occurs outside of the site (Portion 3 of farm McTaggarts

Camp), however it is also a sensitive feature shown in Figure 6.1. In order to reduce impacts on these features, it is proposed that the development footprint for Upington Solar Thermal Plant Two is not directly on or near this drainage line. The water resources study undertaken for this site (under the Khi Solar One project) considered the on-site streams from a flow and connectivity point of view, and the smaller drainage lines would present some risk in terms of disturbance to natural hydrological regimes.

» *Areas previously disturbed through mining activities:* While the area previously disturbed through mining activities in the 1900s would be least sensitive in terms of ecological conservation value, those areas in the northern portion of the site degraded from previous mining activities on site could present a stability risk to the development. The mined out areas is ~25 hectares and is currently being rehabilitated under the Khi Solar One project (due to safety risk associate with open excavations/depressions). The previously mined area is considered a no-go area for development.
» *Heritage Sites*: A Middle Stone Age site (not shown in the sensitivity map) does occur near the Khi Solar One Plant, however not within the vicinity of the construction footprint for the Upington Solar Thermal Plant Two and Plant Three.
» *Sensitive Vegetation:* The Kalahari Karroid Shrubland vegetation on the site proposed for Phase 2 and Phase 3 of the Upington Solar Thermal Plant has a medium ecological sensitivity. Areas with surface rockiness may have a higher proportion of unique vegetation, diversity and possibly protected species. An ecological survey will be undertaken during the EIA phase and the potentially ecological sensitivity areas will be verified in the EIA phase

With an understanding of which areas of the site would be impacted by the development of Phase 2 and Phase 3 of the Upington Solar Thermal Plant, Abengoa Solar Power South Africa (Pty) Ltd can prepare the detailed infrastructure layouts for consideration within the EIA Phase. During this phase more detailed environmental and social studies will be conducted in line with the Plan of Study contained in Chapter 7 of this report.

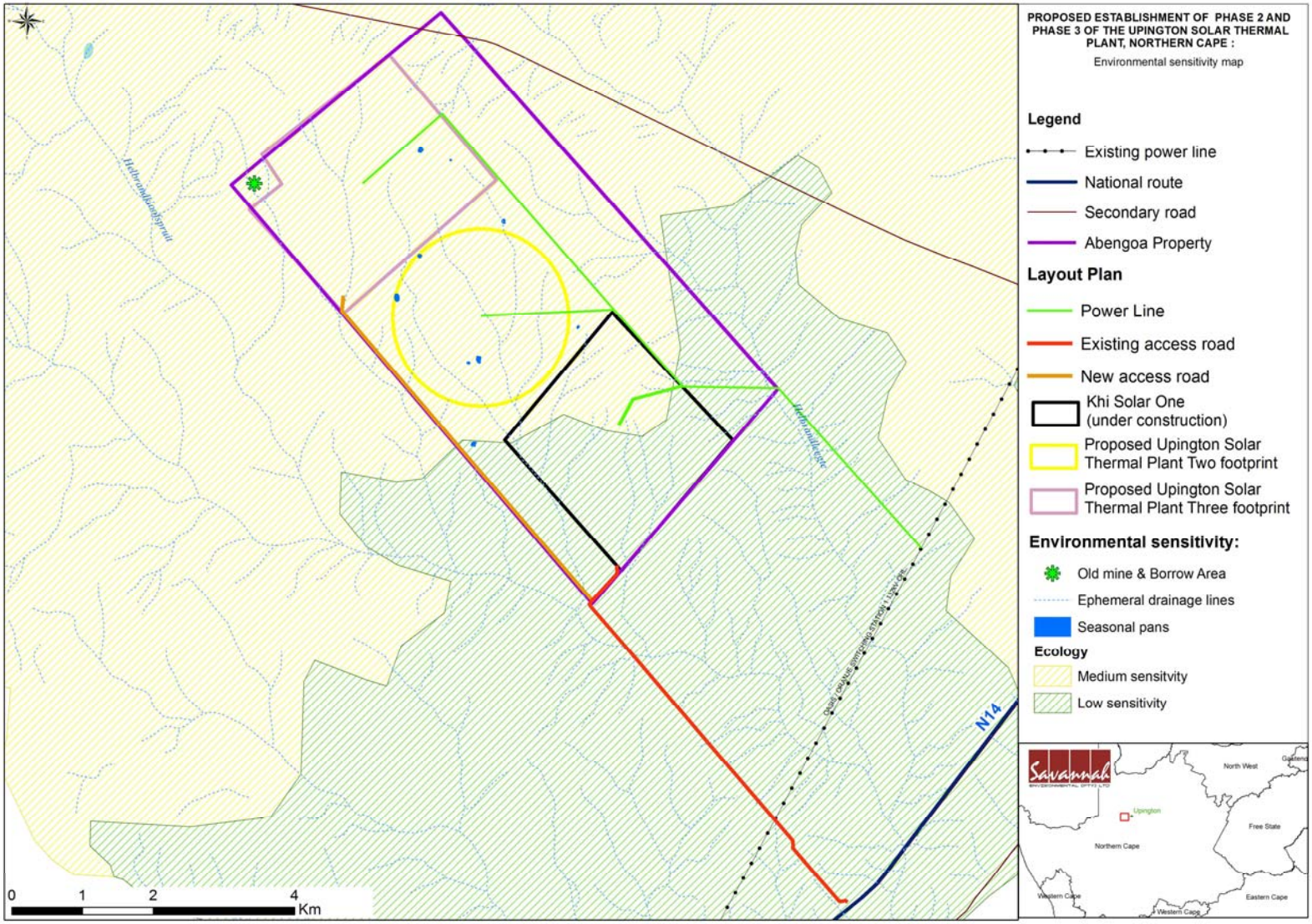


**Figure 6.1:** Combined Scoping Environmental Sensitivity Map for the Proposed Phase 2 and Phase 3 of the Upington Solar Thermal Plant

# PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT CHAPTER 7

This Final Scoping Report includes a detailed description of the nature and extent of the proposed Phase 2 and Phase 3 of the Upington Solar Thermal Plant. The projects are proposed to be located on Portion 3 of the Farm McTaggarts Camp 453 within the Kai !Garib Local Municipality. This Chapter provides the details regarding the Scoping Phase, as well as the issues identified and evaluated through the Scoping Phase (to date). This chapter describes the Plan of Study for the EIA.

The Plan of Study describes how the EIA Phase will proceed and includes detailed specialist studies for those potential impacts recorded to be of significance. The key findings of the Scoping Phase includes inputs from authorities, the public, the proponent and the EIA specialist team and are used to inform the Plan of Study for EIA together with the requirements of the NEMA EIA Regulations and applicable guidelines.

## 7.1. Aims of the EIA Phase

The EIA Phase will aim to achieve the following:

» Provide an overall assessment of the social and biophysical environment affected by the proposed Upington Solar Thermal Plant Phase 2.
» Provide an overall assessment of the social and biophysical environment affected by the proposed Upington Solar Thermal Plant Phase 3.
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with Phase 2 of the Upington Solar Thermal Plant and associated infrastructure.
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with Phase 3 of the Upington Solar Thermal Plant and associated infrastructure.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA will address potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all Phases of the project including design, construction, operation and decommissioning, and will aim to provide the environmental authorities with sufficient information to make an informed decision

regarding the proposed project. All feasible alternatives (including the 'do nothing' alternative) will be assessed.

## 7.2. Authority Consultation

Consultation with the regulating authorities (i.e. DEA and DENC) has been undertaken and will continue throughout the EIA process; on-going consultation and input from DEA and DENC will include the following:

» Submission of a Final Scoping Report following a 30-day public review period (and consideration of comments received).
» Consultation with DEA and DENC, where required, in order to discuss the findings of the Scoping Report and the issues identified for consideration in the EIA Phase.
» Submission of a Final EIA Report following a 30-day public review period.
» Consultation and a site visit with DEA and DENC in order to discuss the findings and conclusions of the EIA Report.

## 7.3. Consideration of Alternatives

The following project alternatives will be investigated in the EIA Phase:

» **The 'do nothing' alternative:** Abengoa Solar Power South Africa (Pty) Ltd does not establish the two proposed solar thermal plants near Upington.
» **Layout/design alternatives:** in terms of the design of the facility, particularly the corridors/servitudes for associated infrastructure such as the access roads, powerlines, water supply pipelines.

## 7.4. Assessment of Potential Impacts and Recommendations regarding Mitigation Measures

Based on the findings of the Final Scoping Study, Table 7.1 provides the issues that were identified as requiring further investigation within the EIA (which also serves as the Terms of Reference for specialist studies):

**Table 7.1:** Issues requiring further investigation during the EIA Phase and activities to be undertaken in order to assess the significance of these potential impacts relevant to both Phase 2 and Phase 3 of the Upington Solar Thermal Plant.

| Issue | Activities to be undertaken in order to assess significance of impacts | Specialist |
|---|---|---|
| Ecology (flora and fauna) | » Ecological survey of the development footprints.<br>» The field survey will confirm which of the species already recorded in will actually occur on site, as well as their locations on the site (to inform layout design and/or the need for permit applications). The survey may reveal the presence of additional species that may not have been recorded in official databases up to date.<br>» Determine if any protected trees / fauna/ birds occur/ utilise the site.<br>» A full flora and fauna species list for the study area will be established.<br>» Results will include:<br>• A phytosociological classification of the vegetation found on the study area according to a TWINSPAN analysis of survey data<br>• A corresponding description of all defined plant associations and their typical habitats, including a full species list for each plant association and a representative photographic record taken on site of each association<br>• A map of all plant communities within the boundaries of the study area<br>• A description of the sensitivity of each plant association, based on sensitivity criteria.<br>» The scoping ecological sensitivity map will be verified and refined in the EIA phase.<br>» An assessment of ecological impacts associated with both CSP Plants will be undertaken in the EIA phase.<br>» Cumulative impacts will be assessed in the EIA phase.<br>» Mitigation measure to manage the impacts of construction activities on flora and fauna will be provided in the EMPr | Marianne Strohbach of Savannah Environmental |
| Soils and agricultural potential | The soils and agricultural potential assessment will be undertaken considering the National Department of Agriculture, Forestry and Fisheries document: Regulations for the evaluation and review of applications pertaining to renewable energy on agricultural land, dated September 2011.<br>» The soils study will include: | Johann Lanz of Johnn Lanz cc |

| Issue | Activities to be undertaken in order to assess significance of impacts | Specialist |
|---|---|---|
| | o Identify and assess all potential impacts (direct, indirect and cumulative) and economic consequences of the proposed development on soils and agricultural potential.<br>o Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers).<br>o Map soil survey points.<br>o Describe the topography of the site.<br>o Do basic climate analysis and identify suitable crops and their water requirements.<br>o Summarise available water sources for agriculture.<br>o Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options.<br>o Describe the erosion, vegetation and degradation status of the land.<br>o Determine and map, if there is variation, the agricultural potential across the site.<br>o Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts | |
| Water resources | The water resources assessment study undertaken during the EIA Phase will consider the potential impacts on:<br>» Impact on water quality/quantity of the region in terms of physical, biophysical and social impacts due to abstraction from the Gariep River<br>» Impact on water quantity of the region due to abstraction from the Gariep River<br>» Impact on dry riverbeds and localised drainage systems including wetland delineation for the development footprints of each phase.<br>» Impact on riparian systems (form and function)<br>» Impact of riverine and instream habitats<br>» Impact on riparian systems (conservation & biodiversity) | Brian Colloty of Scherman, Colloty and Associates |

| Issue | Activities to be undertaken in order to assess significance of impacts | Specialist |
|---|---|---|
| Heritage and palaeontology | Heritage:<br>A Phase 1 Archaeological Impact Assessment (AIA) in line with SAHRA's requirements and the NHRA will be undertaken in the EIA phase, and will include the following:<br>» A site visit will be necessary to inspect various parts of the terrain, focusing on areas of expected impact (construction of facility, sub-station, and secondary infrastructure such as roads, pipelines and power lines).<br>» Heritage traces would be evaluated in terms of their archaeological significance.<br>Palaeontology:<br>A desktop palaeontological report has been done and recommended no further studies or field survey regarding fossils is required due to the low fossil potential of the site. The desktop states that what is required is that the EMPr (to be developed in the EIA phase) should contain guidelines for potential fossil finds and a reporting/action protocol for when finds are uncovered. SAHRA's requirements will also be considered, once comment from SAHRA is obtained. | David Morris of the McGregor Museum |
| Visual | A Visual Impact Assessment will be conducted in the EIA phase including the following methodology:<br>» Potential sensitive receptors will be identified and the severity of the visual impact assessed.<br>» Photo simulations from critical viewpoints will be undertaken in order to aid in the visualisation of the envisaged visual impact of the proposed power tower (central receiver and heliostats) technology.<br>» Additional spatial analyses will be undertaken in order to create a visual impact index that will further aid in determining potential areas of visual impact. This exercise will be undertaken for the core facility as well as the ancillary infrastructure, as these structures (e.g. power line) are envisaged to have varying levels of visual impact at a more localised scale.<br>» Site-specific issues and potential sensitive visual receptors will be measured against a visual impact index and should be addressed individually in terms of nature, extent, duration, probability, severity and significance of visual impact.<br>» Cumulative impacts will be assessed in the EIA phase. | Bernard Oberholzer Landscape Architect |

| Issue | Activities to be undertaken in order to assess significance of impacts | Specialist |
|---|---|---|
| Social Impact Assessment | A Social Impact Assessment will be conducted in the EIA phase including the following methodology:<br>» Site visit and interviews with key stakeholders in the area including local landowners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc;<br>» Assess the potential impact on farming activities and on property prices.<br>» Determine the potential influx of job seekers into the area which may result in an increase in sexually transmitted diseases, an increase in prostitution, alcohol and drug abuse crime; and creation of tension and conflict in the community<br>» Identify the impact on local communities through the creation of employment and business opportunities<br>» Evaluate the potential training and skills development opportunities for local communities and businesses<br>» Determine the potential threat to farm safety due to increased number of people in the area<br>» Assess the potential for stock losses, damage to water/farm infrastructure and damage to roads through heavy equipment and increased traffic volumes.<br>» Assess the potential impact on farming operations due to the loss of productive land.<br>» Cumulative impacts will be assessed in the EIA phase. | Tony Barbour Environmental Consulting and Research |
| Assessment of Waste Management Activities Requiring a Waste Licence | » A waste licence is required for the evaporation ponds (which is part of this integrated application for environmental authorisation and waste licencing).<br>» Each specialist study will consider the site and evaporation pond locations, specifically the ecological, soil and water resources study.<br>» DWA will be consulted regarding any specific requirements regarding the evaporation ponds.<br>» The impacts associated with the waste management activities (evaporation ponds) will be assessed in the EIA phase along with the appropriateness of the design level mitigation measures.<br>» The EMPr will include measures regarding the management of general waste. | » Marianne Strohbach<br>» Johann Lanz<br>» Brian Colloty<br>» EAPs - Ravisha Ajodhapersadh & Karen Jodas |

## 7.5. Methodology for the Assessment of Potential Impacts

Direct, indirect and cumulative impacts of the above issues, as well as all other issues identified will be assessed in terms of the following criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
  - local extending only as far as the development site area – assigned a score of 1;
  - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
  - will have an impact on the region – assigned a score of 3;
  - will have an impact on a national scale – assigned a score of 4; or
  - will have an impact across international borders – assigned a score of 5.
- The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment;
  - 2 is minor and will not result in an impact on processes;
  - 4 is low and will cause a slight impact on processes;
  - 6 is moderate and will result in processes continuing but in a modified way;
  - 8 is high (processes are altered to the extent that they temporarily cease); and
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  - Assigned a score of 2 is improbable (some possibility, but low likelihood);
  - Assigned a score of 3 is probable (distinct possibility);
  - Assigned a score of 4 is highly probable (most likely); and
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).

» the **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
» the **status**, which will be described as positive, negative or neutral.
» the degree to which the impact can be reversed.
» the degree to which the impact may cause irreplaceable loss of resources.
» the *degree* to which the impact can be *mitigated.*

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

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

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

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

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

As Abengoa Solar Power South Africa (Pty) Ltd has the responsibility to avoid and/or minimise impacts as well as plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts will be discussed. Assessment of mitigated impacts will demonstrate the effectiveness of the proposed mitigation measures.

The results of the specialist studies and other available information will be integrated and synthesised by the Savannah Environmental project team; the EIA Report will be compiled, and will include:

» **Detailed description** of the proposed activity
» A description of the property(ies) on which the activity is to be undertaken and the location of the activity on the property(ies)
» A description of the **environment that may be affected by the activity** and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity

- Details of the **public participation process** conducted, including:
  - steps undertaken in accordance with the plan of study for EIA;
  - a list of persons, organisations and organs of state that were registered as interested and affected parties;
  - a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response to those comments; and
  - copies of any representations, objections and comments received from registered interested and affected parties
- A description of the **need and desirability** of the proposed project and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity
- An indication of the methodology used in determining the **significance** of potential environmental impacts
- A description and comparative **assessment of all alternatives** identified during the environmental impact assessment process
- A summary of the findings and recommendations of **specialist reports**
- A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
- An assessment of each identified potentially significant impact
- A description of any assumptions, uncertainties and gaps in knowledge
- an environmental **impact statement** which contains:
  - a summary of the key findings of the environmental impact assessment; and
  - a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives
- A draft **environmental management programme** for each phase of the project
- Copies of specialist reports

The Draft EIA Report will be released for a 30-day public review period. The comments received from I&APs will be captured within a Comments and Response Report, which will be included within the Final EIA Report, for submission to the authorities for decision-making. Should there be significant changes between the draft EIA report and the final EIA report, the final EIA report will be made available for public review for a period of 21 days.

## 7.6. Public Participation Process

A public participation process will be undertaken by Savannah Environmental. Consultation with key stakeholders and I&APs will be on-going throughout the EIA Phase. Through this consultation process, stakeholders and I&APs will be encouraged to identify additional issues of concern or highlight positive aspects of the project, and to comment on the findings of the EIA Phase. In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their inputs regarding the project, various opportunities will be provided for stakeholders and I&APs to be involved in the EIA Phase of the process, as follows:

» Focus group or public meetings (pre-arranged and stakeholders invited to attend).
» One-on-one consultation meetings (for example with directly affected and surrounding landowners).
» Telephonic consultation sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants).
» Written, faxed or e-mail correspondence.

The Draft EIA Report will be made available for public review for a 30-day period prior to finalisation and submission to the DEA for review and decision-making. In order to provide an overview of the findings of the EIA process and facilitate comments, a public meeting may be held during this public review period.

## 7.7. Key Milestones of the Programme for the EIA

The envisaged key milestones of the programme for the EIA Phase are outlined in the following table.

| Key Milestone Activities | Proposed timeframe[6] |
|---|---|
| Public review period for Draft Scoping Report | 30 October 2013 – 28 November 2013 |
| Finalisation of Scoping Report & submission to DEA | 29 November 2013 |
| Authority acceptance of the Final Scoping Report and Plan of Study to undertake the EIA | January 2014 |
| Undertake specialist studies and public participation process | January 2014 |
| Make Draft EIA Report and Draft EMP available to the public, stakeholders and authorities | February 2014 |
| Finalisation of EIA Report | March 2014 |
| Submit Final EIA Report to DEA for review and decision-making | March 2014 |

[6] Indicative dates only

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