PAULPUTS CSP PROJECT, NEAR POFADDER, NORTHERN CAPE PROVINCE

ENVIRONMENTAL MANAGEMENT PROGRAMME

DEA REFERENCE: 14/12/16/3/3/2/870

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Prepared for

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

Alien species: A species that is not indigenous to the area or out of its natural distribution range.

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.

Assessment: The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

Biological diversity: The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Concentrated solar power: Solar generating facilities use the energy from the sun to generate electricity. Concentrated Solar Power facilities collect the incoming solar radiation and concentrate it (by focusing or combining it) onto a receiver, allowing heat absorption to take place, thereby allowing for heat to generate steam and ultimately electrical generation.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity as per Regulations GNR 983, 984 and 985 of December 2014. Construction begins with any activity which requires Environmental Authorisation.

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

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

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

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

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

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

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

Environment: the surroundings within which humans exist and that is 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 assessment practitioner: An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

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

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations, is a systematic process of identifying, assessing and reporting environmental impacts associated with an activity.

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

Environmental management programme: A 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.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

Heliostat: Highly reflective mirror technology which focuses solar radiation to a solar receiver. These mirrors are guided by software which allows for continuous solar tracking to ensure optimal power generation throughout the day.

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

Indirect impacts: Indirect or induced changes that may occur because 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 because 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 public.

Pre-construction: The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Project development property: The project development areas considered through the EIA process in defining the area for the CSP facility project include, and are defined as follows:

- **Project area:** The project area refers to the total extent of Portion 4 of the Farm Scuitklip 92 which is 3508 ha in extent. The entire 3507 ha of the project area was subjected to the scoping level assessment in order to provide the option of identifying more suitable positions for development of the CSP facility, should any of the areas be found to be technically or environmentally constrained.
- **Development site:** The site of the proposed CSP Project is situated in the north eastern position on Portion 4 of Farm Scuitklip 92 (project area), and is 900 ha in extent.
- **Facility development footprint:** The total development footprint on the development site for the CSP project, including associated infrastructure is ~ 900 ha in extent.

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.

Solar thermal power: The generation of electricity can be easily explained as the conversion of energy from one form to another. Solar thermal facilities, like conventional coal-fired power plants operate by heating water for the purpose of steam generation. This steam is used to turn a generator which is a rotating machine that converts mechanical energy into electrical energy by creating relative motion between a magnetic field and a conductor. Where conventional power stations burn fossil fuels (i.e. coal or gas) to generate steam, their solar counterparts extract this energy from the sun. Two types of solar thermal technologies make use of reflectors / mirrors to concentrate the incoming solar radiation onto a focal point. These are referred to as line and point concentrating solar power (CSP) technologies. The point focus technologies include the tower and dish technologies, the line focus technologies include the parabolic trough and linear Fresnel technologies. The solar tower is the proposed technology for the Paulputs CSP project.

Waste: any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to the Waste Amendment Act (as amended on June 2014); or any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the *Gazette*,

TABLE OF CONTENTS

APPENDICES

INTRODUCTION CHAPTER 1

This Construction and Operation Environmental Management Programme (CEMP and OEMP) has been compiled for the 200 MW **Paulputs CSP Project** being planned by Paulputs CSP RF (Pty) Ltd. The project involves the development of a Concentrated Solar Power (CSP) plant and associated infrastructure on Portion 4 of the Farm Scuitklip 92, located approximately 40km north-east of Pofadder within the Khai-Ma Local Municipality in the Northern Cape. The Paulputs Concentrated Solar Power (CSP) Project is proposed to be a CSP facility using molten salt tower technology of up to 200MW in capacity and will be constructed over an area of approximately 900ha in extent within the broader property. The project is to be developed by Abengoa Solar Power South Africa (Pty) Ltd, through Paulputs CSP RF (Pty) Ltd, a Special Purpose Vehicle (SPV) established to be the applicant for the project.

The EMPr has been developed on the basis of the findings of the EIA, and must be implemented to protect sensitive on-site and off-site features through controlling planning, construction, operation and decommissioning activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts. This EMPr is applicable to all Paulputs CSP RF (Pty) Ltd employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the Paulputs CSP Project. The document will be adhered to and updated as relevant throughout the project life cycle.

PROJECT DETAILS *CHAPTER 2*

Paulputs CSP RF (Pty) Ltd is proposing to develop a Concentrated Solar Power (CSP) Project and associated infrastructure on Portion 4 of the farm Scuitklip 92, in the Khai-Ma Local Municipality in the Northern Cape Province (refer to Figure 2.1). A broader study area of approximately 3508 ha (Portion 4 of the farm Scuitklip 92) was considered through a feasibility level assessment in 2010, and the area was considered to be highly acceptable for the development of CSP facilities. This farm portion currently contains the Paulputs Substation as well as two CSP facilities owned by Abengoa Solar South Africa, known as KaXu Solar One (operational) and Xina Solar One (under construction). The development footprint for the Paulputs CSP Project (approximately 900 ha in extent) would be appropriately located within the remaining extent of the farm portion (approximately 1600ha in extent) – refer to Figure 2.2 and 2.3. The identified site is accessible via the R357 and MR73 existing access road, via the N14.

Table 2.1: Detailed description of the farm Scuitklip 92

Province	**Northern Cape Province**
District Municipality	Namakwa District Municipality
Local Municipality	Khai-Ma Local Municipality
Ward number(s)	1
Nearest town(s)	Pofadder
Farm name(s) and number(s)	The Farm Scuitklip 92
Portion number(s)	Portion 4
SG 21 Digit Code (s)	C03600000000009200004
Landowner	Abengoa Solar South Africa Pty Ltd
Land use	Zoned Special Solar

The proposed Paulputs CSP Project will have a contracted capacity of up to 200MW. Molten salt technology will be utilised to allow for at least 5 hours of storage to meet the requirements of the REIPPPP. The Paulputs CSP Project will consist of a field of heliostats and a central receiver (known as a power tower). The Paulputs CSP project will be constructed over an area of approximately 900 ha in extent, and include *inter alia* the following infrastructure:

- Molten salt tower up to 300m in height with surrounding heliostat field
- Power island including salt storage tanks, steam turbine generator, heat exchangers, and dry cooled condenser
- Cabling linking the power block to the on-site substation;
- Water supply abstraction point located at the Gariep River close to Onseepkans
- Filter and booster station at abstraction point
- Water supply pipeline along R357 Onseepkans Road to the site

- On-site lined ground water storage reservoir and various steel water tanks
- Lined evaporation ponds
- Packaged water treatment plant and associated chemical store
- Auxiliary wet cooled chiller plant
- Control room and office building
- Heliostat assembly building and workshop.
- Access roads
- On-site substation and overhead power line

Table 2.2: Details or dimensions of typical structures required for the Paulputs CSP project

Infrastructure	Footprint and dimensions
Salt Tower	~10ha Up to 300m (maximum height)
Heliostat field	up to 800 ha up to 10m pedestal
Power island and steam turbine and generator	6.5ha
Molten salt storage tanks	4 tanks each 40m diameter
Auxiliary boilers	10m x 10m
Water storage reservoir and tanks (combined capacity up to 15 000m^3) and associated infrastructure	Tanks 15m to 20m diameter
Substation	50m x 50m
132 kV power line	32 m wide servitude, up to 3km in length 25 - 35m high towers
Workshop building (maintenance) and office buildings	20m x 50m each
Packaged waste treatment plant	30m x 30m
Lined evaporation ponds	6 ha - 6 ponds at 1ha each
Mirror assembly facility	100m x 50m
Internal access roads	8m wide, 1.5km in length
Water abstraction point located at the Gariep River, plus filter station	20m x 30m
Water supply pipeline	~30km in length
Temporary laydown area and construction camp.	200m x 200m

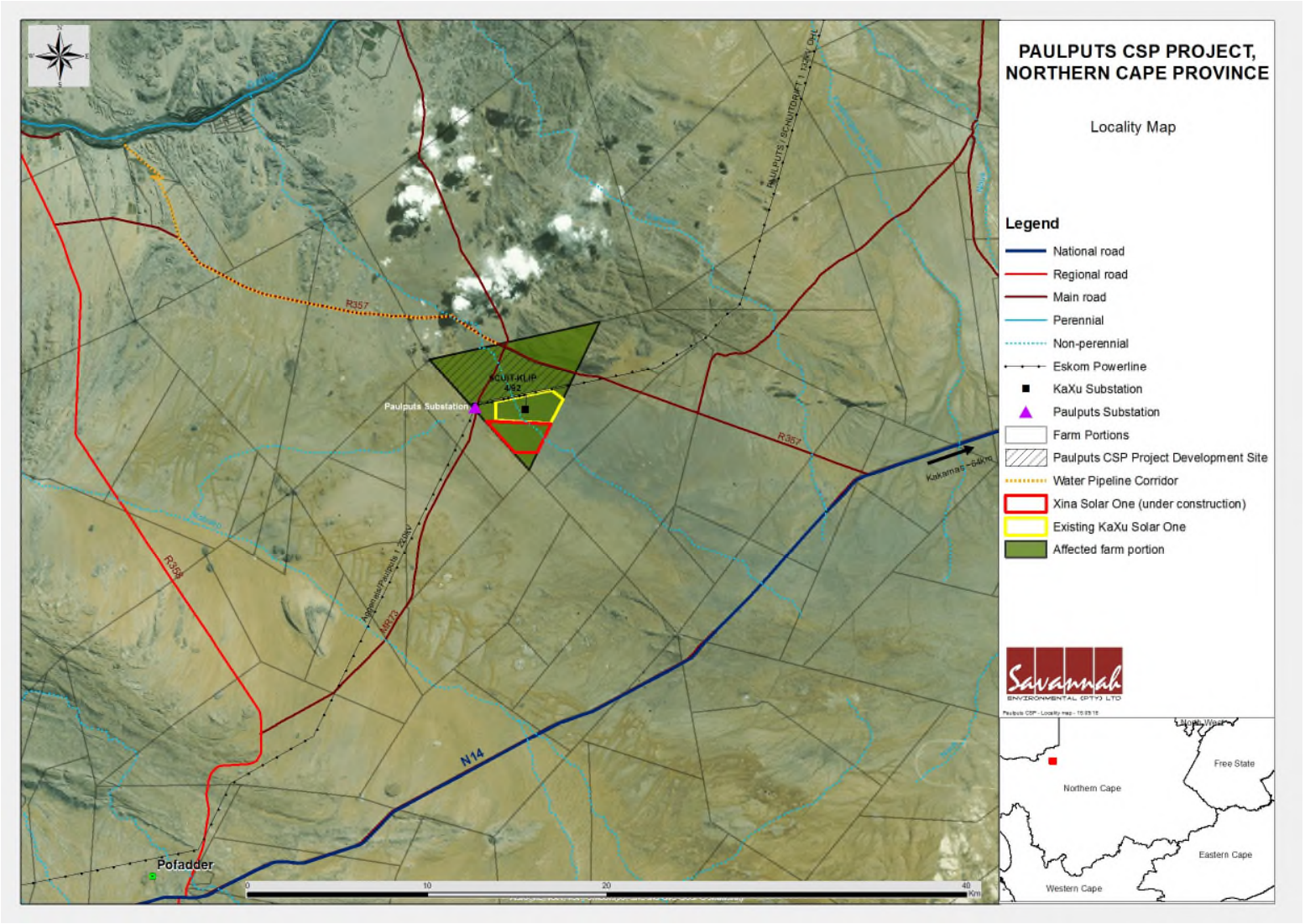

Figure 2.1: Locality map showing the extent of Portion 4 of the Farm Scuitklip 92 and the proposed location of Paulputs CSP project within the extent of the farm portion.

2.1. Findings of the Environmental Impact Assessment

The EIA report for Paulputs CSP project together with the specialist studies contained within **Appendices D - J** provide a detailed assessment of the environmental impacts on the social and biophysical environment as a result of the proposed project. A summary of the conclusions of the assessment of the proposed site for the Paulputs CSP project and the associated infrastructure is provided. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental team during the course of the EIA and presents an informed opinion of the environmental impacts associated with the proposed project.

The assessment of potential environmental impacts presented in the EIA report is based on a preliminary layout of the Paulputs CSP Project and associated infrastructure (for the 200MW facility) provided by Paulputs CSP RF (Pty) Ltd. The environmental sensitivities (ecological and avifauna sensitivities) identified during the EIA phase have informed the layout of the proposed facility (Refer to **Figure 2.1**). All identified sensitivities were excluded from the proposed development where feasible.

No environmental fatal flaws were identified to be associated with the proposed facility. However the following potentially significant environmental impacts have been identified through the EIA Phase.

» Local site specific impacts resulting from the physical modification/disturbance of the site primarily during the construction phase.
» Impacts on avifauna.
» Impacts on water resources.
» Visual impacts.
» Impacts on the social environment.
» Cumulative impacts.

2.1.1 Local site-specific impacts

The development of the proposed Paulputs CSP Facility is likely to result in a variety of impacts, associated largely with the disturbance, loss and transformation of intact vegetation and faunal habitat due to hard infrastructure such as roads, operations buildings, etc. The impact assessment determined that 8 main impacts are likely to occur due to the development, namely:

» Vegetation Clearing and subsequent loss of species of concern;
» Spillage of harmful or toxic substances;
» Disturbance of biodiversity due to vibration and noise;
» Habitat degradation and fauna impacts due to dust;
» Effects on local migrations;
» Increased prevalence of exotic invasive species;
» Increased erosion; and

» Impact of attracting insects and subsequently bats to the tower due to artificial light at night.

There are no features within the proposed development area considered to be very high sensitivity or which present a no go area, and the abundance of species of concern within the development area is also low.

- According to the Khai-Ma Land Use Decision Support tool, the study area falls within an Ecological Support Area (ESA). The development will affect less than 30% of the width of the migration route and should have very little effect on species using this route. It must also be noted that the migration route indicated is part of a large system of migration routes and that the percentage of these migration routes that will be impacted will be negligible..

Due to the fact that there are already three existing solar facilities in the area, as well as the fact there are more planned, the cumulative impacts of the impacts general to solar facilities are likely to be of a higher order of magnitude than the significance ratings given here. It must however be noted that none of the other solar facilities are tower facilities and impacts unique to tower facilities are therefore unlikely to have a higher cumulative impact.

With implementable mitigation measures and a functional monitoring – management – implementation – monitoring feedback loop in order to monitor and mitigate impacts, all probable ecological impacts can be managed to a low impact rating. Based on this and the fact that South Africa is experiencing a significant energy crisis, the risks and losses associated with this development can be seen as acceptable and defendable

2.1.2 Impacts on Avifauna

Potential impacts on avifauna as a result of the proposed project include disturbance during construction and operation, loss of habitat and potential for collision with the heliostats and the tower. A total of 29 species were recorded and a total of 1341 individual birds were recorded. Only one species of conservation importance was recorded during the study namely, the Maccoa Duck.

During the study the following factors which could provide biological requirements for local avifauna were identified. These potential factors should therefore be mitigated in order to reduce the number of birds likely to occupy the CSP facility (i.e. deter birds from using the area by making it as unsuitable for meeting avian biological requirements as possible, and therefore less attractive to birds):

- Openings at either end of the proposed horizontal rotating cylinder – may potentially provide nesting sites;
- Flat surfaces at the base of the proposed tower – may provide possible nesting and perching sites for a large number of species; and

- Colour of the proposed tower – may attract insects, which are a food source for insectivorous avifauna.

One of the main aspects of avifauna behaviour noted was that the majority of birds recorded during the study flew at a height below that of the heliostats (i.e. below a maximum height of 12m). in addition, it was noted that bird activity on the site was low between 11:00 and 16:00 every day, during this time most species were found to be active in the riparian or wash areas traversing the study area. As was expected, during the dry season survey, species activities were restricted to foraging and feeding or searching for food. No nesting or mating behaviour was observed. During the wet season survey no nesting was in progress, but recently used nests were abundant, especially in areas with larger trees and shrubs. These factors will most likely reduce the risk of mortality in avifauna species as a result of the proposed project.
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2.1.3 Impacts on Agricultural Potential and soils

Two major impacts were assessed. The first impact on the natural resources of the study area would be the loss of arable land due to the construction of the various types of infrastructure. However, this impact would in all probability be of limited significance due to the limited potential of the land in this regard, and would be local in extent. At the end of the project life, it is anticipated that removal of the structures would enable the land to be returned to more or less a natural state, with little impact, especially given the low prevailing agricultural potential.

The second impact would be the possibility of increased soil erosion due to the removal of vegetation in the construction process. This would probably be due to wind action on the relatively sandy topsoils.

Two CSP facilities, KaXu Solar One and Xina Solar One are located in the southern portion of the site. The major potential cumulative impact would be the possibility of wind erosion caused by construction activities at the Paulputs CSP site that would cause

topsoil to be blown and deposited elsewhere, for example at any nearby facilities, where dust accumulation would be a problem.

Much of the area comprises either shallow to very shallow soils or surface rock outcrops, and only a very small portion of deep soils. The very low rainfall in the area means that the only means of cultivation would be by irrigation there are no signs of any agricultural infrastructure and certainly none of irrigation. The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is very low, around 40-50 ha/large stock unit. No areas were identified as degraded. In addition, no areas of cultivation were identified except for the strip of cultivated orchards and pivots along the Gariep River to the north.

There are no identified highly sensitive areas with regards to agricultural potential and soil and the Paulputs CSP Project will not have a significant impact on the agricultural potential of the area.

2.1.4 Impacts on aquatic resources

With the implementation of suitable mitigation and of the proposed layout, the development should have limited impact on the overall status of the site specific riparian systems. The assessment of the potential impacts of the proposed CSP project on the fish biota of Gariep River also did not reveal any significant impacts on the fish fauna and associated aquatic habitats, provided the appropriate mitigation measures are implemented. All impacts that were assessed can be reduced to medium or low significance with the implementation of appropriate mitigation, apart from the moderate impact of water abstraction from the Gariep River. However, in this case the precautionary principle was applied due the lack of data on the Ecological Water Requirements of the Gariep River for this locality.

Impacts on the Gariep River system due to water abstraction, and site-specific impacts on instream biota are difficult to quantify due to the number of unknowns and the highly regulated nature of the system.

In conclusion therefore, the facility is deemed to have a limited direct potential impact on the aquatic environment, considering the number of unknowns and the highly regulated nature of the Gariep River system. It is however assumed that any such changes would be detrimental to the various projects owners, i.e. reduce water availability for all projects. Therefore, based on this assessment the significance of the impacts assessed for the aquatic systems after mitigation would be Medium - Low. While all of the proposed alternatives would have a similar impact on the aquatic environment

2.1.5 *Heritage Impacts*

The destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial 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). A water pipeline, if sourcing water at the river, could traverse more sensitive terrain, i.e. impacting a potentially greater density of archaeological sites.

The rocky outcrops that occur at the north eastern side of the proposed project footprint are regarded as no go areas and a 60 meter buffer has been considered around each outcrop. . These sites and others like them in the broader landscape provided shelter and variety of resources that attracted human activity through Stone Age times. Although two of these areas are shown to fall within the heliostat field in Figure 8.1, it has been confirmed by the developer that these areas will be avoided through the placement of the heliostats. This has been fully considered from a technical perspective and will result in the loss of approximately 93 heliostats within the northern portion of the heliostat field (refer to Figure 8.2).

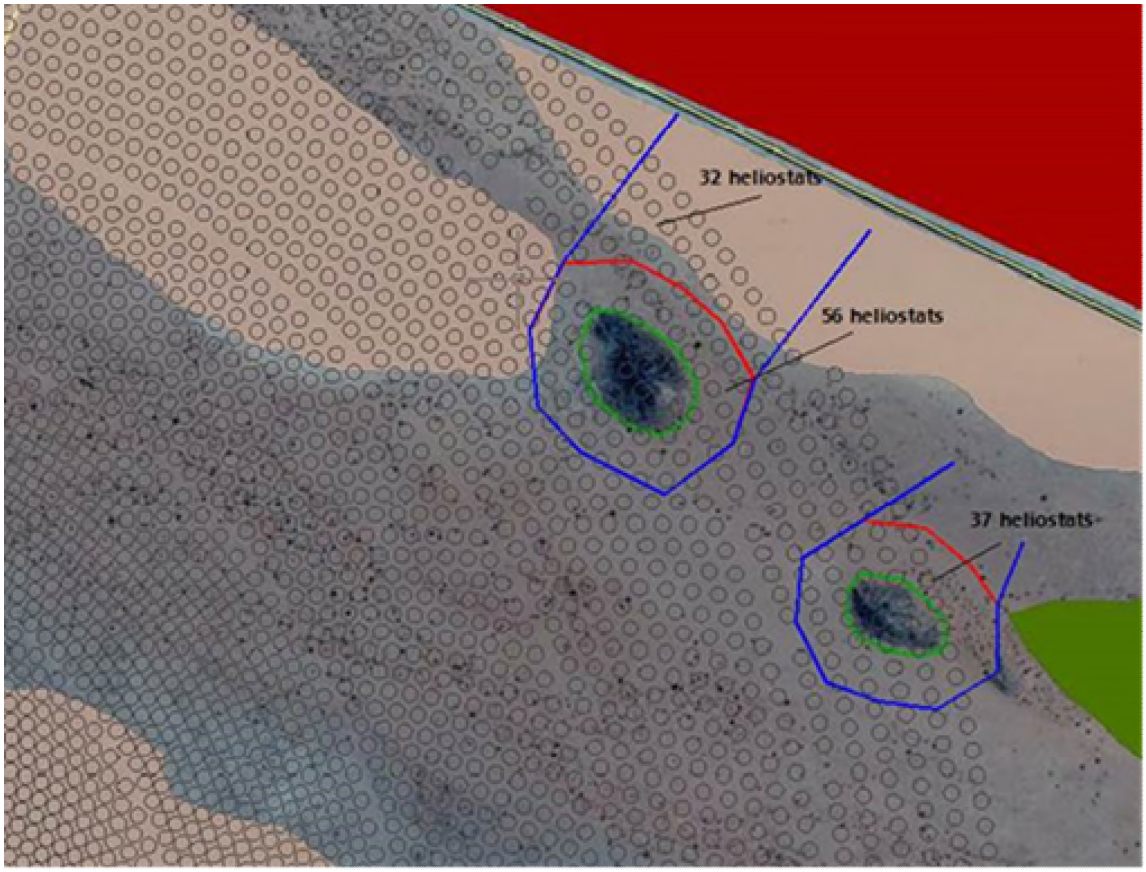


Figure 8.2: Image showing heritage no go areas and associated buffer and the number of heliostats to be lost through avoidance of these areas.

From a technical perspective, it is confirmed that this approach will not result in an impact on the feasibility of the project as these are further away from the receiver and are located within the northern heliostat field, which in the southern hemisphere are less efficient.

2.1.6 Visual impacts

The assessment indicates that the development is likely to have two main areas of visual impact;

1) It will intensify the current industrial character of the area immediately surrounding the proposed development area.
2) The proposed tower at 300m high will form a major new feature in the landscape. It is likely to be a dominant feature up to 15 to 20 km away. It is also likely to be obvious in the landscape up to 30km away.

The impact of the tower is mitigated to a degree by landform in that;

» It will largely be viewed against and within a rock formation that is taller and has substantially greater visual mass than the tower, it will therefore be in scale with its surroundings and seen against a landform backdrop from many viewpoints.

» The landform to the north will provide a large degree of screening from that direction.
» The compartmentalised nature of the landscape will mean that the impact will be limited.
» The steep slopes of the Orange River Valley will screen views of the tower from that area.
» Inselberge will help to further reduce the impact from key viewpoints such as the N14.

Identified cumulative impacts only relate to the low development components and associated infrastructure associated with the proposed power tower. The impacts associated with these elements will be similar to and will largely impact the same area as the two existing CSP parabolic trough projects and the Paulputs Substation which are located adjacent to the proposed development. The proposed project will therefore not extend but will intensify the industrial character within a limited impact area.

The proposed development will not affect protected areas and whilst the landscape in which it is set in is a dramatic and memorable landform it serves to compartmentalise views in a progressive way for travellers through the area. This compartmentalisation of the landscape serves to help limit impacts.

2.1.7 Impacts on the social environment

The proposed development site is located within a rural setting and is removed from settlements and homesteads. Impacts on the social environment are expected during both the construction phase and the operation phase of the CSP facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the CSP facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

Positive impacts associated with the project are largely due to job creation opportunities, business opportunities for local companies, skills development, and training. The proposed project could assist in alleviating poverty amongst some individuals in the study area through the provision of permanent employment opportunities.

The development of a renewable energy facility of this nature 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).

Potential negative impacts which require mitigation relate to an influx of workers and jobseekers to an area (whether locals are employed or outsiders are employed) and an associated perceived risk of an increase in crime in the area, and traffic and intrusion influences during construction. As a limited number of workers are proposed to be housed on site, certain impacts could arise as a result of worker conduct at this site. Stringent mitigation is required to be implemented to reduce these impacts to acceptable levels.

Impacts on farming activities may occur as a result of the proposed development. However, due to the limited agricultural potential of the proposed development site, and the low rainfall in the area, the impact on agricultural potential as a result of the loss of land associated with the development is not expected to be significant. In fact, the proposed development may present opportunities for additional agriculture on the site and surrounds in that the water supply infrastructure could be utilised to transport water to irrigate crops within these areas. This would be a positive impact.

2.2. Environmental Sensitivities

» Ecology: On a local/site level, areas of high ecological function include the more inaccessible or unutilisable areas such as rocky outcrops should be regarded as no-go areas. These areas of high ecological function include Konkoonsiekop in the north western corner of the farm portion as well as Ysterberg located on the north eastern portion of the farm portion. The natural areas are considered to be of conservation importance due to the presence of Red Data species in these areas and should be avoided as far is reasonably possible. Such natural areas are located on the south western portion of the farm and to the eastern portion of the farm closer to Ysterberg (refer to Figure 8.1). The impacts for the construction and operational phase range from local to regional level. Overall, and with the suggested mitigation measures implemented, the impacts of the development are likely to be of moderate to low significance and no impacts of high significance are likely.

» Avifauna: Sensitive avifaunal habitats on the site are linked to landform and habitat. The areas of high ecological function including the rocky outcrops (Konkoonsiekop in the north western corner of the farm portion as well as Ysterberg located on the north eastern portion of the farm portion) should be regarded as no-go areas. Heritage: Areas of heritage sensitivity on the site include terrain close to hills or rocky features and the known road-side grave below Ysterberg. The rocky outcrops that occur at the north eastern side of the proposed project footprint are regarded as no go areas and a 60 m buffer around each outcrop has been considered. These sites and others like them in the broader landscape provided shelter and variety of resources that attracted human activity through Stone Age times. As indicated in Section 8.2.5, these areas have been considered within the design of the facility and would not be impacted. The open plains have been found to have sparsely scattered artefacts. The construction of the project could have a low impact on a local scale.

Limited impact on palaeontological resources are envisaged due to the poor fossil assemblage in the local lithology.

As is evident in Figure 2.3, some areas of moderate and high sensitivity will be impacted by the proposed layout. These areas are however limited and impacts on these areas are not expected to result in impacts at a broader scale which could compromise habitat availability or species abundance. The layout as proposed is therefore considered to be acceptable. Figure 2.4 overlays sensitivity on the site layout

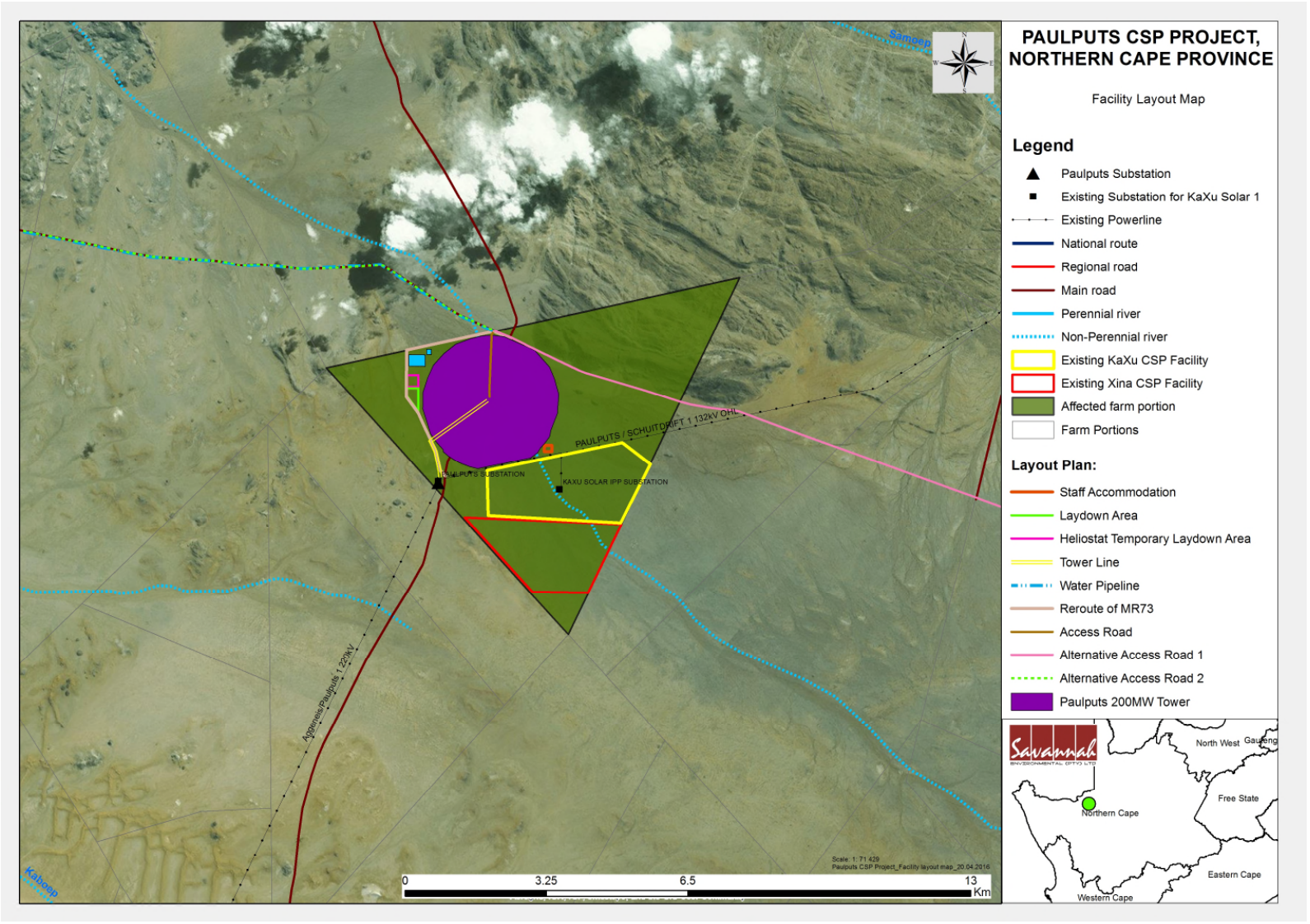


Figure 2.2: Facility layout map for the proposed Paulputs CSP Project.

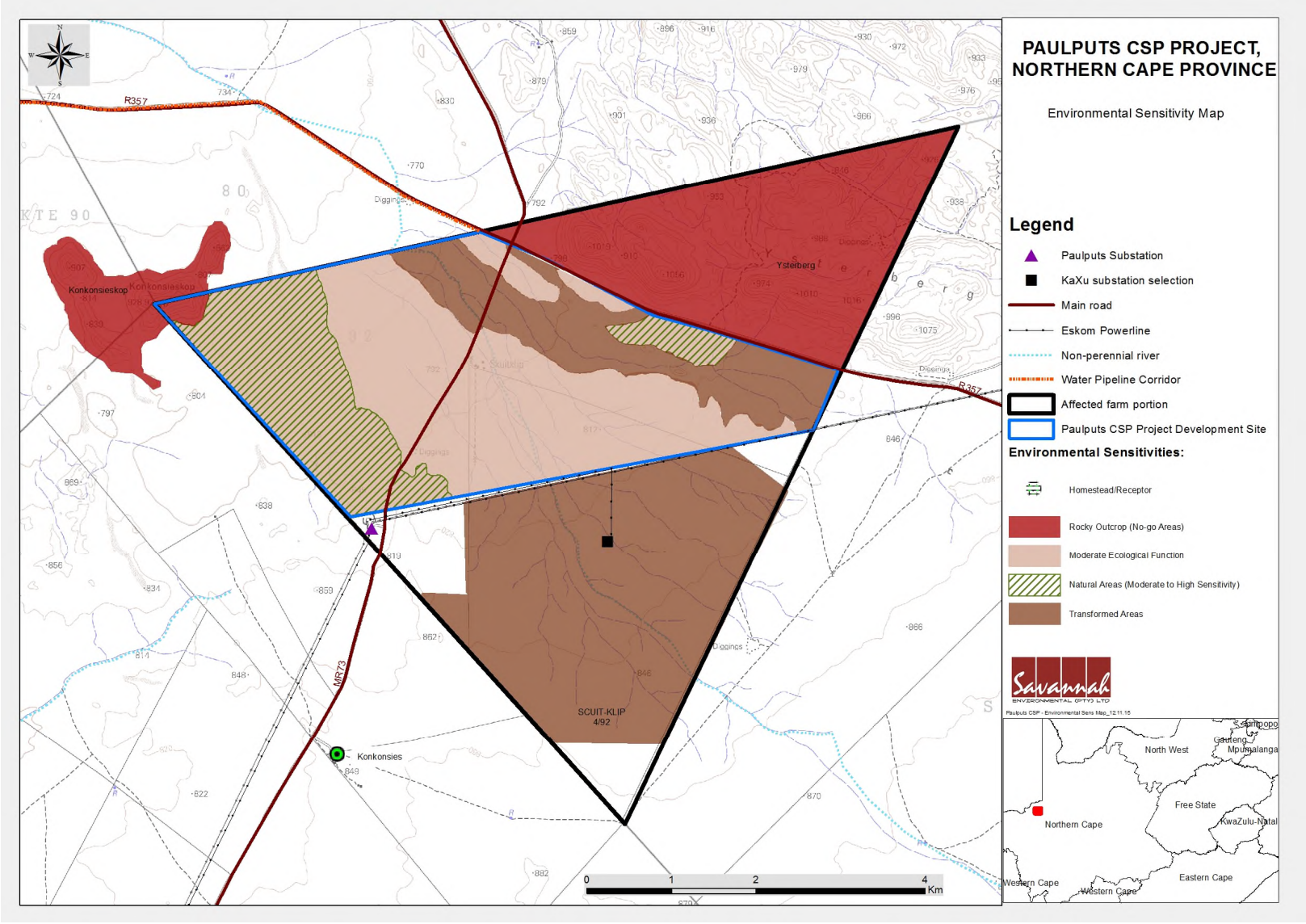


Figure 2.3: Environmental sensitivity map.

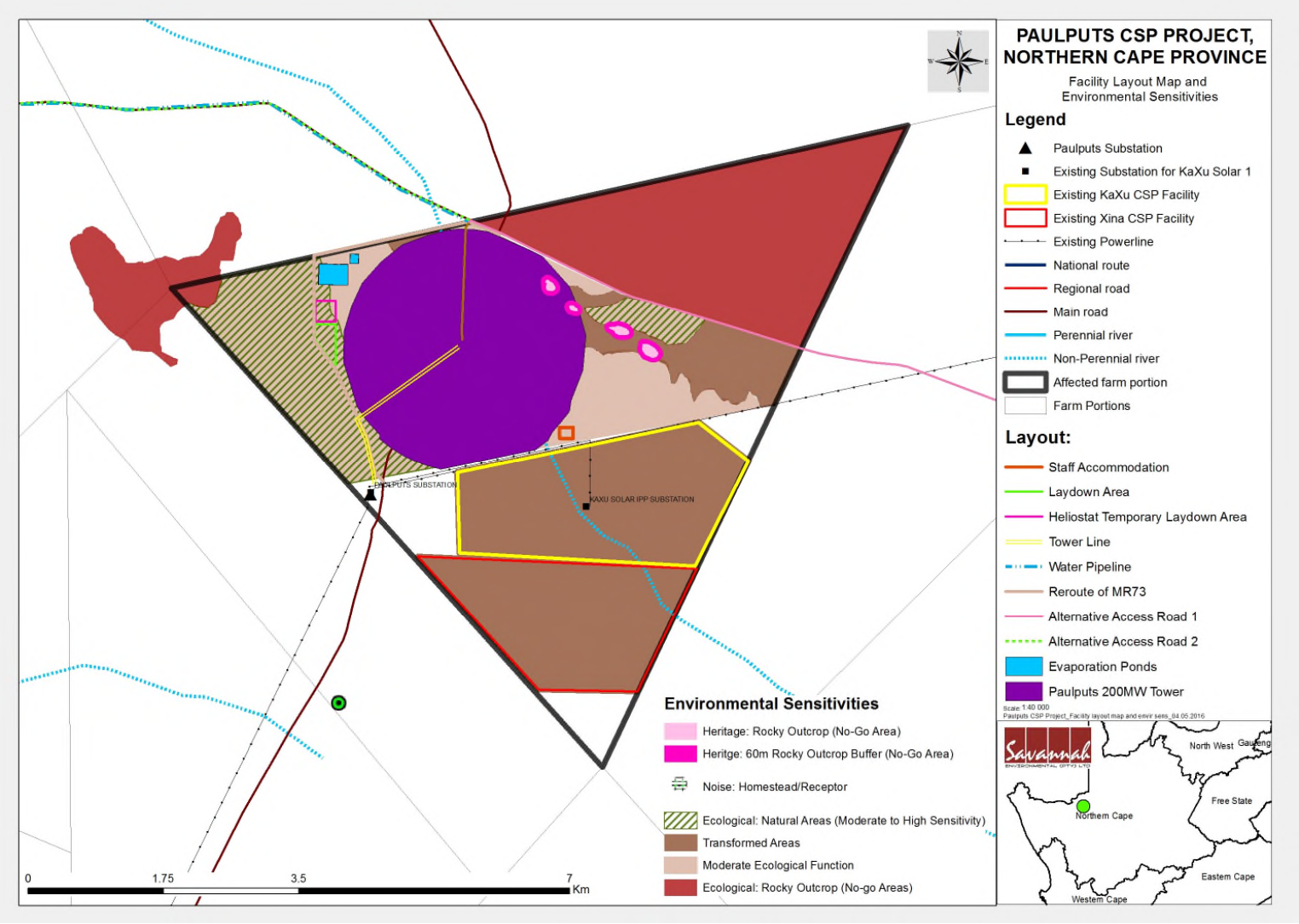


Figure 2.4: Layout and environmental sensitivity map

2.3. Activities and Components associated with the Solar Thermal Facility

The main activities/components associated with the proposed facility are detailed in the tables which follow.

Table 2.3: Activities to be undertaken during the pre-construction and construction phase of the Paulputs CSP project, 200MW facility

PRE-CONSTRUCTION AND CONSTRUCTION
» *Staff requirements* – on average an estimated labour force of 850 will be used on-site during the construction phase. These positions will be comprised of low skilled, semi-skilled, and skilled workers (8%), the latter of which will most likely be sourced outside Upington (i.e. as these skills are unlikely to be available within the local community- 90% will be South African, approximately 30% should be local depending on skills pool available). The specialists forming part of the construction team are likely to be sourced from outside the area and are likely to make use of the local establishments for accommodation facilities. The use of local contractors such as Small, Medium, and Micro Enterprises (SMMEs) operating in the area will be considered by the EPC partner, and will be driven largely by what skills and services could be sourced from local SMMEs (i.e. as part of a competitive tendering process). The EPC partner will determine the standards which all workers need to comply to and this will be in line with South African standards and laws applicable to the construction industry. The actual planning and recruitment phase is expected to start approximately 6 months to one year after financial close.
» *Construction materials and equipment requirements* **-** around 30 - 40% of the construction material and equipment may be sourced locally (i.e. within South Africa), depending on technical capabilities and prices of local industry. The materials and equipment will be transported to site by road, rail, and air if necessary.
» *Water requirements* - The proposed development will require approximately 200 000 - 300 000 m^3 per annum over the 30 month construction phase.
» *Housing of the labour force* – Key personnel will be housed on site, whilst majority of workers commuting to site from Pofadder and Kakamas. *Length of the construction phase* – Construction of the facility will take approximately 30 months to complete, however commencement of the construction phase is dependent on the project being approved by DOE a generating license being issued by NERSA, and a Power Purchase Agreement being secured with Eskom/ Treasury or the designated buyer of renewable energy electricity and successfully reaching financial close.

Activity	***Detailed description***
Pre-construction surveys	Prior to initiating construction, a number of surveys will be required including, but not limited to: » Geotechnical survey - the geology and topography of the development footprint will be surveyed. The geotechnical study will focus on topographical constraints, foundation conditions, potential for excavations, and the availability of natural construction materials. The geotechnical examination will include surface and subsurface exploration, soil sampling and laboratory analysis. » Site surveys - will be done for the finalisation of the design layout of the heliostats, solar tower and other associated infrastructure. The micro-siting footprint will consider any environmental sensitivity identified during the EIA Phase investigations and will need to be confirmed in line with the Environmental Authorisation issued for the Project.
Undertake site preparation	» Site preparation activities will include: * Clearance of vegetation within the development area. * Levelling of site (as necessary) * The development of stormwater control management systems which will include drainage channels which will collect all rain water and lead it to the natural stormwater drainage system. » These activities will require the stripping of topsoil which will need to be backfilled as construction progresses and stockpiled for future rehabilitation.
Establishment of access roads	» The site can be accessed via the existing tarred access road off the R357 Onseepkans Road via the N14. The existing tarred access road is currently being used for access to the other two CSP facilities on the farm portion
Transport of components to site	» The components for the proposed Project will be transported to site in sections by road. Some of the Project components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[1] by virtue of the dimensional limitations (i.e. 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.

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

Activity	*Detailed description*
	» 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 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.
Establishment of construction equipment camps, storage facilities and laydown areas	» Once the required equipment has been transported to site, dedicated construction equipment camp(s), storage facilities, and laydown area/s will need to be established. These areas serve to confine activities to a designated area to limit potential site disturbance. The laydown area will be used for the assembly of the heliostats, as a logistical area for the contractors and as a prefabrication area. » The fuel required for on-site construction vehicles and equipment will need to be secured in a temporary bunded facility within the construction equipment camp to prevent leakages and soil contamination.
Establishment of electricity generation infrastructure	» Following the pre-construction surveys and clearing activities, the power block infrastructure (i.e. the steam turbine, generator, substation, and thermal storage units) will be constructed. Foundations will be established using concrete mixed at the on-site batching plant. » The heliostats will be assembled in the heliostat assembly building located in the solar field logistic area and transported around the site to the exact position where they will be erected and connected to the electrical and communications system. » Construction of Tower- The foundation will be established using concrete mixed at the on-site batching plant.
Undertake site rehabilitation and establishment of the stormwater management plan	» Areas requiring rehabilitation will include those areas disturbed during the construction phase and are not required for operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area. » Where relevant disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved. » All temporary facilities, temporary equipment, and waste materials must be removed from site. » Erosion control measures (i.e. drainage works and anti-erosion measures) should be used in sensitive areas (i.e. steep slopes, hills, and drainage lines), to minimise loss of topsoil and control

Activity	*Detailed description*
	erosion. » Any access points and/or access roads which are not required during the operational phase must be closed as part of the post-construction rehabilitation.

Table 2.4: Activities to be undertaken during the operation phase of the Paulputs CSP project, 200MW facility

OPERATION
» *Staff requirements* - approximately 68 staff members are expected to be required on-site during the operational phase of the project. » *Length of the operation phase* – the facility is expected to be commissioned in 2020 and is expected to be operational for 20 years, where after it could be decommissioned or its lifespan extended depending on the power generation requirements at the time.

Activity	*Detailed description*
Sourcing, treatment and use of water	» Approximately 400 000 m^3 of water will need to be abstracted annually from the Gariep River via a 28 km pipeline to meet the proposed development requirements. The water will be pumped to the de-gritting and filtration reservoir. The water will flow by gravity through the pipeline (as described above) to the storage reservoir at the power block area, where it will be treated according to the needs of the project. » The heat collection system is comprised of mirrors which reflect concentrated sunlight onto a large heat exchanger called a receiver that sits on a tower with a maximum height of approximately 300m high. Within the receiver, fluid flows through the piping that forms the external walls; this fluid absorbs the heat from the concentrated sunlight. The fluid utilised is molten salt, which is heated from 260° to over 538° Celsius. » The collected energy 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 » Once the water leaves the cycle, it will be released into the evaporation pond.
Treatment and disposal of waste water	» Water from the polishing plant will be collected in a neutralisation basin and then will be directed to the collecting pond while wastewater from the demineralisation plant will go directly to the collecting pond. » All surface water, stormwater, and drains, etc. will pass through an oil separator station and all chemical waste water will be pH adjusted before entering the collection pond. The water from the

Activity	*Detailed description*
	collecting pond is finally directed to the evaporation pond system. » Any water from ablution facilities will be collected in a septic tank.
Chemical dosing for the water-steam cycle	In order to maintain the required condensate quality of the water-steam cycle, ammonia is dosed in small quantities.
Inhibitor dosing for the closed cooling system	To minimise oxidation of the system a corrosion inhibitor (carbohydrazide) is dosed to the closed system.
Operation of the solar field	» The solar radiation will be concentrated by the mirrors onto the receiver (solar tower) which contains the molten salt. The molten salt is heated and circulated through the solar field back to the power block area where heat exchangers will transfer the collected solar thermal energy from the heat transfer system to the water steam cycle where superheated steam is generated. » The thermal energy in form of superheated steam is routed to the steam turbine generator in which the thermal energy is converted into electric power. » The solar collectors will track the sun during the progression of the day in order to maximise the solar energy yield.
Operation of the electrical infrastructure	» The steam turbine generator will generate electricity at a voltage of approx. 16 kV and will be alternating current (AC). The electricity will be stepped up to a voltage of 132 kV and evacuated into the overhead distribution line and into the electricity grid.
Site operation and maintenance	» It is anticipated that a full-time security, maintenance, and control room staff will be required on site. » The facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions, or routine maintenance activities.

Table 2.5: Activities to be undertaken during the decommissioning phase

DECOMMISSIONING
» *Length of the decommissioning phase* – following the operational phase it could be decommissioned or its lifespan extended depending on the power generation requirements at the time. » *Activities during the decommissioning phase* - it is most likely that decommissioning would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at that time.

Activity	***Detailed description***
Site preparation	» Site preparation activities similar to those undertaken in the construction phase will be required during the decommissioning phase. This will include confirming the integrity of site access to the site in order to accommodate the required equipment (e.g. lay down areas and decommissioning camp) and the mobilisation of decommissioning equipment.
Disassemble and remove existing components	» The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

PURPOSE AND OBJECTIVES OF THE EMPR CHAPTER 3

An Environmental Management Programme (EMPr) is defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts associated with the planning, construction, operation and decommissioning of a project are avoided or mitigated, and that the positive benefits of the projects are enhanced". The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (i.e. site clearing and site establishment), during the construction activities themselves (i.e. erosion, noise, dust, and visual impacts), during site rehabilitation (i.e. soil stabilisation, re-vegetation), during operation and during decommissioning (i.e. similar to construction phase activities).

This Construction and Operation Environmental Management Programme (CEMPr and OEMPr) has been compiled for the proposed Paulputs CSP Project. This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the project. The document will be adhered to, updated as relevant throughout the project life cycle.

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations of December 2014. This document is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project and/or as the project develops. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

This EMPr has the following objectives:

» Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction and rehabilitation, operation, and

decommissioning phases of the project in order to manage and minimise the extent of potential environmental impacts associated with the facility.

» Ensure that all the phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
» Identify entities responsible for the implementation of the measures and outline functions and responsibilities.
» Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
» Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the EIA process.

The management and mitigation measures identified within the Environmental Impact Assessment (EIA) process are systematically addressed in this EMPr, and ensure the minimisation of adverse environmental impacts to an acceptable level.

Paulputs CSP RF (Pty) Limited must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr and through its integration into the contract documentation. Since this EMPr is part of the EIA process for the proposed Paulputs CSP Project, it is important that this document be read in conjunction with the Scoping and EIA Reports compiled for this project. This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

This EMPr shall be binding on all the parties involved in the construction and operation phases of the project, and shall be enforceable at all levels of contract and operational management within the project. The document must be adhered to and updated as relevant throughout the project life cycle.

STRUCTURE OF THIS EMPR *CHAPTER 4*

The first three chapters provide background to the EMPr and the proposed project, while the chapters which follow consider the following:

» Planning and design activities;
» Construction activities;
» Operation activities; and
» Decommissioning activities.

These chapters set out the procedures necessary for Paulputs CSP Project as the project owner, to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The EMPr has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMPr table has been established for each environmental objective. The information provided within the EMPr table for each objective is illustrated below:

OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the EIA specialist studies

Project Component/s	» List of project components affecting the objective.
Potential Impact	» Description of potential environmental impact if objective is not met.
Activity/Risk Source	» Description of activities which could affect achieving objective.
Mitigation: Target/Objective	» Description of the target and/or desired outcomes of mitigation.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures?	Periods for implementation.

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the EMPr.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into

	consideration responsibility, frequency, methods, and reporting.

The objectives and EMPr tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

» Planned activities change (i.e. in terms of the components and/or layout of the facility);
» Modification to or addition to environmental objectives and targets;
» Relevant legal or other requirements are changed or introduced; and
» Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

The table below specifies plans required for the proposed project as specified by the DEA in the acceptance of the scoping report.

Table 4.1: Management plans for the proposed project

Plans required	Location in report
Grievance Mechanism for Public Complaints and Issues	Appendix C
Waste Management Plan	Appendix D
Alien Invasive Species and Open Management Plan	Appendix E
Re-Vegetation and Habitat Rehabilitation Plan	Appendix F
Plant Protection and Rescue Plan	Appendix G
Traffic Management Plan	Appendix H
Stormwater Management Plan	Appendix I
Erosion Management Plan	Appendix J
Fire Management Plan	Appendix K

4.1 Project Team

This EMPr was compiled by:

	Name	Company
EMPr Compilers:	Jared Padavattan Michelle Moodley Karen Jodas	Savannah Environmental
Specialists:	Adrian Hudson (Ecology)	Hudson Ecology
	Adrian Hudson (Avifauna)	Hudson Ecology
	Garry Paterson (Soil and Agricultural Potential)	ARC-Institute for Soil, Climate and Water
	David Morris (Heritage)	McGregor Museum Department of Archaeology
	John Marshall (Visual)	Afzeilia Environmental Consultant &

	Name	Company
		Environmental Planning and Design
	Candice Hunter (Social)	Savannah Environmental
	Brian Colloty (Water Resources)	Scherman Colloty and Associates

The Savannah Environmental team have extensive knowledge and experience in EIAs and environmental management, having been involved in EIA processes over the past years. They have managed and drafted EMPr for other power generation projects throughout South Africa, including numerous wind and solar energy facilities (refer to **Appendix L** for CVs of the EAP)

MANAGEMENT PROGRAMME: PLANNING AND DESIGN CHAPTER 5

Overall Goal: undertake the pre-construction (planning and design) phase in a way that:

» Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
» Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements
» Ensures that adequate regard has been taken of identified environmental sensitivities, as well as any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
» Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

5.1 Objectives

OBJECTIVE 1: Ensure the facility design responds to identified environmental constraints and opportunities

Areas of sensitivity which have been identified through this EIA process (as indctaed in Figure 2.3) include:

» Ecology: On a local/site level, areas of high ecological function include the more inaccessible or unutilisable areas such as rocky outcrops should be regarded as no-go areas. These areas of high ecological function include Konkoonsiekop in the north western corner of the farm portion as well as Ysterberg located on the north eastern portion of the farm portion. The natural areas are considered to be of conservation importance due to the presence of Red Data species in these areas and should be avoided as far is reasonably possible. Such natural areas are located on the south western portion of the farm and to the eastern portion of the farm closer to Ysterberg. The impacts for the construction and operation phase range from local to regional level. Overall, and with the suggested mitigation measures implemented, the impacts of the development are likely to be of moderate to low significance and no impacts of high significance are likely.
» Avifauna: Sensitive avifaunal habitats on the site are linked to landform and habitat. The areas of high ecological function including the rocky outcrops (Konkoonsiekop in

the north western corner of the farm portion as well as Ysterberg located on the north eastern portion of the farm portion) should be regarded as no-go areas.

» Heritage: Areas of heritage sensitivity on the site include terrain close to hills or rocky features and the known road-side grave below Ysterberg. The rocky outcrops that occur at the north eastern side of the proposed project footprint are regarded as no go areas. These sites and others like them in the broader landscape provided shelter and variety of resources that attracted human activity through Stone Age times. These areas have been considered within the design of the facility and would not be impacted.

In order to minimise impacts associated with the construction and operation of the facility, the following surveys are required to be undertaken during the final design phase:

» Detailed geotechnical survey – this will investigate flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be constructed (i.e. for the power block, and solar field), and the extent of earthworks and compaction required in the establishment of the internal access roads.
» Compilation of a detailed storm-water management plan – this will detail how storm-water runoff (i.e. over engineered hard surfaces) can be managed to reduce velocities and volumes of water that could lead to erosion and potential sedimentation of drainage systems. Stormwater drains should be correctly located and designed with appropriate erosion-control features to ensure local stormwater run-off over the flood embankments and natural riverbanks do not cause erosion and subsequent bank slumping.
» Water usage design - optimise the design or technology to reduce consumptive water requirements as far as possible.
» Heritage survey – a survey of the linear infrastructure will be undertaken prior to construction (i.e. the pipeline, access road, and the tower positions of the power line). If a heritage object of significance is found within the development footprint, appropriate specialists must be brought in to assess the site, notify the administering authority of the item/site, and undertake due/required processes.
» Ecological walkthrough survey

Project Component/s	» Solar field and associated infrastructure. » Construction camps & other temporary infrastructure » Access roads.
Potential Impact	» Impact on identified sensitive areas.
Activities/Risk Sources	» Positioning of all the facility components (i.e. including the infrastructure within the development area and across the broader site to include the access road, pipeline, reservoirs and treatment facilities).
Mitigation:	» The design of the facility responds to the identified environmental

Target/Objective	constraints and opportunities. » Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Developer/Owner EPC Contractor	Pre-construction
Undertake a detailed geotechnical pre-construction survey.	Geotechnical specialist	Pre-construction
Obtain any additional environmental permits required (e.g. water use license, protected tree and protected plant permits, etc.). Copies of permits/licenses must be submitted to the Director: Environmental Impact Evaluation at the DEA.	Developer/Owner	Project planning
Affected individuals of protected species which cannot be avoided should be translocated to a safe area on the site prior to construction. This does not include trees which cannot be translocated and where these are protected by DAFF and permit for their destruction would be required.	Developer/Owner EPC Contractor/ Specialist	Pre-construction
Consider and incorporate design level mitigation measures recommended by the specialists as detailed within the EIA Report and relevant appendices.	Engineering design consultant, solar component supplier, and Developer	Design review
Plan to use Access road 1 road as main access to the facility during construction.	Developer/Owner EPC Contractor	Design
External access point and internal access road to be carefully planned to maximise road user safety and limit any intrusion on the neighbouring property owners and road users.	Developer/Owner EPC Contractor	Design
Compile a comprehensive stormwater management plan for hard surfaces as part of the final design of the project. This must include appropriate means for the handling of stormwater within the site, e.g. separate clean and dirty water streams around the plant, install stilling basins to capture large volumes of run-off, trapping sediments, and reduce flow velocities (i.e. water used when washing the mirrors), as well as appropriate drainage around the site.	Developer/Owner EPC Contractor	Design
Plan and place light fixtures for the plant and the ancillary infrastructure in such a manner as to minimise glare and impacts on the surrounding area.	Developer/Owner EPC Contractor	Planning
Reduce the construction period as far as possible through careful planning and productive implementation of resources.	Developer/Owner EPC Contractor	Planning
Plan new access roads according to contour lines to	Developer/Owner	Design

Mitigation: Action/Control	Responsibility	Timeframe
minimise cutting and filling operations.	EPC Contractor	
Plan the placement of lay-down areas and construction equipment camps in order to minimise vegetation clearing.	Developer/Owner EPC Contractor	Planning
Develop a comprehensive rehabilitation plan for the site (**refer to Appendix F**).	Developer/Owner	Pre-construction
Submit a revised layout plan for the entire solar thermal power plant for approval to the department prior to commencement of construction.	Developer/Owner	Pre-construction
The quantity of water needed for the duration of the construction phase is to be calculated and planned for in detail.	EPC Contractor	Pre-Construction
Fourteen (14) days written notice must be given to the Department that the activity will commence. The notification must include a date on which the activity will commence as well as the reference number.	Developer/Owner	Pre-construction
ECO to be appointed prior to the commencement of any authorised activities. Once appointed the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring at the DEA.	Developer/Owner	Pre-construction
The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and Contractors contracts	Developer/Owner EPC Contractor	Tender process
The procurement and design strategy of the project is required to implement technically feasible and cost-effective measures of reducing resource consumption and greenhouse gases, the measures of which should be communicated to all relevant staff members.	Developer/Owner EPC Contractor	Planning & Design phase Duration of project life cycle

Performance Indicator	» The design meets the objectives and does not degrade the environment. » Design and layouts respond to the mitigation measures and recommendations in the EIA Report. » Minimal impact on the riparian environment
Monitoring	» Review of the design by the Project Manager and the Environmental specialist prior to the commencement of construction.

OBJECTIVE 2: Minimise stormwater runoff and subsequent alteration of the local hydrological regime

The study area site is situated within quaternary catchment D81E and is dominated by highly ephemeral river systems (DWAF, 2004). Potential runoff would flow in a North

Westerly direction towards the Gariep River, while runoff from the elevated portions of the Skuitklip ridges flows in a Northerly direction towards the Kaboep River, which then flows into the Gariep River.

No natural wetlands were observed within 500m of the proposed CSP site, i.e. more than 3km away, while wetlands / reedbeds (*Phragmites australis*) were observed near the proposed abstraction point along the Gariep River floodplain.

The region is however dominated by several dry alluvial water courses which only flow during high rainfall events. The proposed CSP site itself is mostly dry, although a large number of drainage lines were observed and will thus be impacted upon by the proposed layout. These systems were highly fragmented by the roads and farming practices in the past while the adjacent projects have now disrupted any flows within these systems. The significance of this impact at the time of assessing the adjacent projects was low, due to the impacts and high degree of fragmentation coupled to the general lack of any important / visible aquatic habitat

Project Component/s	» Stormwater management components. » Solar field. » All hard engineered surfaces. » Evaporation ponds.
Potential Impact	» Poor stormwater management and alteration of the hydrological regime. » Risk of river system erosion and downstream sedimentation.
Activities/Risk Sources	» Construction of the facility (i.e. placement of hard engineered surfaces). » Construction of internal access roads.
Mitigation: Target/Objective	» Appropriate management of stormwater to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
Appropriately plan hard-engineered erosion protection structures.	Developer/Owner EPC Contractor	Planning and design
Design an appropriate stormwater management plan to ensure the suitable handling of stormwater within the site (i.e. clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trapping sediments and reduce flow velocities).	Developer/Owner EPC Contractor	Planning/ Construction
All surface run-off should be discharged via detention dams to allow sediment to settle out before leaving the site.	EPC Contractor	Planning and design/ Construction
Construction must include appropriate design measures that allow surface and sub-surface movement of water along drainage lines so as not to impede natural surface	Developer/Owner EPC Contractor	Planning and design/ Construction

Mitigation: Action/Control	Responsibility	Timeframe
and subsurface flows. Drainage measures must promote the dissipation of stormwater runoff.		
Optimise the design or technology of the solar power facility to reduce consumptive water requirements as far as possible	Owner	Planning and design
Adapt the abstraction regime to meet the EWR and requirements of other users where required.	Owner	Planning and design
Capture and recycle any form of run-off created by the daily operations. This would minimise the amount of water required by the project, but also serve to limit the downstream impacts on the riparian systems through an increase in run-off, a situation that these systems are currently unaccustomed to.	EPC Contractor	Planning and design

Performance Indicator	» Sound water quality and quantity management (i.e. as per the Water Use Licence Conditions). » Minimal erosion. » Minimal sedimentation from the CSP facility. » Functional storm water systems. » Efficient separation of clean and dirty water systems.
Monitoring	» Surface water quality monitoring plan.

OBJECTIVE 3: To ensure effective communication mechanisms

On-going communication with affected and surrounding landowners is important to maintain during the construction and operational phases of the CSP facility. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project component/s	» CSP facility
Potential Impact	» Impacts on affected and surrounding landowners and land uses
Activity/risk source	» Activities associated with CSP facility construction » Activities associated with CSP facility operation
Mitigation: Target/Objective	» Effective communication with affected and surrounding landowners » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible

Mitigation: Action/control	Responsibility	Timeframe
Implement a grievance mechanism procedure	Developer/Owner	Pre-construction

Mitigation: Action/control	Responsibility	Timeframe
for the public (following the guidelines of the grievance mechanism in **Appendix C**) to be implemented during both the construction and operational phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	EPC Contractor O&M Contractor	(construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Developer/Owner EPC Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Liaison with landowners is to be undertaken prior to the commencement of construction in order to provide sufficient time for them to plan agricultural activities.	Developer/Owner EPC Contractor	Pre-construction
Before construction commences, representatives from the local municipality, community leaders, community-based organisations and the surrounding property owners (of the larger area), should be informed of the details of the contractors, size of the workforce and construction schedules.	Owner EPC Contractor	Pre-construction and construction

Performance Indicator	» Effective communication procedures in place.
Monitoring	» An incident reporting system should be used to record non-conformances to the EMPr.

MANAGEMENT PROGRAMME: CONSTRUCTION CHAPTER 6

Overall Goal: Undertake the construction phase in a way that:

» Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
» Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
» Minimises the impact on the indigenous natural vegetation, protected tree species, and habitats of ecological value (i.e. drainage lines).
» Minimises impacts on fauna using the site.
» Minimises the impact on heritage sites should they be uncovered.
» Establishes an environmental baseline during construction activities on the site, where possible.

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

As the proponent, Paulputs CSP RF (Pty) Limited must ensure that the implementation of the facility complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation. Paulputs CSP RF (Pty) Limited will retain various key roles and responsibilities during the construction of the facility.

OBJECTIVE: Establish clear reporting, communication, and responsibilities in relation to overall implementation of environmental management programme during construction

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Technical Director/Manager; Site Manager; Safety, Health and Environment Representative; Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below. Formal responsibilities are necessary to ensure that key procedures are executed. Figure 6.1 provides an organogram indicating the organisational structure for the implementation of the EMPr.

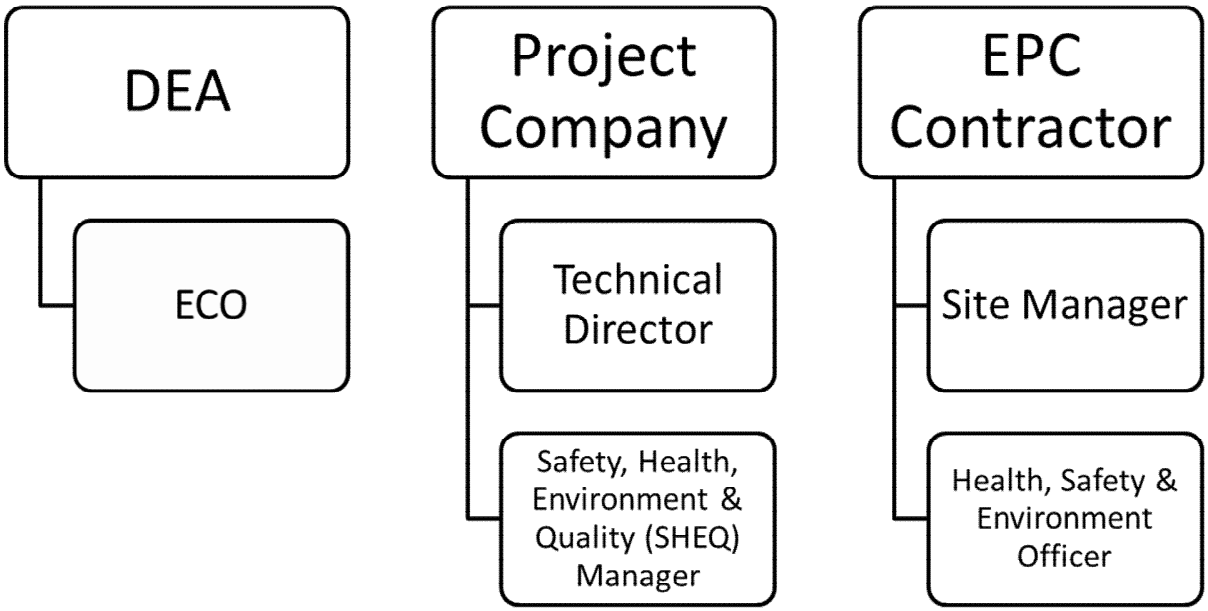


Figure 6.1: Organisational structure for the implementation of the EMP

Technical Director will:

» Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
» Ensure that Paulputs CSP RF (Pty) Limited and its Contractor(s) are made aware of all stipulations within the EMPr.
» Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
» Be fully conversant with the EIA for the project, the EMPr, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.
» Be fully knowledgeable with the contents of all relevant licences and permits.

Site Manager (EPC Contractor's on-site Representative) will:

» Be fully knowledgeable with the contents of the EIA and risk management
» Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued)
» Be fully knowledgeable with the contents of the EMPr
» Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these
» Have overall responsibility of the EMPr and its implementation
» Conduct audits to ensure compliance to the EMPr

» Ensure there is communication with the Technical Director, the ECO, and relevant discipline engineers on matters concerning the environment.
» Be fully knowledgeable with the contents of all relevant licences and permits.
» Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site
» Confine activities to the demarcated construction site

An independent **Environmental Control Officer (ECO)** must be appointed by the project proponent prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of the EMP and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

» Be fully knowledgeable with the contents with the EIA.
» Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
» Be fully knowledgeable with the contents with the EMPr.
» Be fully knowledgeable of all the licences and permits issued to the site.
» Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
» Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
» Ensure that the compliance of the EMPr, EA and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas.
» Ensure that if the EMPr, EA and/or the legislation conditions, regulations or specifications are not followed then appropriate measures are undertaken to address any non-compliances (for example an ECO may cease construction or an activity to prevent a non-compliance from continuing).
» Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
» Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
» Ensure that activities on site comply with all relevant environmental legislation.
» Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr.
» Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
» Ensure that the compilation of progress reports for submission to the Technical Director, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
» Ensure that there is communication with the Site Manager regarding the monitoring of the site.

» Ensure that any non-compliance or remedial measures that need to be applied are reported.
» Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
» Submit independent reports to the DEA and other regulating authorities regarding compliance with the requirements of the EMPr, EA and other environmental permits.

As a general mitigation strategy, the Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). Thereafter weekly site compliance inspections would probably be sufficient. However, in the absence of the ECO there should be a designated environmental officer present to deal with any environmental issues that may arise such as fuel or oil spills. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

Contractors and Service Providers: It is important that contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The contractor's obligations in this regard include the following:

» Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
» A copy of the EMPr must be easily accessible to all on-site staff members.
» Employees must be familiar with the requirements of this EMPr and the environmental specifications as they apply to the construction of the proposed facility.
» Prior to commencing any site works, all employees and sub-contractors must have attended an environmental awareness training course which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Staff will be informed of environmental issues as deemed necessary by the ECO.

All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

» Ensuring adherence to the environmental management specifications

- Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken
- Any lack of adherence to the above will be considered as non-compliance to the specifications of the EMPr
- Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to
- Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting
- Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO
- Ensuring that a register of all public complaints is maintained
- Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations)

Contractor's Safety, Health and Environment Representative: The Contractor's Safety, Health and Environment (SHE) Representative, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

The Contractor's Safety, Health and Environment Representative should:

- Be well versed in environmental matters.
- Understand the relevant environmental legislation and processes.
- Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.
- Know the background of the project and understand the implementation programme.
- Be able to resolve conflicts and make recommendations on site in terms of the requirements of this Specification.
- Keep accurate and detailed records of all EMP-related activities on site.

6.2 Objectives

In order to meet the overall goal for construction, the following objectives, actions, and monitoring requirements have been identified.

OBJECTIVE 1: Minimise impacts related to inappropriate site establishment

Project Component/s	» Solar field. » Power block. » Solar tower. » Access roads. » Contractors' offices and laydown areas. » Accommodation for key personnel » Evaporation ponds. » Water pipeline. » Power line.
Potential Impact	» Hazards to landowners and public. » Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located. » Loss of threatened plant species and protected tree species.
Activities/Risk Sources	» Open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site.
Mitigation: Target/Objective	» To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the Site Manager.	EPC Contractor	Site establishment, and duration of construction
Where necessary control access, fence, and secure area.	EPC Contractor	Site establishment, and duration of construction
The developer and engineering, procurement and construction (EPC) contractors must ensure that there is a dedicated access and an access control point at the entrance gate off the R357.	EPC Contractor	Site establishment, and duration of construction
Develop an efficient access control system which allows for the identification of all people on site.	EPC Contractor	Site establishment and duration of contract
The contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager.		
All unattended open excavations shall be adequately demarcated and/or fenced. Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.	EPC Contractor	Duration of contract
Establish impermeable bunded areas for storage of hazardous materials as per the relevant SANS codes. Ensure that a detailed method statement is provided for bund management (i.e. removal of oily water and spills within the bund).	EPC Contractor	Site establishment
Minimise vegetation clearance or removal associated with site establishment activities, trim trees under supervision. Compile a method statement specific to vegetation clearance.	EPC Contractor	Site establishment
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers at appropriate locations on site (separate toilets for different sexes and 1 toilet per every 30 workers, as per the 2014 Construction Regulation, Section 30(1) (b)).	EPC Contractor	Site establishment, and duration of construction
Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including water courses, wetlands.	EPC Contractor	Site establishment, and duration of construction
Supply adequate weather and vermin proof waste collection bins and skips (covered at minimum with secured netting or shade cloth) at site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	EPC Contractor	Site establishment, and duration of construction

Performance Indicator	» Site is secure and there is no unauthorised entry. » No members of the public/ landowners injured. » Appropriate and adequate waste management and sanitation facilities provided at construction site.
Monitoring	» An incident reporting system will be used to record non-conformances to the EMPr. » ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the site manager.

OBJECTIVE 2: Appropriate management of the construction site and construction workers

Some construction workers such as essential personnel may be accommodated on site, while the rest (i.e. those who will commute from their residences) are expected to be accommodated at nearby towns. Construction equipment will need to be stored at appropriate locations on site.

In order to minimise impacts on the surrounding environment, contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation, the EIA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.

Project Component/s	» Contractors' offices. » Accommodation for essential personnel. » Laydown areas. » Access roads. » CSP facility. » Water pipeline. » Power line.
Potential Impact	» Damage to indigenous natural vegetation and sensitive areas. » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.). » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities. » Pollution/contamination of the environment.
Activities/Risk Sources	» Vegetation clearing and levelling of equipment storage area/s. » Access to and from the equipment storage area/s. » Ablution facilities. » Accommodation facilities. » Contractors not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment.
Mitigation: Target/Objective	» Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
The siting of the essential personnel accomodation and construction camp/s must take cognisance of any sensitive areas identified by the EIA studies and reflected on the site layout plan included within this	EPC Contractor	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
EMPr.		
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	EPC Contractor	Site establishment, and during construction
Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak. A fire management plan (refer to **Appendix K**) must be developed with emergency procedures to be implemented in the event of a fire.	EPC Contractor	Erection: during site establishment Maintenance: duration of contract
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	EPC Contractor	Duration of Contract
All work sites must be kept free of waste. No solid waste may be burned or buried on site or disposed of by any other method on site or within quarries or borrows pits. Solid waste (general waste) to be disposed of at the nearest appropriately permitted waste disposal facility. Proof of disposal to be retained as proof of responsible disposal	EPC Contractor	Site establishment, and duration of construction
No liquid waste, including grey water, may be discharged into any water body or drainage line. All sewage disposal to take place at a registered and operational wastewater treatment works. Proof of disposal to be retained as proof of responsible disposal	EPC Contractor	Maintenance: duration of contract within a particular area
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.	EPC Contractor	Construction
Keep a record of all hazardous substances stored on site. Clearly label all the containers storing hazardous waste.	Contractor	Construction
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel (refer to **Section 6.4** of this EMPr). Records of all training undertaken must be kept.	EPC Contractor	Duration of construction
Safety representatives, managers and workers must be trained in workplace safety. The construction process must be compliant with all safety and health measures as prescribed by the relevant Act.	EPC Contractor and sub-contractor/s	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution activities will be permitted outside the designated areas. These facilities must be regularly serviced by appropriate contractors.	EPC Contractor and sub-contractor/s	Duration of contract
Ensure ablution facilities are appropriately maintained. Ablutions must be cleaned regularly and associated waste disposed of at a registered/permitted waste disposal site. Ablutions must be removed from site when construction is completed.	EPC Contractor	Site establishment, and duration of construction
Cooking/meals must take place in a designated area. No firewood or kindling may be gathered from the site or surrounds.	EPC Contractor and sub-contractor/s	Duration of contract
No open fires are permitted on site and construction personnel must be made aware of the consequences of starting a fire on site to avoid damage to neighbouring farms.	EPC Contractor and sub-contractor/s	Duration of contract
Fire-fighting equipment and training must be provided before the construction phase commences.	EPC Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	EPC Contractor and sub-contractor/s	Duration of contract
Ensure waste containers are maintained and emptied as and when required.	EPC Contractor	Site establishment, and duration of construction
A Method Statement should be compiled for the management of pests and vermin within the site, specifically relating to the canteen area.	EPC Contractor	Construction
No one may disturb flora or fauna outside of the demarcated construction area/s.	EPC Contractor and sub-contractor/s	Duration of contract
Contractors appointed by the Contractor must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent properties.	EPC Contractor and sub-contractor/s	Construction
Provide opportunities for workers to go home over weekends where required and practically possible.	EPC Contractor and sub-contractor/s	Construction
On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.	EPC Contractor and sub-contractor/s	Construction

Performance Indicator	» The construction camps have avoided sensitive areas. » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement. » All areas are rehabilitated promptly after construction in an area is complete. » Excess vegetation clearing and levelling is not reported. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of construction phase.
Monitoring	» Regular audits of the construction camps and areas of construction on site by the Contractor's SHE Officer and the ECO. » Proof of disposal of sewage at an appropriate waste water treatment works. » Observation and supervision of Contractor practices throughout construction phase by the Contractor's SHE Officer and the ECO. » Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 3: Facilitate local employment and skills opportunities associated with the construction phase

Although limited, employment opportunities could be created during the construction phase, specifically for semi-skilled and unskilled workers. The unemployment rate in the study area is quite high and there are therefore various individuals in the area in search of employment. Employment of locals and the involvement of local SMMEs would enhance the social benefits associated with the project, even if the opportunities are only temporary. The procurement of local goods could furthermore result in positive economic spin-offs.

Project Component/s	» Construction activities associated with the establishment of the facility, including the associated infrastructure.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and skills development.
Activities/Risk Sources	» Construction procurement practice employed by the EPC contractor. » Developer's investment plan.
Mitigation: Target/Objective	» The developer should aim to employ as many low-skilled and semi-skilled workers from the local area as possible. This should also be made a requirement for all contractors.

Enhancement: Action/control	Responsibility	Timeframe
If possible, employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria	The Developer & EPC Contractor	Pre-construction & construction phase
It is recommended that local employment policy is adopted to maximise the opportunities made available to the local labour force (sourced from nearest towns (Pofadder, Onseepkans and Pella) or within the KMLM).	The Developer & EPC Contractor	Pre-construction & construction phase
The recruitment selection process should seek to promote gender equality and the employment of women wherever possible	EPC Contractor	Pre-construction & construction phase
Where feasible, training and skills development programmes are to be initiated prior to the commencement of the construction phase	The Developer	Pre-construction & construction phase
A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained, by the Contractor to record all complaints and queries relating to the project and the action taken to resolve the issue.	EPC Contractor	Pre-construction & construction phase

Performance Indicator	» Employment policy document that sets out local employment and targets completed before construction phase commences; » Employ as many local semi and low-skilled labour as possible. » Training and skills development programme undertaken prior to the commencement of construction phase.
Monitoring	» The developer and EPC contractor must keep a record of local recruitments and information on local labour to be shared with the ECO for reporting purposes.

OBJECTIVE 4: Reduce the pressure on economic and social infrastructure and social conflicts from an influx of jobseekers during the construction phase

Project Component/s	» Construction of the proposed solar energy facility and associated infrastructure.
Potential Impact	» Decline on local economic and social infrastructure and services as

	well as a rise in social conflicts from an influx of jobseekers.
Activities/Risk Sources	» Influx of jobseekers.
Mitigation: Target/Objective	» To avoid or minimise the potential impact on local infrastructure, services and communities and their livelihoods.

Mitigation: Action/control	**Responsibility**	**Timeframe**
A 'locals first' policy should be advertised for construction employment opportunities, especially for semi and low-skilled job categories.	The Developer & EPC contractor	Pre-construction & construction phase
Tender document should stipulate the use of local labour as far as possible	EPC contractor	Pre-construction & construction phase
Prior to construction commencing representatives from the local community (e.g. ward councillor, surrounding landowners) should be informed of details of the construction schedule and exact size of the workforce.	The Developer & EPC contractor	Pre-construction & construction phase
Recruitment of temporary workers at the gates of the development should not be allowed. A recruitment office should be established by the contractor in a nearby town to deal with jobseekers.	EPC contractor	Pre-construction & construction phase
A security company is to be appointed and appropriate security procedures to be implemented.	EPC contractor	Pre-construction & construction phase
Establish procedures for the control and removal of loiters at the construction site.	EPC contractor	Pre-construction & construction phase
A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained, by the Contractor and monitored by the ECO, to record all complaints and queries relating to the project and the action taken to resolve the issue.	EPC contractor	Pre-construction phase & Construction phase

Performance Indicator	» Ensure 'locals first' policy is adopted/advertised » Ensure no recruitment takes place on site » Control/removal of loiters
Monitoring	» The developer must keep a record of local recruitments and information on local labour to be shared with the ECO for reporting purposes

OBJECTIVE 5: Minimise impacts related to traffic management and transportation of equipment and materials to site

The following site access alternatives have been considered:

1. Access road 1: Access to site from the N14 national road via the existing R357 Onseepkans road used to access the farm, and the CSP facilities on this farm. This road is located to the east of the farm portion. The access point to the site off this road is 17km from the N14, with a formal entrance to the existing CSP facilities off of this public road. This section of the R357 is a tarred road.
2. Access road 2: Access to site from the N14 national road via the existing R358 and minor road MR73. This road is to the west of the farm portion. The access point to the site off this road is 30km from the N14. This is a gravel road.

The preferred option for implementation, as confirmed through the EIA is Access Road 1

Project Component/s	» N14, R357, R358 and MR73. » Temporary access roads.
Potential Impact	» Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals. » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.
Activities/Risk Sources	» Construction vehicle movement. » Speeding on local roads. » Degradation of local road conditions. » Site preparation and earthworks. » Foundations or plant equipment installation. » Transportation of ready-mix cement from off-site batching plant to the site. » Mobile construction equipment movement on-site. » Substation construction activities.
Mitigation: Target/Objective	» Minimise impact of traffic associated with the construction of the facility on local traffic volume, existing infrastructure, property owners, animals, and road users. » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction » To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions

Mitigation: Action/Control	Responsibility	Timeframe
Compile and implement a traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted (refer to **Appendix H**).	Developer/Owner EPC Contractor	Pre-construction
Appropriate dust suppression must be implemented on gravel roads to limit dust creation.	Developer/Owner EPC Contractor	Construction
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Transport Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Transport Contractor	Construction
All relevant permits for abnormal loads must be applied for from the relevant authority.	EPC Contractor (or appointed transportation contractor)	Pre-construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	EPC Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	EPC Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	EPC Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	EPC Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards) along the R357. Signage must be appropriately maintained for the duration of the construction period.	EPC Contractor	Duration of contract
Signs must be placed along construction roads to identify speed limits, travel restrictions, and other standard traffic control information. Signage must be appropriately maintained for the duration of the construction period.	EPC Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	EPC Contractor	Duration of contract
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	EPC Contractor	Duration of contract
To minimise impacts on local communities,	EPC Contractor	Duration of

Mitigation: Action/Control	Responsibility	Timeframe
consideration should be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.		contract
Source general construction material and goods locally where available to limit transportation over long distances.	EPC Contractor	Construction

Performance Indicator	» Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » No construction traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard. » Complaints of residents are not received (e.g. concerning the s Provision of traffic warning signs on R357 and N14peeding of heavy vehicles).
Monitoring	» The Owner and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 6: Minimise the potential impact on health, safety and security

An inflow of workers could, as a worst case scenario and irrespective of the size of the workforce, pose some security risks. Criminals could also use the opportunity due to "outsiders" being in the area to undertake their criminal activities. The actual safety of construction workers is also of concern. Further health and safety issues associated with the actual construction site include unauthorised entry to the site and construction areas, the usage of large equipment on site, the risks associated with the storage of equipment and material on site, as well as the increased risk of accidents due to the increased movement of construction vehicles on the local roads.

Other concerns relate to littering, unwanted behaviour of construction workers, transmission of Sexually Transmitted Diseases (STDs), environmental pollution, an increase risk in fires and so forth. Although such perceptions cannot be substantiated or be changed it should be sensitively dealt with. It is thus clear that even though the construction phase when these impacts could occur is only of a short duration, the effects of the impacts could remain in the medium term.

Project Component/s	» Inflow of workers could result in increased safety and security risks.
Potential Impact	» Outside workers are involved in criminal activities and/or fires occur.

Activities/Risk Sources	» Safety of individuals and animals are at risk. » Theft of livestock. » Theft of construction material. » On-site accidents. » Littering and environmental pollution.
Mitigation: Target/Objective	» Employment of local labour should be maximised and strict security measures should be implemented at the construction site.

Mitigation: Action/Control	Responsibility	Timeframe
Employing local community members could minimise the potential for criminal activity or perceived perception of an increase in criminal activity due to the presence of an outside workforce.	EPC Contractor	Pre-construction
On-site security should be active prior to the construction phase.	EPC Contractor	Pre- construction
Screening of applicants could lessen perceived negative perceptions about the outside workforce.	EPC Contractor	Construction
Construction workers should be easily identifiable by wearing uniforms and even identity tags.	EPC Contractor	Construction
All staff should undergo a general H&S induction and simplified environmental awareness training session	EPC Contractor (and sub-contractor/s)	Duration of contract
Local community members and property owners should be informed of the presence of the outside workforce, the construction schedule, and movement of workers.	Owner and EPC Contractor	Construction
Property owners, their workers, and local communities should be motivated to be involved in crime prevention and by reporting crimes.	Developer/Owner and Local communities	All phases of project
The construction site should be fenced and access to the area controlled.	EPC Contractor	All phases of project
Informal vending stations should not be allowed on or near the construction site. Construction workers should preferably receive daily meals and beverages to avoid the need for a vending station.	EPC Contractor	Construction
Security personnel should be aware of the possibility of animal theft and poaching and should be able to identify possible criminal elements and/or criminal activities in this regard.	EPC Contractor	Construction
Procedures and measures to prevent, and in	Owner, Local	Pre- construction and

Mitigation: Action/Control	Responsibility	Timeframe
worst cases, attend to fires should be developed in consultation with the surrounding property owners and the Local Municipality	Municipality, and local communities	when required
Contact details of emergency services should be prominently displayed on site.	EPC Contractor	Construction
Appropriate fire-fighting equipment must be present on site and members of the workforce should be appropriately trained in using this equipment in the fighting of veld fires	EPC Contractor	Construction
The construction site and accommodation facility should be properly managed to avoid any environmental pollution (due to inadequate water, sanitation and waste infrastructure and services) and littering.	EPC Contractor	Construction
Construction activities should not interfere with the farming activities on surrounding properties.	EPC Contractor	Construction

Performance Indicator	» No criminal activities and theft of livestock attributable to the construction workforce are reported.' » Limited intrusions on surrounding property owners. » No reports from property owners regarding problems with construction activities and workforce. » No fires or on-site accidents occur.
Monitoring	» The Owner, and appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 7: Management of dust and air emissions

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the main and internal access roads.

Project Component/s	» Vegetation clearing. » Solar field. » Subcontractors' camps and laydown areas. » Stockpile areas. » Batching plant. » Pipeline. » Power line.

Potential Impact	» Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility. » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles and construction equipment
Activities/Risk Sources	» Clearing of vegetation and topsoil. » Excavation, grading, scraping, levelling, digging, drilling. » Transport of materials, equipment, and components on internal access roads. » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	» To ensure emissions from all vehicles and construction engines are minimised, where possible, for the duration of the construction phase » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared in a progressive manner. Road surfaces and other infrastructure to be constructed as soon as possible after vegetation clearing in order to minimise exposed ground surfaces, specifically roads which carry traffic.	EPC Contractor	Duration of contract
Roads must be maintained to a manner that will ensure that nuisance to the community from dust emissions from road or vehicle sources is not visibly excessive. Ensure that any damage to roads because of construction activities is repaired before completion of the construction phase.	EPC Contractor	Site establishment and construction
Appropriate dust suppressant must be applied on all exposed areas and stockpiles as required to minimise/control airborne dust.	EPC Contractor	Duration of contract
Height of spoil/subsoil/overburden (not topsoil) stockpiles to be limited to 3m. Spoil and subsoil to be compacted and watered down as necessary	EPC Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown will be covered with suitable material tarpaulins shade cloth.	EPC Contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the H&S Officer.	EPC Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences outside the site.		
Strictly control vibration pollution from compaction plant or excavation plant.	EPC Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable in line with the progression of construction activities.	EPC Contractor	Completion of construction
Vehicles and equipment must be maintained in a road-worthy condition at all times.	EPC Contractor	Duration of contract
All vehicles and containers used for moving waste must encapsulate the waste, which prevents the waste from causing odours and from escaping or blowing around the site. This will also prevent leachate material from spilling out of the containers, which is hazardous.	EPC Contractor	Duration of contract
The batching plant must be enclosed with shade cloth to reduce the amount of cement particulates/ particles released into the environment.	EPC Contractor	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Dust does not cause health (inhaling, eye irritation) and safety risks (low visibility). » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase commences. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » All heavy vehicles equipped with speed monitors before they are used in the construction phase in accordance with South African vehicle legislation. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring	» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE 8: Minimisation of development footprint and disturbance to topsoil

In order to minimise impacts on flora, fauna, and ecological processes, the development footprint should be limited.

Project Component/s	» Solar field. » Water pipeline. » Power line. » Subcontractors' offices and laydown areas. » Access roads.
Potential Impact	» Impacts on natural vegetation. » Impacts on soil. » Loss of topsoil.
Activity/Risk Source	» Site preparation and earthworks. » Trenching activities for water supply pipeline. » Excavation of foundations. » Construction of site access road. » Site preparation (e.g. compaction). » Foundations or plant equipment installation. » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	» To retain natural vegetation, where possible. » To minimise footprints of disturbance of vegetation/habitats on-site » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas. » Minimise spoil material.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	EPC Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on flora and fauna is restricted.	EPC Contractor	Site establishment & duration of contract
Construction activities must be restricted to demarcated areas so that impact on flora and fauna is restricted.	EPC Contractor	Site establishment & duration of contract
All fill material must be sourced from a commercial off-site suitable/permitted source, quarry or borrow pit. Where possible, material from foundation excavations must be used as fill on-site.	EPC Contractor	Duration of contract
Topsoil must be stockpiled and managed in terms of the erosion management plan (refer to **Appendix J**).	EPC Contractor	Duration of contract
Excavated topsoil must be stockpiled in designated areas separate from base material and covered until replaced during rehabilitation. As far as possible, topsoil must not be stored for longer than 3 months.	EPC Contractor	Site establishment & duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur.	EPC Contractor	Site establishment Maintenance: for duration of contract
The maximum topsoil stockpile height must not exceed 2m in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.	EPC Contractor	Duration of contract
Topsoil recovered from site, must not be used for any construction related activities, including that of bedding for underground cabling.	EPC Contractor	Duration of contract

Performance Indicator	» Zero disturbance outside of designated work areas. » Minimise clearing of existing vegetation. » Topsoil appropriately stored.
Monitoring	» Observation of vegetation clearing and soil management activities by Contractor's SHE Officer and the ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 9: Minimise the impacts on and loss of indigenous vegetation

A total of 11 species were determined to possibly be occurring in the study area (SANBI database). The species, listed as possibly occurring in the study area, were evaluated to determine the probability of occurrence in the study area based on habitat suitability. Of the species that are considered to occur within the area under investigation, there were five species that could occur in habitats that are available in the study area. According to IUCN (IUCN, 2013) two of these are listed as Vulnerable, one as Near Threatened and two as Declining. One of the vulnerable species, *Aloe dichotoma*, was recorded in the study area and could occur anywhere within the hills in the study area, or in rocky areas in Bushmanland Arid Grassland.

The other vulnerable species, *Lithops olivaea*, occurs only in white translucent quartzite patches. This habitat was not found in the study area during the ecological baseline and impact assessment study. The species has been recorded 30 km away, and has a wide distribution within the Gariep Centre of Floristic Endemism, there is thus a high probability of occurrence on site, if available habitat is present. The Near Threatened species, *Conophytum limpidum*, is found on inselbergs in Bushmanland in vertical crevices in rocks, generally preferring shaded situations. If it occurs in the study area, it is most likely to be found on the hills or rocky areas. The one Declining species, *Acacia*

erioloba, also a protected tree, has a high probability of occurring in the study area, while *Hoodia gordonii* was recorded in the study area in a number of places.

Project Component/s	» Solar field. » Contractors' offices and laydown areas. » Site offices. » Access roads. » Power block. » Water pipeline. » Power line.
Potential Impact	» Loss of indigenous natural vegetation due to construction activities, or poor behaviour on the part of the construction team.
Activity/Risk Source	» Vegetation clearing. » Construction of access roads. » Construction/placement of water pipeline, storage/treatment reservoirs, and water abstraction infrastructure » Chemical contamination of the soil by vehicles and machinery. » Operation of construction camps. » Storage of materials required for construction.
Mitigation: Target/Objective	» Retain natural vegetation in the highly sensitive areas of the site. » Minimise footprints of disturbance of vegetation/habitats on-site. » Minimise loss of indigenous vegetation. » Minimise loss of species of conservation concern.

Mitigation: Action/Control	Responsibility	Timeframe
All development footprints within areas of natural vegetation should be surveyed and protected species identified and marked.	EPC Contractor	Duration of construction
Conduct a pre-construction walkthrough to identify species which need to be conserved *in situ*, removed or relocated. Identify suitable relocation sites for each species.	EPC Contractor	Pre-construction/ Construction
Search and Rescue (S&R) of all protected plants that will be affected by the development, especially species occurring in long term and permanent, hard surface development footprints (i.e. all buildings, new roads and tracks, laydown areas, and panel positions) should take place. The necessary permits must be in place » All development footprints must be surveyed and pegged out as soon as possible, after which a local horticulturist with Search and Rescue experience should be appointed to undertake the S&R. » All rescued species should be transplanted immediately as soon as possible. Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment.	EPC Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
» Replanting should occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment		
It should be made very clear to all contractors that there is to be no disturbance outside of demarcated areas.	EPC Contractor	Duration of construction
Minimise large-scale clearance of natural vegetation and disturbance to the proposed site.	EPC Contractor	Duration of construction
Limit impacts on riparian vegetation at the water abstraction point.	EPC Contractor	Duration of contract
A site rehabilitation programme must be implemented (refer to **Appendix F**).	EPC Contractor in consultation with Specialist	Duration of contract
All protected tree and herbaceous species that may be present near construction activities must be demarcated with highly visible barriers, in order to prevent accidental damage or removal by subcontractors	EPC Contractor	Construction
Monitor and control declared weeds and invader species. » Continually monitor the re-emergence of these species and manage according to the invasive species management plan	EPC Contractor	Duration of construction

Performance Indicator	» No disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation.
Monitoring	» Observation of vegetation clearing activities by Contractors EO/SHE throughout construction phase. » Monitoring of vegetation clearing activities in terms of permit conditions. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 10: Minimise the potential impact on farming activities and on the surrounding landowners

Project Component/s	» Possible negative impacts of activities undertaken on site on the activities of surrounding property owners.

	» Impact on farming activities on site.
Potential Impact	» Possible limited intrusion impact on surrounding land owners. » Possible phasing out of cattle farming.
Activities/Risk Sources	» Increase in traffic to and from site could affect daily living and movement patterns of surrounding residents.
Mitigation: Target/Objective	» Effective management of the facility. » Mitigation of intrusion impacts on property owners. » Mitigation of impact on farming activities.

Mitigation: Action/Control	Responsibility	Timeframe
Effective management of the facility and accommodation facility to avoid any environmental pollution focusing on water, waste and sanitation infrastructure and services.	Owner O&M Operator	Operation
Vehicle movement to and from the site should be minimised as far as possible.	Owner Employees	Operation
Limit the development of new access roads on site as far as possible.	Owner Contractors	Operation

Performance Indicator	» No environmental pollution occurs (i.e. waste, water, and sanitation). » No intrusion on private properties and on the activities undertaken on the surrounding properties. » Continuation of farming activities.
Monitoring	» The Owner should be able to demonstrate that facility is well managed without environmental pollution and that the above requirements have been met.

OBJECTIVE 11: Minimise the establishment and spread of alien and indigenous invasive plants

The disturbance created during the construction phase of the project would leave the site highly vulnerable to invasion by alien plant species, which would impact diversity and ecological processes within the area. Alien species that were observed at the Gariep River and which might increase in response to the disturbance include Mesquite (*Prosopis spp*.)

Project Component/s	» Solar field. » Temporary access roads. » Contractors'' offices and laydown areas. » Abstraction point. » Water pipeline. » Power line.
Potential Impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species.
Activities/Risk Sources	» Construction, environmental management.
Mitigation: Target/Objective	» There is a target of no alien plants within project control area during the construction and operation phases.

Mitigation: Action/Control	Responsibility	Timeframe

Mitigation: Action/Control	Responsibility	Timeframe
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants.	EPC Contractor Owner	Construction and operation
Establish an ongoing monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act) (refer to **Appendix E**).	EPC Contractor Owner	Construction and operation
Immediately control any alien plants that become established using registered control methods.	EPC Contractor Owner	Construction and operation
The use of herbicides and pesticides and other related horticultural chemicals should be carefully controlled and only applied by personnel adequately certified to apply pesticides and herbicides. It must be ensured that WHO Recommended Classification of Pesticides by Hazard Class 1a (extremely hazardous) or 1b (highly hazardous) are not purchased, stored or used on site along with any other nationally or internationally similarly restricted/banned products.	EPC Contractor	Construction and rehabilitation

Performance Indicator	» All alien invasive species eradicated from the area. » Minimal increase in alien and indigenous invasive species.
Monitoring	» Ongoing monitoring of area by Contractor's SHE Officer and the ECO during construction. » Ongoing monitoring of area by environmental manager during operation. » Annual audit of project area and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. » The environmental manager should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE 12: Minimise the impacts on fauna

Reptile diversity in the area is high with approximately 45 reptile species occurring in the area and reptile endemism is especially high in the region with 19 species (42%) being endemic. Ten were confirmed during the wet and dry season site surveys. Most of the expected species in the area are common and widespread, with only the Black-necked spitting Cobra (*Naja nigricollis*) being classified as rare

The study area is a fair distance from any permanent open water bodies and therefore, as expected amphibian diversity is low. Only seven species are expected to occur in the study area and during the wet and dry season surveys no amphibian species were recorded. Due to the dry conditions, distance from any open water bodies and distance from the Gariep River, the lack of amphibian species in the study area was expected. The study site area falls outside the natural range of giant bullfrogs, desert rain frog and the Karoo caco, and these species should not occur on the study site.

Of the 67 mammal species expected to occur in the study area only 16 were confirmed during the site survey. Mammals reliant on wetland and arboreal habitats are absent from the study site as these habitat-types do not occur. All 16 species recorded are robust and widespread, mostly with the proviso that suitable habitat and sufficient space to maintain home ranges / territories are available. The nearby roads are obviously a main source of fatalities – several carcasses were recorded during transit to and from the study area.

A number of bat species are known to occur in the region. Bat species recorded in the area during the surveys area are *Rhinolophus darlingi, Neoromicia capensis, Pipistrellus rueppelli* and *Tadarida aegyptiaca* of these species only Tadarida aegyptiaca is likely to be attracted to the infrastructure for roosting purposes.

According to the Khai-Ma Land Use Decision Support tool, the study area falls with an Ecological Support Area (ESA) The ESA is listed as a migration route, although the species utilising this migration route are not indicated. The migration route does seem to be counter-intuitive as it seems to start in the lowlands of the Gariep River, crosses over rocky mountainous areas only to return to the lowlands of the Gariep River lowlands again. Notwithstanding this the development will affect less than 30% of the width of the migration route and should have very little effect on species using this route.

Project Component/s	» Power block. » Solar field. » Contractors' offices and laydown areas. » Evaporation pond. » Access roads. » Abstraction point. » Water pipeline. » Power line.
Potential Impact	» Vegetation clearance and associated impacts on faunal habitats.

	» Traffic to and from site. » Human interaction with fauna. » Solar flux from tower (attracting insects).
Activity/Risk Source	» Site preparation and earthworks. » Construction-related traffic. » Foundations or plant equipment installation. » Mobile construction equipment.
Mitigation: Target/Objective	» To minimise footprints of habitat destruction » To minimise disturbance to (and death of) resident and visitor faunal and avifaunal species

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing/disturbance.	EPC Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on fauna and their habitats is restricted.	EPC Contractor	Site establishment & duration of contract
Animals that cannot flee from the affected areas by themselves (e.g. tortoises, amphibians, small mammals) must be removed from the affected areas before the start of site clearing/construction and relocated to safe areas.	Suitably qualified person	Pre-construction
Ensure storage water reservoirs are covered, or bird deterrent measures are used.	EPC Contractor	Construction
A site rehabilitation programme should be implemented (refer to **Appendix F**).	EPC Contractor in consultation with Specialist	Duration of contract
Implement a faunal removal plan/ rescue plan with designated/ trained personnel and contact numbers.	EPC Contractor	Duration of contract
All cable trenches, excavations, etc., through sensitive areas should be excavated carefully in order to minimise damage to surrounding areas and biodiversity. » The trenches must be checked on a daily basis for the presence of trapped animals. » Any animals found must be removed by a suitably qualified person in a safe manner, unharmed, and placed in an area where the animal will be comfortable. » All mammal, large reptiles and avifauna species found injured during construction will be taken to a suitably qualified veterinarian or rehabilitation centre to either be put down in a humane manner or cared for until it can be released again	EPC Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Place notice boards around site indicating protected and dangerous species for the protection of fauna and workers.	EPC Contractor	Duration of contract
The fence surrounding the evaporation pond/s must be constructed in such a way to prevent fauna from accessing the ponds.	EPC Contractor	Construction

Performance Indicator	» No disturbance outside of designated work areas » Minimised clearing of existing/natural vegetation and habitats for fauna » Limited impacts on faunal species (i.e. noted/recorded fatalities). » Minimal/ no bat mortalities.
Monitoring	» Observation of vegetation clearing activities by The SHE Officer throughout construction phase » Supervision of all clearing and earthworks » Recording faunal fatalities to monitor success of relocation efforts » An incident reporting system will be used to record non-conformances to the EMPr. » Bat monitoring by ECO/ specialist as soon as heliostats begin to focus on the tower.

OBJECTIVE 13: Minimise the impacts on avifauna

Approximately 171 avifauna species occur in the region. Of these species 13 (9%) are listed as endemic and 11 (7%) are listed as being Red Data species. The number of species would have been higher if the survey had been conducted during the summer months. The only Red Data avifauna species recorded during the study were the Maccoa Duck, which are resident on the evaporation ponds of the operational KaXu CSP facility, and Lanner Falcon recorded just outside of the study area. Only one exotic avifauna species is expected to occur in the study area, namely the House Sparrow (*Passer domesticus*).

Seven Species of Special Concern have been identified, based on distribution ranges and habitat requirements that are likely to occur within the study area; Secretarybird (*Sagittarius serpentarius*) – Near Threatened, Lanner Falcon (*Falco biarmicus*) – Near Threatened, Sclater's Lark (*Spizocorys sclateri*) – Near Threatened, Kori Bustard (*Ardeotis kori*) – Vulnerable, Ludwig's Bustard (*Neotis ludwigii*) – Vulnerable, Martial Eagle (*Polemaetus bellicosus*) – Vulnerable, Maccoa Duck (*Oxyura maccoa)* – Near Threatened.

Project Component/s	» Solar tower. » Heliostats. » Overhead power line. » Power block.
Potential Impact	» Decrease in avifaunal populations. » Decrease in avifaunal species diversity. » Loss of specially protected species.
Activity/Risk Source	» Clearance of vegetation with established nests. » Erection of powerlines and stringing of earth wires. » Mirrors on heliostats.
Mitigation: Target/Objective	» To minimise footprints of habitat destruction » To minimise disturbance to (and death of) resident and visitor avifaunal species » To minimise injury and death to avifaunal species. » To minimise loss of avifaunal populations. » To minimise loss of species diversity.

Mitigation: Action/Control	Responsibility	Timeframe
Where possible, avoid clearing vegetation in drainage channels or washes, where bird density and diversity has the potential to be higher.	EPC Contractor	Construction
If possible, the servitude of the power line exiting the site should follow existing roads and not cut across habitat.	EPC Contractor	Construction
All social weavers nests that may be affected by the development (or become established during construction/ operation) must be moved by a qualified contractor or with the assistance of the relevant qualified persons (and acquire the relevant permits); other bird nests in trees/higher shrubs need to be monitored and only removed if not used for breeding.	EPC Contractor/ Owner	Construction/ Operation
If the nest of a large species is detected within the vicinity of the area to be disturbed, then all attempts made to minimise the amount of disturbance near it.	EPC Contractor/ Owner	Construction
Openings at the ends of the rotating heliostat cylinders should be sealed to prevent any avifauna from using this as a nesting site.	EPC Contractor/ Owner	Construction/ Operation
Heliostats should be limited to being in the vertical position for as short a time as possible. The trucks which clean the heliostats should follow each other as close as possible and the heliostats returned to a static (horizontal) or focussed position as soon as possible after cleaning.	EPC Contractor/ Owner	Construction/ Operation
All ledges at the base of the solar tower should be built or panelled so that they prevent nesting or perching.	EPC Contractor	Construction/ Operation
Netting can be placed across the opening at the top of	EPC Contractor	Construction/

Mitigation: Action/Control	Responsibility	Timeframe
the tower to prevent birds from entering the tower		Operation
Painting of the solar tower a neutral brown, concrete colour or grey as it would prevent the reflection of UV light and thus mitigate the possible impact of the white tower.	EPC Contractor	Construction/ Operation
Toxicity levels of the water in the evaporation ponds will need to be monitored and maintained in order to prevent poisoning of species that may use the ponds	EPC Contractor/ Owner	Construction/ Operation
The power line should be kept as low as possible and span lengths should be kept as low as possible taking into account engineering and legal requirements.	EPC Contractor	Construction/ Operation
Bird flappers as markers should be placed on the earth wire, which will increase the visibility of the power line. Markers should be placed with sufficient regularity (at least every 5-10m).	EPC Contractor	Construction/ Operation
Monopole bird friendly tower structures must be utilised in the development as this will significantly minimise the number of electrocutions.	EPC Contractor	Construction

Performance Indicator	» Minimised clearing of existing/natural vegetation and habitats for avifauna » Limited impacts on avifaunal species (i.e. noted/recorded fatalities).
Monitoring	» An incident reporting system will be used to record non-conformances to the EMPr. » An avifaunal monitoring plan should be implemented.

OBJECTIVE 14: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern across the entire site which is underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion).
» Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of the river.
» Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems. Degradation of parent rock is considered low as there are no deep excavations envisaged.

Project Component/s	» Solar field. » Offices and workshops. » Contractors' offices and laydown areas. » Access roads. » Water pipeline. » Power line.
Potential Impact	» Soil and rock degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Removal of vegetation, excavation, stockpiling, compaction, and pollution of soil. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity. » Establishment or extension of the water abstraction facilities etc on the banks and floodplains of the Orange River.
Mitigation: Target/Objective	» Minimise extent of disturbance areas. » Minimise activity within disturbance areas. » Minimise soil degradation (mixing, wetting, compaction, etc). » Minimise soil erosion. » Minimise deposition of soil into drainage lines. » Minimise instability of embankments/excavations.

Mitigation: Action/Control	Responsibility	Timeframe
Minimise the clearing of topsoil from the solar field as this will increase erosion, generate large volumes of dust issues and increase alien invasive species.	EPC Contractor	Before and during construction
Identify disturbance areas and restrict construction activity to these areas.	EPC Contractor	Before and during construction
Rehabilitate disturbance areas as soon as practicable when construction in an area is complete.	EPC Contractor	Construction
Access roads to be carefully constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.	EPC Contractor	Construction
Where access roads cross natural drainage lines, culverts must be designed to allow free flow and regular maintenance must be carried out.	EPC Contractor	Construction
Minimise removal of vegetation which adds stability to soil.	EPC Contractor	Construction
Stockpile topsoil for re-use in rehabilitation phase must be protected from erosion	EPC Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Keep soil moist if possible during construction activities	EPC Contractor	Construction
Regular monitoring (at least every 6 months) until vegetation cover re-established	EPC Contractor	Construction
Implement erosion control measures denuded areas as required.	EPC Contractor	Construction
Control depth of excavations and stability of cut faces/sidewalls.	EPC Contractor	Construction
Salvaging topsoil: » Topsoil must always be salvaged and stored separately from subsoil and lower-lying parent rock or other spoil material. o Topsoil stripping removes up to 30 cm or less of the upper soils. » Prior to salvaging topsoil the depth, quality and characteristics of topsoil should be known for every management area. * This will give an indication of total volumes of topsoil that need to be stored to enable the proper planning and placement of topsoil storage. * Different types of topsoil – rocky soils and sands or loams must be stored separately » Topsoil should be removed (and stored) under dry conditions to avoid excessive compaction whenever topsoil will have to be stored for longer than one year.	EPC Contractor	Pre-construction/ Construction
Storing topsoil: » Viability of stored topsoil depends on moisture, temperature, oxygen, nutrients and time stored. » Rapid decomposition of organic material in warm, moist topsoil rapidly decreases microbial activity necessary for nutrient cycling, and reduces the amount of beneficial micro-organisms in the soil. » Stockpile location if not adjacent to a linear development: * At least 50 m from any wetland or watering point * Ideally a disturbed but weed-free area » Topsoil is typically stored in berms with a width of 150 – 200 cm, and a maximum height of 100 cm, preferably lower * Place berms along contours or perpendicular to the prevailing wind direction * Adhere to the following general rule: the	Contractor	Pre-construction/ Construction

Mitigation: Action/Control	Responsibility	Timeframe
larger the pile of topsoil storage needs to be, the shorter should be the time it is stored » Topsoil handling should be reduced to stripping, piling (once), and re-application. Between the stockpiling and reapplication, stored topsoil should not undergo any further handling except control of erosion and (alien) invasive vegetation » Where topsoil can be reapplied within six months to one year after excavation, it will be useful to store the topsoil as close as possible to the area of excavation and re-application, e.g. next to cabling trenches * In such case, use one side of the linear development for machinery and access only * Place topsoil on the other/far side of this development, followed by the subsoil (also on geotextile) * If there will be a need for long-term storage of topsoil in specified stockpiles, this must be indicated in the design phase already and accompanied by a detailed topsoil stockpile management plan » In cases where topsoil has to be stored longer than 6 months or during the rainy season, soils should be kept as dry as possible and protected from erosion and degradation by: * Preventing ponding on or between heaps of topsoil * Or covering topsoil berms * Preventing all forms of contamination or pollution * Preventing any form of compaction * Monitoring establishment of all invasive vegetation and removing such if it appears * Keeping heights of topsoil at 2m to prevent wind erosion * Keeping slopes of topsoil at a maximal 2:1 ratio * Monitoring and mitigating erosion where it appears * Where topsoil needs to be stored in excess of one year, it is recommended to either cover the topsoil or allow an indigenous grass cover to grow on it – if this does not happen spontaneously, seeding should be considered		
Reapplying topsoil:	EPC Contractor	Construction and

Mitigation: Action/Control	Responsibility	Timeframe
» Spoil materials and subsoil must be back-filled first, then covered with topsoil » Generally, topsoil should be re-applied to a depth equal to slightly greater than the topsoil horizon of a pre-selected undisturbed reference site » The minimum depth of topsoil needed for re-vegetation to be successful is approximately 20 cm » If the amount of topsoil available is limited, a strategy must be worked to out to optimise re-vegetation efforts with the topsoil available » Reapplied topsoil should be landscaped in a way that creates a variable microtopography of small ridges and valleys that run parallel to existing contours of the landscape. The valleys become catch-basins for seeds and act as run-on zones for rainfall, increasing moisture levels where the seeds are likely to be more concentrated. This greatly improves the success rate of re-vegetation efforts. » To stabilise reapplied topsoil and minimise raindrop impact and erosion: o Use organic material from cleared and shredded woody vegetation where possible o Alternatively, suitable geotextiles or organic erosion mats can be used as necessary » Continued monitoring will be necessary to detect any sign of erosion early enough to allow timeous mitigation		rehabilitation
Re-applied topsoil needs to be re-vegetated as soon as possible, following the specifications of the re-vegetation and rehabilitation plan.	EPC Contractor	Construction monitored during operation phase
General Erosion control measures: » Runoff control and attenuation can be achieved by using any or a combination of sand bags, logs, silt fences, storm water channels and catch-pits, shade nets, geofabrics, seeding or mulching as needed on and around cleared and disturbed areas o Ensure that all soil surfaces are protected by vegetation or a covering to avoid the surface being eroded by wind or water. » Ensure that heavy machinery does not compact areas that are not meant to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion	EPC Contractor	Construction monitored during operational phase

Mitigation: Action/Control	Responsibility	Timeframe
potential of the area. » Prevent the concentration or flow of surface water or storm water down cut or fill slopes or along pipeline routes or roads and ensure measures to prevent erosion are in place prior to construction. » Storm water and any runoff generated by hard impervious surfaces should be discharged into retention swales or areas with rock rip-rap. These areas should be grassed with indigenous vegetation. These energy dissipation structures should be placed in a manner that flows are managed prior to being discharged back into the natural water courses, thus not only preventing erosion, but also supporting the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained. » Mitigate against siltation and sedimentation of wetlands using the above mentioned structures and ensure that no structures cause erosion. » Minimise and restrict site clearing to areas required for construction purposes only and restrict disturbance to adjacent undisturbed natural vegetation. » Vegetation clearing should occur in parallel with the construction progress to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment » If implementing dust control measures, prevent over-wetting, saturation, and run-off that may cause erosion and sedimentation » Water course / river crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing water		

Performance Indicator	» No activity outside demarcated disturbance areas. » Limited level of activity within disturbance areas. » Limited level of soil erosion around site due to construction activities. » Limited level of increased siltation in drainage lines. » Acceptable state of excavations. » No activity in restricted areas.
Monitoring	» Monthly inspections of sediment control devices. » Monthly inspections of surroundings, including drainage lines. » Immediate reporting of ineffective sediment control systems.

	» An incident reporting system will record non-conformances.

OBJECTIVE 15: Protection of heritage resources

Project Component/s	» Solar field. » Power block. » Contractors' offices and laydown areas. » Access roads. » Evaporation pond. » Water pipeline. » Power line.
Potential Impact	» Heritage objects or artefacts found on site are inappropriately managed or destroyed
Activity/Risk Source	» Site preparation and earthworks » Foundations or plant equipment installation » Mobile construction equipment movement on site » Pipeline construction activities.
Mitigation: Target/Objective	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation

Mitigation: Action/control	Responsibility	Timeframe
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas.	EPC Contractor in consultation with Specialist	Site establishment
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	EPC Contractor in consultation with Specialist	Pre-construction
Project employees and any contract staff must maintain, at all times, a high level of awareness of the possibility of discovering heritage sites.	Owner / EPC Contractor	Duration of contract
If a heritage object is found, work in that area must be stopped immediately, and appropriate specialists brought in to assess to site, notify the administering authority of the item/site, and undertake due/required processes. Apply for sampling permits from SAHRA for work on any archaeological sites identified as needing intervention.	EPC Contractor in consultation with Specialist	Duration of contract
No development to breach 60 m buffer around rocky outcrops located on the north eastern corner of the property	EPC Contractor in consultation with Specialist	Duration of contract

Performance Indicator	» No disturbance outside of designated work areas » All heritage items located are dealt with as per the legislative guidelines
Monitoring	» Observation of excavation activities by Contractor's SHE Officer throughout construction phase » Supervision of all clearing and earthworks » Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported. » Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 16: Minimisation of visual impacts

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a visual nuisance to landowners and residents in the area as well as road users. The placement of lay-down areas and temporary construction offices should be carefully considered in order to not negatively influence the future perception of the facility. Secondary visual impacts associated with the construction phase, such as the sight of construction vehicles, dust and construction litter must be managed to reduce visual impacts. The use of dust-suppression techniques on the access roads (where required), timely removal of rubble and litter, and the erection of temporary screening will assist in doing this.

A number of farmsteads are located in the broader area ranging from 5 to 20km distance from the proposed Paulputs CSP Project. Pofadder is approximately 35km south east of the site and out of visual range of the proposed CSP development. The Augrabies National Park is more than 50km north east of the site and would also not be affected. The wilderness character of the area has been altered to some degree by the existing CSP trough developments, substation and Eskom power line on the property.

The site is fairly remote and in an arid, sparsely populated area. The CSP tower would potentially be visible from the N14 National Road 20km to the south, but distance would be a mitigating factor. The CSP tower is also 30km from the Gariep River, but the river is in a low-lying area and visibility is unlikely to be an issue.

Visually sensitive landscape features include prominent rocky terrain and rock outcrops, and the R357 view corridor.

Project	» Heliostats.

Component/s	» Solar tower. » Power line.
Potential Impact	» Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing.
Activity/Risk Source	» The viewing of the above mentioned by observers on or near the site.
Mitigation: Target/Objective	» Minimal visual intrusion by construction activities and construction accommodation and intact vegetation cover outside of immediate works areas.

Mitigation: Action/Control	Responsibility	Timeframe
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	EPC Contractor	Construction
Use pilot activated aviation warning lights.	EPC Contractor	Pre-construction/ Construction
Plan to utilise infra-red security systems or motion sensor triggered lighting.	EPC Contractor/ Owner	Construction/ Operation
Ensure that lighting is focused on the development with no light spillage outside the site.	EPC Contractor/ Owner	Construction/ Operation
Maintain stockpiles to less than 3 m in height.	EPC Contractor	Construction
Ensure that rubble, litter, and disused construction materials are managed and removed regularly.	EPC Contractor	Construction
Ensure a designated area is selected for waste management and that the area is maintained daily.	EPC Contractor	Construction
Ensure that all infrastructure and the site and general surrounds are maintained in a neat a manner.	EPC Contractor	Construction
Reduce and control construction dust using approved dust suppression techniques.	EPC Contractor	Construction
As far as possible, restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	EPC Contractor	Construction
Rehabilitate all disturbed areas, construction areas, roads, and servitudes to acceptable visual standards.	EPC Contractor	Construction
Screen the solar field with opaque fencing / earth berms.	EPC Contractor	Construction

Performance Indicator	» Vegetation cover on and near the site is intact with no evidence of degradation or erosion. » Construction site is kept in a neat and tidy state.
Monitoring	» Monitoring of vegetation clearing during construction. » Monitoring of rehabilitated areas post construction.

OBJECTIVE 17: Appropriate handling and management of waste

The construction of the CSP facility will involve the generation of various wastes. In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented. The main wastes expected to be generated by the construction of the solar energy facility will include:

» general solid waste
» hazardous waste
» inert waste (rock and soil)
» liquid waste (including grey water and sewage)

Project Component/s	» CSP facility. » Offices and workshops. » Access roads. » Water pipeline. » Power line.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices
Activity/Risk Source	» Packaging » Other construction wastes » Hydrocarbon use and storage » Spoil material from excavation, earthworks and site preparation
Mitigation: Target/Objective	» To comply with waste management legislation » To minimise production of waste » To ensure appropriate waste storage and disposal » To avoid environmental harm from waste disposal. » A waste manifests should be developed for the ablutions showing proof of disposal of sewage at appropriate water treatment works.

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	EPC Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	EPC Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.		
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	EPC Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	EPC Contractor	Duration of contract
Uncontaminated waste will be removed at least weekly for disposal; other wastes will be removed for recycling/ disposal at an appropriate frequency.	EPC Contractor	Duration of contract
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	EPC Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area and clearly labelled.	EPC Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	EPC Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	EPC Contractor	Duration of contract
SABS approved spill kits to be available and easily accessible.	EPC Contractor	Duration of contract
Regularly serviced chemical toilets facilities must be used to ensure appropriate control of sewage.	EPC Contractor	Duration of contract
Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt or buried on site.	EPC Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management must be compiled and appropriate measures implemented to ensure compliance with legislative requirements.	EPC Contractor	Duration of construction
Implement an integrated waste management approach that is based on waste minimisation and incorporates reduction, recycling, re-use and disposal where appropriate.	EPC Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Septic tanks and portable toilets must be monitored and maintained daily.	EPC Contractor	Duration of construction
Discharge of sewage into the environment must be prevented and if leaks occur from sewage systems, then this must be fixed and the contaminated vegetation/ soil must be removed immediately and treated as hazardous waste.	EPC Contractor	Duration of construction
Ensure the above ground septic tank is in an impermeable bund that can contain at least 110% of the tanks contents.	EPC Contractor	Duration of construction
Ensure that the below ground storage of any septic tanks can withstand the external forces of the surrounding pressure. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the tank.	EPC Contractor	Duration of construction
Daily inspection of all portable toilets and septic tanks must be performed by SHE/ environmental representatives on site.	EPC Contractor	Duration of construction
Waste manifests must be provided for all waste streams generated on site, and must be kept on site.	EPC Contractor	Duration of Construction
All waste facilities and waste transportation contractors must be licensed and registered where necessary.	EPC Contractor	Duration of Construction
Upon the completion of construction, the area must be cleared of potentially polluting materials. Spoil stockpiles must also be removed and appropriately disposed of or the material re-used for an appropriate purpose.	EPC Contractor	Completion of construction

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	» Observation and supervision of waste management practices throughout construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation completed. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 18: Appropriate handling and storage of chemicals, hazardous substances and dangerous goods

The construction phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents. Chemical storage is likely to occur within the power block site.

Project Component/s	» Storage and handling of chemicals, hazardous substances.
Potential Impact	» Release of contaminated water from contact with spilled chemicals » Generation of contaminated wastes from used chemical containers
Activity/Risk Source	» Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon use and storage.
Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons.

Mitigation: Action/Control	Responsibility	Timeframe
Implement an appropriate emergency preparedness plan during the construction phase (refer to **Appendix K**).	EPC Contractor	Pre-construction and implement for duration of Contract
Any liquids stored on site, including admixtures, fuels and lubricants, should be stored in accordance with applicable legislation.	EPC Contractor	Construction phase
Establish an appropriate. Hazardous Stores which is in accordance with the Hazardous Substance Amendment Act, No. 53 of 1992. This should include but not limited to: » Designated area; » All applicable safety signage; » Fire-fighting equipment; » Enclosed by an impermeable bund; » Protected from the elements, » Lockable; » Ventilated; and » Has adequate capacity to contain 110% of the largest container contents.	EPC Contractor	Pre-construction and implement for duration of Contract
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	EPC Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	EPC Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1.	EPC Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	EPC Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	EPC Contractor	Duration of contract
No chemicals must be stored or vehicle maintenance undertaken within 350m of the temporal zone of wetlands or a drainage line.	EPC Contractor	Duration of contract
Oily water from bunds at the substation must be removed from site by licensed contractors.	EPC Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files and applicable regulations and safety instructions.	EPC Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	EPC Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	EPC Contractor	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	EPC Contractor	Duration of contract
Evaporation dams must be appropriately lined, as required by the NEM: Waste Act and associated Regulations, and in line with the water use license issued for the site (once issued).	EPC Contractor	Construction
An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, installation and storage.	EPC Contractor	Construction
Precautions must be in place to limit the possibility of oil and other toxic liquids from entering the soil or clean stormwater system.	EPC Contractor	Construction
Upon the completion of construction, the area must be	EPC Contractor	Completion of

Mitigation: Action/Control	Responsibility	Timeframe
cleared of potentially polluting materials.		construction
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	EPC Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents. Where required, a NEMA section 30 report must be submitted to DEA within 14 days of the incident.	EPC Contractor	Duration of contract

Performance Indicator	» No chemical spills outside of designated storage areas. » No unattended water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping.
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any complaints from the community will be logged. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE 19: Effective management of concrete batching plants

A considerable amount of concrete is required during the construction of the solar energy facility. In this regard there could be a need to establish a batching plant within the site. Turbid and highly alkaline wastewater, dust emissions and noise are the key potential impacts associated with concrete batching plants. Concrete batching plants, cement, sand and aggregates can produce dust. Potential pollutants in batching plant wastewater and stormwater include cement, sand, aggregates, chemical additive mixtures, fuels and lubricants.

Project component/s	» Batching plant and associated activities
Potential Impact	» Dust emissions » Release of contaminated water » Change in surrounding waterbodies' pH and resultant impacts. » Generation of contaminated wastes from used chemical containers

	» Inefficient use of resources resulting in excessive waste generation
Activity/risk source	» Operation of the batching plant » Packaging and other construction wastes » Hydrocarbon use and storage
Mitigation: Target/Objective	» To ensure that the operation of the batching plant does not cause pollution to the environment or harm to persons

Mitigation: Action/control	Responsibility	Timeframe
Concrete batching plants should be sited such that impacts on the environment or the amenity of the local community from noise, odour or polluting emissions are minimised	EPC Contractor	Construction phase
The provision of natural or artificial wind barriers such as trees, fences and landforms may help control the emission of dust from the plant.	EPC Contractor	Construction phase
Where there is a regular movement of vehicles, access and exit routes for heavy transport vehicles should be planned to minimise noise and dust impacts on the environment	EPC Contractor	Construction phase
Good maintenance practices must be implemented, including regular sweeping to prevent dust build-up	EPC Contractor	Construction phase
The prevailing wind direction should be considered to ensure that bunkers and conveyors are sited in a sheltered position to minimise the effects of the wind.	EPC Contractor	Construction phase
Aggregate material should be delivered in a damp condition, and water sprays or a dust suppression agent should be correctly applied to reduce dust emissions and reduce water usage	EPC Contractor	Construction phase
Conveyors must be designed and constructed to prevent fugitive dust emissions. This may include covering the conveyor with a roof, installing side protection barriers and equipping the conveyor with spill trays, which direct material to a collection point. Belt cleaning devices at the conveyor head may also assist to reduce spillage.	EPC Contractor	Construction phase
Process wastewater and contaminated stormwater collected from the entire batching plant area should be diverted to an impervious settling tank or pond. Water should be reused in the concrete batching process, where possible.	EPC Contractor	Construction phase
Where possible, waste concrete should be used for construction purposes at the batching plant or project site.	EPC Contractor	Construction phase

Performance	» No complaints on dust

Indicator	» No water or soil contamination by chemical spills » No complaints received regarding waste on site or indiscriminate dumping
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr. » The appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase

6.3 Detailing Method Statements

OBJECTIVE: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

» Details of the responsible person/s
» Construction procedures
» Materials and equipment to be used
» Getting the equipment to and from site
» How the equipment/material will be moved while on-site
» How and where material will be stored
» The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur
» Timing and location of activities
» Compliance/non-compliance with the Specifications, and
» Any other information deemed necessary by the Site Manager.

Method Statements must be compiled for all activities which affect any aspect of the environment and should be applied consistently to all activities. Specific areas to be addressed in the method statement: pre, during and post construction include:

» Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
» Preparation of the site (i.e. Clearing vegetation, compacting soils and removing existing infrastructure and waste).
» Soil management/stockpiling and erosion control.
» Excavations and backfilling procedure.

- Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions)
- Stipulate the stormwater management procedures recommended in the stormwater management method statement.
- Stormwater and water crossings method statement.
- Ablution facilities (placement, maintenance, management and servicing)
- Solid Waste Management:
  - Description of the waste storage facilities (on site and accumulative).
  - Placement of waste stored (on site and accumulative).
  - Management and collection of waste process.
  - Recycle, re-use and removal process and procedure.
- Liquid waste management:
  - The design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into rivers, streams or existing drainage systems.
  - Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facilities where possible. Where no facilities are available, grey water runoff must be controlled to ensure there is no seepage into wetlands or natural watercourses.
- Dust and noise pollution
  - Describe necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels.
  - Procedure to control dust at all times on the site, access roads, borrow pits and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.
- Hazardous substance storage (Ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
  - Lists of all potentially hazardous substances to be used.
  - Appropriate handling, storage and disposal procedures.
  - Prevention protocol of accidental contamination of soil at storage and handling areas.
  - All storage areas, (i.e.: for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
- Fire prevention and management measures on site.
- Fauna and flora protection process on and off site (ie removal to reintroduction or replanting, if necessary).
  - Rehabilitation, re-vegetation process and bush clearing.
- Incident and accident reporting protocol.
- General administration

» Designate access road and the protocol on while roads are in use.
» Requirements on gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been reviewed and approved by the Site Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved.

6.4 Awareness and Competence: Construction Phase of the CSP Facility

OBJECTIVE 19: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractors obligations in this regard include the following:

» All Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment. This includes the discussion/explanation of site environmental matters during toolbox talks.
» The content and requirements of Method Statements are to be clearly explained to all plant operators and general workers. All staff acting in a supervisory capacity is to have copies of the relevant Method Statements and be aware of the content thereof.
» Ensuring that a copy of the EMPr is readily available on-site, and that all senior site staff is aware of the location and have access to the document. Senior site staff will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
» Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training session. The training session must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
    * Records must be kept of those that have completed the relevant training.

- Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
- Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.

» All sub-contractors must have a copy of the EMPr and sign a declaration/ acknowledgement that they are aware and familiar with the contents and requirements of the EMPr and that they will conduct work in such a manner as to ensure compliance with the requirements of the EMPr.
» Contractors and main sub-contractors should have a basic training in the identification of archaeological sites/objects, and protected flora and fauna that may be encountered on the site.
» Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
» Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.

Therefore, prior to the commencement of construction activities on site and before any person commences with work on site thereafter, adequate environmental awareness and responsibility are to be appropriately presented to all staff present onsite, clearly describing their obligations towards environmental controls and methodologies in terms of this EMPr. This training and awareness will be achieved in the following ways:

6.4.1 Environmental Awareness Training

Environmental Awareness Training must be undertaken by the EPC Contractor and must take the form of an on-site talk and demonstration by the SHE Officer and/or ECO before the commencement of site establishment and construction on site. The education/awareness programme should be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the SHE Officer on site.

6.4.2 Induction Training

Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to site.

This induction training should be undertaken by the Contractor's SHE Officer and should include discussing the developer's environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall do's and don'ts on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and

clarifications must form part of this training. A record of attendance of this training must be maintained by the SHE Officer on site.

6.4.3 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least once a week) where foremen, environmental and safety representatives of different components of the Works and sub-consultants hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

6.5 Monitoring Programme: Construction Phase of the CSP Facility

OBJECTIVE 20: To monitor the performance of the control strategies employed against environmental objectives and standards.

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the Environmental Authorisation (once issued). Where this is not clearly dictated, Paulputs CSP Project will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Technical Director/Manager will ensure that the monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to routinely monitor the implementation of the specified environmental specifications, in order to:

» Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications
» Ensure adequate and appropriate interventions to address non-compliance
» Ensure adequate and appropriate interventions to address environmental degradation
» Provide a mechanism for the lodging and resolution of public complaints
» Ensure appropriate and adequate record keeping related to environmental compliance
» Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site
» Aid communication and feedback to authorities and stakeholders

6.5.1. Non-Conformance Reports

All supervisory staff including Foremen, Resident Engineers, and the ECO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor. Records of penalties imposed may be required by the relevant authority within 48 (forty eight) hours.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO.

6.5.2. Monitoring Reports

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to the Director: Compliance Monitoring at DEA for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out. The EPC contractor must ensure that all waste manifests are provided to the ECO on a monthly basis in order to inform and update the DEA regarding waste related activities.

6.5.3. Final Audit Report

A final environmental audit report must be compiled by an independent external auditor and be submitted to DEA upon completion of the construction and rehabilitation activities (within 30 days of completion of the construction phase (i.e. within 30 days of site handover) and within 30 days of completion of rehabilitation activities). This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

MANAGEMENT PROGRAMME: REHABILITATION CHAPTER 7

Overall Goal: Undertake the rehabilitation measures in a way that:

» Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed

7.1. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OBJECTIVE 1: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

Project Component/s	» Construction offices and laydown areas. » Temporary stockpile areas. » Temporary access roads. » Water pipeline. » Power line.
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
Activity/Risk Source	» Temporary construction areas. » Temporary access roads/tracks. » Pipeline servitude » Other disturbed areas/footprints.
Mitigation: Target/Objective	» Ensure and encourage site rehabilitation of disturbed areas. » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

Mitigation: Action/Control	Responsibility	Timeframe
Implement revegetation and rehabilitation plan (refer to **Appendix F**).	EPC Contractor	Following execution of the works

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitation must be undertaken as soon as possible after completion of construction activities to reduce the area of habitat converted at any one time and to speed up recovery of natural habitats.	EPC Contractor	Following execution of the works
All temporary facilities, equipment, and waste materials must be removed from site.	EPC Contractor	Following execution of the works
All rehabilitated areas must be demarcated and movement in this area minimised, in order to prevent damage by construction vehicles and activities. Demarcation must remain in place until acceptable rehabilitation has been achieved.	EPC Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	EPC Contractor	Following completion of construction activities in an area
The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up.	EPC Contractor	Following completion of construction activities in an area
All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated.	EPC Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked.	EPC Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	EPC Contractor	Following completion of construction activities in an area
Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use of native/indigenous plant species removed from disturbance areas in the rehabilitation phase to be determined by a botanist as applicable.	EPC Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Owner in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive	Owner in consultation	Post-

Mitigation: Action/Control	Responsibility	Timeframe
areas such as steep slopes, hills, and drainage lines is necessary.	with rehabilitation specialist	rehabilitation
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Owner in consultation with rehabilitation specialist	Post-rehabilitation

Performance Indicator	» All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities. » Topsoil replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas. » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites. » Completed site free of erosion and alien invasive plants.
Monitoring	» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented during the operational lifespan of the facility. » On-going alien plant monitoring and removal should be undertaken on an annual basis.

MANAGEMENT PROGRAMME: OPERATION CHAPTER 8

Overall Goal: To ensure that the operation of the solar energy facility does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the solar energy facility in a way that:

» Ensures that operation activities are properly managed in respect of environmental aspects and impacts
» Enables the solar energy facility operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents
» Minimises impacts on fauna using the site
» Establishes an environmental baseline for solar energy facility sites in South Africa

An environmental manager must be appointed during operation whose duty it will be to ensure the implementation of the operation EMPr.

8.1. Objectives

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE 1: Establish clear reporting, communication, and responsibilities in relation to overall implementation of environmental management programme during operation

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Operations Manager, and Environmental Manager for the operation phase of this project are detailed below.

The **Operations Manager** will:
» Ensure that adequate resources (human, financial, technology) are made available and appropriately managed for the successful implementation of the operational EMP.
» Conduct annual basis reviews of the EMPr to evaluate its effectiveness.
» Take appropriate action as a result of findings and recommendations in management reviews and audits.
» Provide forums to communicate matters regarding environmental management.

The **Technical/SHEQ Manager** will:

» Develop and Implement an Environmental Management System (EMS) for the solar energy facility and associated infrastructure.
» Manage and report on the facility's environmental performance.
» Maintain a register of all known environmental impacts and manage the monitoring thereof.
» Conduct internal environmental audits and co-ordinate external environmental audits.
» Liaise with statutory bodies such as the National and Provincial Department of Environmental Affairs (DEA) on environmental performance and other issues.
» Conduct environmental training and awareness for the employees who operate and maintain the CSP facility.
» Compile environmental policies and procedures.
» Liaise with interested and affected parties on environmental issues of common concern.
» Track and control the lodging of any complaints regarding environmental matters.

The Technical/SHEQ Manager must provide fourteen (14) days written notification the DEA that the activity operation phase will commence.

OBJECTIVE 2: Protection of indigenous natural vegetation, fauna and maintenance of rehabilitation

Indirect impacts on vegetation and terrestrial fauna during operation could result from maintenance activities and the movement of people and vehicles on site. In order to ensure the long-term environmental integrity of the site following construction, maintenance of the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established.

Project component/s	» Solar field. » Perimeter fence. » Power line. » Areas disturbed during the construction phase and subsequently rehabilitation at its completion
Potential Impact	» Disturbance to or loss of vegetation and/or habitat. » Disturbance to fauna and associated habitats. » Impacts on avifauna. » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
Activity/Risk	» Movement of employee vehicles within and around site.

Source	
Mitigation: Target/Objective	» Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation.

Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movements must be restricted to designated roadways.	Owner O&M Operator	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Owner O&M Operator	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Owner O&M Operator	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	Owner in consultation with Specialist	Annual monitoring until successful re-establishment of vegetation in an area
Employ an Environmental Manager for the duration of the operational phase of the plant to ensure compliance of all environmental related legislation and best practice.	Owner O&M Operator	Operation
Eagle eye devices may be used, if feasible to deter birds from the CSP plant area/ solar field	Owner	Operation
Implement an animal removal plan to ensure safety of workers and fauna.	Owner O&M Operator	Operation
During maintenance, heliostats should be positioned in such a way as to prevent hotspots above the tower	Owner	Operation
A detailed avifauna monitoring plan should be compiled prior to operation and implemented in order to constantly monitor the CSP facility and all associated infrastructure, including the power lines. Any and all avifauna mortalities should be investigated. The results of these investigations should be reviewed after the first year of monitoring and inform the management of the CSP facility and associated infrastructure, regarding the implementation, update and/or upgrade to any mitigation measures at the facility as necessary.	Owner	Prior to commencement of Operation

Performance Indicator	» No further disturbance to vegetation or terrestrial faunal habitats. » Continued improvement of rehabilitation efforts.
Monitoring	» Observation of vegetation on-site by CSP Manager and environmental

	manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

OBJECTIVE 3: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern across the entire site which is underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion).
» Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of drainage systems or the river (in the case of the abstraction point).
» Degradation of the natural soil profile due to pollution.

Project Component/s	» Solar field. » Contractors' offices and laydown areas. » Abstraction point. » Access roads. » Power line. » Water pipeline servitude.
Potential Impact	» Soil degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Poor rehabilitation of cleared areas. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity.
Mitigation: Target/Objective	» Ensure rehabilitation of disturbed areas is maintained. » Minimise soil degradation (i.e. wetting). » Minimise soil erosion and deposition of soil into drainage lines. » Ensure continued stability of embankments/excavations.

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	Owner O&M Operator	Operation
Ensure dust control on site: wetting of denuded areas or the use of an appropriate dust suppression measure.	Owner O&M Operator	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, stormwater catch-pits, and shade nets).	Owner O&M Operator	Operation
Control depth of excavations and stability of cut faces/sidewalls.	Owner O&M Operator	Operation
Maintain pump inlets and their supporting infrastructure so to prevent the potential for scour / erosion and downstream sedimentation of the Orange River.	Owner O&M Operator	Operation

Performance Indicator	» Acceptable level of soil erosion around site, as determined by the site manager. » Acceptable level of increased siltation in drainage lines, as determined by the site manager.
Monitoring	» Inspections of site on a bi-annual basis. » Water management plan

OBJECTIVE 4: Minimise dust and air emissions

Project Component/s	» Solar field. » Internal access roads. » Previously rehabilitated areas. » Diesel boiler. » On-site vehicles. » Power line.
Potential Impact	» Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles and the augmentation plant.
Activities/Risk Sources	» Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	» To ensure emissions from all vehicles are minimised, where possible. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements.

Mitigation: Action/Control	Responsibility	Timeframe
Roads must be maintained to a manner that will ensure that nuisance to the community from dust is not visibly excessive.	Owner EPC Contractor	Site establishment and construction
Appropriate dust suppressant must be applied to the roads as required to minimise/control airborne dust.	Owner EPC Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Speed of vehicles must be restricted, as defined by the Health and Safety Manager.	Owner EPC Contractor	Duration of contract
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Owner EPC Contractor	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Dust suppression measures implemented for where required. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.
Monitoring	» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints must be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMPr.

OBJECTIVE 5: Ensure the implementation of an appropriate fire management plan during the operation phase

The vegetation in the study area may be at risk of fire, particularly the heliostats which are situated closer to the ground. The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

Project Component/s	» Solar field. » Power block. » Rehabilitated and natural areas. » Workshops. » Power line.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a risk to the solar energy facility infrastructure.
Activities/Risk Sources	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate fire-fighting equipment on site and establish a fire-fighting management plan during	Owner O&M Operator	Operation

Mitigation: Action/Control	Responsibility	Timeframe
operation (refer to **Appendix K**).		
Provide fire-fighting training to selected operation and maintenance staff.	Owner O&M Operator	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Owner O&M Operator	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Owner O&M Operator	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	Owner O&M Operator	Operation
Contact details of emergency services should be prominently displayed on site.	Owner O&M Operator	Operation

Performance Indicator	» Fire-fighting equipment and training provided before the construction phase commences. » Appropriate fire breaks in place.
Monitoring	» The project developer must monitor indicators listed above to ensure that they have been met.

OBJECTIVE 6: Maximise local employment and business opportunities

Project Component/s	» Operation and maintenance of the facility.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	» Locals are not employed where the skills exist. » Local procurement is not undertaken if possible. » Local businesses are not supported.
Mitigation: Target/Objective	» Maximise the appointment of local employees.

Mitigation: Action/Control	Responsibility	Timeframe
A skills development plan should be developed which should concentrate on the transfer of skills to employees to increase their capacity and to equip them with alternative skills should they wish to be employed elsewhere.	Owner O&M Operator	Operation

Mitigation: Action/Control	Responsibility	Timeframe
The Owner should capacitate locals where practical.	Owner O&M Operator	Operation
The Owner should consider training and capacity building programmes to lessen the skills disparity.	Owner O&M Operator	Operation
The skill requirements should be communicated to the local community leaders and community based organisations.	Owner	Operation
Make use of local recruitment agencies or other relevant community based organisations to obtain a list of jobseekers.	Owner	Operation
An equitable process whereby minorities and previously disadvantaged individuals (including women) are taken into account should be implemented.	Owner	Operation
Local sourcing of materials, general services to assist in providing economic, and employment opportunities for the local people.	Owner	Operation

Performance Indicator	» An employee list drawn up indicating the percentage of locals employed. » Local procurement is undertaken.
Monitoring	» The project developer should be able to demonstrate that the above indicators are implemented.

OBJECTIVE 7: Assist with social development and enhance capacity building and skills development within the local communities

An important positive role that the developer could fulfil as part of their social responsibility towards the local communities is to assist in addressing community development needs during the operational phase.

The project applicant is therefore accountable to optimise the productive potential of those employed at the proposed facility's operation through capacity building and skills training, whether these individuals are temporary or permanent employees.

One of the aims of the project could be to revitalise the area in terms of job creation and infrastructure development, in other words it would focus on broad based empowerment.

Project Component/s	» Capacity building and skills training undertaken during the operational phase.
Potential Impact	» Positive contribution to the capacity of individuals involved with the

	project, and equipping them with transferable skills. » Contribution towards local development initiatives.
Activities/Risk Sources	» No social responsibility from developer. » No contribution towards local development initiatives. » Inefficient training or lack of capacity building and skills training.
Mitigation: Target/Objective	» Capacity building and skills training continuously undertaken during the operational phase of the project. » Positive social responsibility initiatives.

Mitigation: Action/Control	Responsibility	Timeframe
Involvement in upliftment programmes could be done according to the needs identified as part of the IDP of the //Khara Hais Municipality.	Owner Local Municipality	Operation
Capacity building and skills training should form part of the social development support provided to local communities.	Owner Local Municipality	Operation
In cases for the middle to lower skilled jobs, where the relevant skills do not exist, training should be provided to willing local community members to enable them to fill the positions.	Owner Local Municipality	Operation
The project applicant should create conditions that are conducive for the involvement of entrepreneurs, small businesses, and SMMEs during the operational phase for rendering ancillary services to the proposed facility.	Owner	Operation

Performance Indicator	» The skills development plan concentrates on the transfer of skills to employees to increase their capacity and to equip them with alternative skills should they wish to be employed elsewhere. » Local development initiatives should be supported
Monitoring	» The Owner should be able to demonstrate that the above indicators are implemented.

OBJECTIVE 9: Appropriate handling and management of hazardous substances, waste and dangerous goods

The operation of the solar energy facility will involve the storage of chemicals and hazardous substances, as well as the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general solid waste, hazardous waste and liquid waste.

Project Component/s	» Solar tower and heliostats » Substation.

	» Water treatment works. » Operation and maintenance staff. » Workshop.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices. » Contamination of water or soil because of poor materials management.
Activity/Risk Source	» Transformers and switchgear – substation. » Heliostat motors. » Water storage and treatment reservoirs. » Fuel and oil. » Maintenance building.
Mitigation: Target/Objective	» Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste disposal. » Avoid environmental harm from waste disposal. » Ensure appropriate storage of chemicals and hazardous substances.

Mitigation: Action/Control	Responsibility	Timeframe
Hazardous substances (such as used/new transformer oils, etc.) must be stored in sealed containers within a clearly demarcated designated area.	Owner O&M Operator	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	Owner O&M Operator	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	Owner O&M Operator	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	Owner O&M Operator	Operation and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Owner O&M Operator	Operation and maintenance
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Owner/ waste management contractor	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	Owner/ waste management contractor	Operation
Used oils and chemicals:	Owner	Operation

Mitigation: Action/Control	Responsibility	Timeframe
» Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority » Waste must be stored and handled according to the relevant legislation and regulations		
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Owner	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Owner	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Owner	Operation
On-site hazardous chemicals and hazardous waste storage facilities must not exceed the design limits for liquid waste containment as stipulated in the relevant regulations and SANS codes.	Owner	Operation

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests. » No contamination of soil or water.
Monitoring	» Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor. » All appropriate waste disposal certificates with the monthly reports.

MANAGEMENT PROGRAMME: DECOMMISSIONING CHAPTER 9

The solar infrastructure which will be utilised for the proposed solar energy facility is expected to have a lifespan of approximately 20 years and eventual extensions (i.e. with maintenance). Equipment associated with this facility 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 would comprise the disassembly and replacement of the solar infrastructure with more appropriate technology/infrastructure available at that time.

The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore is not repeated in this section.

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

» ***Disassemble and Remove Infrastructure***
Disassembled components will be reused, recycled, or disposed of in accordance with regulatory requirements.

9.1. Objectives

In decommissioning the facility, Paulputs CSP RF (Pty) Limited must ensure that:

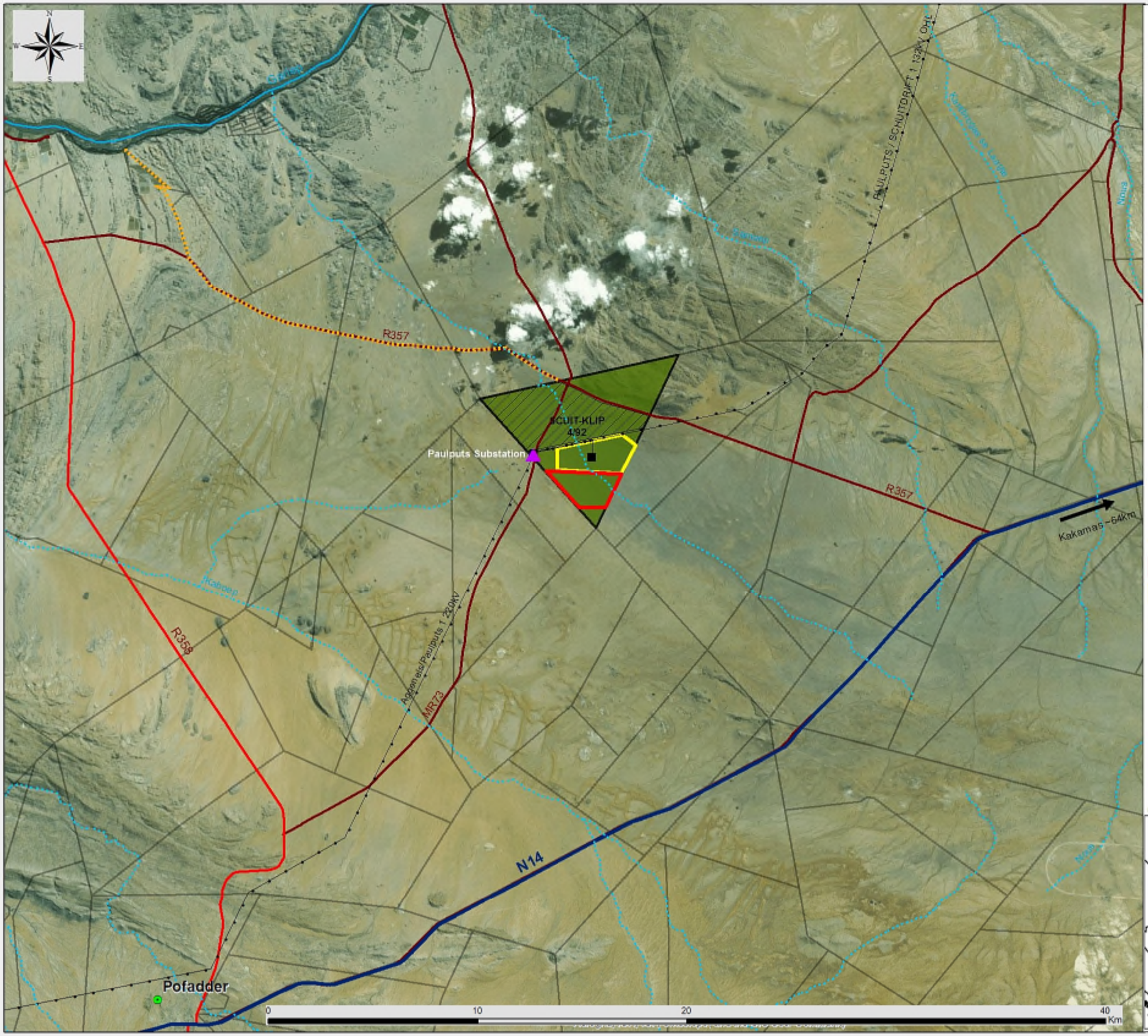
» All sites not already vegetated are vegetated as soon as possible after operation ceases with species appropriate to the area.
» Any fauna encountered during decommissioning should be removed to safety by a suitably qualified person,
» All structures, foundations and sealed areas are demolished, removed and waste material disposed of at an appropriately licensed waste disposal site or as requirement by the relevant legislation.
» All access/service roads not required to be retained by landowners are closed and fully rehabilitated.
» All vehicles to adhere to low speed limits (i.e. 30km/h max) on the site, to reduce risk of faunal collisions as well as reduce dust.
» All disturbed areas are compacted, sloped and contoured to ensure drainage and runoff and to minimise the risk of erosion.
» All rehabilitated areas are monitored for erosion.
» Components of the facility are removed from the site and disposed of appropriately.
» Retrenchments should comply with South African Labour legislation of the day.

The general specifications of Chapter 6 (Construction) and Chapter 7 (Rehabilitation) are also relevant to the proposed project and must be adhered to.

APPENDIX A:
LAYOUT AND SENSITIVITY MAPS

PAULPUTS CSP PROJECT, NORTHERN CAPE PROVINCE

Locality Map



Legend

- National road
- Regional road
- Main road
- Perennial
- Non-perennial
- Eskom Powerline
- KaXu Substation
- Paulputs Substation
- Farm Portions
- Paulputs CSP Project Development Site
- Water Pipeline Corridor
- Xina Solar One (under construction)
- Existing KaXu Solar One
- Affected farm portion

Savannah ENVIRONMENTAL (PTY) LTD

Paulputs CSP - Locality map - 15.09.15

PAULPUTS CSP PROJECT, NORTHERN CAPE PROVINCE

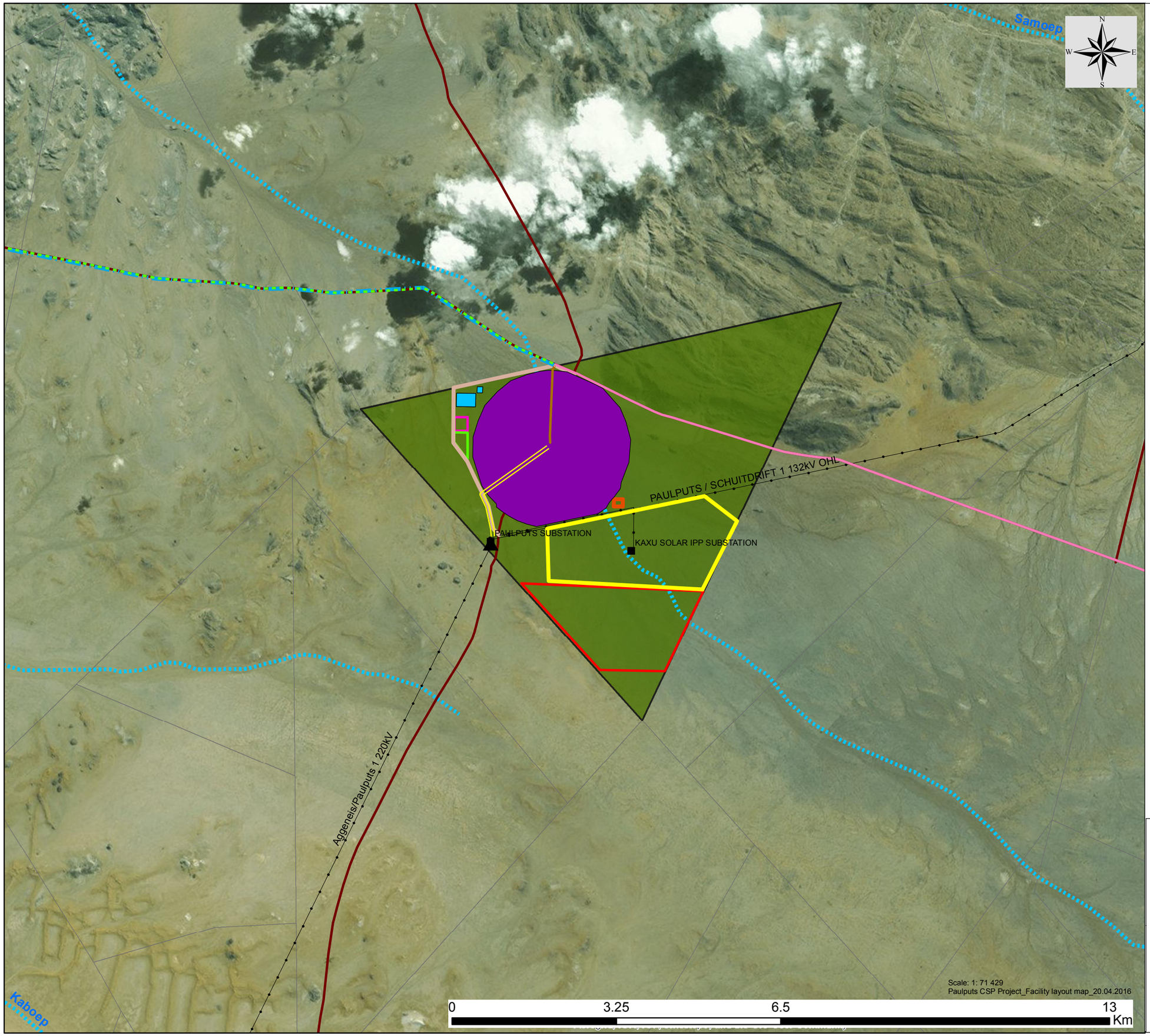
Facility Layout Map

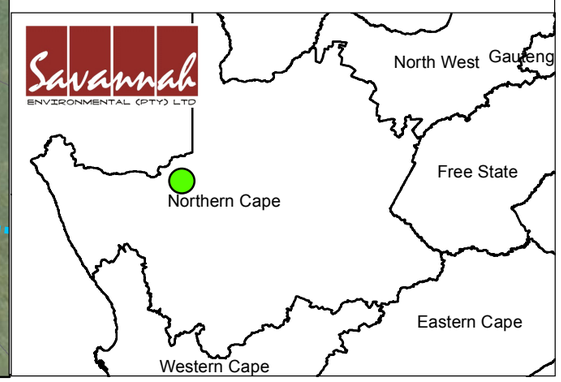
Legend

- Paulputs Substation
- Existing Substation for KaXu Solar 1
- Existing Powerline
- National route
- Regional road
- Main road
- Perennial river
- Non-Perennial river
- Existing KaXu CSP Facility
- Existing Xina CSP Facility
- Affected farm portion
- Farm Portions

Layout Plan:

- Staff Accommodation
- Laydown Area
- Heliostat Temporary Laydown Area
- Tower Line
- Water Pipeline
- Reroute of MR73
- Access Road
- Alternative Access Road 1
- Alternative Access Road 2
- Paulputs 200MW Tower





PAULPUTS CSP PROJECT, NORTHERN CAPE PROVINCE

Facility Layout Map and Environmental Sensitivities

PAULPUTS SUBSTATION

KAXU SOLAR IPP SUBSTATION

0 1.75 3.5 7 Km

Legend

- Paulputs Substation
- Existing Substation for KaXu Solar 1
- Existing KaXu CSP Facility
- Existing Xina CSP Facility
- Existing Powerline
- National route
- Regional road
- Main road
- Perennial river
- Non-Perennial river
- Affected farm portion
- Farm Portions

Layout:

- Staff Accommodation
- Laydown Area
- Heliostat Temporary Laydown Area
- Tower Line
- Water Pipeline
- Reroute of MR73
- Alternative Access Road 1
- Alternative Access Road 2
- Evaporation Ponds
- Paulputs 200MW Tower

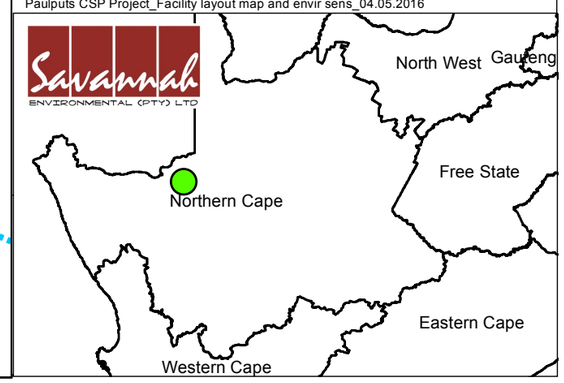
Environmental Sensitivities

- Heritage: Rocky Outcrop (No-Go Area)
- Heritge: 60m Rocky Outcrop Buffer (No-Go Area)
- Noise: Homestead/Receptor
- Ecological: Natural Areas (Moderate to High Sensitivity)
- Transformed Areas
- Moderate Ecological Function
- Ecological: Rocky Outcrop (No-go Areas)

Scale: 1:40 000

Paulputs CSP Project_Facility layout map and envir sens_04.05.2016

Savannah Environmental (Pty) Ltd



APPENDIX B:
KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT

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

» National Environmental Management Act (Act No 107 of 1998)
» EIA Regulations, published under Chapter 5 of the NEMA (GNR 982, appendix 4 in Government Gazette 38282 of 4 December 2014)
» 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 2014
» Public Participation in the EIA Process (DEA, 2014)
» Integrated Environmental Management Information Series (published by DEA)
» International guidelines – the Equator Principles and the International Finance Corporation and World Bank Guidelines.

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the EIA Report. A review of legislative requirements applicable to the proposed project is provided in the table that follows.

Table 1.1: Relevant legislative and permitting requirements applicable to the establishment of the Paulputs CSP Project.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. In terms of NEMA: EIA Regulations 2014, a scoping and EIA process was required to be undertaken for the proposed project.	» National Department of Environmental Affairs » Department of Environmental and Nature Conservation (DENC) – commenting authority	The listed activities triggered by the proposed Project has been identified and assessed in the EIA process being undertaken. This EIA Report will be submitted to the competent and commenting authority in support of the application for authorisation.
National Environmental Management Act (Act No 107 of 1998)	In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are	Department of Environmental Affairs (as regulator of NEMA).	While no permitting or licensing requirements arise directly by virtue of the proposed project,

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.		this section will find application during the EIA phase and will continue to apply throughout the life cycle of the project.
National Environmental Management: Waste Act (Act No 59 of 2008)	The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list.	DEA (hazardous waste) Provincial Department of Environmental Affairs (general waste)	As no waste disposal site is to be associated with the project. In terms of GNR921, no permit is required for this project. Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in this EMPr (refer to Appendix O.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	In terms of the Regulations published in terms of this Act (GN 912 of November 2013), a Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented.		

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
National Water Act (Act No 36 of 1998)	Water uses under S21 of the Act must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under general authorisation in terms of S39 and GN 1191 of GG 20526 October 1999. In terms of Section 19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing or recurring.	Department of Water and Sanitation (DWS)	A Water Use Licence (WUL) is required as water for the project will be sourced from the Gariep River. Other water uses relate to the storage of wastewater and impacts on ephemeral drainage lines on the site. Application for a WUL will be made with the DWS in terms of Section 21 of the Act.
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.	Department of Mineral Resources (DMR)	Should material not be sourced from a commercial source and a borrow pit(s) be considered necessary, the Contractor shall source and apply for the relevant permit from the DMR.
National Environmental Management: Air	S18, S19, and S20 of the Act allow certain areas to be declared and	DEA Khai-Ma Local Municipality	No permitting or licensing requirements arise from this

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
Quality Act (Act No 39 of 2004)	managed as "priority areas." Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards. GN R 827 – National Dust Control Regulations prescribes general measures for the control of dust in all areas		legislation. The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act. The air quality officer may require a dust monitoring programme as per the Regulations for dust control. The draft EMPr however makes provision for managing and mitigating potential dust impacts (Refer to Appendix O).
National Heritage Resources Act (Act No 25 of 1999)	Section 38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including » the construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length;	South African Heritage Resources Agency (SAHRA) Northern Cape Heritage Resources Authority	A Heritage and Paleontological Impact Assessment (HIA) was undertaken as part of the EIA Process to identify heritage sites. The overall area is considered as having a low archaeological significance. The relevant mitigation measures are included

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	» any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent. The relevant Heritage Resources Authority must be notified of developments such as linear developments (such as roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m^2; or the re-zoning of a site exceeding 10 000 m^2 in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided. Standalone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA component		in the EMPr (refer to **Appendix O** in the EIAr).

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	that fulfils the provisions of Section 38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» In terms of Section 57, the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. » In terms of GNR 152 of 23 February 2007: Regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA Phase of the project to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to	National Department of Environmental Affairs DENC	As the applicant will not carry out any restricted activity, as is defined in Section 1 of the Act, no permit is required to be obtained in this regard. A Specialist Ecological Assessment was undertaken as part of the Environmental Impact Assessment process (refer to Appendix D). As such the potential occurrence of critically endangered, endangered, vulnerable, and protected species, as well as critically endangered (CR), endangered (EN), vulnerable (VU) or protected ecosystems and species and the potential for them to be affected has been

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	identify permitting requirements at an early stage of the EIA Phase. » The Act provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (GG 34809, GN 1002), 9 December 2011).		considered.
National Veld and Forest	» In terms of S12 the landowner	Department of Agriculture,	While no permitting or licensing

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
Fire Act (Act 101 of 1998)	would be required to burn firebreaks to ensure that should a veldfire occur on the property, that it does not spread to adjoining land. » In terms of S13 the landowner must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. » In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.	Forestry and Fisheries (DAFF)	requirements arise from this legislation, this Act will find application during the construction and operational phase of the project The relevant management and mitigation measures has been included in the EMPr.
Conservation of Agricultural Resources Act (CARA) (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5). » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur. » Requirement & methods to implement control measures for	Department of Agriculture, Forestry and Fisheries (DAFF)	An Ecology study was undertaken (refer to **Appendix D** in the EIAr). The relevant mitigations measures for the management of alien and invasive species were identified and are included in the EMPr (**Appendix O** in the EAIr).

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	alien and invasive plant species (Regulation 15E of GN R1048).		
National Forests Act (Act No 84 of 1998)	» In terms of S5 (1) no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated". » The list of protected tree species was published in GN 877 of 22 November 2013.	» Department of Agriculture, Forestry and Fisheries (DAFF) » NC DENC	A permit or license is required for the destruction of protected tree species and/or indigenous tree species within a natural forest. No Protected tree species or indigenous tree species were identified on site.
Aviation Act (Act No 74 of 1962) 13th amendment of the Civil Aviation Regulations	Any structure exceeding 45m above ground level or structures where the top of the structure exceeds 150m above the mean ground level, the mean	Civil Aviation Authority (CAA)	While no permitting or licence requirements arise from the legislation, this act will find application during the

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
(CARS) 1997	ground level considered to be the lowest point in a 3km radius around such structure. Structures lower than 45m, which are considered as a danger to aviation shall be marked as such when specified. Overhead wires, cables etc., crossing a river, valley or major roads shall be marked and in addition their supporting towers marked and lighted if an aeronautical study indicates it could constitute a hazard to aircraft. Section 14 of Obstacle limitations and marking outside aerodrome or heliport – CAR Part 139.01.33 relates specifically to appropriate marking of wind energy facilities.		operational phase of the project. Appropriate marking is required to meet the specifications as detailed in the CAR Part 139.01.33.
Hazardous Substances Act (Act No 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death by reason of their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of	Department of Health Khai-Ma Local Municipality	It is necessary to identify and list all the Group I, II, III and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; » Group IV: any electronic product; » Group V: any radioactive material. The use, conveyance or storage of any hazardous substance (such as distillate fuel) is prohibited without an		to be obtained from the Department of Health.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	appropriate license being in force.		
National Road Traffic Act (Act No 93 of 1996)	The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and culverts. The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio,	Provincial Department of Transport (provincial roads) South African National Roads Agency Limited (national roads)	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 components may not meet specified dimensional limitations (height and width).

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		
Astronomy Geographic Advantage Act (Act 21 of 2007)	» The Astronomy Geographic Advantage Act (No. 21 of 2007) provides for the preservation and protection of areas within South Africa that are uniquely suited for optical and radio astronomy; for intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas and for matters connected thereto. » Chapter 2 of the act allows for the declaration of astronomy advantage areas while Chapter 3 pertains to the management and control of astronomy advantage areas. Management and control of	Department of Science and Technology	The study area falls outside the Sutherland Central Astronomy Advantage Area gazetted in GN R140 of 28 February 2015, the 75km circular buffer centred on the SALT. The study area falls nearest SKA station has been identified as SKA ID 1896, at approximately 107 km from the proposed installation therefore Paulputs CSP Project poses a very low risk of detrimental impact on the SKA

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	astronomy advantage areas include, amongst others, the following: » Restrictions on use of radio frequency spectrum in astronomy advantage areas; » Declared activities in core or central astronomy advantage area; » Identified activities in coordinated astronomy advantage area; and » Authorisation to undertake identified activities. 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 advantage area containing the		

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	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. » 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		

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	electricity, or any activity capable of causing radio frequency interference or which may detrimentally influence the astronomy and scientific endeavour.		
Provincial Legislation/ Policies / Plans			
Northern Cape Nature Conservation Act (Act No. 9 of 2009)	» Provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province. In terms of this act the following section may be relevant with regards to any security fencing the development may require. **Manipulation of boundary fences** 19. No Person may – (a) erect, alter remove or partly remove or cause to be erected, altered removed or partly removed, any fence, whether on a common boundary or on such person's own property, in such a	» NC DENC	A permit is required for any activities which involve species listed under schedule 1 or 2. The NC DENC permit offices provide an integrated permit which can be used for all provincial and Threatened or Protected Species (TOPS)-(flora and fauna) related permit requirements. If Provincially protected plant species are found within the study area during the site walkthrough, a permit would be applied for, for the removal or relocation of such species.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	manner that any wild animal which as a result thereof gains access or may gain access to the property or a camp on the property, cannot escape or is likely not to be able to escape therefrom; The Act also lists protected fauna and flora under 3 schedules ranging from Specially protected (Schedule 1), protected (schedule 2) to common (schedule 3). The majority of mammals, reptiles and amphibians are listed under Schedule 2, except for listed species which are under Schedule 1.		
Local Legislation / Policies / Plans			
Khai-Ma Local Municipality Integrated Development Plan (IDP)	» The IDP notes that the Khai Ma LM is primarily an agricultural community. Conservation of the environment and sustainable development are identified as primary points of departure in policy.	Khai-Ma Local Municipality	New developments in the municipality to be in line with the IDP.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	» The main socio-economic developmental issues are identified as lack of basic services , poverty and unemployment, lack of sport and recreational facilities and services and lack of sufficient and proper health services		
Standards			
Noise Standards	Four South African Bureau of Standards (SABS) scientific standards are considered relevant to noise from a Wind Energy Facility. They are: » SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'. » SANS 10210:2004. 'Calculating and predicting road traffic noise'. » SANS 10328:2008. 'Methods for environmental noise impact assessments'. » SANS 10357:2004. 'The calculation	Local Municipality	The recommendations that the standards make are likely to inform decisions by authorities, but non-compliance with the standards will not necessarily render an activity unlawful per se.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	of sound propagation by the Concave method'. The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes.		

Table 3.2: Standards applicable to the Paulputs CSP project

Theme	Standard	Summary
Air	South African National Standard (SANS) 69	Framework for setting and implementing national ambient air quality standards
	SANS 1929: Ambient Air Quality	Sets limits for common pollutants
Noise	SANS 10328:2003: Methods for Environmental Noise Impact Assessments	General procedure used to determine the noise impact
	SANS 10103:2008: The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication	Provides noise impact criteria
	National Noise Control Regulations	Provides noise impact criteria

Theme	Standard	Summary
	SANS 10210: Calculating and Predicting Road Traffic Noise	Provides guidelines for traffic noise levels
Waste	DWAF (1998) Waste Management Series. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste	DWAF Minimum Requirements
	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) – National norms and standard for the storage of waste.	» Provides uniform national approach relating the management of waste facilities » Ensure best practice in management of waste storage » Provides minimum standards for the design and operation of new and existing waste storage
Water	Best Practise Guideline (G1) Stormwater Management DWS2006	Provides guidelines to the management of stormwater
	South African Water Quality Guidelines	Provides water quality guidelines

APPENDIX C:
GRIEVANCE MECHANISM FOR PUBLIC COMPLAINTS AND ISSUES

GRIEVANCE MECHANISM / PROCESS

PURPOSE

This Grievance Mechanism has been developed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The aim of the grievance mechanism is to ensure that grievances or concerns raised by local landowners and or communities are addressed in a manner that:

» Provides a predictable, transparent, and credible process to all parties, resulting in outcomes that are seen as fair, effective, and lasting.
» Builds trust as an integral component of broader community relations activities.
» Enables more systematic identification of emerging issues and trends, facilitating corrective action and pre-emptive engagement.

The aim of this Grievance Mechanism is to address grievances in a manner that does not require a potentially costly and time consuming legal process.

PROCEDURE FOR RECEIVING AND RESOLVING GRIEVANCES

» Local landowners, communities and authorities must be informed in writing by the Proponent of the grievance mechanism and the process by which grievances can be brought to the attention of the Proponent through its designated representative.
» A company representative must be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person must be provided to local landowners, communities and authorities.
» Project related grievances relating to the construction, operational and or decommissioning phase must be addressed in writing to the contact person. The contact person should assist local landowners and or communities who may lack resources to submit/prepare written grievances.
» The grievance must be registered with the contact person who, within 2 working days of receipt of the grievance, must contact the Complainant to discuss the grievance and agree on suitable date and venue for a meeting in order to discuss the grievances raised. Unless otherwise agreed, the meeting should be held within 2 weeks of receipt of the grievance.
» The contact person must draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting (once agreed).
» Prior to the meeting being held the contact person must contact the Complainant to discuss and agree on the parties who should attend the

meeting. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or proponent are entitled to invite their legal representatives to attend the meeting/s, it should be made clear that to all the parties involved in the process that the grievance mechanism process is not a legal process. It is therefore recommended that the involvement of legal representatives be limited.

» The meeting should be chaired by the Proponent's representative appointed to address grievances. The Proponent must provide a person to take minutes of and record the meeting/s. Any costs associated with hiring venues must be covered by the Proponent.

» Draft copies of the minutes must be made available to the Complainant and the Proponent within 4 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days of receipt of the draft minutes.

» In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome must recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.

» In the event of a dispute between the Complainant and the Proponent regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s must note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned.

» In the event that the parties agree to appoint a mediator, the Proponent will be required to identify three (3) mediators and forward the names and CVs to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the Proponent, must identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator must be borne by the Proponent. The Proponent must provide a person to take minutes of and record the meeting/s.

» In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome must be recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.

» In the event of the dispute not being resolved, the mediator must prepare a draft report that summaries the nature of the grievance and the dispute. The

report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.

» The draft report must be made available to the Complainant and the Proponent for comment before being finalised and signed by all parties. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days. The way forward will be informed by the recommendations of the mediator and the nature of the grievance.

A Complaint is closed out when no further action can be or needs to be taken. Closure status will be classified in the Complaints Register as follows:

» Resolved. Complaints where a resolution has been agreed and implemented and the Complainant has signed the Confirmation Form.
» Unresolved. Complaints where it has not been possible to reach an agreed resolution and the case has been authorised for close out by the Appeals Committee.
» Abandoned. Complaints where the Complainant is not contactable after one month following receipt of a Complaint and efforts to trace his or her whereabouts have been unsuccessful.

The grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the Proponent, either party may be of the opinion that legal action may be the most appropriate option.

APPENDIX D:
WASTE MANAGEMENT PLAN

WASTE MANAGEMENT PLAN

1. PURPOSE

A Waste Management Plan (WMP) plays a key role in achieving sustainable waste management throughout all phases of the project. The plan prescribes measures for the collection, temporary storage and safe disposal of the waste streams associated with the project and includes provisions for the recovery, re-use and recycling of waste. The purpose of this plan is therefore to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste that is generated from the project activities on site.

This WMP has been compiled as part of the project Environmental Management Programme (EMPr) and includes waste stream information available at the time of compilation. Construction practices and operations must be measured and analysed on an ongoing basis in order to determine the efficacy of the plan and whether further revision of the plan is required. This plan should be further updated should further detail regarding waste quantities and categorisation become available, during the construction and/or operational stages.

2. RELEVANT ASPECTS OF THE SITE

It is expected that the development of the Paulputs CSP project will generate construction solid waste, general waste, contaminated water and soil.

Waste generated on site, originates from various sources including but not limited to:

- Concrete waste generated from removal foundations, spoil and excess concrete.
- Contaminated water, soil, rocks and vegetation due to hydrocarbon spills.
- Hazardous waste from vehicle, equipment and machinery parts (oil cans, filters, rags etc), and servicing.
- Hazardous waste from, flouresent tubes, used hydrocarbon containers, and waste ink carteridges.
- Recycable waste in the form of paper, glass, steel, aluminium, wood/ wood pallets, plastic (PET bottles, PVC, LDPE) and cardboard.
- Organic waste from food waste and alien and endemic vegetation removal.
- Sewage from portable toilets and septic tanks.
- Inert waste from spoil material from site clearence and trenching works.

3. LEGISLATIVE REQUIREMENTS

Waste in South Africa is currently governed by means of a number of pieces of legislation, including:

- National Environmental Management: Waste Act (NEM:WA), 2008 (Act 59 of 2008)
- National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014)
- The South African Constitution (Act 108 of 1996)
- Hazardous Substances Act (Act 5 of 1973)
- Health Act (Act 63 of 1977)
- Environment Conservation Act (Act 73 of 1989)
- Occupational Health and Safety Act (Act 85 of 1993)
- National Water Act (Act 36 of 1998)
- The National Environmental Management Act (Act 107 of 1998) (as amended)
- Municipal Structures Act (Act 117 of 1998)
- Municipal Systems Act (Act 32 of 2000)
- Mineral and Petroleum Resources Development Act (Act 28 of 2002)
- Air Quality Act (Act 39 of 2004)

Storage of waste must be undertaken in accordance with the National Norms and Standards for the Storage of Waste published in GN926.

4. WASTE MANAGEMENT PRINCIPLES

An integrated approach to waste management on site is needed. Such an approach is illustrated in the Figure 1.

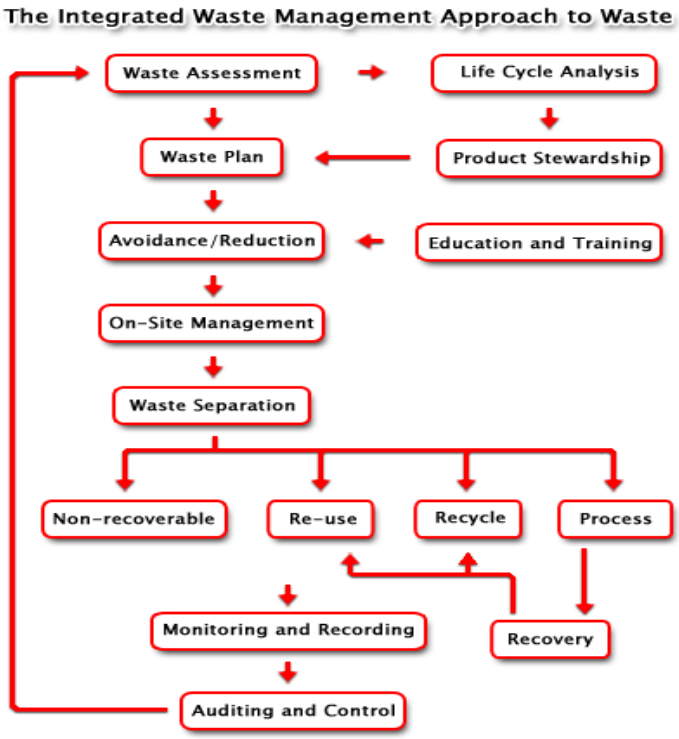


Figure 1: Integrated Waste Management Flow Diagram
(Source: http://www.enviroserv.co.za/pages/content.asp?SectionId=496)

It is important to ensure that waste is managed with the following objectives in mind during all phases of the project:

» Reducing volumes of waste is a priority;
» If reduction is not feasible, the maximum amount of waste is to be recycled; and
» Waste that cannot be recycled is to be disposed of in the most environmentally responsible manner as possible.

4.1. Construction phase

A plan for the management of waste during construction waste is detailed below. As previously stated, construction practices must be measured and analysed in order to determine the efficacy of the plan and whether further revision of the plan is required. A Method Statement detailing specific waste management practices during construction should be prepared by the Contractor prior to the commencement of construction.

4.1.1. Waste Assessment / Inventory

» The Environmental Officer (EO), or designated staff member, must develop, implement and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste streams.
» Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.
» Once a waste inventory has been established, targets for recovery of waste (minimisation, re-use, recycling) should be set.
» The EO must conduct waste classification and rating in terms of SANS 10288 and Government Notice 634 published under the NEM: WA.

4.1.2. Waste collection, handling and storage

» It is the responsibility of the EO to ensure that each subcontractor implements their own waste recycling system, i.e. separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc.
» Waste manifests and waste acceptance approvals from designated waste facilities must be kept on hand in order to prove compliance.
» Septic tanks and portable toilets must be monitored and maintained daily. Below ground storage of septic tanks must withstand the external forces of the surrounding environment. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from driving around the area.
» Waste collection bins and hazardous waste containers must be provided by the principal contractor and subcontractors and placed at various areas around site for the storage of organic, recyclable and hazardous waste.
» A dedicated waste area must be established on site for the storage of all waste streams, before removal from site. The storage period must not trigger listed waste activities as per the NEMWA, GN 921 of November 2013.
» Signage/ colour coding must be used to differentiate disposal areas for the various waste streams (i.e. paper, cardboard, metals, food waste, glass etc.).
» Hazardous waste must be stored within a bunded area constructed according to SABS requirements. The volume of waste stored in the bunds must not exceed 110% of the bund capacity.
» The location of all temporary waste storage areas must aim to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.
» Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
» If possible a dedicated waste management team must be appointed by the principal contractors' EO, whom will be responsible for ensuring the continuous sorting of waste and maintenance of the area. The waste management team must be trained in all areas of waste management and monitored by the EO.

» All waste removed from site must be done so by a registered/ licensed subcontractor, whom must supply information regarding how waste recycling/ disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month or for every disposal made.

4.1.3. Management of waste storage areas

» The position of all waste storage areas must be located at least 32m away from water courses and ensure minimal degradation to the environment. The main waste storage area must have a suitable storm water system separating clean and dirty storm water.
» Collection bins placed around site and at subcontractors' camps (if at a different location than the main site camp) must be maintained and emptied on a regular basis by the principal contractor.
» Inspections and maintenance of the main waste storage area must be undertaken daily. Skips and storage containers must be clearly marked or colour coded and well-maintained, not allowing access to vermin or other rodents. A Tarp or Shade cloth should ideally be used to ensure avifauna does not have access to waste.
» Waste must be stored in designated containers and not on the ground.
» Inspections and maintenance of bunds must be undertaken daily. Bunds must be inspected for leaks or cracks in the foundation and walls.
» It is assumed that any rainwater collected inside the bund is contaminated and must be removed and stored as hazardous waste, and not released into the environment. If any leaks occur in the bund, these must be removed immediately.

4.1.4. Disposal

» Waste generated on site must be removed on a regular basis, as determined by the EO and ECO. This frequency may change during construction depending on waste volumes generated at different stages of the construction process.
» Waste must be removed by a suitably qualified contractor and disposed at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor to the EO and ECO.

4.1.5. Record keeping

The success of the Waste Management Plan is determined by measuring criteria such as waste volumes, cost recovery from recycling, cost of disposal. Recorded data can indicate the effect of training and education, or the need for education. It will provide trends and benchmarks for setting goals and standards. It will provide clear evidence of the success or otherwise of the plan.

» Documentation (waste manifest, certificate of issue or safe disposal) must be kept detailing the quantity, nature, and fate of any regulated waste for audit purposes.
» Waste management must form part of the monthly reporting requirements in terms of volumes generated, types, storage and final disposal.

4.1.6. Training

Training and awareness regarding waste management shall be provided to all employees and contractors as part of the toolbox talks or on-site awareness sessions with the EO and at the frequency as set out by the ECO.

5. Operational phase

It is expected that the operational phase will result in the production of limited amounts of general waste consisting mostly of cardboard, paper, plastic, tins, metals and a variety of synthetic compounds. Limited amounts of hazardous wastes (grease, oils) may also be generated. All waste generated will be required to be temporarily stored at the facility in appropriate sealed containers prior to disposal at a permitted landfill site.

The following waste management principles apply during the operational phase:

» The SHE Manager must develop, implement and maintain a waste inventory reflecting all waste generated during operation for both general and hazardous waste streams.
» Adequate waste collection bins at site must be supplied. Separate bins should be provided for general and hazardous waste.
» Recyclable waste must be removed from the waste stream and stored separately.
» All waste must be stored in appropriate temporary storage containers (separated between different construction wastes, and contaminated or wet waste).
» Waste storage shall be in accordance with all best-practice guidelines and under no circumstances may waste be burnt on site.
» Waste generated on site must be removed on a regular basis throughout the operational phase.
» Waste must be removed by a suitably qualified contractor and disposed at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor and kept on site.

6. Monitoring of Waste Management Activities

Records must be kept of the volumes/ mass of the different waste streams that are collected from the site throughout the life of the project. The appointed waste contractor is to provide monthly reports to the operator containing the following information:

- Monthly volumes/ mass of the different waste streams collected;
- Monthly volumes/ mass of the waste that is disposed of at a landfill site;
- Monthly volumes/ mass of the waste that is recycled;
- Data illustrating progress compared to previous months.

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place. If it is found that the implemented procedures are not as effective as required, this WMP is to be reviewed and amended accordingly. This report must from part of the EO's reports to the ECO on a monthly basis.

APPENDIX E:
ALIEN INVASIVE AND OPEN SPACE MANAGEMENT PLAN

ALIEN PLANT AND OPEN SPACE MANAGEMENT PLAN

1. PURPOSE

Invasive alien species pose the second largest threat to biodiversity after direct habitat destruction. The purpose of this Alien Plant Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Paulputs CSP project. The broad objectives of the plan includes the following:

» Ensure alien plants do not become dominant in parts or the whole site, through the control and management of alien and invasive species presence, dispersal & encroachment.
» Develop and implement a monitoring and eradication programme for alien and invasive species.
» Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

2. RELEVANT ASPECTS OF THE SITE

The disturbance created during the construction phase of the project would leave the site highly vulnerable to invasion by alien plant species, which would impact diversity and ecological processes within the area. Alien species that were observed at the Gariep River and which might increase in response to the disturbance include Mesquite (*Prosopis spp*.).

3. LEGISLATIVE CONTEXT

Conservation of Agricultural Resources Act (Act No. 43 of 1983)

In terms of the amendments to the regulations under the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all declared aliens must be effectively controlled. Landowners are legally responsible for the control of invasive alien plants on their properties. In terms of this Act alien invasive plant species are ascribed to one of the following categories:

» Category 1: Prohibited and must be controlled.
» Category 2 (commercially used plants): May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.
» Category 3 (ornamentally used plants): May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

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

The National Environmental Management: Biodiversity Act (NEM:BA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations have been published in Government Notices R.506, R.507, R.508 and R.509 of 2013 under NEMBA. According to this Act and the regulations, any species designated under Section 70 cannot be propagated, grown, bought or sold without a permit. Below is an explanation of the three categories:

» **Category 1a:** Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
» **Category 1b:** Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
» **Category 2:** Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Cat 2 plants to exist in riparian zones.
» **Category 3:** Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Cat 3 plants to exist in riparian zones.

The following guide is a useful starting point for the identification of alien species: Bromilow, C. 2010. Problem Plants and Alien Weeds of South Africa. Briza, Pretoria.

It is important to note that alien species that are regulated in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) as weeds and invader plants are exempted from NEM:BA. This implies that the provisions of the CARA in respect of listed weed and invader plants supersede those of NEM: BA.

4. ALIEN PLANT MANAGEMENT PRINCIPLES

4.1. Prevention and early eradication

A prevention strategy should be considered and established, including regular surveys and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas.

Monitoring plans should be developed which are designed to identify Invasive Alien Plant Species shortly after they arrive in the project area. Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update

this information on a regular basis. When new Invasive Alien Plant Species are recorded on site, an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

4.2. Containment and control

If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Separate plans of control actions should be developed for each location and/or each species. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The key is to ensure that no invasions get out of control. Effective containment and control will ensure that the least energy and resources are required to maintain this status over the long-term. This will also be an indicator that natural systems are impacted to the smallest degree possible.

4.3. General Clearing & Guiding Principles

Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area. The lighter infested areas should be cleared first to prevent the build-up of seed banks. Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently. Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of aliens are easily dispersed across boundaries by wind or water courses. All clearing actions should be monitored and documented to keep records of which areas are due for follow-up clearing.

i. <u>Clearing Methods</u>

Different species require different clearing methods such as manual, chemical or biological methods or a combination of both. Care should however be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.

Fire should not be used for alien control or vegetation management at the site. The best-practice clearing method for each species identified should be used.

» **<u>Mechanical control</u>**
This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice,

need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive, and could cause severe soil disturbance and erosion.

» **Chemical Control**

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien invasion and may also be ineffective for many woody species which resprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

For all herbicide applications, the following Regulations and guidelines should be followed:

- Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.
- Pesticide Management Policy for South Africa published in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) – GNR 1120 of 2010.
- South African Bureau of Standards, Standard SANS 10206 (2010)

According to Government Notice No. 13424 dated 26 July 1992, it is an offence to "*acquire, dispose, sell or use an agricultural or stock remedy for a purpose or in a manner other than that specified on the label on a container thereof or on such a container*".

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). This is regulated by the Department of Agriculture, forestry and Fisheries.

» **Biological control**

Biological weed control consists in the use of natural enemies to reduce the vigour or reproductive potential of an invasive alien plant. Biological control agents include insects, mites, and micro-organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers or fruit) or the seeds after they have dropped. The stress caused by the biological control agent may kill a plant outright or it might impact on the plants reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilised. All of these outcomes will help to reduce the spread of the species.

To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), Department of Agriculture, Forestry and Fisheries (DAFF) can be contacted.

4.4. General management practices

The following general management practices should be encouraged or strived for:

- Establish an ongoing monitoring programme for construction phase to detect and quantify any alien species that may become established and identify the problem species.
- Alien vegetation regrowth on areas disturbed by construction must be immediately controlled once recorded throughout the entire site during construction and operation.
- Care must be taken to avoid the introduction of alien invasive plant species to the site. Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment. Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.
- Cleared areas that have become invaded by alien species can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.
- The effectiveness of vegetation control varies seasonally and this is also likely to impact alien species. Control early in the wet season will allow species to re-grow and follow-up control is likely to be required. It is tempting to leave control until late in the wet season to avoid follow-up control. However, this may allow alien species to set seed before control and hence will not contribute towards reducing alien species abundance. Therefore, vegetation control should be aimed at the middle of the wet season, with a follow-up event towards the end of the wet season. There are no exact dates that can be specified here as each season is unique and management must therefore respond according to the state and progression of the vegetation.
- Alien management is an iterative process and it may require repeated control efforts to significantly reduce the abundance of a species. This is often due to the

presence of large and persistent seed banks. However, repeated control usually results in rapid decline once seed banks become depleted.

» Some alien species are best individually pulled by hand. Regular vegetation control to reduce plant biomass within the site should be conducted. This should be timed so as to coincide with the critical growth phases of the most important alien species on site. This will significantly reduce the cost of alien management as this should contribute towards the control of the dominant alien species and additional targeted control will be required only for a limited number of species.
» No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally-occurring species should be used
» During operation, surveys for alien species should be conducted regularly. It is recommended that this be undertaken every 6 months for the first two years after construction and annually thereafter. All aliens identified should be cleared using appropriate means.

4.5. Monitoring

In order to monitor the impact of clearing activities, follow-ups and rehabilitation efforts, monitoring must be undertaken. This section provides a description of a possible monitoring programme that will provide and assessment of the magnitude of alien invasion on site as well as an assessment of the success of the management programme.

In general, the following principles apply for monitoring:

» Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.
» Simple records must be kept of daily operations, e.g. area/location cleared, labour units and, if ever used, the amount of herbicide used.
» It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action.

The following monitoring should be implemented to ensure management of alien invasive plant species.

Construction Phase

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien species	Preconstruction & monthly thereafter
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien control measures implemented	Record of clearing activities	3 Monthly

Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

Operation Phase

Monitoring Action	Indicator	Timeframe
Document alien species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Biannually
Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

APPENDIX F:
RE-VEGETATION AND REHABILITATION PLAN

REVEGETATION AND REHABILITATION PLAN

1. PURPOSE

The purpose of the rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the Paulputs CSP project are rehabilitated with a plant cover that reduces the risk or erosion from these areas as well as restores some ecosystem function. The purpose of the rehabilitation plan for the site can be summarised as follows:

» Achieve long-term stabilisation of all disturbed areas to minimise erosion potential.
» Re-vegetate all disturbed areas with suitable local plant species.
» Minimise visual impact of disturbed areas.
» Ensure that disturbed areas are safe for future uses.

This Revegetation and Rehabilitation Plan should be closely aligned with other site-specific plans, including the Erosion Management Plan, Soil Management Plan, Alien Plant Management Plan, and Plant Rescue and Protection Plan. Prior to commencement of construction, a detailed Rehabilitation Plan and Method Statement for the site should be compiled with the aid of a Rehabilitation Specialist.

2. RELEVANT ASPECTS OF THE SITE

A floral survey was conducted in August 2015 (the dry season survey) and during the wet season (March – April 2016). Based on species composition, physiognomy, moisture regime, rockiness, slope and soil properties, three main vegetation communities were recognised (refer to **Figure 1**). The vegetation communities are described below and named according to dominant species and underlying substrate. The majority of the site is covered by *Stipagrostis ciliata – Aristida congesta* open grassland.

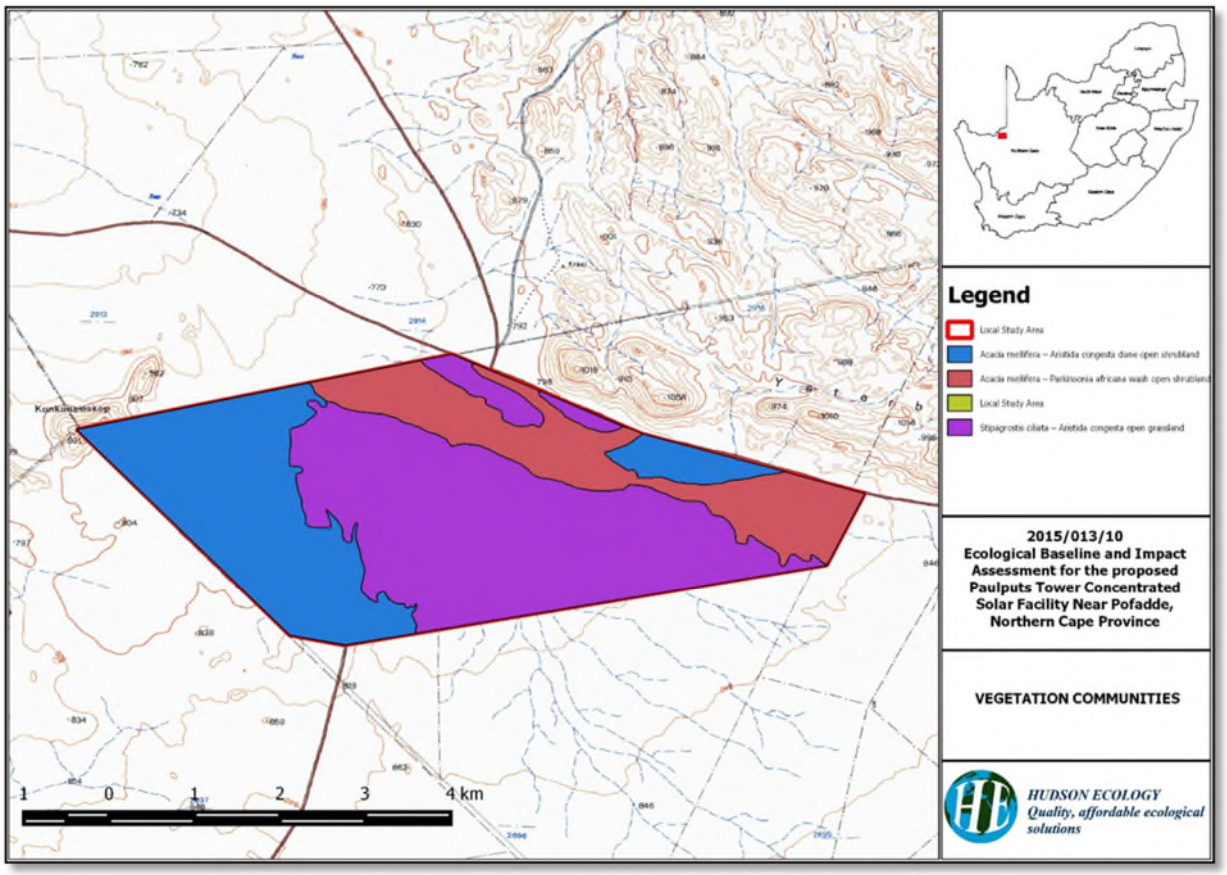


Figure 1: Paulputs CSP Project site showing distribution of the identified vegetation communities.

Acacia mellifera – Aristida congesta dune open shrubland

This vegetation community is typically covered by sparse open grassland, with *Stipagrostis ciliata* and *Aristida congesta* being the dominant grass species. Due to the deeper soils, as well as soil chemistry and an increased water retention potential, larger *Acacia mellifera* are dominant in this vegetation community, with scattered, drought resistant dwarf shrubs or small trees, e.g. *Rhigozum trichotomum* and *Boscia foetida* (refer to **Figure 2**). Species of concern found to occur in this vegetation community are the protected species *Aloe dichotoma* and *Boscia foetida*.

Figure 2: *Acacia mellifera – Aristida congesta* dune open shrubland in the northern part of the study area.

Acacia mellifera – Parkinsonia africana wash open shrubland

The drainage lines within the plains of the study area are regarded as washes, as water will only flow after good rains, and soon they will be dry again. The increased water retention in the underlying substrate allows for the growth of larger individuals of the species *Acacia mellifera* and *Parkinsona africana*. These washes are wide and sandy, and blend into the landscape, merging with the adjacent grassland vegetation, but are nevertheless visible due to their microtopography and change in species composition (refer to **Figure 3**).

The vegetation is often somewhat heterogeneous and with weeds, due to the disturbance of the periodic flooding. Washes are of conservation concern and regarded as sensitive ecosystems, due to the ecosystem processes linked to provision and transport of water in the landscape.

Figure 3: Wash shrubby grassland running from left to right in the central part of the photo.

Stipagrostis ciliata – Aristida congesta open grassland

The open, sparse grassland is dominated by *Stipagrostis ciliata* and *Aristida congesta*. The shrubby *Rhigozum trichotomum* is prominent on the sandy localities while *Salsola aphylla* is more prominent where calcrete is exposed (refer to Error! Reference source not found.**4**). Other dominant grass species occurring in this vegetation community include *Stipagrostis obtusa, Aristida adscensionis* and, to a much lesser extent, *Fingerhuthia africana* and *Eragrostis lehmanniana*.

Figure 4: Calcrete shrubby vegetation.

Sparse Acacia mellifera – Aristida congesta rocky outcrop vegetation

The vegetation on the slopes and crests of the mountains and hills is a shrubland with both succulent and non-succulent bushes and a sparse grassy layer (refer to **Figure 5**). This vegetation community was not mapped as a separate vegetation community as it is a subset of the *Acacia mellifera – Aristida congesta* dune open shrubland vegetation community in which it occurs. These vegetation communities are dominated by *Acacia mellifera* and *Aristida congesta* with, to a lesser extent, *Stipagristis ciliata*, *Aristida adscensionis, Stipagrostis obtusa* and *Eragrostis lehmanniana*, with isolated stunted *Boscia foetida* and *Parkinsona africana* near the foothills of the outcrops.

Figure 5: Rocky outcrop vegetation.

3. REHABILITATION METHODS

» Immediately after replacing topsoils in disturbed areas, the soil surface must be revegetated with a suitable plant cover.
» It is expected that soil seed banks of indigenous vegetation will be present to initiate initial vegetation cover. However, simply applying this topsoil to a well prepared rehabilitation site does not result in the same species richness and diversity as the surrounding areas. In some areas the natural regeneration of the vegetation may be poor and the application relevant of seed to enhance vegetation recovery may be required.
» Where possible, seed should be collected from plants present at the site during plant rescue oprerations. Indigenous seeds may also be harvested for purposes of re-vegetation in areas that are free of alien or invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites.
» Seed collection should be undertaken by a suitably qualified specialist who is familiar with the various seed types associated with the plant species and rehabilitation in the area.
» Seed collection may be done throughout the year as seed ripens, but can also be restricted to summer, when a large amount of the perennial seed should have ripened. The collection of unripe seeds will reduce the percentage germination thereby reducing the effectiveness of the rehabilitation efforts. Seeds should be

stored in paper or canvas bags dusted with insecticide, and sown at the onset of the rainy season.

» Seed can be sown onto the soil, but should preferably be applied in conjunction with measures to improve seedling survival such as scarification of the soil surface or simultaneous application of mulch. Additional organic material may be added to the soil mix, if required, to assist with water retention during the early stages of seedling establishment.
» It should be ensured that the seed mix is as diverse as possible in the first season. After the first season, when pioneer plant communities have successfully established, attempts should be made to re-sow and replant the area with more perennial and woody species. It is a process that will require several follow-ups.
» Planting is dependent on species involved. Planting of species recommended for rehabilitation should be carried out as far as is practicable to coincide with the onset of the first significant rains. In general however, planting should commence as soon as possible after construction is completed in order to minimise the potential for erosion.
» The final vegetation cover should resemble the original (non-encroached and indigenous) vegetation composition and structure as far as practicably possible.
» Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible. Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed.
» Once revegetated, areas should be protected to prevent trampling and erosion.
» No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated.
» Where rehabilitation sites are located within actively grazed areas, they should be fenced, this must be undertaken in consultation with the landowner.
» Fencing should be removed once a sound vegetative cover has been achieved.
» Any runnels, erosion channels or wash aways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.

4. MONITORING AND FOLLOW-UP ACTION

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of rehabilitated areas. During the construction phase, the Environmental Officer (EO) and EPC Contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the Proponent will need to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:

» Composition and density of replanted vegetation, distinguishing between species introduced for initial revegetation only and species that are part of the pre-determined desirable end state.
» Associated nature and stability of surface soils
» Re-emergence of alien and invasive plant species. If noted, remedial action must be taken immediately.

The initial revegetation period post construction is estimated to be over a period of 6 months (minimum) to 12 months (maximum), or a time period specified by the rehabilitation specialist, particularly if planting of trees and shrubs occurs. The rehabilitation phase (including post seeding maintenance) should be at least 12 months (depending on time of seeding and rainfall) to ensure establishment of an acceptable plant cover is achieved (excluding invasive plant species or weeds).

As rehabilitation success, monitoring and follow-up actions are important to achieve the desired cover and soil protection. The following monitoring protocol is recommended:

» Re-vegetated areas should be monitored every 4 months for the first 12 months following construction.
» Re-vegetated areas showing inadequate surface coverage (less than 20% within 12 months after re-vegetation) should be prepared and re-vegetated;
» Any areas showing erosion, should be re-contoured and seeded with indigenous grasses or other locally occurring species which grow quickly.

If the plants have not established and the acceptable plant cover is not achieved within the specified maintenance period, maintenance of these areas shall continue until an acceptable plant cover is achieved (excluding alien plant species or weeds). Additional seeding or planting may be necessary to achieve acceptable plant cover. Hand seeding may have to be considered as an option in this case.

Monitoring of rehabilitation success and follow-up adaptive management, together with clearing of emerging alien plant species should continue for as long as considered necessary.

APPENDIX G:
PLANT PROTECTION AND RESCUE PLAN

PLANT RESCUE AND PROTECTION PLAN

1. PURPOSE

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures, in addition to the mitigations included in the Environmental Management Programme (EMPr) to reduce the impact of the development of the Paulputs CSP project on listed and protected plant species and their habitats and to provide guidance on search and rescue of species of conservation concern.

2. RELEVANT ASPECTS OF THE SITE

A list of plant species previously recorded in the quarter degree grid in which the study area is situated was obtained from the South African National Biodiversity Institute. Additional species that could occur in similar habitats, as determined from official database searches and reviewed literature, but not recorded in these grids are also listed. A total of 11 species were determined to possibly be occurring in the study area.

The species, listed as possibly occurring in the study area, were evaluated to determine the probability of occurrence in the study area based on habitat suitability. Of the species that are considered to occur within the area under investigation, there were five species that could occur in habitats that are available in the study area. According to IUCN (IUCN, 2013) two of these are listed as Vulnerable, one as Near Threatened and two as Declining. One of the vulnerable species, *Aloe dichotoma*, was recorded in the study area and could occur anywhere within the hills in the study area, or in rocky areas in Bushmanland Arid Grassland.

Figure 1: *Aloe dichotoma* recorded in the study area.

The other vulnerable species, *Lithops olivaea*, occurs only in white translucent quartzite patches. This habitat was not found in the study area during the ecological baseline and impact assessment study. The species has been recorded 30 km away, and has a wide distribution within the Gariep Centre of Floristic Endemism, there is thus a high probability of occurrence on site, if available habitat is present. The Near Threatened species, *Conophytum limpidum*, is found on inselbergs in Bushmanland in vertical crevices in rocks, generally preferring shaded situations. If it occurs in the study area, it is most likely to be found on the hills or rocky areas. The one Declining species, *Acacia erioloba*, also a protected tree, has a high probability of occurring in the study area, while *Hoodia gordonii* was recorded in the study area in a number of places (Error! Reference source not found.).

Figure 2: *Hoodia gordonii* recorded in the study area.

The quantity and quality of floristic data for the study area is poor. There are few taxonomic collections and relatively little floristic information for the area (Van Wyk & Smith, 2001). There are over 400 succulent species listed as being endemic or near-endemics for the Gariep Centre of Endemism as well as a long list of non-succulents (Van Wyk & Smith, 2001). A number of these have been recorded in the region around the current study area, for example, *Aloe gariepensis, Crassula corallina* subsp. *macrorrhiza*, *Hoodia gordonii*, *Ruschia muricata* and *Sarcocaulon patersonii. Aloe gariepensis, Ruschia muricata* and *Maerua gilgii* are found in Bushmanland Arid Grassland, *Crassula corallina* subsp. *macrorrhiza* is found in Lower Gariep Broken Veld and *Sarcocaulon patersonii* is found in a variety of vegetation types, including Lower Gariep Broken Veld and Bushmanland Arid Grassland. Areas associated with calcareous soils and heavy metals are likely to have high numbers of species of restricted distribution. There is also a high probability that there are previously undescribed species from the site or surrounding areas. A list of flora species of concern, as well as their probability of occurrence and reasoning behind the probability of occurrence is given in **Table 1**.

Table 1: Red Data floral species possibly occurring in the area

Family	Taxon	Status	Habitat	Likelihood of occurrence in the study area
FABACEAE	*Acacia erioloba*	Declining	Savanna, semi-desert and desert areas, deep sandy soils and along drainage lines in very arid areas, sometimes in rocky outcrops.	HIGH
ASPHODALACEAE	*Aloe dichotoma subsp. dichotoma*	VU	North-facing rocky slopes (particularly dolomite) in the south of its range. Lower Gariep Broken Veld and rocky areas in Bushmanland Arid Grassland	RECORDED
Capparaceae	*Boscia foetida*	Protected	Savanna, semi-desert and desert areas, deep sandy soils and along drainage lines in very arid areas, sometimes in rocky outcrops	RECORDED
APIACEAE	*Anginon jaarsveldii*	EN	Pofadder. Groot Pellaberg. Dry rocky area, xerophytic plants. Agganeys Gravel Vygieveld.	LOW, nearest locality is 50 km away
ASPHODALACEAE	*Bulbine striata*	Critically rare	Groot Pellaberg, this species appears to be endemic to the mountains north of Pella. Quartz pebbles and rocks in well-drained soil on the upper and middle slopes at the base of sheer rock faces.	LOW, nearest locality is 50 km away
FABACEAE	*Caesalpinia bracteata*	VU	This species is only known from below the Augrabies Falls near the Orange	LOW, nearest locality is 20 km away

			River and Klein Pella on granite. Blouputs Karroid Thornveld.	
MESEMBRYANTHEMACEAE	*Conophytum achabense*	VU	Namiesberge, near Poffader. Western end of the Namiesberge on an elevated quartz vlakte. Bushmanland Inselberg Shrubland.	LOW, nearest locality is 60 km away
MESEMBRYANTHEMACEAE	*Conophytum limpidum*	NT	Inselbergs in Bushmanland. Particularily dense on the Namiesberg. Vertical crevices generally prefering shaded situations. Lower Gariep Broken Veld	HIGH
EBENACEAE	*Euclea pseudebenus*	LC	Euclea pseudebenus is found in harsh, stony and sandy desert and semi-desert areas, usually in lowlying areas along watercourses, or fairly nearby.	LOW, nearest lrecorded locality is approximately 40km from the site
MESEMBRYANTHEMACEAE	*Conophytum ratum*	VU	Ghaamsberg, South West of Pofadder. Spongy quartz soil.	LOW, nearest locality is 70 km away
APOCYNACEAE	*Hoodia gordonii*	Declining	Wide variety of arid habitats	RECORDED
MESEMBRYANTHEMACEAE	*Lithops dinteri subsp. frederici*	VU	Only known from a small area near Pella (near Pofadder) in Northern Cape. Eastern Gariep Plains Desert	LOW, nearest locality is 50 km away
MESEMBRYANTHEMACEAE	*Lithops dorotheae*	EN	Just N of Pofadder / Pella vicinity, Pella mountains between Pella and Pofadder. Grows on fine grained, sheared, feldspathic quartzite. False Succulent Karoo Veld or Orange River Broken Veld (Eastern Gariep Rocky Desert)	LOW, known distribution is to the west

MESEMBRYANTHEMACEAE	*Lithops olivacea*	VU	Aggenys to Pofadder. Habitat specialist - grows on white translucent quartzite in Arid Karoo Veld (Aggeneys Gravel Vygieveld).	MEDIUM

* Conservation Status Category assessment according to IUCN Ver. 3.1 (IUCN, 2001), as evaluated by the Threatened Species Programme of the South African National Biodiversity Institute in Pretoria. *IUCN (3.1) Categories: VU = Vulnerable, EN = Endangered, CR = Critically Endangered, NT = Near Threatened.

3. PRINCIPLES FOR SEARCH AND RESCUE

Successful plant rescue can only be achieved if:

» Species can be removed from their original habitat with minimal damage to the plant, especially the roots.
» All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
» They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
» Timing of planting activities is planned with the onset of the growing season.
» Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

The following principles apply in terms of plant rescue and protection:

» A permit is required from the Northern Cape Department of Environment and Nature Conservation to translocate or destroy any listed and protected species identified by the ecological walkthrough survey undertaken for the optimised final Paulputs CSP project layout, even if they do not leave the property. This permit should be obtained prior to any search and rescue operations being undertaken.
» Where suitable species are identified, a search and rescue operation of these species should be undertaken within the development footprint, where these species would be affected, and prior to the commencement of construction.
» As far as possible, timing of search and rescue activities should be planned with the onset of the growing season.
» Affected individuals should be translocated to a similar habitat outside of the development footprint and marked and recorded for monitoring purposes. For each individual plant that is rescued, the plant must be photographed before removal, tagged with a unique number or code and a latitude longitude position recorded using a hand-held GPS device.
» The rescued plants must be planted into a container to be housed within a temporary nursery on site or immediately planted into the target habitat.
» Rescued plants, if re-planted back in the wild, should be placed as close as possible to where they were originally removed. Re-planting into the wild must cause as little disturbance as possible to existing natural ecosystems. The position of the rescued individual/s must be recorded to aid in future monitoring of that plant as noted earlier.
» During construction, the Environmental Control Officer (ECO)/ Contractor's Environmental Officer (EO)/ Environmental Representative must monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the Environmental Control Officer (ECO)/ Contractor's Environmental Officer (EO/ SHE Representative) and any listed

species present which are able to survive translocation should be translocated to a safe site.

» Any listed species suitable for translocation observed within the development footprint, and that would be affected, that were not previously observed be translocated to a safe site.
» The collecting of plants of their parts should be strictly forbidden. Staff should be informed of the legal and conservation aspects of harvesting plants from the wild as part of the environmental induction training.
» Sensitive habitats and area outside project development should be clearly demarcated as no go areas during the construction and operational phase to avoid accidental impacts.

4. REFERENCES

Van Wyk, A. & Smith, G., 2001. *Regions of floristic endemism in southern Africa.* Hatfield.: Umdaus press.

APPENDIX H:
TRAFFIC MANAGEMENT PLAN

PRINCIPLES FOR TRAFFIC AND TRANSPORTATION MANAGEMENT

1. PURPOSE

The purpose of this Traffic and Transportation Management Plan (TTMP) is to address regulatory compliance, traffic management practices, and protection measures to help reduce impacts related to transportation and the construction of temporary and long-term access within the vicinity of the Paulputs CSP Project site. The objectives of this plan include the following:

» To ensure compliance with all legislation regulating traffic and transportation within South Africa (National, Provincial, Local & associated guidelines).
» To avoid incidents and accidents while vehicles are being driven and while transporting personnel, materials, and equipment to and from the project site.
» To raise greater safety awareness in each driver and to ensure the compliance of all safe driving provisions for all the vehicles.
» To raise awareness to ensure drivers respect and follow traffic regulations.
» To avoid the deterioration of access roads and the pollution that can be created due to noise and emissions produced by equipment, machinery, and vehicles.

2. RELEVANT ASPECTS OF THE PROJECT

The following site access alternatives have been considered:

1. Access road 1: Access to site from the N14 national road via the existing R357 Onseepkans road used to access the farm, and the CSP facilities on this farm. This road is located to the east of the farm portion. The access point to the site off this road is 17km from the N14, with a formal entrance to the existing CSP facilities off of this public road. This section of the R357 is a tarred road.
2. Access road 2: Access to site from the N14 national road via the existing R358 and minor road MR73. This road is to the west of the farm portion. The access point to the site off this road is 30km from the N14. This is a gravel road.

3. TRAFFIC AND TRANSPORTATION MANAGEMENT PRINCIPLES

» Prior to the commencement of construction the contractor must develop their own detailed Transport Management Plan (TMP) based on the requirements laid out in this plan.
» The transport contractor must ensure that all required permits for the transportation of abnormal loads are in place prior to the transportation of equipment and project components to the site. Specific abnormal load routes must be developed with environmental factors taken into consideration.

- Before construction commences, authorised access routes must be clearly marked in the field with signs or flagging. The Construction Contractor must review the location of designated access and will be responsible for ensuring construction travel is limited to designated routes. The entrance of the main access road must not be constructed before a blind rise or on a bend of the public road.
- All employees must attend an environmental training program (e.g. toolbox talks) by the Environmental Officer (EO). Through this program, employees will be instructed to use only approved access roads, drive within the delineated road limits, and obey jurisdictional and posted speed limits to minimise potential impacts to the environment and other road users.
- The contractor will be responsible for making sure that their suppliers, vendors, and subcontractors strictly comply with the principles of this TMP and the contractor's TMP.
- Adjacent landowners must be notified of the construction schedule.
- Access roads and entrances to the site should be carefully planned to limit any intrusion on the neighbouring property owners and road users.
- Signs must be posted in the project area to notify landowners and others of the construction activity.
- Flagging must be provided at access points to the site and must be maintained until construction is completed on the site.
- Speed limits must be established prior to commencement of construction and enforced over all construction traffic.
- Speed controls and implementation of appropriate dust suppression measures must be enforced to minimise dust pollution.
- Throughout construction the contractor will be responsible for monitoring the condition of roads used by project traffic and for ensuring that roads are maintained in a condition that is comparable to the condition they were in before the construction began.
- Drivers must have an appropriate valid driver's license and other operation licences required by applicable legislation.
- All vehicles must be maintained in good mechanical, electrical, and electronic condition, including but not limited to the brake systems, steering, tires, windshield wipers, side mirrors and rear view mirror, safety belts, signal indicators, and lenses.
- Any traffic delays attributable to construction traffic must be co-ordinated with the appropriate authorities.
- No deviation from approved transportation routes must be allowed, unless roads are closed for reasons outside the control of the contractor.
- Impacts on local communities must be minimised. Consideration should be given to limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time.

4. MONITORING

- The principal contractor must ensure that all vehicles adhere to the speed limits.
- A speeding register must be kept with details of the offending driver.
- Repeat offenders must be penalised.
- Where traffic signs are not being adhered to, engineering structures must be used to ensure speeds are reduced.

APPENDIX I:
STORMWATER MANAGEMENT PLAN

STORMWATER MANAGEMENT PLAN

1. PURPOSE

It is widely recognised that developments could impact negatively on drainage systems. By taking greater cognisance of natural hydrological patterns and processes it is possible to develop stormwater management systems in a manner that reduces these potentially negative impacts and mimic nature. The main risks associated with inappropriate stormwater management are increased erosion risk and risks associated with flooding. Therefore, this Stormwater Management Plan and the Erosion Management Plan are closely linked to one another and should be managed together.

This Stormwater Management Plan addresses the management of stormwater runoff from the development site and significant impacts relating to resultant impacts such as soil erosion and downstream sedimentation. The main factors influencing the planning of storm water management measures and infrastructure are:

» Topography and slope gradients;
» Placing of infrastructure and infrastructure design;
» Annual average rainfall;and
» Rainfall intensities.

The objective of the plan is therefore to provide measures to address runoff from disturbed portions of the site, such that they:

» do not result in concentrated flows into natural watercourses i.e. provision should be made for temporary or permanent measures that allow for attenuation, control of velocities and capturing of sediment upstream of natural watercourses.
» do not result in any necessity for concrete or other lining of natural watercourses to protect them from concentrated flows off the development if not necessary.
» do not divert flows out of their natural flow pathways, thus depriving downstream watercourses of water.

This Storm Water Management Plan must be updated and refined once the construction/ civil engineering plans have been finalised following detailed design.

2. RELEVANT ASPECTS OF THE SITE

The study area site is situated within quaternary catchment D81E (Figure 5.17) and is dominated by highly ephemeral river systems (DWAF, 2004). Potential runoff would flow in a North Westerly direction towards the Gariep River, while runoff from the elevated portions of the Skuitklip ridges flows in a Northerly direction towards the Kaboep River, which then flows into the Gariep River.

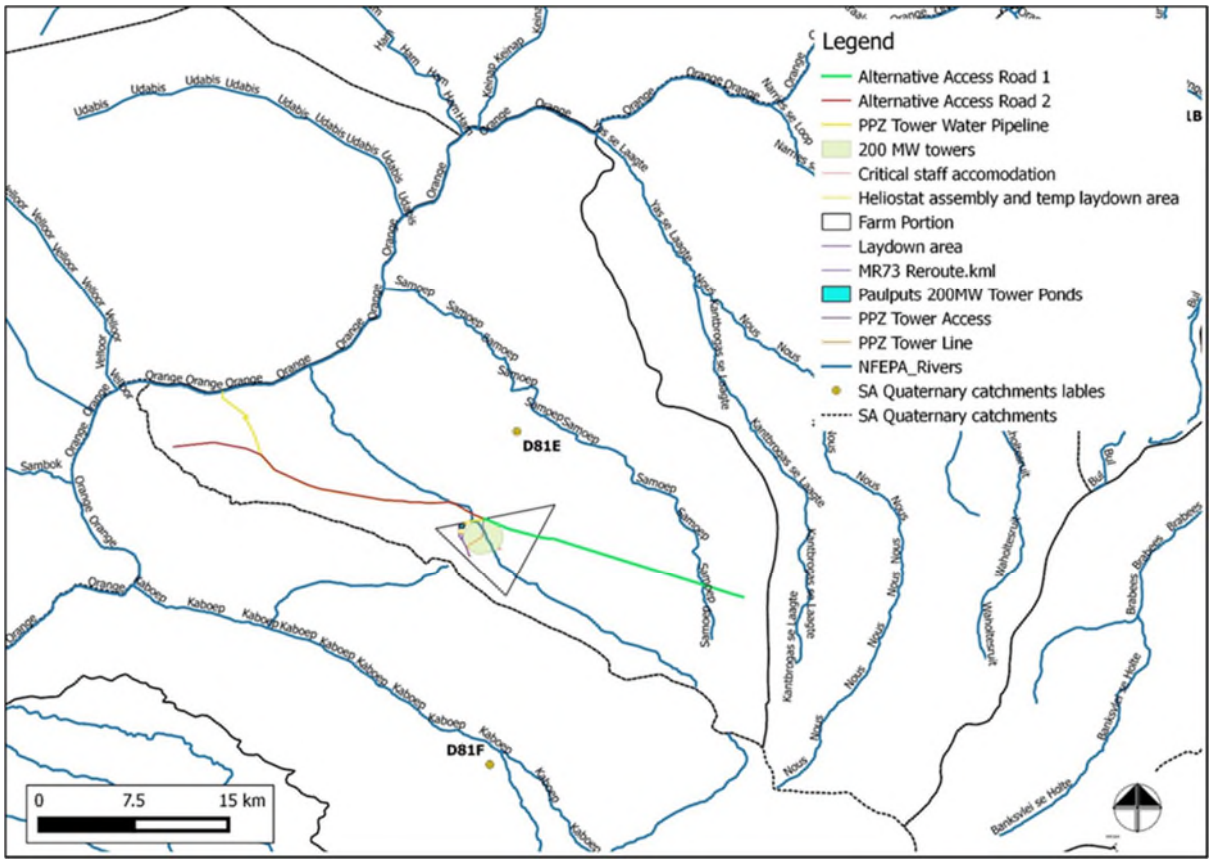


Figure 1: Project locality map indicating various quaternary catchments within the region (NFEPA & DWS)

No natural wetlands were observed within 500m of the proposed CSP site, i.e. more than 3km away, while wetlands / reedbeds (*Phragmites australis*) were observed near the proposed abstraction point along the Gariep River floodplain.

The region is however dominated by several dry alluvial water courses which only flow during high rainfall events. The proposed CSP site itself is mostly dry, although a large number of drainage lines were observed and will thus be impacted upon by the proposed layout (**Figure 2**). These systems were highly fragmented by the roads and farming practices in the past while the adjacent projects have now disrupted any flows within these systems. The significance of this impact at the time of assessing the adjacent projects was low, due to the impacts and high degree of fragmentation coupled to the general lack of any important / visible aquatic habitat.

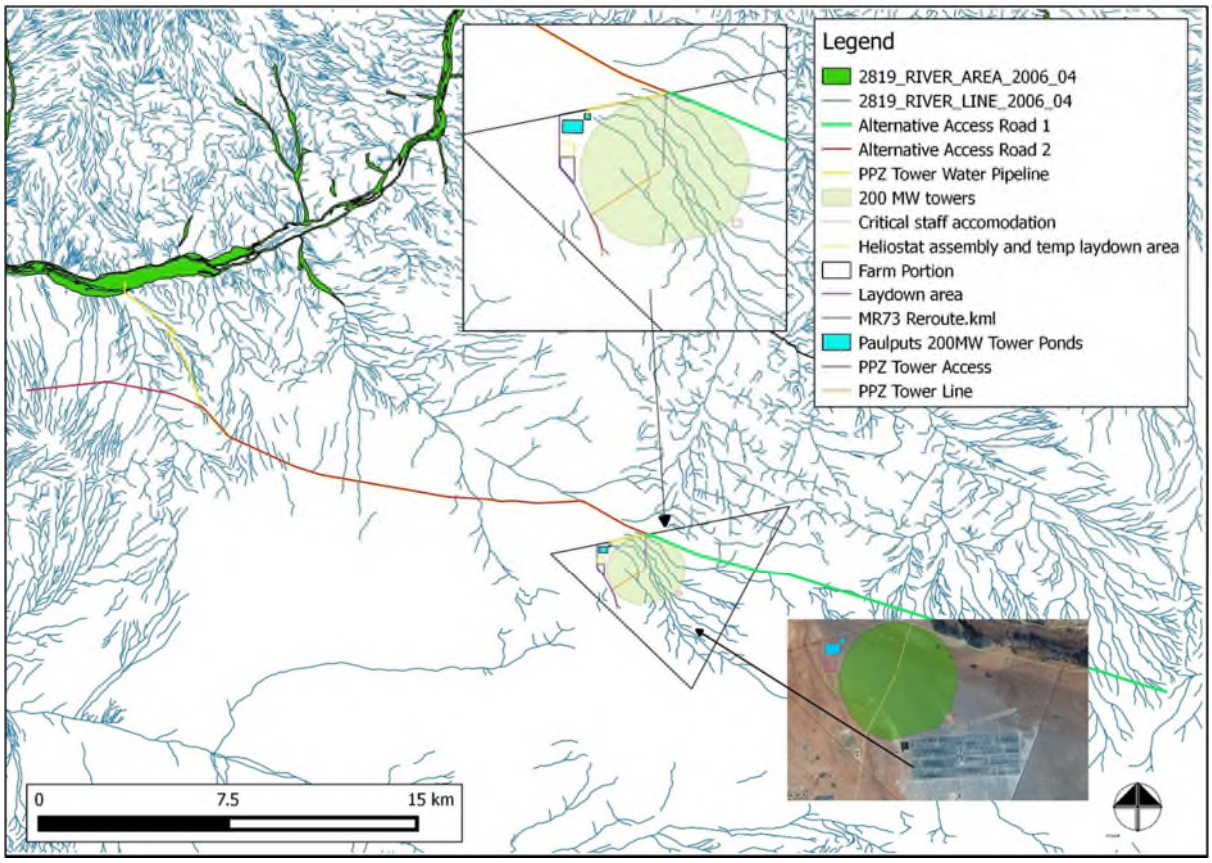


Figure 2: Delineated water courses in relation to the study area, CSP site (inset above) and present day impacts posed by the adjacent sites.

3. STORMWATER MANAGEMENT PRINCIPLES

In the design phase, various stormwater management principles should be considered including:

» Prevent concentration of stormwater flow at any point where the ground is susceptible to erosion.
» Reduce stormwater flows as far as possible by the effective use of attenuating devices (such as swales, berms, silt fences). As construction progresses, the stormwater control measures are to be monitored and adjusted to ensure complete erosion and pollution control at all times.
» Minimse the area of exposure of bare soils to minimse the erosive forces of wind, water and all forms of traffic.
» Ensure that development does not increase the rate of stormwater flow above that which the natural ground can safely accommodate at any point in the sub-catchments.
» Ensure that all stormwater control works are constructed in a safe and aesthetic manner in keeping with the overall development.
» Plan and construct stormwater management systems to remove contaminants before they pollute surface waters or groundwater resources.

» Contain soil erosion, whether induced by wind or water forces, by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction.
» Avoid situations where natural or artificial slopes may become saturated and unstable, both during and after the construction process.
» Design and construct roads to avoid concentration of flow along and off the road. Where flow concentration is unavoidable, measures to incorporate the road into the pre-development stormwater flow should not exceed the capacity of the culvert. To assist with the stormwater run-off, gravel roads should typically be graded and shaped with a 2-3% crossfall back into the slope, allowing stormwater to be channelled in a controlled manor towards the, natural drainage lines and to assist with any sheet flow on the site.
» Design culvert inlet structures to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point. Provide detention storage on the road and/or upstream of the stormwater culvert.
» Design outlet culvert structures to dissipate flow energy. Any unlined downstream channel must be adequately protected against soil erosion.
» Where the construction of a building causes a change in the vegetative cover of the site that might result in soil erosion, the risk of soil erosion by stormwater must be minimised by the provision of appropriate artificial soil stabilisation mechanisms or re-vegetation of the area. Any inlet to a piped system should be fitted with a screen, or grating to prevent debris and refuse from entering the stormwater system.
» Preferably all drainage channels on site and contained within the larger area of the property (i.e. including buffer zone) should remain in the natural state so that the existing hydrology is not disturbed.

3.1. Engineering Specifications

A detailed engineering specifications Stormwater Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase and should be based on the underlying principles of this Storm-water Management Plan. This should include erosion control measures. Requirements for project design include:

» Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction).
» All temporary and permanent water management structures or stabilisation methods must be indicated within the Final/Updated Stormwater Management Plan.
» The drainage system for the site should be designed to specifications that can adequately deal with a 1:50 year intensity rainfall event or more to ensure sufficient capacity for carrying storm waters around and away from infrastructure.
» Procedures for storm water flow through a project site need to take into consideration both normal operating practice and special circumstances. Special circumstances in this case typically include severe rainfall events.

» An onsite Engineer or Environmental Officer to be responsible for ensuring implementation of the erosion control measures on site during the construction period.
» The EPC Contractor holds ultimate responsibility for remedial action in the event that the approved stormwater plan is not correctly or appropriately implemented and damage to the environment is caused.

During the construction phase, the contractor must prepare a Stormwater Control Method Statement to ensure that all construction methods adopted on site do not cause, or precipitate soil erosion and shall take adequate steps to ensure that the requirements of the Stormwater Management Plan are met before, during and after construction. The designated responsible person on site, must be indicated in the Stormwater Control Method Statement and shall ensure that no construction work takes place before the relevant stormwater control measures are in place.

An operational phase Stormwater Management Plan should be designed and implemented if not already addressed by the mitigations implemented as part of construction, with a view to preventing the passage of concentrated flows off hardened surfaces and onto natural areas.

APPENDIX J:
EROSION MANAGEMENT PLAN

PRINCIPLES FOR EROSION MANAGEMENT

1. PURPOSE

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, this erosion management plan and the revegetation and rehabilitation plan are closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

This Erosion Management Plan addresses the management and mitigation of potential impacts relating to soil erosion. The objective of the plan is to provide:

» A general framework for soil erosion and sediment control, which enables the contractor to identify areas where erosion can occur and is likely to be accelerated by construction related activities.
» An outline of general methods to monitor, manage and rehabilitate erosion prone areas, ensuring that all erosion resulting from all phases of the development is addressed.

2. RELEVANT ASPECTS OF THE SITE

Within a broad 20 km buffer area, the Paulputs CSP Project site is covered by only five land types, as shown on the map in the Appendix, namely:

» Ae67 (Red, freely-drained soils, high base status)
» Ag2, Ag37 (Shallow, red, freely-drained soils, high base status)
» Fb142 (Shallow lithosols and rock, mostly calcareous)
» Ic136 (Mostly rock, little soil)

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

A summary of the dominant soil characteristics is given in **Table 1** below.

Table 1 Land types occurring (with soils in order of dominance).

Land Type	Dominant soils	Depth (mm)	Percent of land type	Characteristics	Agric. Potential (%)
Ae67	Hutton 32/25/42/45 Hutton 32/25/42/45 Rock	500-1000 200-300 -	49% 30% 13%	Red, sandy soils on hard rock and calcrete Red, sandy topsoils on hard rock and calcrete -	High: 0.0 Mod: 49.0 **Low: 51.0**
Ag2	Hutton 34/44/45/46	100-300	48% 29%	Red, sandy topsoils on hard rock and calcrete	High: 0.0

	Mispah 10/12/14/22 Rock	50-150 -	7%	Grey-brown, sandy/loamy topsoils on hard rock/calcrete –	Mod: 12.0 **Low: 88.0**
Ag37	Hutton 32/35/42/45 Rock Dundee 10 + Oakleaf 24	200-300 - 500-1000	48% 20% 15%	Red, sandy topsoils on hard rock and calcrete - Red-brown, alluvial soils on calcrete	High: 0.0 Mod: 23.0 **Low: 77.0**
Fb142	Rock Mispah + Glenrosa Hutton 32/35	- 100-350 100-300	54% 25% 13%	Grey-brown, sandy/loamy topsoils on hard rock/calcrete Red, sandy topsoils on hard rock and calcrete	High: 0.0 Mod: 8.0 **Low: 92.0**
Ic136	Rock Mispah 10/20	- 50-150	89% 7%	Grey-brown, sandy/loamy topsoils on hard rock/calcrete	High: 0.0 Mod: 3.5 **Low: 96.5**

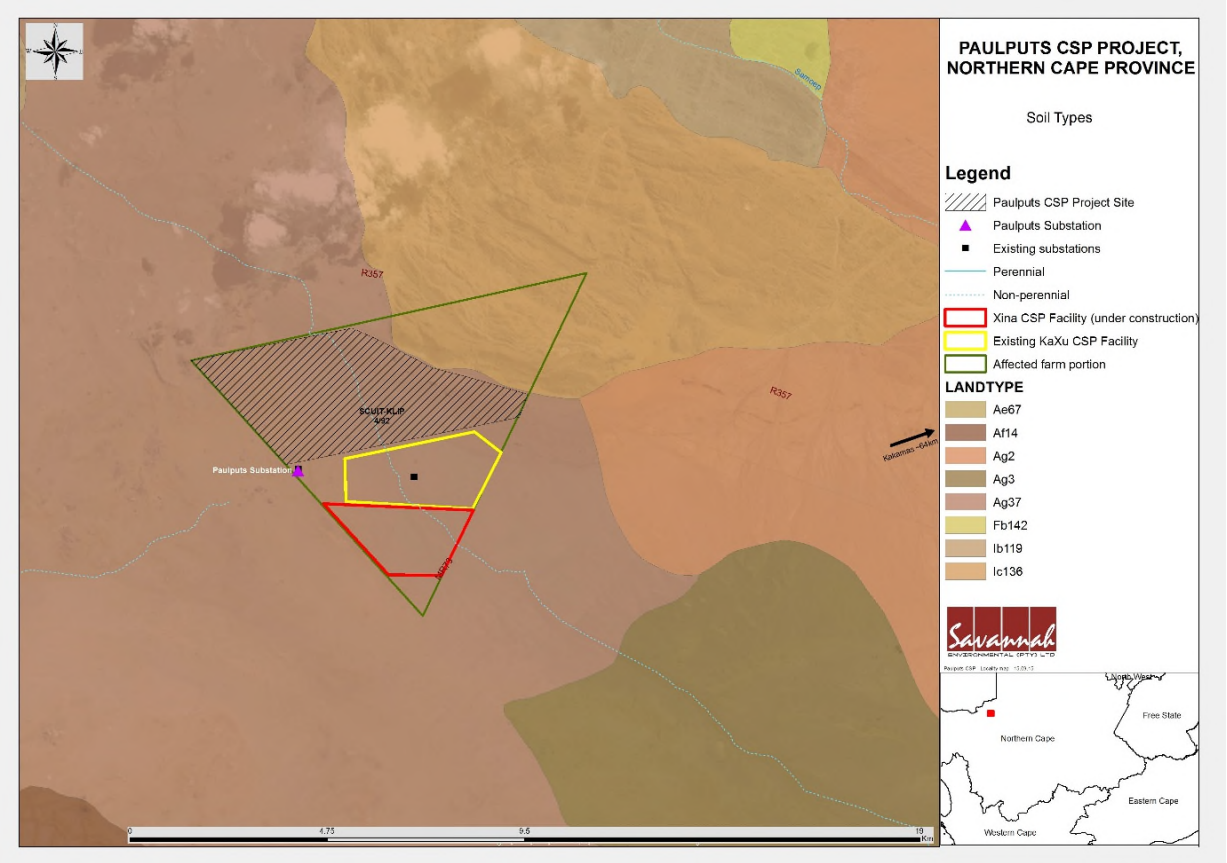


Figure 1: Land types of the proposed area for the Paulputs CSP Project site.

Soils on the site have below 5% dominant clay in the top soils. The soils are moderately susceptibility to water erosion which varies across the site. The general assumption is that the erosion susceptibility increases with an increase in the slope angle and/if the slope length is constant.

3. EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion control during and after construction at the site should be to:

» Protect the land surface from erosion;
» Intercept and safely direct run-off water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment; and
» Progressively revegetate or stabilise disturbed areas.

These goals can be achieved by applying the management practices outlined in the following sections.

3.1. On-Site Erosion Management

General factors to consider regarding erosion risk at the site includes the following:

» Due to the sandy nature of Soils in the study area, soil loss will be greater during dry periods as it is more prone to wind erosion. Therefore precautions to prevent erosion should be present throughout the year.
» Soils loss will be greater on steeper slopes. Ensure that steep slopes are not de-vegetated unnecessarily and subsequently become hydrophobic (i.e. have increased runoff and a decreased infiltration rate) increasing the erosion potential.
» Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore the gap between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control strategy.
» The extent of disturbance will influence the risk and consequences of erosion. Therefore site clearing should be restricted to areas required for construction purposes only. As far as possible, large areas should not be cleared all at once, especially in areas where the risk of erosion is higher.
» Roads should be planned and constructed in a manner which minimises their erosion potential. Roads should therefore follow the natural contour as far as possible. Roads parallel to the slope direction should be avoided as far as possible.

» Where necessary, new roads constructed should include water diversion structures present with energy dissipation features present to slow and disperse the water into the receiving area.
» Roads and other disturbed areas should be regularly monitored for erosion. Any erosion problems recorded should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
» Compacted areas should have adequate drainage systems to avoid pooling and surface flow. Heavy machinery should not compact those areas which are not intended to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. Where compaction does occur, the areas should be ripped.
» All bare areas should be revegetated with appropriate locally occurring species, to bind the soil and limit erosion potential.
» Silt fences should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
» Gabions and other stabilisation features should be used on steep slopes and other areas vulnerable to erosion to minimise erosion risk as far as possible.
» Activity at the site after large rainfall events when the soils are wet and erosion risk is increased should be reduced.
» Topsoil should be removed and stored in a designated area separately from subsoil and away from construction activities (as per the recommendations in the EMPr). Topsoil should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation in cleared areas.
» Regular monitoring of the site for erosion problems during construction (ongoing) and operation (at least twice annually) is recommended, particularly after large summer thunderstorms have been experienced. The ECO will determine the frequency of monitoring based on the severity of the impacts in the erosion prone areas.

3.1.1. Erosion control mechanisms

The contractor may use the following mechanisms (whichever proves more appropriate/ effective) to combat erosion when necessary:

» Reno mattresses;
» Slope attenuation;
» Hessian material;
» Shade catch nets;
» Gabion baskets;
» Silt fences;
» Storm water channels and catch pits;
» Soil bindings;
» Geofabrics;

» Hydro-seeding and/or re-vegetating;
» Mulching over cleared areas;
» Boulders and size varied rocks; and
» Tilling.

3.2. Engineering Specifications

A detailed engineering specifications Storm-water Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers during the detailed design phase and should be based on the underlying principles of the Storm-water Management Plan (**Appendix I** of the EMPr) and this should include erosion control measures. Requirements for project design include:

» Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction).
» All temporary and permanent water management structures or stabilisation methods must be indicated within the Stormwater Management Plan.
» An onsite Engineer or Environmental Officer (EO)/ SHE Representative to be responsible for ensuring implementation of the erosion control measures on site during the construction period. The ECO to monitor the effectiveness of these measures on the interval agreed upon with the Site Manager and EO.
» The EPC Contractor holds ultimate responsibility for remedial action in the event that the approved Storm-Water Plan is not correctly or appropriately implemented and damage to the environment is caused.

3.3. Monitoring

The site must be monitored continuously during construction and operation in order to determine any indications of erosion. If any erosion features are recorded as a result of the activities on site the Environmental Officer (EO)/ SHE Representative (during construction) or Environmental Manager (during operation) must:

» Assess the significance of the situation.
» Take photographs of the soil degradation.
» Determine the cause of the soil erosion.
» Inform the contractor/operator that rehabilitation must take place and that the contractor/operator is to implement a rehabilitation method statement and management plan to be approved by the Site/Environmental Manager in conjunction with the ECO.
» Monitor that the contractor/operator is taking action to stop the erosion and assist them where needed.
» Report and monitor the progress of the rehabilitation weekly and record all the findings in a site register (during construction).

» All actions with regards to the incidents must be reported on a monthly compliance report which should be kept on file for if/when the Competent Authority requests to see it (during construction) and kept on file for consideration during the annual audits (during construction and operation).

The Contractor (in consultation with an appropriate specialist, e.g. an engineer) must:

» Select a system/mechanism to treat the erosion.
» Design and implement the appropriate system/mechanism
» Monitor the area to ensure that the system functions like it should. If the system fails, the method must be adapted or adjusted to ensure the accelerated erosion is controlled.
» Continue monitoring until the area has been stabilised.

4. CONCLUSION

The Erosion Management Plan is a document to assist the Proponent/ EPC Contractor with guidelines on how to manage erosion during all phases of the project. The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure compliance with legislative requirements. This document forms part of the EMPr, and is required to be considered and adhered to during the design, construction, operation and decommissioning phases of the project (if and where applicable).

5. REFERENCES

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APPENDIX K:
FIRE MANAGEMENT PLAN

EMERGENCY PREPAREDNESS AND RESPONSE PLAN

1. PURPOSE

The purpose of the Emergency Preparedness and Response Plan is:

- To assist contractor personnel to prepare for and respond quickly and safely to emergency incidents, and to establish a state of readiness which will enable prompt and effective response to possible events.
- To control or limit any effect that an emergency or potential emergency may have on site or on neighbouring areas;
- To facilitate emergency response and to provide such assistance on the site as is appropriate to the occasion;
- To ensure communication of all vital information as soon as possible;
- To facilitate the reorganisation and reconstruction activities so that normal operations can be resumed;
- To provide for training so that a high level of preparedness can be continually maintained.

This plan outlines response actions for potential incidents of any size. It details response procedures that will minimise potential health and safety hazards, environmental damage, and clean-up efforts. The plan has been prepared to ensure quick access to all the information required in responding to an emergency event. The plan will enable an effective, comprehensive response to prevent injury or damage to the construction personnel, public, and environment during the project. Contractors are expected to comply with all procedures described in this document. A Method Statement should be prepared at the commencement of construction detailing how this plan is to be implemented as well as details of relevant responsible parties for the implementation. The method statement must also reflect conditions of the IFC PS1 and include the following:

» Identification of areas where accidents and emergency situations may occur;
» Communities and individuals that may be impacted;
» Response procedure;
» Provisions of equipment and resources;
» Designation of responsibilities;
» Communication; and
» Periodic training to ensure effective response to potentially affected communities.

2. PROJECT-SPECIFIC DETAILS

Paulputs CSP RF (Pty) Ltd is proposing to develop a Concentrated Solar Power (CSP) Project and associated infrastructure on Portion 4 of the farm Scuitklip 92, in the Khai-Ma Local Municipality in the Northern Cape Province. The development footprint for the Paulputs CSP Project (approximately 900 ha in extent) would be appropriately located within the remaining extent of the farm portion (approximately 1600ha in extent). Due to the scale and nature of this development, it is anticipated that the following risks could potentially arises during the construction and operational phases:

» Fires;
» Leakage of hazardous substances;
» Storage of flammable materials and substances;
» Flood events and overflow of wastewater retention dam;
» Accidents; and
» Natural disasters.

3. EMERGENCY RESPONSE PLAN

There are three levels of emergency as follows:

» Local Emergency: An alert confined to a specific locality.
» Site Emergency: An alert that cannot be localised and which presents danger to other areas within the site boundary or outside the site boundary.
» Evacuation: An alert when all personnel are required to leave the affected area and assemble in a safe location.

If there is any doubt as the whether any hazardous situation constitutes an emergency, then it must be treated as an Evacuation.

Every effort must be made to control, reduce or stop the cause of any emergency provided it is safe to do so. For example, in the event of a fire, isolate the fuel supply and limit the propagation of the fire by cooling the adjacent areas. Then confine and extinguish the fire (where appropriate) making sure that re-ignition cannot occur; for a gas fire it is usually appropriate to isolate the fuel and let it burn itself out but keep everything around the fire cold.

3.1. Emergency Scenario Contingency Planning

3.1.1. Scenario: Spill which would result in the contamination of land, surface or groundwater

i. Spill Prevention Measures

Preventing spills must be the top priority at all operations which have the potential of endangering the environment. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor and the ECO. In order to reduce the risk of spills and associated contamination, the following principles should be considered during construction and operation activities:

» All equipment refuelling, servicing and maintenance activities should only be undertaken within appropriately sealed designated areas.
» All maintenance materials, oils, grease, lubricants, etc. should be stored in a designated area in an appropriate storage container.
» No refuelling, storage, servicing, or maintenance of equipment should take place within 50m of drainage lines or sensitive environmental resources in order to reduce the risk of contamination by spills.
» No refuelling or servicing should be undertaken without absorbent material or drip pans properly placed to contain spilled fuel.
» Any fluids drained from the machinery during servicing should be collected in leak-proof containers and taken to an appropriate disposal or recycling facility.
» If these activities result in damage or accumulation of product on the soil, the contaminated soil must be disposed of as hazardous waste. Under no circumstances shall contaminated soil be added to a spoils pile and transported to a regular disposal site.
» Chemical toilets used during construction must be regularly cleaned. Chemicals used in toilets are also hazardous to the environment and must be controlled. Portable chemical toilets could overflow if not pumped regularly or they could spill if dropped or overturned during moving. Care and due diligence should be taken at all times.
» Contact details of emergency services and HazMat Response Contractors are to be clearly displayed on the site. All staff are to be made aware of these details and must be familiar with the procedures for notification in the event of an emergency.

ii. Procedures

The following action plan is proposed in the event of a spill:

1. Spill or release identified.
2. Assess person safety, safety of others and environment.
3. Stop the spill if safely possible.

4. Contain spill to limit entering water bodies and surrounding areas.
5. Identify substance spilled.
6. Quantify spill (under or over guideline/threshold levels).
7. Notify Site Manager and emergency response crew and authorities (in event of major spill).
8. Inform users (and downstream users) of potential risk.
9. Clean up of spill using spill kit or by HazMat team.
10. Record of spill incident on company database.

a) Procedures for containing and controlling the spill (i.e. on land or in water)

Measures can be taken to prepare for quick and effective containment of any potential spills. Each contractor must keep sufficient supplies of spill containment equipment at the construction sites, at all times during and after the construction phase. These should include specialised spill kits or spill containment equipment. Other spill containment measures include using drip pans underneath vehicles and equipment every time refuelling, servicing, or maintenance activities are undertaken.

Specific spill containment methods for land and water contamination are outlined below.

Containment of Spills on Land

Spills on land include spills on rock, gravel, soil and/or vegetation. It is important to note that soil is a natural sorbent, and therefore spills on soil are generally less serious than spills on water as contaminated soil can be more easily recovered. It is important that all measures be undertaken to avoid spills reaching open water bodies. The following methods could be used:

» *Dykes*
Dykes can be created using soil surrounding a spill on land. These dykes are constructed around the perimeter or down slope of the spilled substance. A dyke needs to be built up to a size that will ensure containment of the maximum quantity of contaminant that may reach it. A plastic tarp can be placed on and at the base of the dyke such that the contaminant can pool up and subsequently be removed with sorbent materials or by pump into barrels or bags. If the spill is migrating very slowly, a dyke may not be necessary and sorbents can be used to soak up contaminants before they migrate away from the source of the spill.

» *Trenches*
Trenches can be dug out to contain spills. Spades, pick axes or a front-end loader can be used depending on the size of trench required. Spilled substances can then be recovered using a pump or sorbent materials.

Containment of Spills on Water

Spills in water can negatively impact water quality and aquatic life. All measures need to be undertaken to contain spills on open water. The following methods could be used:

» *Weirs*
Weirs can be used to contain spills in streams and to prevent further migration downstream. Plywood or other materials found on site can be placed into and across the width of the stream, such that water can still flow under the weir. Weirs are however only effective for spilled substances which float on the water surface.

» *Barriers*
In some situations barriers made of netting or fence material can be installed across a stream, and sorbent materials placed at the base to absorb spilled substance. Sorbents will need to be replaced as soon as they are saturated. Water will be allowed to flow through.

b) Procedures for transferring, storing, and managing spill related wastes

Used sorbent materials are to be placed in plastic bags for future disposal. All materials mentioned in this section are to be available in the spill kits. Following clean up, any tools or equipment used must be properly washed and decontaminated, or replaced if this is not possible.

Spilled substances and materials used for containment must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

c) Procedures for restoring affected areas

Criteria that may be considered include natural biodegradation of oil, replacement of soil and revegetation. Once a spill of reportable size has been contained, the ECO and the relevant Authority must be consulted to confirm that the appropriate clean up levels are met.

3.1.2. Scenario: Fire (and fire water handling)

i. Action Plan

The following action plan is proposed in the event of a fire:

1. Quantify risk
2. Assess person safety, safety of others and environment

3. If safe – attempt to extinguish fire using appropriate equipment
4. If not safe to extinguish, contain fire
5. Notify Site Manager and emergency response crew and authorities
6. Inform users (and downstream users) of potential risk of fire
7. Record of incident on company database

ii. Procedures

Because large scale fires may spread very fast in the environment it is most advisable that the employee/contractor not put his/her life in danger in the case of an uncontrolled fire.

Portable firefighting equipment must be provided in line with the Building Code of South Africa and the relevant provincial building code. All emergency equipment including portable fire extinguisher, hose reels, hydrants must be maintained and inspected by a qualified contractor in accordance with the relevant legislation and National standards.

Current evacuation signs and diagrams for the building or site that are compliant to relevant state legislation must be provided in a conspicuous position, on each evacuation route. Contact details for the relevant emergency services should be clearly displayed on site and all employees should be aware of procedures to follow in the case of an emergency.

a) Procedures for initial actions

Persons should not fight the fire if any of the following conditions exist:

» They have not been trained or instructed in use of a fire extinguisher.
» They do not know what is burning.
» The fire is spreading rapidly.
» They do not have the proper equipment.
» They cannot do so without a means of escape.
» They may inhale toxic smoke.

b) Reporting procedures

» Report fire immediately to the site manager, who will determine if it is to be reported to the relevant emergency services and authorities.
» The site manager must have copies of the Report form to be completed.

3.1.3. Scenario: Flood events and overflow of wastewater retention dam

i. Action Plan

The following action plan is proposed in the event of a flood of overflow of wastewater retention dam:

1. Identify flood state or overflow
2. Assess personal safety, safety of others and environment
3. Identify source
4. Stop the source of water(waste) causing overflow if safely possible
5. Contain overflow water to limit it entering surrounding water bodies
6. Quantify overflow
7. Notify Site Manager and emergency response crew and authorities
8. Inform users (and downstream users) of potential risk
9. Record of incident on company database

ii. Flood/overflow Effect Prevention Measures

Preventing flood/ overflowing of wastewater retention dam must be a top priority. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor and the Environmental Manager. All parties are expected to:

» Always conduct proper maintenance and inspections on the area and machinery/vehicles.
» Never allow for the risk of over flowing, especially in or near sensitive areas.
» Know the limits of the wastewater dam/s.
» Store all materials in protected areas.

Restrictions must be placed on amounts of wastewater to be pumped into the dam. All technical detail as to capacity and limitations of the facility must be made extremely clear to reduce the potential of contamination.

iii. Procedures

Although attempts can be made to minimise the effects of flooding, it is impossible to prevent floods altogether. Being prepared for flooding and having emergency plans must therefore be a priority.

a) Procedures for initial actions

» Ensure safety of all personnel.
» Assess hazards and risks.
» Stop the flood/overflow if safely and physically possible, e.g. shut off pump.
» No matter what the volume is, notify site manager.
» Contain the wastewater.

b) Reporting procedures

» Report immediately to the site manager, who will determine if it is to be reported to the relevant emergency services and authorities.
» The site manager, will have copies of the Report form to be completed.

c) Procedures for containing and controlling overflow of wastewater retention dam

Measures can be taken to prepare for quick and effective containment of any potential overflow.

» Initiate overflow containment by first determining what will be affected by the incident.
» Assess speed and direction of overflow and cause of movement (water, wind and slope).
» Determine best location for containing wastewater, avoiding any water bodies.
» Have a contingency plan ready in case event worsens beyond control or if the weather or topography impedes containment.

d) Procedures for transferring, storing, and management.

Following clean up, any tools or equipment used will be properly washed and decontaminated, or replaced if this is not possible. All materials used for containment of spilled wastewater must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

SUMMARY: RESPONSE PROCEDURE

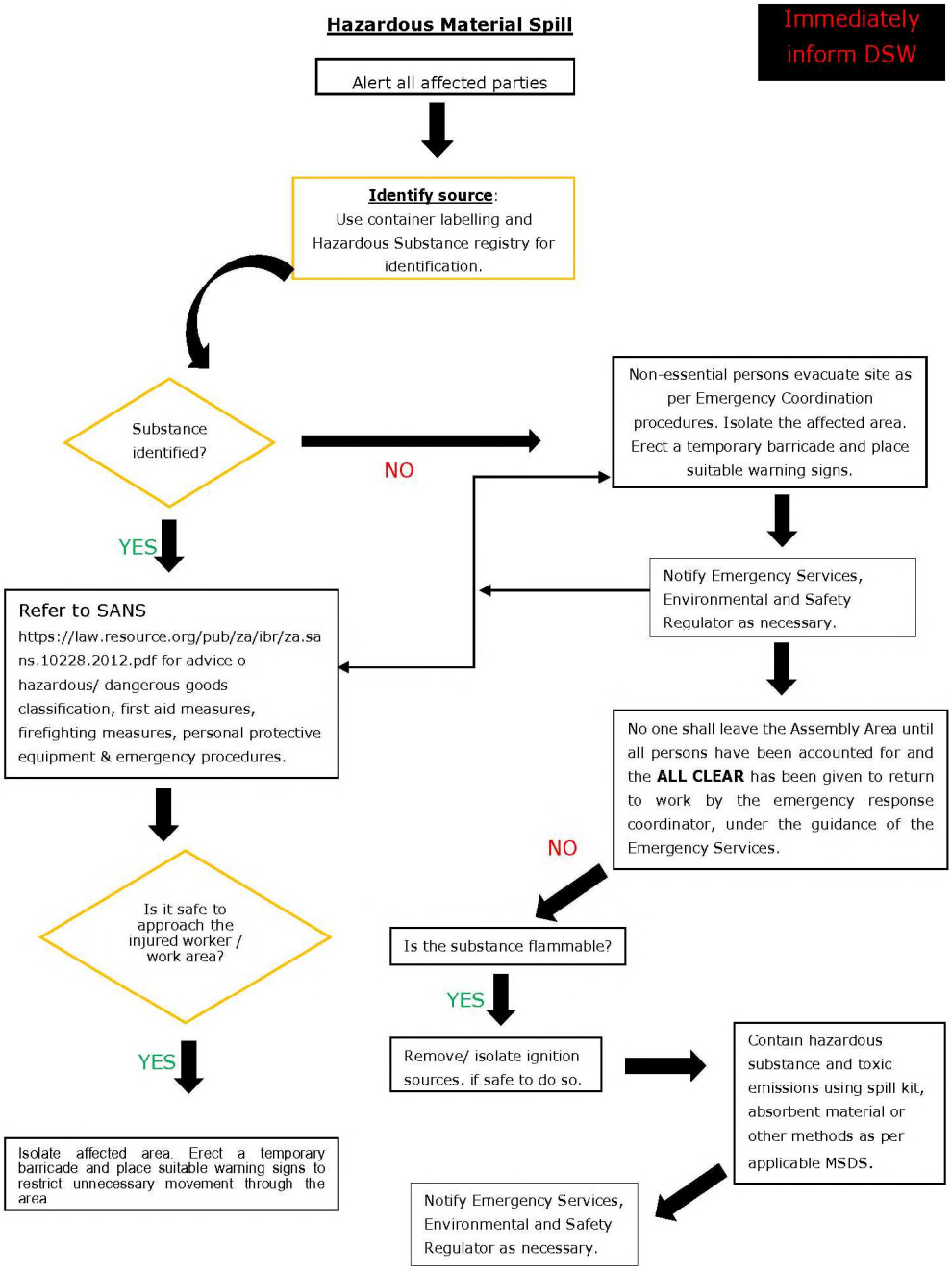

Figure 1: Hazardous Material Spill

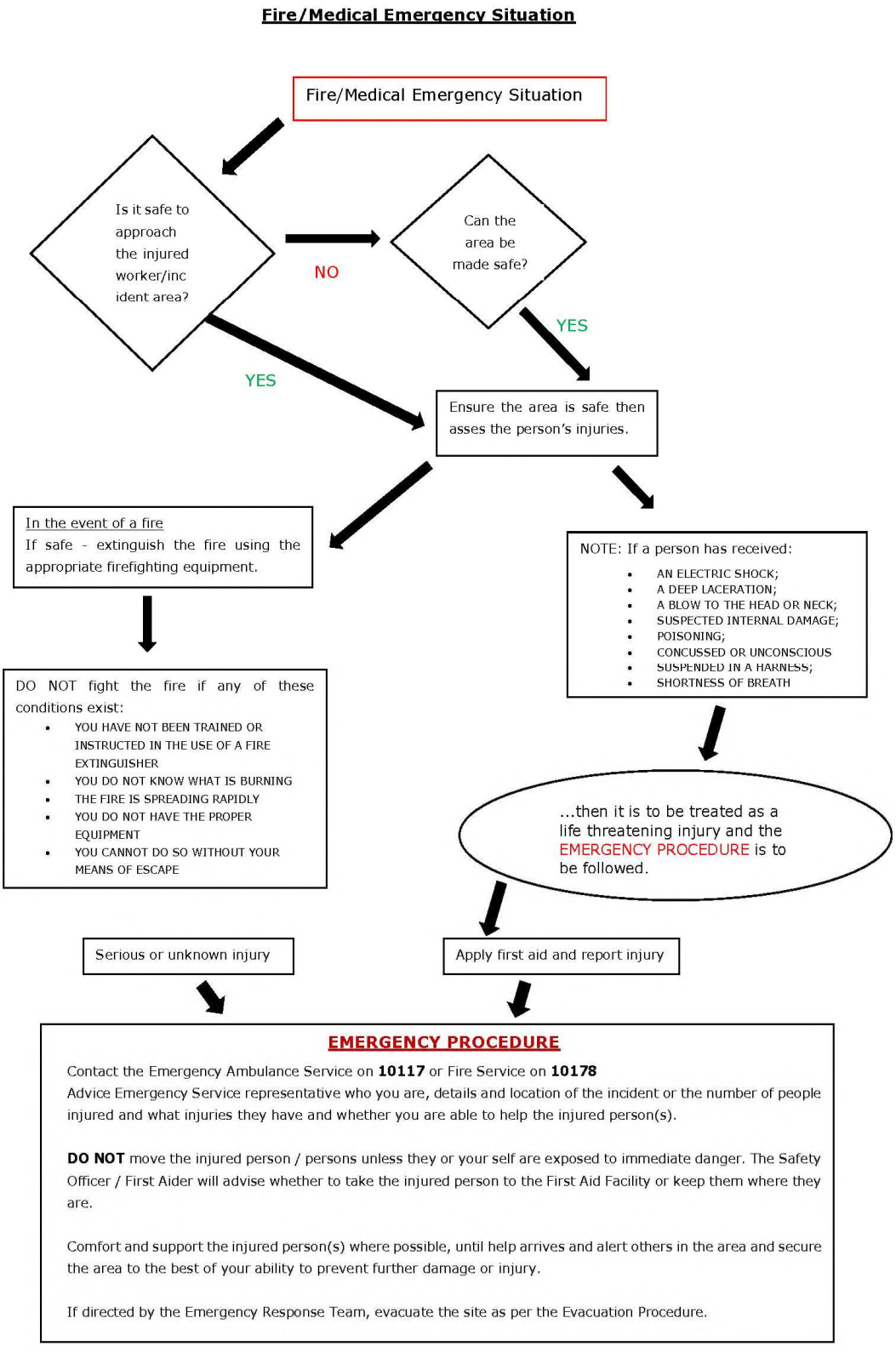

Figure 2: Emergency Fire/Medical

APPENDIX L:
CURRICULUM VITAE OF THE PROJECT TEAM

CURRICULUM VITAE
(Energy-related projects)

KAREN JODAS

SAVANNAH ENVIRONMENTAL (PTY) LTD

Profession	:	Environmental Management and Compliance Consultant ; Environmental Assessment Practitioner
Specialisation	:	Strategic environmental assessment and advice; project management and co-ordination of environmental projects; environmental compliance advise and monitoring; Environmental Impact Assessment; environmental management; peer review; policy, strategy and guideline formulation; renewable energy projects; water resources management
Work experience	:	Nineteen (19) years in the environmental assessment and management field

VOCATIONAL EXPERIENCE

Provide technical input for projects in the environmental management field, specialising in strategic evaluation, Environmental Impact Assessment studies, Environmental Management Plans, integrated environmental management, environmental compliance monitoring; peer review of EIA reports and processes, strategy and guideline development, and public participation. Key focus on overall Project Management, integration of environmental studies and environmental processes into larger engineering-based projects, strategic assessment, and the identification of environmental management solutions and mitigation/risk minimising measures.

Undertaking studies requiring all environmental-related disciplines has allowed for considerable experience to be gained in the environmental assessment and management fields. A specialist area of focus is on management and assessment of multi-faceted projects, including electricity generation and transmission projects (with a strong focus on the renewable energy sector), linear developments (roads and power lines), bulk infrastructure and supply (e.g. WTWs, pipelines, landfills), the mining industry, urban, rural and township developments, environmental aspects of IDPs, EMFs, SoERs, as well as environmental planning, development and management.

Working knowledge of environmental legislation, strategies, guidelines and policies. Compilation of the reports for environmental studies are in accordance with the all relevant environmental legislation under the National Environmental Management Act.

SKILLS BASE AND CORE COMPETENCIES

- Nineteen years of experience in the environmental management, impact assessment and compliance fields
- Seventeen years of experience in Project Management - Project management of large environmental assessment and management projects
- Strategic and compliance advise for all aspects of environmental assessment and management
- External and peer review of environmental assessment and compliance reporting as well as EIA processes
- Working knowledge of environmental planning policies, regulatory frameworks and legislation
- Identification and assessment of potential environmental impacts and benefits
- Development of practical and achievable mitigation measures and management plans and evaluation of risk to project execution

- Experienced in environmental compliance advise, monitoring and reporting for construction projects
- Compilation and review of the reports in accordance with all relevant environmental legislation
- Public participation/involvement and stakeholder consultation
- Environmental strategy, policy and guidelines development
- Experienced in assessments for both linear developments and nodal developments
- Key experience in the assessment of impacts associated with renewable energy projects
- Wide range of experience for public and private sector projects
- Completed projects in all nine Provinces of South Africa, as well as Zambia and Lesotho

EDUCATION AND PROFESSIONAL STATUS

Degrees:
- B.Sc Earth Sciences, majoring in Geography and Zoology, *Rhodes University, Grahamstown,* 1993
- B.Sc Honours in Geography (in Environmental Water Management), *Rhodes University, Grahamstown,* 1994. Major subjects included Water Resources Management, Streams Ecology, Fluvial Geomorphology and Geographic Information Systems.
- M.Sc in Geography (Geomorphology), *Rhodes University, Grahamstown,* 1996

Short Courses:
Water Quality Management, *Potchefstroom University,* 1998
Environmental Law Course, *Aldo Leopold Institute*, 2002
WindFarmer Wind Farm Design course, *Garrad Hassan*, 2009

Professional Society Affiliations:
Registered with the South African Council for Natural Scientific Professions as a Professional Natural Scientist: *Environmental Scientist (400106/99)*

Other Relevant Skills:
Xtrack Extreme – Advanced Off-Road Driving Course (2003)

EMPLOYMENT

2006 - Current: Director of *Savannah Environmental (Pty) Ltd.* Independent specialist environmental consultant, Environmental Assessment Practitioner (EAP) and advisor. Primary focus on energy-sector projects.

1997 –2005: Associate of *Bohlweki Environmental (Pty) Ltd*. Environmental Management Unit: Manager; Principle Environmental Scientist focussing on Environmental Management and Project Management.

PROJECT EXPERIENCE

Experience includes projects associated with electricity generation and transmission, wastewater treatment facilities, mining and prospecting activities, property development, and national roads, as well as strategy and guidelines development. Selected projects in the energy and renewable energy sector include:

Strategic and Regional Assessments
- *Regional Assessment for wind energy developments within an identified area on the West Coast of the Western Cape Province (for Eskom Holdings Limited)*
- *Five Regional Assessment for wind energy developments within five identified area across South Africa (for Eskom Holdings Limited)*
- *Part of the Strategic Task Team for the identification of Eskom's future wind farm sites (Wind 1000) (for Eskom Holdings Limited)*
- *Regional Assessment for wind energy developments within an identified area in the De Aar Area of the Northern Cape Province (for juwi Wind)*
- *Strategic Regional Assessment for the Environmental Suitability of Wind Energy Facilities for the entire Western Cape Province (for DEA&DP)*

- *Regional Assessments for wind energy developments within identified areas in the Northern and Eastern Cape, including mapping (for Networx)*

Renewable power generation projects: Wind Energy Facilities

Environmental Impact Assessments and Environmental Management Plans

- *ABs Wind Energy Facility near Indwe, Eastern Cape (for Rainmaker Energy)*
- *Amakhala Emoyeni Wind Energy Facility near Cookhouse, Eastern Cape (for Windlab Developments)*
- *Castle Wind Energy Facility, in De Aar (for Juwi Renewable Energies)*
- *Cookhouse II Wind Energy Facility (for ACED & Tertia Waters)*
- *Dorper Wind Energy Facility near Molteno, Eastern Cape (for Rainmaker Energy)*
- *Elliot Wind Energy Facility (for Rainmaker Energy)*
- *Garob Wind Energy Facility, in Copperton (for Juwi Renewable Energies)*
- *Gouda Wind Energy Facility near Gouda, Western Cape (for VentuSA)*
- *Gunstfontein Wind Energy Facility (for Networx)*
- *Happy Valley Wind Energy Facility, Eastern Cape (for REISA)*
- *Hidden Valley Wind Energy Facility (for ACED)*
- *Hopefield Wind Energy Facility (for Umoya Energy)*
- *Karoo Renewable Wind and PV Solar Energy Facility near Victoria West, Northern & Western Cape (for SARGE)*
- *Pofadder 3x 140MW Wind Energy Facilities, Northern Cape (for Mainstream Renewable)*
- *Riverbank Wind Energy Facility near Wesley, Eastern Cape (for Just Energy)*
- *Sere Wind Energy Facility on the West Coast in the Western Cape (for Eskom Generation)*
- *Springfontein Wind Energy Facility (for Mainstream Renewable)*
- *Stormberg Wind Energy Facility (for Networx)*
- *West Coast One Wind Energy Facility (for Moyeng Energy (Pty) Ltd)*
- *West Coast Wind Energy Facility (for Exxaro)*
- *Wind Energy Facility at Cookhouse, Eastern Cape (for African Clean Energy Developments)*
- *Wind Energy Facility near Britannia Bay, Western Cape (for TerraPower Solutions)*
- *Zen Wind Energy Facility, near Gouda (for VentuSA Energy)*

Basic Assessments for wind monitoring masts

- *Caledon, Worcester, Tulbach Wind Energy Facilities (for SAGIT)*
- *Dorper, ABs, Dobos Wind Energy Facilities (for Rainmaker Energy)*

Compliance Advice

- *Amakhala Emoyeni Wind Energy Facility (for Amakhala Emoyeni)*
- *Amakhala Emoyeni Wind Energy Facility, Environment and Social Action Plan (for Cennergi)*
- *Cookhouse Wind Energy Facility site (for ACED Cookhouse Renewables)*
- *Cookhouse II Wind Energy Facility (for ACED)*
- *Dorper Phase 1 Wind Energy Facility (for Rainmaker Energy)*
- *Gouda Wind Farm (for Aveng / Acciona)*
- *Happy Valley Wind Energy Facility (for VentuSA Energy / EDPR)*
- *Loperberg Wind Farm (for Rainmaker Energy)*
- *Nobelsfontein Wind Energy Facility (for Coria / SARGE)*
- *Nojoli Wind Energy Facility (for ACED)*
- *Oyster Bay Wind Energy Facility (for RES)*

Due Diligence Reporting

- *ESG DD for Loeriesfontein, Khobab and Noupoort Wind Energy Facilities (for Actis)*

Renewable power generation projects: Solar Energy Facilities

Environmental Impact Assessments and Environmental Management Plans

- *5x CSP and 2x PV Solar Energy Facilities, Kenhardt, Northern Cape (for Kotulo Tsatsi)*
- *Blackwood PV Solar Energy Facility, near Kimberley/Boshoff (for VentuSA Energy)*
- *Bosjesmansberg PV Solar Energy Facility, Copperton (for Networx)*
- *Boundary PV Solar Energy Facility (for VentuSA Energy)*
- *De Aar CSP Energy Facility at De Aar, Northern Cape (for African Clean Energy Developments)*
- *De Aar PV Solar Energy Plant (for Solar Capital)*
- *Gihon and Kison PV Solar Energy Facilicies (for Networx)*

- *Grootdrink (Albany) PV Solar Energy Facility (for Africoast Engineers)*
- *Gunstfontein PV Solar Energy Facility (for Networx)*
- *Kabi Kimberley PV facility at DeBeers, Kimberley (Kabi Solar)*
- *Karoo Renewables PV Solar Energy Facility (for SARGE)*
- *KaXu CSP Facility near Pofadder, Northern Cape (for Abengoa Solar)*
- *Kheis Phase 1, 2 & 3 PV Solar Energy Facility (for GeStamp Solar)*
- *Khi CSP Facility near Upington, Northern Cape (for Abengoa Solar)*
- *Klipgat PV Solar Energy Facility (for Terra Solar)*
- *Loeriesfontein/Helios PV Solar Energy Plant (for Solar Capital)*
- *Naauwpoort PV Solar Energy Facility (for Terra Solar)*
- *Pofadder 75MW Solar Energy Facility, Northern Cape (for Mainstream Renewable)*
- *Prieska PV Solar Energy Facility, Prieska (for VentuSA Energy)*
- *PV Solar Energy Facility near De Aar, Northern Cape (for Solar Capital)*
- *Ritchie PV Solar Energy Facility (for Solar Capital)*
- *San Solar PV Solar Energy Facility, Kathu (for VentuSA Energy)*
- *Sirius (Tungston Lodge) x2 - PV Solar Energy Plants (for Aurora Power Solutions)*
- *Solar Plant in the Northern Cape Solar at Kathu (Wincanton) (for REISA)*
- *Solar Plant in the Northern Cape Solar at Sishen (Wincanton) (for VentuSA Energy)*
- *Stormberg Solar PV Solar Energy Facility (for Networx / Prana Energy)*
- *Tiger Kloof PV Solar Energy Facility (for Kabi Energy)*
- *Tiger Solar PV Solar Energy Facility, Northern Cape (for Kabi Energy)*
- *Upington 2 and 3 CSP Facilites near Upington, Northern Cape (for Abengoa Solar)*
- *Vaalkop and Witkop PV Solar Energy Facilities, North West (for Kabi Solar)*
- *Wagnbietjiespan PV Solar Energy Facility near Boshoff, Free State (for VentuSA)*
- *Wolmaransstad Municipality Solar PV Solar Energy Facility (for BlueWave)*
- *Xina CSP facility near Pofadder, Northern Cape (or Abengoa Solar)*
- *Zuurwater PV Solar Energy Facilities (x4) (for Solafrica / BlueWave)*

Basic Assessments
- *Amandla Welanga and Dida PV Solar Energy Facilities(for Terra Solar)*
- *Carolusberg PV Solar Energy Facility (for Ilio Energy (SARGE))*
- *Gosforth Park and Kynoch Rooftop PV Solar Energy (for Building Energy)*
- *Hibernia 5MW PV Solar Energy Facility (for EA Energy)*
- *Inkulukelo PV Solar Energy Facility (for Terra Solar)*
- *Kokerboom and Boabab PV Solar Energy Plants (for Brax Energy)*
- *Nigramoep PV Solar Energy Plant, Nababeep (for SARGE)*
- *Noupoort (Kleinfontein and Toitdale) CPV (for Terra Power)*
- *O'Kiep 1 PV Solar Energy Plant, Springbok (for Ilio Energy (SARGE))*
- *O'Kiep 2 PV Solar Energy Plant, Springbok (for BluePort Trade 118 (SARGE))*
- *O'Kiep 3 PV Solar Energy Plant (for Ilio Energy (SARGE))*
- *PV Solar Energy Plant - Kimberley (for Kabi Energy)*
- *Slurry PV Solar Energy Facility (for PPC)*
- *Small projects for PV Solar Energy Facilities (for BlueWave)*
- *Son Sitrus Rooftop PV Solar Energy (for Building Energy)*
- *Tollie PV Solar Energy Facility (for Terra Solar)*
- *x2 Southern Farms PV Solar Energy Plants, Augrabies (for Southern Farms)*

Compliance
- *Bokpoort PV Solar Energy Facility (for Solafrica)*
- *Kathu II Bid compliance (for Building Energy)*
- *Kathu PV Solar Energy Facility (for Building Energy / REISA)*
- *Pofadder and Upington CSP (for Abengoa Solar)*
- *Prieska PV Solar Energy Facility (for VentuSA)*
- *Sishen PV Solar Energy Facility phase 1, 75MW (for Aveng / Acciona)*
- *Xina compliance (for Abengoa Solar)*

Screening Studies
- *75MW facilities criteria-based analysis screenings (for BlueWave)*
- *Allemans, Wonderheuwel, Damfontein, Dida PV Solar Energy Facilities (for Terra Solar)*
- *Bobididi 5MW PV Solar Energy Facility (for Root 60Four Energy)*
- *Bosjesmansberg PV Solar Energy Facility, Copperton (for Networx)*
- *Lephalale PV Solar Energy Facility (for Exxaro)*
- *Northern Cape 5MW PV Solar Energy Facility, 2nd Stage One (for EDIP)*

- *Senekal 1 & 2, Pongola and Newcastle PV Solar Energy Facilities (for Building Energy)*
- *Small projects - PV Solar Energy Facility (x15) (for Building Energy)*
- *Small projects PV Solar Energy Facility (x3) (for GeoSolar)*
- *Small scale PV Solar Energy Facility - 2nd Stage One (for BlueWave)*
- *Small scale PV Solar Energy Facility - 2nd Stage One (for Building Energy)*
- *Various PV Solar Energy Facilities (for INCA Energy)*

Siting Study
- *CSP siting study (for Exxaro)*

Due Diligence Reporting
- *Equator Principles Due Diligence reporting - Kabi Kimberley PV plant (for Enertis Solar)*
- *Equator Principles Due Diligence reporting - Vaal River Solar 1 PV plant (for Enertis Solar)*

Power Generation Projects

Environmental Impact Assessments and Environmental Management Plans
- *Ankerlig OCGT to CCGT Conversion project, and the associated 400 kV transmission power line between Ankerlig and the Omega Substation, Western Cape (for Eskom Generation)*
- *Gourikwa OCGT to CCGT Conversion project, and the associated 400 kV transmission power line between Gourikwa and the Proteus Substation, Mossel Bay(for Eskom Generation)*

Basic Assessments
- *New raw water reservoir and pipeline for the Medupi Power Station, Limpopo Province (for Eskom Generation)*
- *Substation for Aggeneys PV facility (for BioTherm Energy)*

Screening
- *Indwe Power Station (for IPSA)*
- *IPP Baseload screening (coal) (for Exxaro)*

Siting Study
- *Siting study for a coal fired power station in the Bethal area (for ISS Global)*

Power line projects

Environmental Impact Assessments and Environmental Management Plans
- *Steelpoort Integration Project, Limpopo Province (for Eskom Transmission)*
- *Kyalami/Midrand Substation and 3 Transmission lines, Gauteng (for Eskom Transmission)*

Basic Assessments
- *Amakhala Emoyeni Power Line and Kopleegte substation (for Cennergi)*
- *Cuprum-Burchell; Burchell-Mooidraai power line BAR (Prieska) (for Eskom)*
- *Garob-Kronos Power Line (for Juwi Renewable Energies)*
- *Golden Valley Dx-Poseidon line and substation & Golden Valley-Kopleegte power line (for BioTherm Energy)*
- *Ilanga Lethemba-Hydra 132kV (for Solar Capital)*
- *Iziduli Emoyeni Substation, Power Line & LA18 (for Windlab)*
- *Kathu 132kV Power Line (for VentuSA Energy)*
- *Loeries 2 Power Line (for Mainstream Renewable)*
- *Loeriesfontein substation and power lines (for Mainstream Renewable)*
- *Nobelsfontein Wind Substation and Power line (for Coria / SARGE)*
- *Realignment of Dx lines at Hopefield Wind Energy Facility(for Umoya Energy)*
- *Rheboksfontein Power Line(for Moyeng Energy (Pty) Ltd)*
- *Sishen Solar PV Energy Facility 132kV Power line (for Aveng/Vexicom)*
- *Springfontein Power Line (for Mainstream Renewable)*
- *Wesley-Peddie / Riverbank Phase 2 Power Line 132 kV (for Just Energy)*

CURRICULUM VITAE
Michelle Moodley

Profession : Environmental Consultant - Savannah Environmental (Pty) Ltd
Specialisation : Environmental Assessment Practitioner
Years' experience : Four

KEY RESPONSIBILITIES

- Providing consulting services to clients for Environmental-related matters
- Conducting Environmental Impact Assessment (EIA) processes
- Preparation of EIA reports
- Environmental Compliance Auditing and Environmental Control Officer (ECO) Services

SKILLS BASE AND CORE COMPETENCIES

- Compilation of environmental reports in accordance with relevant environmental legislative requirements
- Undertaking public participation processes for a variety for projects
- Identification and assessment of potential negative environmental impacts and benefits through the review and manipulation of data
- Identification of achievable mitigation measures and the development of appropriate management plans

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc Natural & Environmental Sciences, University of Johannesburg, 2009
- B.Sc Honours in Biodiversity & Conservation, University of Johannesburg, 2010

Professional Society Affiliations:

- *The South African Council for Natural Scientific Professions: Professional Natural Scientist Pr.Sci.Nat: Registration Number: 114265*

EMPLOYMENT HISTORY

- May 2015 – Present: Savannah Environmental (Pty) Ltd (Environmental Consultant)
- May 2011 – April 2015: Wilbrink & Associates cc (Environmental Consultant)

PROJECT EXPERIENCE

Waste Management Licenses

- Basic Assessment Process for the Spent Catalyst Processing Plant in Canelands, Durban, KZN
- Scoping & EIA Process for Scott Bader Distillate in Hammarsdale, KZN
- Basic Assessment Process for Turbomeca Africa Effluent Treatment facility in Bonaero Park, Johannesburg, Gauteng
- Scoping & EIA Process for Drumpal cc Container Reconditioners in Phoenix, Durban, KZN
- Scoping & EIA Process for ChemerG Waste Treatment in Harrison, KZN
- Scoping & EIA Process for ChemerG Decommissioning for Plant Relocation in Hammarsdale

Atmospheric Emission Licenses

- Lubrizol South Africa (Pty) Ltd in Prospecton, Durban, KZN
- Scott Bader (Pty) Ltd

Environmental Authorisations

ChemerG Plant Relocation, Cato Manor, KZN

CURRICULUM VITAE
GABRIELE WOOD

Public Participation and Social Consultant: *Savannah Environmental (Pty) Ltd*

Gabriele Wood holds an Honours Degree in Anthropology, obtained from the University of Johannesburg. She has 8 years consulting experience in public participation and social research. Her experience includes the design and implementation of public participation programmes and stakeholder engagement strategies for numerous integrated development planning and infrastructure projects.

SKILLS BASE AND CORE COMPETENCIES

- Qualitative and Quantitative Social Research
- Social Assessment (Stakeholder and Social Analysis)
- Public participation process implementation, monitoring and evaluation
- Facilitation (Focus Groups, Community Meetings, Interest Group Meetings, Public Meetings, Public Open Days, Workshops, Forums, Committees, etc.)
- Stakeholder Management
- Community Needs Assessment
- Relocation Facilitation
- Project Administration
- Minute Taking
- Report Writing

TERTIARY EDUCATION

- B. Hons. Anthropology (Cum Laude): University of Johannesburg (2004 – 2005)
- B.A. Psychology: University of Johannesburg (2002 – 2004)

EMPLOYMENT HISTORY

May 2012 – Current:
Savannah Environmental (Pty) Ltd: Public Participation and Social Consultant

March 2007 – April 2012:
NMA Effective Social Strategists (Pty) Ltd: Assistant Project Manager – Public Participation and Social Research

January 2005 – March 2007 (Part-time):
University of Johannesburg: Department of Anthropology and Development Studies: Student Tutor and Research Assistant

RELEVANT PROJECT EXPERIENCE

- Blackwood 132kV Power Line and Substation – BA (for VentuSA Energy) – Free State Province
- Ankerlig-Koeberg 132kV Power Line and Substation (for Eskom Holdings SOC Ltd) – Western Cape Province
- Umbani Coal-fired Power Station – EIA (for ISS Global Mining) – Mpumalanga Province
- Thabametsi Coal-fired Power Station – EIA (for GDF SUEZ Energy Southern Africa) – Limpopo Province
- Pofadder Wind Energy Facilities – EIA (for Mainstream Renewable Power) – Northern Cape Province
- Karreebosch Wind Energy Facility – EIA (for G7 Energies) – Northern Cape Province & Western Cape Province
- SolarReserve Kotulo Tsatsi Energy CSP Facilities – EIA (for SolarReserve & Kotulo Tsatsi Energy) – Northern Cape Province
- Grootdrink Solar PV Energy Facility – EIA (for Africoast Engineering) – Northern Cape Province
- Byromate Biomass Power Generation Facility – EIA (for Energuys) – KwaZulu-Natal Province

CURRICULUM VITAE

Lisa Opperman

Profession	:	Junior Environmental Consultant
Specialisation	:	Environmental Management
Years experience	:	7 months

KEY RESPONSIBILITIES

- Execution of professional consulting services for a variety of projects
- Impact assessment reporting
- GIS mapping
- Permitting reporting
- Compliance monitoring and audit reporting
- Public consultation
- Development of project proposals for procuring new work or projects

SKILLS BASE AND CORE COMPETENCIES

- GIS Mapping
- Report writing

EDUCATION AND PROFESSIONAL STATUS

Degrees:

- B.Sc. (Hons) Environmental Management (2014), North-West University, Potchefstroom.
- B.A Psychology, Geography and Environmental Studies (2013), North-West University, Potchefstroom

Professional Society Affiliations:

- IAIAsa (Membership number: 3719)

EMPLOYMENT

- 16 February 2015 – Current: Savannah Environmental (Pty) Ltd: Junior Environmental Assessment Practitioner and GIS

PROJECT EXPERIENCE

- Basic Assessment Reports for Harmony Gold 3x PV Facilities, Welkom.
- Environmental Impact Assessment Reports for Buffels PV 1 & Buffels PV 2, near Orkney.
- Basic Assessment Reports for the proposed Golden Valley road and power line.
- Environmental Impact Assessment Reports for Buffels PV 1 & Buffels PV 2, near Orkney.
- Basic Assessment Reports for the proposed Golden Valley road and power line.
- Environmental Impact Assessment Reports for Woodhouse Solar 1 & Woodhouse Solar 2 PV Facilities, near Vryburg.
- Environmental Impact Assessment Reports for Vierfontein Solar 1 & Vierfontein Solar 2 PV Facilities.
- Environmental Impact Assessment Report for the Orkney Solar Energy Facility.
- Environmental Impact Assessment Report for the Kuruman Industrial Cluster.
- Environmental Management Programme for the Nxuba Wind Farm
- Lamberts Bay Wind Farm Screening.