

---

# PROPOSED S-KOL PHOTOVOLTAIC PLANT, NORTHERN CAPE

---

## DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the final Environmental Impact  
Assessment Report  
January 2012

**Prepared for**

NetWorx S28 Energy (Pty) Ltd  
18 Melrose Boulevard  
2nd Floor, Melrose Arch  
2076

**Prepared by**

UNIT 606, 1410 EGLIN OFFICE PARK  
14 EGLIN ROAD, SUNNINGHILL, GAUTENG  
PO BOX 148, SUNNINGHILL, 2157  
TEL: +27 (0)11 234 6621  
FAX: +27 (0)86 684 0547  
E-MAIL: [INFO@SAVANNAHSA.COM](mailto:INFO@SAVANNAHSA.COM)  
[WWW.SAVANNAHSA.COM](http://WWW.SAVANNAHSA.COM)





## PROJECT DETAILS

---

- DEA Reference No.** : 12/12/20/2230
- Title** : Environmental Impact Assessment Process  
Draft Environmental Management Programme:  
Proposed Project S-Kol Photovoltaic Plant, Northern  
Cape
- Authors** : Savannah Environmental (Pty) Ltd  
Tammy Kruger  
Jo Anne Thomas
- Specialists** : Tony Barbour Environmental Consulting and Research  
David Hoare Consulting cc  
Heritage Contracts and Archaeological Consulting CC  
TerraSoil Science  
MetroGIS (Pty) Ltd
- Client** : NetWorx S28 Energy (Pty) Ltd
- Report Status** : Draft Environmental Management Programme  
submitted as part of the Final Environmental Impact  
Assessment Report for submission to DEA

**When used as a reference this report should be cited as:** Savannah Environmental (2012)  
Draft Environmental Management Programme: Proposed Project S-Kol Photovoltaic Plant, Northern  
Cape.

**COPYRIGHT RESERVED**

This technical report has been produced by Savannah Environmental (Pty) Ltd for NetWorx S28 Energy (Pty) Ltd. No part of the report may be copied, reproduced or used in any manner without written permission from NetWorx S28 Energy (Pty) Ltd or Savannah Environmental (Pty) Ltd.

---

## DEFINITIONS AND TERMINOLOGY

---

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

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

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

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

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

**Early stone age:** A very early period of human development dating between 300 000 and 2.6 million years ago.

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

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

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

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

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

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

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

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

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

**Heritage:** That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

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

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

**Integrated energy plan:** A plan commissioned by the DME in response to the requirements of the National Energy Policy, in order to provide a framework in which specific energy policies, development decisions and energy supply trade-offs can be made on a project-by-project basis. The framework is intended to create a balance between the energy demand and resource availability to provide low cost electricity for social and economic development, while taking into account health, safety and environmental parameters.

**Integrated strategic electricity planning:** Eskom's planning process which provides strategic projections of supply-side and demand-side options to be implemented to deal with the energy management issues and meet long-term load forecasts.

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

**Late stone age:** In South Africa this time period represents fully modern people who were the ancestors of southern African Khoekhoen and San groups (40 000 – 300 years ago).

**Middle stone age:** An early period in human history characterised by the development of early human forms into modern humans capable of abstract thought process and cognition 300 000 – 40 000 years ago.

**National integrated resource plan:** Commissioned by NERSA in response to the National Energy Policy's objective relating to affordable energy services, in order to provide a long-term, cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social and economic policies.

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

**Rare species:** Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive

range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

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

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

## TABLE OF CONTENTS

---

	PAGE
<b>CHAPTER 1: PURPOSE AND OBJECTIVES OF THE EMP</b> .....	1
<b>CHAPTER 2: PROJECT DETAILS</b> .....	13
2.1. Activities and Components associated with the Solar Energy Facility ...	13
<b>CHAPTER 3: STRUCTURE OF THIS EMP</b> .....	17
3.1. Project Team .....	18
<b>CHAPTER 4: KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT</b> .....	19
<b>CHAPTER 5: MANAGEMENT PROGRAMME: PLANNING AND DESIGN</b> .....	34
5.1 Objectives .....	34
OBJECTIVE: Ensure the facility design responds to identified environmental constraints and opportunities .....	34
OBJECTIVE: Ensure the selection of the best environmental option for the alignment of the power line, and access roads.....	36
OBJECTIVE: Minimise stormwater runoff.....	37
<b>CHAPTER 6: MANAGEMENT PROGRAMME: CONSTRUCTION</b> .....	38
6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase .....	38
OBJECTIVE: Establish clear reporting, communication, and responsibilities in relation to overall implementation of the EMP.....	38
6.2 Objectives .....	41
OBJECTIVE: Minimise impacts related to inappropriate site establishment....	41
OBJECTIVE: Appropriate management of the construction site and construction workers.....	43
OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase.....	45
OBJECTIVE: Minimise the potential impacts on family structures and social networks associated with presence of construction workers from outside the area .....	47
OBJECTIVE: Minimise impacts related to traffic management and transportation of equipment and materials to site .....	49
OBJECTIVE: To avoid and or minimise the potential impact of the activities during the construction on the safety of local communities and the potential loss of stock and damage to farm infrastructure ..	51
OBJECTIVE: Management of dust and air emissions .....	53
OBJECTIVE: Minimisation of development footprint and disturbance to topsoil	54
OBJECTIVE: Minimise the impacts on and loss of indigenous vegetation and faunal habitat.....	56
OBJECTIVE: Minimise the establishment and spread of alien invasive plants	57
OBJECTIVE: Minimise impacts on water resources .....	58
OBJECTIVE: Minimise soil degradation and erosion .....	60
OBJECTIVE: Protection of heritage resources.....	62
OBJECTIVE: Minimisation of visual impacts associated with construction.....	63

OBJECTIVE: Appropriate handling and management of waste.....	65
OBJECTIVE: Appropriate handling and storage of chemicals, hazardous substances .....	67
6.3    Detailing Method Statements .....	69
OBJECTIVE: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk.....	69
6.4    Awareness and Competence: Construction Phase of the Solar Energy Facility .....	70
OBJECTIVE: 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 .....	70
6.5    Monitoring Programme: Construction Phase.....	71
OBJECTIVE: To monitor the performance of the control strategies employed against environmental objectives and standards.....	71
<b>CHAPTER 7: MANAGEMENT PROGRAMME: REHABILITATION .....</b>	<b>72</b>
7.1.    Objectives .....	72
OBJECTIVE: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed .....	72
<b>CHAPTER 8: MANAGEMENT PROGRAMME: OPERATION .....</b>	<b>75</b>
8.1.    Objectives .....	75
OBJECTIVE: Protection of indigenous natural vegetation, fauna and maintenance of rehabilitation .....	75
OBJECTIVE: Protection of avifauna.....	76
OBJECTIVE: Minimisation of visual impacts .....	77
OBJECTIVE: Minimise soil degradation and erosion .....	78
OBJECTIVE: Minimise dust and air emissions.....	79
OBJECTIVE: Ensure the implementation of an appropriate fire management plan during the operation phase .....	80
OBJECTIVE: Maximise local employment and business opportunities .....	81
OBJECTIVE: Appropriate handling and management of waste.....	82
<b>CHAPTER 9: MANAGEMENT PROGRAMME: DECOMMISSIONING .....</b>	<b>85</b>
9.1.    Site Preparation .....	85
9.2    Disassemble and Replace Infrastructure .....	85
OBJECTIVE: To avoid and or minimise the potential impacts associated with the decommissioning phase .....	85
<b>CHAPTER 10: FINALISATION OF THE EMP .....</b>	<b>87</b>

## PURPOSE AND OBJECTIVES OF THE EMP

## CHAPTER 1

---

An Environmental Management Programme (EMP) 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.”<sup>1</sup> The objective of this EMP 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 EMP 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 EMP is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMP 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 EMP has been compiled in accordance with Section 33 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. The EMP 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 EMP 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.

---

<sup>1</sup> Provincial Government Northern Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

- » 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 EMP, and ensure the minimisation of adverse environmental impacts to an acceptable level.

NetWorx S28 Energy (Pty) Ltd 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 EMP and through its integration into the contract documentation. Since this EMP is part of the EIA process for the proposed Photovoltaic (PV) Plant, it is important that this document be read in conjunction with the final Scoping and EIA Reports compiled for this project. This will contextualise the EMP 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 EMP and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMP, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMP.

This EMP shall be binding on all the parties involved in the construction and operational phases of the project, and shall be enforceable at all levels of contract and operational management within the project.

## PROJECT DETAILS

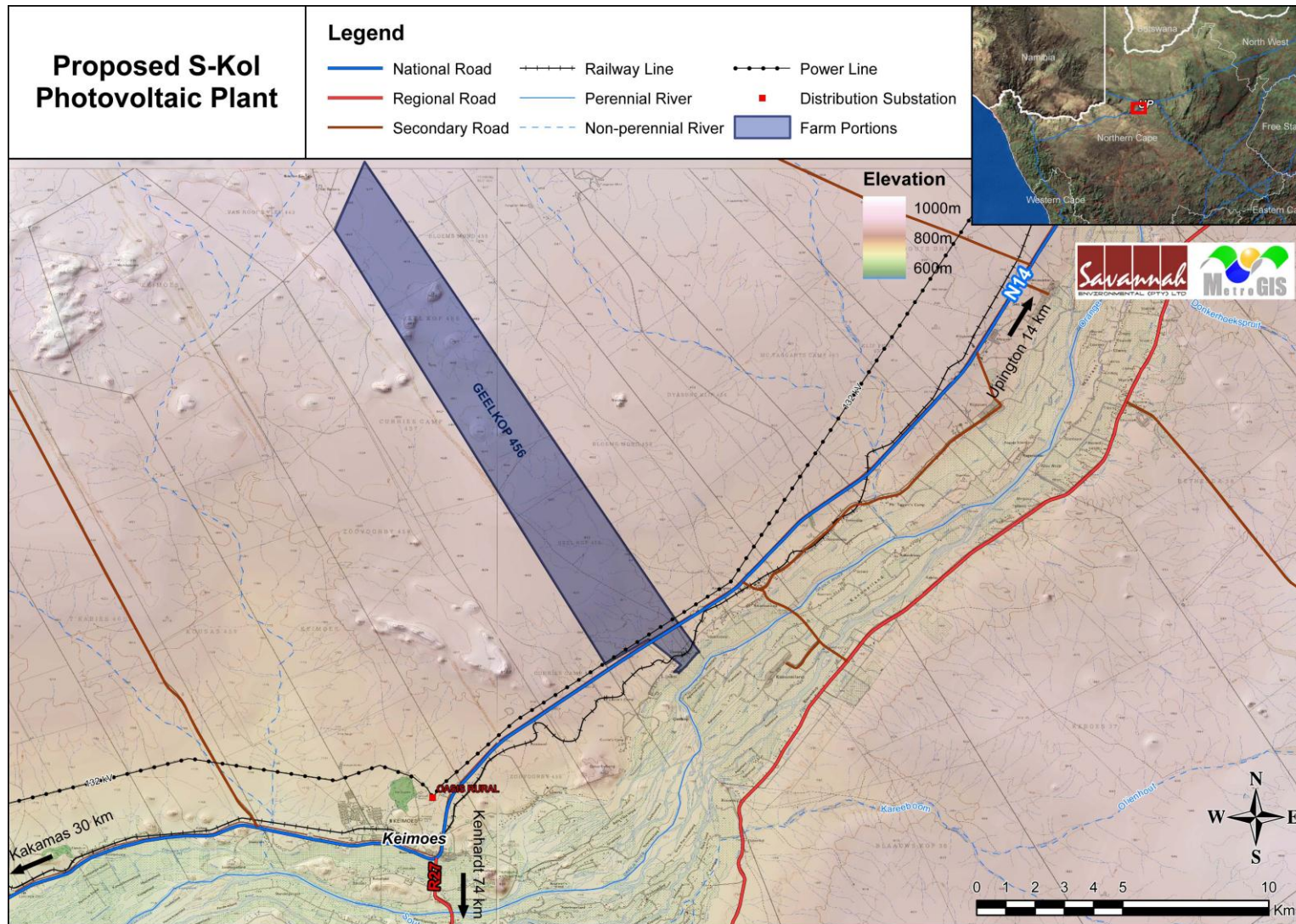
## CHAPTER 2

**NetWorx S28 Energy (Pty) Ltd**, as an independent power producer (IPP), is proposing the establishment of a PV plant for the purpose of commercial electricity generation. NetWorx S28 Energy has identified a favourable site located approximately 10 km north-east of Keimoes on the farm Geelkop 456 (refer to Figure 2.1).

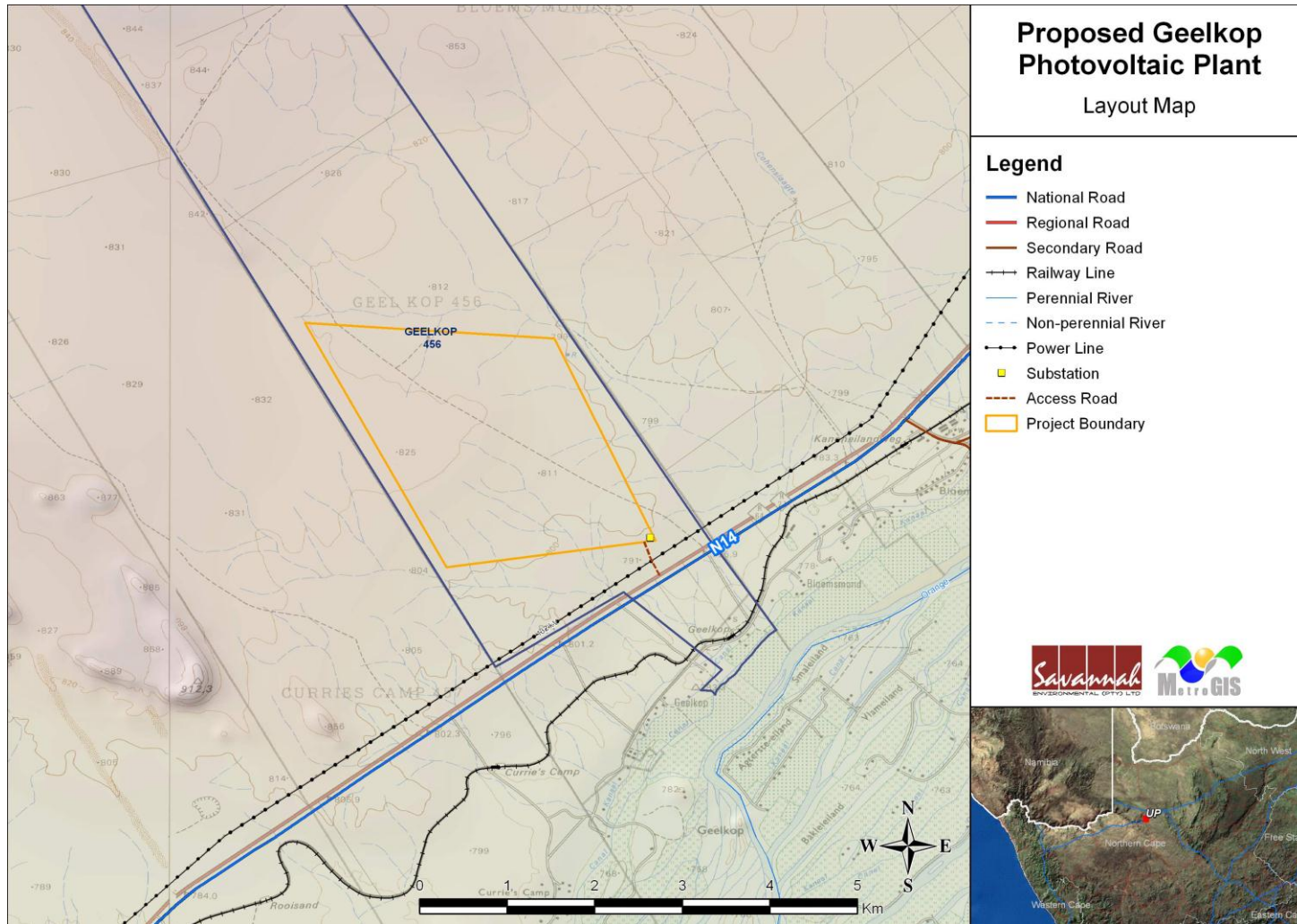
This broader site, which is approximately 3 600 ha in size, is preferred for the development of a PV plant by way of the solar resource, the topography, and slope of the site, the current land use, accessibility to the land, and the potential for evacuation options.

The proposed project will be comprised of the following primary elements:

- » An inverter situated at the end of each "string" in order to switch the power from direct current (DC) to alternating current (AC).
- » Underground cabling of 33 kV in order to distribute the power to a central on-site substation.
- » A transformer together with the on-site substation to step-up the power from 33 kV to 132 kV, to be distributed between the plant and the Eskom grid.
- » Connection of the PV plant to the power distribution grid. An existing 132 kV distribution line, which connects the Oranje Substation at Upington and the Oasis Substation at Keimoes crosses the southern portion of the site. It is proposed that a new 132 kV power line will be built from the on-site substation to connect with the existing power line.
- » An external access road.
- » Internal access roads for construction and maintenance purposes.
- » Maintenance, security buildings, and a workshop.



**Figure 2.1:** Locality map showing the broader study site identified for the proposed facility



**Figure 2.2:** Preliminary layout of the Project S-Kol Photovoltaic Plant

## 2.1. Activities and Components associated with the Photovoltaic Plant

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

The PV plant is proposed to have a maximum generating capacity of 200 MW, to be developed in three phases (i.e. 30 MW (phase 1); up to 100 MW (phase 2); up to 200 MW (phase 3). Approximately 50 - 100 people are expected to be employed during the construction phase, of which 10% will be low skilled positions, 20% semi-skilled, and 70% skilled. Low skilled and semi-skilled positions will ideally be filled by locals living in and around Kakamas and Keimoes. Workers not living in the area, including those for skilled positions, will not be housed on site. However, a 24-hour security team will be required on site.

**Table 2.1:** Activities associated with the construction of a PV facility

Activity	Description
Pre-construction surveys	Prior to initiating construction, a number of detailed surveys will be required including, but not limited to: <ul style="list-style-type: none"> <li>» <i>Geotechnical survey</i> – the geology and topography of the study area will be confirmed. The geotechnical study will look at 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 built and the extent of earthworks and compaction required in the establishment of any internal access roads.</li> <li>» <i>Site survey</i> – this will be required to finalise the design layout of the PV field and other associated infrastructure. The finalisation will need to be confirmed in line with the Environmental Authorisation issued for the PV plant.</li> <li>» <i>Power line servitude survey</i> – once the placement of the towers for the power line has been finalised, a walk through survey will be undertaken for ecological, archaeology and heritage resources which may necessitate certain towers to be moved to avoid sensitivities.</li> </ul>
Establishment of access roads	<ul style="list-style-type: none"> <li>» The study site is accessible off the N14 from Keimoes to Kakamas. Therefore at this time the establishment of additional <i>external</i> access roads is not deemed necessary.</li> <li>» A gravel road traverses the periphery of the broader study site. However, additional roads may need to be established within the site for construction and maintenance purposes. The extent of earthworks and compaction required in the establishment of the access roads will be established through the detailed geotechnical study which will be undertaken as part of the design phase of the PV plant.</li> </ul>

Activity	Description
Undertake site preparation	<ul style="list-style-type: none"> <li>» Site preparation activities will include clearance of vegetation at the footprint of the area infrastructure (i.e. sub-station, maintenance, security buildings, and a workshop), and linear components (i.e. internal access roads, power line towers). These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.</li> </ul>
Transport of components and equipment to site	<ul style="list-style-type: none"> <li>» The components for the proposed PV plant will be transported to site, in sections, by road. Some of the transformer may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)<sup>2</sup> by virtue of the dimensional limitations (i.e. length and weight). The typical civil engineering construction equipment will need to be brought to the site (i.e. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the establishment of the substation and power line.</li> <li>» In some instances, the dimensional requirements of the loads to be transported during the construction phase (i.e. the transformer of the substation) may require alterations to the existing road infrastructure (i.e. widening on corners), and protection of road-related structures (i.e. bridges, culverts, etc.) because of abnormal loading.</li> </ul>
Establishment of construction camps and laydown areas	<ul style="list-style-type: none"> <li>» Once the required construction equipment has been transported to site, dedicated equipment camp(s) and laydown area(s) will be required.</li> <li>» The construction camp(s) serve to confine activities and storage of equipment to designated area(s) to limit the potential ecological impacts associated with this phase of the project. The laydown area(s) will be used for assembly purposes and the general placement/storage of construction equipment.</li> <li>» Fuel required for the on-site construction vehicles and equipment will need to be secured in a temporary bunded area within the construction camp(s) to prevent leakages and soil contamination.</li> </ul>
Establishment of the PV panels	<ul style="list-style-type: none"> <li>» Holes for the PV panels will be mechanically excavated to a depth of approximately 2 m and the steel poles will be inserted using the "ramming technique."<sup>3</sup></li> <li>» The installation of the underground cables between the PV panels and the inverters and between the inverters and the substation/transformer will require the excavation of trenches a maximum depth of 2 m within which they can then be laid.</li> </ul>
Construction of the	<ul style="list-style-type: none"> <li>» The substation will be constructed with a high-voltage (HV) yard footprint of a maximum size of 30 m x 50 m.</li> </ul>

<sup>2</sup> A permit will be required for the transportation of these abnormal loads on public roads.

<sup>3</sup> No concrete will be required except where there is a need to drill into rock. Where required, ready mix concrete will be used.

Activity	Description
substation and power line.	<p>The substation would be constructed in the following simplified sequence:</p> <ul style="list-style-type: none"> <li>» <u>Step 1:</u> Survey of the site</li> <li>» <u>Step 2:</u> Site clearing and levelling and construction of access road to substation site</li> <li>» <u>Step 3:</u> Construction of terraces and foundations</li> <li>» <u>Step 4:</u> Assembly, erection and installation of equipment (including transformers)</li> <li>» <u>Step 5:</u> Connection of conductors to equipment; and</li> <li>» <u>Step 6:</u> Rehabilitation of any disturbed areas and protection of erosion sensitive areas.</li> </ul> <p>» The new 132 kV power line will be built from the on-site substation to turn into and out of the existing power line. This means that two lines are actually required. A servitude of approximately 35 m in width for each power line will need to be established. Only the centre line of the servitude may need to be cleared for stringing purposes. The remainder of the servitude will not be cleared, except where trees higher than 4 m exist which could interfere with the operation of the power line.</p>
Undertake site rehabilitation	<ul style="list-style-type: none"> <li>» Once construction is complete and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the PV plant, any access points to the site which are not required during the operational phase must be closed and prepared for rehabilitation.</li> </ul>

### 2.1.1 Operation and Maintenance Phase

During operation approximately 15 - 30 members of staff will be required. Of this, 20% will be for skilled positions (i.e. electrical engineers and maintenance/plant engineers), and 80% for semi to low skilled positions (i.e. plant cleaning, security and maintenance). The PV plant is expected to be operational for 25+ years.

Activity	Description
Operation of the photovoltaic panels and the electrical infrastructure	<ul style="list-style-type: none"> <li>» The PV panels will convert the light energy from the incoming radiation into electrical energy (i.e. as direct current). An inverter will service each loop of photovoltaic panels to change the power to alternating current. Thereafter the electricity will be conveyed to the on-site substation, the power line, and then to the existing 132 kV line south of the site.</li> <li>» For the cleaning of the panels and for staff consumption/ablution facilities approximately 6 5000 l/MW/annum will</li> </ul>

	be required.
Site operation and maintenance	<ul style="list-style-type: none"> <li>» It is anticipated that a full-time security, maintenance, and control room staff will be required on site.</li> <li>» Each component within the PV plant will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions, or routine maintenance activities.</li> </ul>

### 2.1.2 Decommissioning Phase

The PV plant is expected to have a lifespan of 25+ years (i.e. with maintenance). The associated infrastructure would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the PV plant considered in this EIA process would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at that time.

Activity	Description
Site preparation	Site preparation activities will include confirming the integrity of the access to the site to accommodate the required equipment (e.g. lay down areas and decommissioning camp) and the mobilisation of decommissioning equipment.
Disassemble and replace existing components	The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

**STRUCTURE OF THIS EMP**

**CHAPTER 3**

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

- » Key legislation applicable to the development;
- » Planning and design activities;
- » Construction activities;
- » Operation activities; and
- » Decommissioning activities.

These chapters set out the procedures necessary for NetWorx S28 Energy, as the project developer, 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 EMP 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 EMP table has been established for each environmental objective. The information provided within the EMP 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**

<b>Project Component/s</b>	» List of project components affecting the objective.
<b>Potential Impact</b>	» Description of potential environmental impact if objective is not met.
<b>Activity/Risk Source</b>	» Description of activities which could affect achieving objective.
<b>Mitigation: Target/Objective</b>	» 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.

<b>Performance Indicator</b>	Description of key indicator(s) that track progress/indicate the effectiveness of the EMP.
------------------------------	--

<b>Monitoring</b>	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 EMP 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.

### 3.1. Project Team

This draft EMP was compiled by:

	<b>Name</b>	<b>Company</b>
<b>EMP Compilers:</b>	Tammy Kruger – Environmental Assessment Practitioner (EAP) Jo Anne Thomas – EAP	Savannah Environmental
<b>Specialists:</b>	David Hoare – fauna, flora and ecology	David Hoare Consulting
	Johan van der Waals – geology, soils and erosion potential	Terrasoil Science cc
	Jaco van der Walt – heritage resources	Heritage Contracts and Archaeological Consulting CC
	Lourens du Plessis – visual aesthetics	MetroGIS
	Tony Barbour - social	Tony Barbour Environmental Consulting and Research

The Savannah Environmental team have extensive knowledge and experience in EIAs and environmental management, having been involved in EIA processes over the past fourteen years. They have managed and drafted EMPs for other power generation projects throughout South Africa, including numerous wind and solar energy facilities.

## **KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT      CHAPTER 4**

---

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 R545, GNR 546 in Government Gazette 33306 of 18 June 2010).
- » Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - \* Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010).
  - \* Public Participation in the EIA Process (DEA, 2010).
  - \* Integrated Environmental Management Information Series (published by DEA)
- » International guidelines, including the Equator Principles

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the EIA Report. A review of legislative requirements applicable to the proposed project is provided in Table 4.1.

**Table 4.1:** Relevant legislative and permitting requirements applicable to the establishment of the proposed Project S-Kol Photovoltaic Plant

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
<b>National Legislation</b>			
National Environmental Management Act (Act No. 107 of 1998)	<ul style="list-style-type: none"> <li>» NEMA requires, inter alia, that:                             <ul style="list-style-type: none"> <li>* Development must be socially, environmentally, and economically sustainable.”</li> <li>* Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied.”</li> <li>* A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions.”</li> </ul> </li> <li>» EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations.</li> <li>» In terms of S24(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 charged by NEMA with granting of</li> </ul>	<ul style="list-style-type: none"> <li>» National Department of Environmental Affairs</li> <li>» Northern Cape Department of Environment and Nature Conservation (DENC)</li> </ul>	<ul style="list-style-type: none"> <li>» This EIA Report is to be submitted to the DEA for review and decision making.</li> <li>» The DENC will act as the commenting authority.</li> </ul>

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
	<p>the relevant environmental authorisation.</p> <ul style="list-style-type: none"> <li>» In terms of GNR 543 of 18 June 2010, a full Scoping and EIA Process is required to be undertaken for the proposed project.</li> </ul>		
National Environmental Management Act (Act No. 107 of 1998)	<ul style="list-style-type: none"> <li>» A project proponent is required to consider a project holistically and to consider the cumulative effect of potential impacts.</li> <li>» In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with a project is avoided, stopped or minimised.</li> </ul>	» National Department of Environmental Affairs	<ul style="list-style-type: none"> <li>» While no permitting or licensing requirements arise directly, the holistic consideration of the potential impacts of the proposed project has found application in the EIA Phase.</li> <li>» The implementation of mitigation measures are included as part of the Draft EMP and will continue to apply throughout the life cycle of the project.</li> </ul>
National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	<ul style="list-style-type: none"> <li>» In terms of the Biodiversity Act, the developer has a responsibility for:                             <ul style="list-style-type: none"> <li>* The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).</li> <li>* The application of appropriate environmental management</li> </ul> </li> </ul>	» National Department of Environmental Affairs	<ul style="list-style-type: none"> <li>» As the applicant will not carry on any restricted activity in terms of S57, no permit is required to be obtained in this regard.</li> <li>» In terms of GNR 152 specialist flora and fauna studies have been undertaken as part of the EIA process.</li> <li>» A permit may be required should any protected plant species on site be disturbed or destroyed because of the proposed development.</li> </ul>

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
	<p>tools to ensure integrated environmental management of activities.</p> <ul style="list-style-type: none"> <li>* Limit further loss of biodiversity and conserve endangered ecosystems.</li> <li>» In terms of S57, a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 4. In this regard 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.</li> <li>» In terms of S75, (1) The control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs. (2) Any action taken to control and eradicate a listed invasive species must be</li> </ul>		

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
	<p>executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment. (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating, or re-establishing itself in any manner.</p> <ul style="list-style-type: none"> <li>» 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 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 identify permitting requirements.</li> <li>» In terms of GNR 1477 of 2009: Draft National List of Threatened Ecosystems published under S52(1)(a) of the Act provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened</li> </ul>		

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
	terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2004). » GNR1187 Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List published under S56(1)of the Act.		
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	» The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. » In terms of the regulations published in terms of this Act (GN 718), a Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. » Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that (a) The containers in which any waste is stored, are intact and not corroded or in any other way rendered unfit for the safe storage of waste; (b) Adequate measures are taken	» National Department of Water and Environmental Affairs » Provincial Department of Environmental Affairs	» As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. » Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of this Act, as detailed in the EMP. » The volumes of waste to be generated and stored on the site during construction and operation of the facility will not require a waste license (provided these remain below the prescribed thresholds).

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
	to prevent accidental spillage or leaking; (c) The waste cannot be blown away; (d) Nuisances such as odour, visual impacts and breeding of vectors do not arise; and (e) Pollution of the environment and harm to health are prevented.		
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	<ul style="list-style-type: none"> <li>» S18, S19 and S20 of the Act allow certain areas to be declared and managed as "priority areas"</li> <li>» Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards</li> <li>» 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.</li> </ul>	<ul style="list-style-type: none"> <li>» National Department of Environmental Affairs</li> <li>» Provincial Department of Environmental Affairs</li> </ul>	<ul style="list-style-type: none"> <li>» While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project.</li> </ul>
National Water Act (Act No. 36 of 1998)	<ul style="list-style-type: none"> <li>» Under S21 of the act, water uses must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation.</li> <li>» In terms of S19, the project proponent must ensure that reasonable measures are taken</li> </ul>	<ul style="list-style-type: none"> <li>» National Department of Water Affairs</li> <li>» Northern Cape Department of Water Affairs</li> </ul>	<ul style="list-style-type: none"> <li>» The use of water to clean the panels may require the obtaining of a water use license (as defined in terms of S21 of the NWA), depending on the source of water for this purpose.</li> <li>» This section of the Act will apply throughout the life cycle of the project. This will also pertain to the proposed</li> </ul>

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
	throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.		concrete batching site.
Environment Conservation Act (Act No. 73 of 1989)	<ul style="list-style-type: none"> <li>» National Noise Control Regulations (GN R154 dated 10 January 1992)</li> </ul>	<ul style="list-style-type: none"> <li>» National Department of Environmental Affairs</li> <li>» Northern Cape Department of Water Affairs</li> <li>» Local Authorities</li> </ul>	<ul style="list-style-type: none"> <li>» There is no requirement for a noise permit in terms of the legislation.</li> <li>» Any noisy activities carried out during the construction phase that could present an intrusion impact to the local community should be limited to 6:00am to 6:00pm Monday – Saturday (excluding public holidays).</li> <li>» Should these specific activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from the DEA and the Local Municipality.</li> </ul>
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	<ul style="list-style-type: none"> <li>» A mining permit or mining right may be required where a mineral in question is to be mined (i.e. materials from a borrow pit) in accordance with the provisions of the Act.</li> <li>» Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.</li> </ul>	<ul style="list-style-type: none"> <li>» Department of Minerals and Energy</li> </ul>	<ul style="list-style-type: none"> <li>» As no borrow pits are expected to be required for the construction of the facility, no mining permit or mining right is required to be obtained.</li> </ul>
National Heritage Resources	<ul style="list-style-type: none"> <li>» S38 states that Heritage Impact</li> </ul>	<ul style="list-style-type: none"> <li>» South African Heritage</li> </ul>	<ul style="list-style-type: none"> <li>» As per S38 an HIA has been undertaken</li> </ul>

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
<p>Act (Act No. 25 of 1999)</p>	<p>Assessments (HIAs) are required for certain kinds of development including</p> <ul style="list-style-type: none"> <li>» The construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length;</li> <li>» Any development or other activity which will change the character of a site exceeding 5 000 m<sup>2</sup> in extent</li> <li>» The relevant Heritage Authority must be notified of developments such as linear developments (i.e. roads and power line), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m<sup>2</sup>; or the re-zoning of a site exceeding 10 000 m<sup>2</sup> 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.</li> <li>» Stand alone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA</li> </ul>	<p>Resources Agency</p>	<p>as part of the EIA Phase.</p> <ul style="list-style-type: none"> <li>» A permit may be required should identified cultural/heritage sites on site be required to be disturbed or destroyed as a result of the proposed development.</li> <li>» If concentrations of archaeological heritage material and human remains are uncovered during construction, all work must cease immediately. The find must be reported to a heritage specialist so that systematic and professional investigation/ excavation can be undertaken.</li> </ul>

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
	component that fulfils the provisions of S38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		
National Forests Act (Act No. 84 of 1998)	<ul style="list-style-type: none"> <li>» 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”.</li> <li>» GN 1042 provides a list of protected tree species.</li> </ul>	<ul style="list-style-type: none"> <li>» National Department of Forestry</li> </ul>	<ul style="list-style-type: none"> <li>» This Act has found application during the EIA Phase. In this regard, a permit would need to be obtained for any protected trees that are affected.</li> </ul>
National Veld and Forest Fire Act (Act 101 of 1998)	<ul style="list-style-type: none"> <li>» Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 places a duty on landowners to prepare and maintain firebreaks, and Chapter 5 places a duty on all landowners to acquire equipment and have available personnel to fight fires.</li> <li>» In terms of S21 the applicant would be obliged to burn firebreaks to</li> </ul>	<ul style="list-style-type: none"> <li>» National Department of Forestry</li> </ul>	<ul style="list-style-type: none"> <li>» While no permitting or licensing requirements arise from this legislation, this act will find application during the operational phase of the project in terms of fire prevention and management.</li> </ul>

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
	<p>ensure that should a veldfire occur on the property, that it does not spread to adjoining land.</p> <ul style="list-style-type: none"> <li>» In terms of S12 the firebreak would need to be 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.</li> <li>» In terms of s17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.</li> </ul>		
Government Notice No. 1477 of 2009: Draft National List of Threatened Ecosystems	<ul style="list-style-type: none"> <li>» Published under S52(1)(a) of NEMA: Biodiversity Act (Act No. 10 of 2004), it provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2004).</li> </ul>	<ul style="list-style-type: none"> <li>» Provincial Department of Environmental Affairs</li> </ul>	<ul style="list-style-type: none"> <li>» N/A</li> </ul>
Subdivision of Agricultural Land Act (Act No. 70 of 1970)	<ul style="list-style-type: none"> <li>» Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the province</li> </ul>	<ul style="list-style-type: none"> <li>» National Department of Agriculture</li> </ul>	<ul style="list-style-type: none"> <li>» Subdivision is required to be undertaken following the issuing of an environmental authorisation for the proposed project. This generally forms part of the rezoning application process.</li> </ul>

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
Hazardous Substances Act (Act No. 15 of 1973)	<ul style="list-style-type: none"> <li>» This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising, or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products.</li> <li>» 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;</li> <li>» Group IV: any electronic product;</li> <li>» Group V: any radioactive material.</li> <li>» The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in</li> </ul>	<ul style="list-style-type: none"> <li>» Department of Health</li> </ul>	<ul style="list-style-type: none"> <li>» 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.</li> </ul>

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
<p>National Road Traffic Act (Act No 93 of 1996)</p>	<p>force.</p> <ul style="list-style-type: none"> <li>» 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.</li> <li>» 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.</li> <li>» The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other</li> </ul>	<ul style="list-style-type: none"> <li>» South African National Roads Agency Limited (national roads)</li> <li>» Provincial Department of Transport</li> </ul>	<ul style="list-style-type: none"> <li>» 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.</li> <li>» Transport vehicles exceeding the dimensional limitations (length) of 22m.</li> <li>» Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).</li> </ul>

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
	exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		
Development Facilitation Act (Act No 67 of 1995)	<ul style="list-style-type: none"> <li>» Provides for the overall framework and administrative structures for planning throughout the Republic</li> <li>» S2- 4 provide general principles for land development and conflict resolution.</li> </ul>	<ul style="list-style-type: none"> <li>» Local and District Municipalities</li> </ul>	<ul style="list-style-type: none"> <li>» The applicant must submit a land development application in the prescribed manner and form as provided for in the Act.</li> <li>» A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act.</li> </ul>
Promotion of Access to Information Act (Act No. 2 of 2000)	<ul style="list-style-type: none"> <li>» All requests for access to information held by state or private body are provided for in the Act under S11.</li> </ul>	<ul style="list-style-type: none"> <li>» National Department of Environmental Affairs</li> </ul>	<ul style="list-style-type: none"> <li>» No permitting or licensing requirements.</li> </ul>
Promotion of Administrative Justice Act (Act No. 3 of 2000)	<ul style="list-style-type: none"> <li>» In terms of S3 the government is required to act lawfully and take procedurally fair, reasonable, and rational decisions.</li> <li>» Interested and affected parties have right to be heard.</li> </ul>	<ul style="list-style-type: none"> <li>» National Department of Environmental Affairs</li> </ul>	<ul style="list-style-type: none"> <li>» No permitting or licensing requirements.</li> </ul>
<b>Provincial Legislation</b>			
Nature Conservation Ordinance (Act No. 19 of 1974)	<ul style="list-style-type: none"> <li>» Article 63 prohibits the picking of certain fauna (including cutting, chopping, taking, and gathering, uprooting, damaging, or destroying).</li> <li>» Schedule 3 lists endangered flora and Schedule 4 lists protected flora.</li> <li>» Articles 26 to 47 regulate the use of</li> </ul>	<ul style="list-style-type: none"> <li>» Provincial Department of Environmental Affairs</li> </ul>	<ul style="list-style-type: none"> <li>» No permitting or licensing requirements arise from this legislation for the proposed activities to be undertaken for the proposed project.</li> </ul>

<b>Legislation</b>	<b>Applicable Requirements</b>	<b>Relevant Authority</b>	<b>Compliance requirements</b>
	wild animals.		
<b>Guideline Documents</b>			
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads	» Outlines the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits.	» Provincial Department of Transport	» N/A
<b>Policies and White Papers</b>			
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» Investment in renewable energy initiatives, such as the proposed PV plant, is supported by this white Paper.	» N/A	» N/A
The White Paper on Renewable Energy (November 2003)	» This Paper sets out Government’s vision, policy principles, strategic goals, and objectives for promoting and implementing renewable energy in South Africa.	» N/A	» N/A
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» Investment in renewable energy initiatives, such as the proposed PV plant, is supported by this white Paper.	N/A	N/A

## MANAGEMENT PROGRAMME: PLANNING AND DESIGN CHAPTER 5

---

**Overall Goal:** undertake the 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 adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
- » Ensures that the best environmental options are selected for the linear components, including the access roads and power line alignments.
- » Enables the PV plant 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: Ensure the facility design responds to identified environmental constraints and opportunities**

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:

- » *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 substation), and the extent of earthworks and compaction required in the establishment of the internal access roads.
- » *A 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.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV panels.</li> <li>» Substation.</li> <li>» Access roads.</li> <li>» Power line.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impact on identified sensitive areas.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Positioning of all the facilities components.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» The design of the facility responds to the identified environmental constraints and opportunities.</li> <li>» Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Undertake a geotechnical pre-construction survey.	Geotechnical specialist	Design
Obtain any additional environmental permits required (e.g. water use license, permit to impact on protected tree species, heritage permit).	NetWorx Energy S28	Project planning
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 NetWorx Energy S28	Design review
External access point and internal access road to be carefully planned to maximise road user safety.	NetWorx Energy S28	Design
Compile a comprehensive storm water 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 panels).	NetWorx Energy S28	Design
Retain a buffer (approximately 100 m wide) of intact natural vegetation along the perimeter of the development site.	NetWorx Energy S28	Design
Use bird-friendly power line towers and conductor designs.	NetWorx Energy S28	Design

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» The design meets the objectives and does not degrade the environment.</li> <li>» Design and layouts respond to the mitigation measures and recommendations in the EIA Report.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Review of the design by the Project Manager and the</li> </ul>

Environmental Control Officer (ECO) prior to the commencement of construction.

**OBJECTIVE: Ensure the selection of the best environmental option for the alignment of the power line, and access roads**

- » *Access* - the study site is accessible off the N14 from Keimoes to Kakamas. Therefore at this time the establishment of additional external access roads is not deemed necessary. A gravel road traverses the periphery of the broader study site. However, additional roads may need to be established within the site for construction and maintenance purposes. The extent of earthworks and compaction required in the establishment of the access roads will be established through the detailed geotechnical study which will be undertaken as part of the design phase of the PV plant.
- » *Power line* - the new 132 kV power line will be built from the on-site substation to turn into and out of the existing power line. This means that two lines are actually required. A servitude of approximately 35 m in width for each power line will need to be established. Only the centre line of the servitude may need to be cleared for stringing purposes. The remainder of the servitude will not be cleared, except where trees higher than 4 m exist which could interfere with the operation of the power line.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Power line.</li> <li>» Access roads.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Route that degrades the environment unnecessarily, particularly with respect to visual aesthetics, loss of indigenous flora, and erosion.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Alignment of power line within investigated corridor.</li> <li>» Alignment of access roads.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure selection of best environmental option for alignment of linear infrastructure.</li> <li>» Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Select an alignment that curtails environmental impacts and enhances environmental benefits.	NetWorx Energy S28	Prior to submission of the final construction layout plan
Consider design level mitigation measures recommended by the specialists as detailed within the EIA report and relevant appendices.	NetWorx Energy S28	Design
Plan new access roads according to contour lines to	NetWorx S28	Design

Mitigation: Action/Control	Responsibility	Timeframe
minimise cutting and filling operations.	Energy	

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Power line and road alignments meet environmental objectives.</li> <li>» Selected linear alignments that minimise any negative environmental impacts and maximise any benefits.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Ensure that the design implemented meets the objectives and mitigation measures in the EIA Report through review of the design by the Project Manager, and the ECO prior to the commencement of construction.</li> </ul>

**OBJECTIVE: Minimise stormwater runoff**

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Stormwater management components.</li> <li>» Any hard engineered surfaces (i.e. access roads).</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Poor stormwater management and alteration of the hydrological regime (i.e. drainage lines).</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Construction of the facility (i.e. placement of hard engineered surfaces).</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Appropriate management of stormwater to minimise impacts on the environment.</li> </ul>

Mitigation: Action/Control	Responsibility	Timeframe
Reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system through increased sedimentation.	NetWorx S28 Energy	Planning and design
Appropriately plan hard-engineered bank erosion protection structures.	NetWorx S28 Energy	Planning and design
Suitable handling of stormwater within the site (i.e. separate 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).	NetWorx S28 Energy	Construction and operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Sound water quality and quantity management.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Surface water quality monitoring plan.</li> </ul>

**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 site 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, NetWorx S28 Energy 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 EMP, and the implementation of the EMP through its integration into the contract documentation. NetWorx S28 Energy 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 the EMP**

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project 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.

**Project Manager** will:

- » Ensure all specifications and legal constraints specifically concerning the environment are highlighted to the Contractor(s) so that they are aware of these.
- » Ensure that NetWorx S28 Energy and its Contractor(s) are made aware of all stipulations within the EMP.
- » Ensure that the EMP 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 EMP, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.

**Site Manager** (NetWorx S28 Energy'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 EMP.
- » Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- » Have overall responsibility of the EMP and its implementation.
- » Conduct audits to ensure compliance to the EMP.
- » Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- » 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.

**Environmental Control Officer** (ECO) will be responsible for monitoring, reviewing, and verifying compliance by the Contractor with the environmental specification and accordingly 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 EMP.
- » 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 EMP is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that if the EMP conditions or specifications are not followed then appropriate measures are undertaken to address this.
- » 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 EMP.
- » Ensure that the compilation of progress reports for submission to the Project Manager, 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.

**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 EMP must be easily accessible to all on-site staff members.
- » Employees must be familiar with the requirements of this EMP 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 EMP.
- » 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 EMP (i.e. ensure their staff are appropriately trained as to the environmental obligations).

## 6.2 Objectives

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

### OBJECTIVE: Ensure appropriate site establishment

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Area infrastructure (i.e. PV panels, and substation).</li> <li>» Linear infrastructure (i.e. power line, and access roads).</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Hazards to landowners and public.</li> <li>» Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located.</li> <li>» Loss of threatened plant species and protected tree species.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Open excavations (foundations and cable trenches).</li> <li>» Movement of construction vehicles in the area and on-site.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To secure the site against unauthorised entry.</li> <li>» To protect members of the public/landowners/residents.</li> <li>» No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.</li> </ul>

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor	Site establishment, and duration of construction
Where necessary control access, fence, and secure area.	Contractor	Site establishment, and duration of construction
Fence and secure contractor's equipment camp.	Contractor	Site establishment
Establish appropriately bunded areas for storage of hazardous materials (i.e. fuel to be required during construction).	Contractor	Site establishment
All development footprints should be appropriately fenced off and clearly demarcated.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site.	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 drainage lines.	Contractor	Site establishment, and duration of construction
Supply adequate waste collection bins 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.	Contractor	Site establishment, and duration of construction
Rake 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 warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager.	Contractor	Site establishment, and duration of construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Site is secure and there is no unauthorised entry.</li> <li>» No members of the public/ landowners injured.</li> <li>» Appropriate and adequate waste management and sanitation</li> </ul>
------------------------------	---

	facilities provided at construction site.
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» An incident reporting system will be used to record non-conformances to the EMP.</li> <li>» 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.</li> </ul>

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

Less than 100 people are expected to be employed during the construction phase, of which 10% will be low skilled positions, 20% semi-skilled, and 70% skilled. Low skilled and semi-skilled positions will ideally be filled by locals living in and around Kakamas and Keimoies. Workers not living in the area, including those for skilled positions, will not be housed on site. However, a 24-hour security team will be required on site.

<b>Project Component/s</b>	» Area and linear infrastructure.
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Damage to indigenous natural vegetation and sensitive areas.</li> <li>» Damage to and/or loss of topsoil (i.e. pollution, compaction etc.).</li> <li>» Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities.</li> <li>» Pollution/contamination of the environment.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Vegetation clearing and levelling of equipment storage area/s.</li> <li>» Access to and from the equipment storage area/s.</li> <li>» Ablution facilities.</li> <li>» Contractors not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Limit equipment storage within demarcated designated areas.</li> <li>» Ensure adequate sanitation facilities and waste management practices.</li> <li>» Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
The siting of the construction equipment camp/s must take cognisance of any sensitive areas identified by the EIA studies. The location of this construction equipment camp/s shall be approved by the project ECO.	Contractor	Pre-construction

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Site establishment, and during construction
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Contractor	Duration of Contract
Ensure waste removal facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction
The terms of this EMP and the Environmental Authorisation (once issued) must be included in all tender documentation and Contractors contracts	NetWorx S28 Energy	Tender process
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. Records of all training undertaken must be kept.	Contractor	Duration of construction
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. A minimum of one toilet shall be provided per 15 persons at each working area such as the Contractor's camp	Contractor and sub-contractor/s	Duration of contract
Cooking and eating of meals must take place in a designated area. No firewood or kindling may be gathered from the site or surrounds.	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.	Contractor and sub-contractor/s	Duration of contract
No one other than the ECO or personnel authorised by the ECO may disturb flora or fauna outside of the demarcated construction area/s.	Contractor and sub-contractor/s	Duration of contract
Fire fighting equipment and training must be provided before the construction phase commences.	Contractor and sub-contractor/s	Duration of contract
Draft Code of Conduct for construction workers.	Contractor and sub-contractor/s	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	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.	Contractor and sub-contractor/s	Construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» The construction camps have avoided sensitive areas, as approved by the ECO.</li> <li>» Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement.</li> <li>» All areas are rehabilitated promptly after construction in an area is complete.</li> <li>» Excess vegetation clearing and levelling is not reported by the ECO.</li> <li>» No complaints regarding contractor behaviour or habits.</li> <li>» Appropriate training of all staff is undertaken prior to them commencing work on the construction site.</li> <li>» Code of Conduct drafted before commencement of construction phase.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Regular audits of the construction camps and areas of construction on site by the ECO.</li> <li>» Proof of disposal of sewage at an appropriate wastewater treatment works.</li> <li>» An incident reporting system should be used to record non-conformances to the EMP.</li> <li>» Observation and supervision of Contractor practices throughout construction phase by the ECO.</li> <li>» Complaints will be investigated and, if appropriate, acted upon.</li> <li>» An incident reporting system will be used to record non-conformances to the EMP.</li> </ul>

**OBJECTIVE: Maximise local employment and business 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.

<b>Project Component/s</b>	» Construction activities associated with the establishment of the facility.
<b>Potential Impact</b>	» The opportunities and benefits associated with the creation of local employment and business.
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals.</li> <li>» The inflow of various specialists from outside the study area and even abroad.</li> <li>» Sourcing of individuals with skills similar to the local labour pool outside the municipal area.</li> </ul>
<b>Mitigation: Target/Objective</b>	» Employment of a maximum number of low-skilled to semi-skilled workers for the project from the local area where possible.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
As far as possible, maximise employment of local community members, i.e. source labour from within the municipal area focused on the communities in closest proximity to the site should be undertaken where possible.	NetWorx S28 Energy, Local Municipality, and Contractor	Duration of construction
A broad-based approach should be followed to identify and involve relevant organisations which could assist the main contractor and developer in identifying people whose skills may correspond with the required job specifications.	NetWorx S28 Energy, Local Municipality, and contractor	Pre-construction
An equitable process should be promoted whereby locals and previously disadvantaged individuals (including women) are considered for employment opportunities.	NetWorx S28 Energy, and Local Municipality	Duration of construction
Tender documentation should contain guidelines for the involvement of labour, entrepreneurs, businesses, and SMMEs from the local sector.	NetWorx S28 Energy, and Contractor	Pre-construction
Skills audit to be undertaken to determine training and skills development requirements	NetWorx S28 Energy, and Contractor	Pre-construction
A local labour desk should be set-up (if not already established) in the beneficiary communities to co-ordinate the process of involving local labour.	NetWorx S28 Energy, and Contractor	Pre-construction
Develop a database of local BEE service providers and ensure that they are informed of tenders and job opportunities.	NetWorx S28 Energy	Pre-construction and construction

Mitigation: Action/Control	Responsibility	Timeframe
Skills training and capacity building should be embarked upon from the onset of the construction phase and even prior to the construction phase if possible.	NetWorx S28 Energy, and Contractor	Pre-construction and construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Job opportunities, especially of low to semi-skilled positions, are primarily awarded to members of local communities as appropriate.</li> <li>» Locals and previously disadvantaged individuals (including women) are considered during the hiring process.</li> <li>» SMMEs are awarded contracts, where possible, during the construction phase.</li> <li>» Labour, entrepreneurs, businesses, and SMMEs from the local sector are awarded jobs, where possible, based on requirements in the tender documentation.</li> <li>» The involvement of local labour is promoted.</li> <li>» Reports are not made from members of the local communities regarding unrealistic employment opportunities or that only outsiders were employed.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Developer and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.</li> </ul>

**OBJECTIVE: Minimise the potential impacts on family structures and social networks associated with presence of construction workers from outside the area**

Even though the inflow of jobseekers is likely to occur, the probability of this issue becoming problematic and resulting in severe negative social impacts is seen to be improbable.

Other possible negative impacts due to the workforce's presence in the area and especially when jobseekers come to the area would include misconduct of workers, trespassing of workers on privately owned farms, the possible increase in crime, littering, increase in traffic, increase in noise, the development of informal vending stations, and poaching of livestock.

<b>Project Component/s</b>	» Inflow of an outside workforce and jobseekers.
<b>Potential Impact</b>	» The inflow of outsiders and jobseekers could result in negative impacts on the surrounding property owners and local communities, and could even lead to conflict between the locals

	and these outsiders.
<b>Activities/Risk Sources</b>	» The presence of construction workers can affect negatively on family structures and social networks, especially in small, rural communities.
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential impact of construction workers on the local community. This can be achieved by maximising the number of locals employed during the construction phase and minimising the number of workers housed on the site.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Attempt to maximise employment of the low-skilled workers from the local area. This should be included in the tender documents. Construction workers should be recruited from the local area in and around the towns of Keimoes and Kakamas.	Contractor	Pre-construction and construction
Develop and implement a Code of Conduct for construction workers	Contractor	Pre-construction and construction
Provide opportunities for workers to go home over weekends.	Contractor	Construction
Local labourers should remain at their existing residences.	Contractor	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.	NetWorx Energy S28	Pre-construction and construction
On-site security should be active prior to the construction phase.	NetWorx Energy S28	Pre-construction
Construction workers should be easily identifiable by wearing uniforms and even identity tags.	ECO	Construction
The construction site should be appropriately fenced.	Contractors	Pre-construction
The applicant, local leaders, and the Local Municipality should jointly develop a strategy to minimise the influx of jobseekers to the area.	NetWorx Energy, local leaders and Local Municipality	Pre-construction and Construction
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.	Contractors	Construction
Information distributed as part of the existing HIV/Aids	NetWorx S28	Construction

Mitigation: Action/Control	Responsibility	Timeframe
awareness campaigns in the area should again be focused on and communicated to the local workforce.	Energy and Contractors	
Develop a transparent communication and recruitment process to minimise the influx of jobseekers to the area.	NetWorx S28 Energy, local leaders and Local Municipality	Pre-construction
The recruitment process and the use of contractors should be clearly communicated to the local communities. The communication strategy should ensure that unrealistic employment expectations are not created	NetWorx S28 Energy	Pre-construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Locals are employed where possible.</li> <li>» Reports are not made from members of the local communities regarding unrealistic employment opportunities and/or negative intrusions or even possible increase in crime.</li> <li>» Sound environmental management of the construction site.</li> <li>» No conflict between outsiders, jobseekers, and local community members.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» NetWorx S28 Energy and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.</li> </ul>

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

The components for the proposed facility will be transported to site, in sections, by road. The study site is accessible off the N14 from Keimoes to Kakamas.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Delivery of any component required within the construction phase.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals.</li> <li>» Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted</li> <li>» Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Construction vehicle movement.</li> <li>» Speeding on local roads.</li> <li>» Degradation of local road conditions.</li> </ul>

	<ul style="list-style-type: none"> <li>» Site preparation and earthworks.</li> <li>» Foundations or plant equipment installation.</li> <li>» Transportation of ready-mix cement from off-site batching plant to the site.</li> <li>» Mobile construction equipment movement on-site.</li> <li>» Power line and substation construction activities.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Minimise impact of traffic associated with the construction of the facility on local traffic volume, existing infrastructure, property owners, animals, and road users.</li> <li>» To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction</li> <li>» To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions</li> </ul>

Mitigation: Action/Control	Responsibility	Timeframe
The contractor's plans, procedures and schedules, as well as the anticipated intrusion impacts should be clarified with affected parties prior to the commencement of construction activities on site.	NetWorx S28 Energy and ECO	Pre-construction
Source general construction material and goods locally where available to limit transportation over long distances.	NetWorx S28 Energy, and Contractor	Pre-construction and construction
Appropriate dust suppression techniques must be implemented to minimise dust from gravel roads.	NetWorx S28 Energy and ECO	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.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	NetWorx S28 Energy and ECO	Construction
All relevant permits for abnormal loads must be applied for from the relevant authority.	Contractor (or appointed transportation contractor)	Pre-construction
A designated access to the proposed site must be created to ensure safe entry and exit.	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.	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.	Contractor (or appointed transportation contractor)	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	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).	Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	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.	Contractor	Duration of contract
Keep hard road surfaces as narrow as possible.	Contractor	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Vehicles keeping to the speed limits.</li> <li>» Vehicles are in good working order and safety standards are implemented.</li> <li>» Local residents and road users are aware of vehicle movements and schedules.</li> <li>» No construction traffic related accidents are experienced.</li> <li>» Local road conditions and road surfaces are up to standard.</li> <li>» Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Developer and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.</li> </ul>

**OBJECTIVE: To avoid and or minimise the potential impact of the activities during the construction on the safety of local communities and the potential loss of stock and damage to farm infrastructure**

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.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Construction and establishment activities associated with the establishment of the PV facility, including infrastructure etc.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impact on safety of farmers and communities (increased crime etc.) and potential loss of livestock due to stock theft by</li> </ul>

	construction workers and also damage to farm infrastructure, such as gates and fences.
<b>Activities/Risk Sources</b>	» The presence of construction workers on the site can pose a potential safety risk to local farmers and communities and may result in stock thefts. The activities of construction workers may also result in damage to farm infrastructure.
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential impact on local communities and their livelihoods.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
The housing of construction workers on the site should be limited to security personnel.	Contractor	Construction
Consider establishing a Monitoring Forum with the adjacent farmers and develop a Code of Conduct for construction workers	NetWorx S28 Energy & Contractor	Pre-construction
Property owners, their workers, as well as local communities should be motivated to be involved in crime prevention and by reporting crimes.	NetWorx S28 Energy, and Local communities	All phases of project
The construction site should be fenced and access to the area controlled.	NetWorx S28 Energy, and Contractor	All phases of project
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.	NetWorx S28 Energy, and Contractor	Construction
Procedures and measures to prevent, and in worst cases, attend to fires should be developed in consultation with the surrounding property owners and the Local Municipality	NetWorx S28 Energy, Local Municipality, and local communities	Pre-construction and when required
Contact details of emergency services should be prominently displayed on site.	NetWorx S28 Energy, and 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	NetWorx S28 Energy, and Contractor	Construction

<b>Performance Indicator</b>	» No criminal activities and theft of livestock are reported. » No fires or on-site accidents occur.
<b>Monitoring</b>	» NetWorx S28 Energy, and appointed ECO must monitor indicators listed above to ensure that they have been implemented.

**OBJECTIVE: 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.

<b>Project Component/s</b>	» Construction activities associated with the area and linear infrastructure.
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» 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.</li> <li>» Release of minor amounts of air pollutants (for example NO<sub>2</sub>, CO and SO<sub>2</sub>) from vehicles and construction equipment</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Clearing of vegetation and topsoil.</li> <li>» Excavation, grading, scraping, levelling, digging, drilling.</li> <li>» Transport of materials, equipment, and components on internal access roads.</li> <li>» Re-entrainment of deposited dust by vehicle movements.</li> <li>» Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces.</li> <li>» Fuel burning vehicle and construction engines.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure emissions from all vehicles and construction engines are minimised, where possible, for the duration of the construction phase</li> <li>» 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</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Roads must be maintained in a manner that will ensure that nuisance from dust emissions from road or vehicle sources are not visibly excessive.	Contractor	Site establishment and construction
Ensure that any damage to roads because of construction activities is repaired before completion of the construction phase.	Contractor	Site establishment and construction
Appropriate dust suppressant must be applied on all exposed areas and stockpiles as required to minimise/control airborne dust.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown must be	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
covered with tarpaulins if required by the wind conditions.		
Speed of construction vehicles must be restricted, as defined by the ECO.	Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences outside the site.	Contractor	Duration of contract
Strictly control vibration pollution from compaction plant or excavation plant.	Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable once construction in an area is completed.	Contractor	Completion of construction
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints from affected residents or community regarding dust or vehicle emissions.</li> <li>» Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase commences.</li> <li>» Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.</li> <li>» All heavy vehicles equipped with speed monitors before they are used in the construction phase in accordance with South African vehicle legislation.</li> <li>» Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods:</li> <li>» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager.</li> <li>» 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.</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> </ul>

**OBJECTIVE: Minimisation of development footprint and disturbance to topsoil**

PV technology typically requires a large area for the establishment of the panels (i.e. in this scenario a minimum of 392 ha of the broader 3 600 ha site will be

permanently utilised by the panels and associated infrastructure, including the servitude required for the power line). During the construction phase local site-specific impacts may occur because of physical disturbance/modification to the site.

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

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV panels.</li> <li>» Power line.</li> <li>» Ancillary buildings.</li> <li>» Access roads.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Impacts on natural vegetation.</li> <li>» Impacts on soil.</li> <li>» Loss of topsoil.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks.</li> <li>» Excavation of foundations.</li> <li>» Construction of site access road.</li> <li>» Site preparation (e.g. compaction).</li> <li>» Power line construction activities.</li> <li>» Stockpiling of topsoil, subsoil and spoil material.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To retain natural vegetation, where possible.</li> <li>» To minimise footprints of disturbance of vegetation/habitats.</li> <li>» Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas.</li> <li>» Minimise spoil material.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	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 and their habitats is restricted.	Contractor	Site establishment & duration of contract
Construction activities must be restricted to demarcated areas so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract
Any fill material required 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.	Contractor	Duration of contract
Excavated topsoil must be stockpiled in designated areas separate from base material and covered until	Contractor	Site establishment

Mitigation: Action/Control	Responsibility	Timeframe
replaced during rehabilitation. As far as possible, topsoil must not be stored for longer than 3 months.		& duration of contract
Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur.	Contractor	Site establishment Maintenance: for duration of contract
As far as possible, the maximum topsoil stockpile height must not exceed 2 m in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.	Contractor	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Minimal disturbance outside of designated work areas.</li> <li>» Minimise clearing of existing vegetation.</li> <li>» Topsoil appropriately stored.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation clearing and soil management activities by ECO throughout construction phase.</li> <li>» Supervision of all clearing and earthworks.</li> <li>» An incident reporting system will be used to record non-conformances to the EMP.</li> </ul>

**OBJECTIVE: Minimise the impacts on and loss of indigenous vegetation and faunal habitat**

Although the vegetation types present on site are classified as Least or Not Threatened and not considered to be of high conservation value, impacts on natural vegetation must be limited in order to minimise impacts on vegetation and fauna habitats.

<b>Project Component/s</b>	» Any infrastructure or activity that will result in disturbance to natural areas.
<b>Potential Impact</b>	» Loss of indigenous natural vegetation due to construction activities, or poor behaviour on the part of the construction team.
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Vegetation clearing.</li> <li>» Construction of access roads.</li> <li>» Placement of power line towers.</li> <li>» Chemical contamination of the soil by vehicles and machinery.</li> <li>» Operation of construction camps.</li> <li>» Storage of materials required for construction.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Minimise footprints of disturbance of vegetation/habitats.</li> <li>» Minimise loss of indigenous vegetation.</li> </ul>

» Minimise loss of species of conservation concern.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing.	Contractor	Construction
Limit unnecessary impacts on surrounding natural vegetation, e.g. driving around in the veld, use access roads only.	Contractor	Construction
A site rehabilitation programme must be implemented (refer Chapter 6).	Contractor in consultation with Specialist	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.	Specialist	Pre-construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Minimal disturbance outside of designated work areas.</li> <li>» Minimised clearing of existing/natural vegetation and faunal habitats.</li> <li>» Limited impacts on areas of identified and demarcated sensitive habitats/vegetation.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation of vegetation clearing activities by ECO throughout construction phase.</li> <li>» Monitoring of vegetation clearing activities in terms of permit conditions.</li> <li>» Supervision of all clearing and earthworks.</li> <li>» An incident reporting system will be used to record non-conformances to the EMP.</li> </ul>

**OBJECTIVE: Minimise the establishment and spread of alien invasive plants**

Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica*, *Opuntia imbricata*, *Prosopis glandulosa*, *Prosopis velutina*, *Atriplex numularia*, and *Nicotiana glauca*. The shrub, *Prosopis glandulosa*, is potentially the most problematic as it invades riverbeds and drainage lines in semi-arid and arid regions and has been recorded near to the site. There is therefore the potential for alien plants to spread or invade following disturbance on site.

<b>Project Component/s</b>	» Any infrastructure or activity that will result in disturbance to natural areas.
<b>Potential Impact</b>	» Invasion of natural vegetation surrounding the site by declared

	weeds or invasive alien species.
<b>Activities/Risk Sources</b>	» Construction, environmental management.
<b>Mitigation: Target/Objective</b>	» There is a target of no alien plants within project control area during the construction and operation phases.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
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.	Contractor	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).	Contractor	Construction and operation
Immediately control any alien plants that become established using registered control methods.	Contractor	Construction and operation

<b>Performance Indicator</b>	» For each alien species: number of plants and aerial cover of plants within project area and immediate surroundings.
<b>Monitoring</b>	» Ongoing monitoring of area by ECO during construction. » 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: Minimise impacts on drainage lines**

The site is in a very arid area; however, several drainage lines cross the site. According to the National Water Act, these are classified as wetlands or water resources. Construction within any of these areas, would lead to some direct or

indirect loss of or damage to some of these areas or changes to the catchment of these areas.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Any infrastructure or activity that will result in disturbance to drainage lines.</li> <li>» Storage of chemicals and hazardous materials.</li> <li>» Ablution facilities.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Damage to drainage lines areas by any means that will result in hydrological changes (includes erosion, siltation, dust, direct removal of soil of vegetation, dumping of material within wetlands). The focus should be on the functioning of the drainage lines as natural systems.</li> <li>» Pollutants such as lime-containing (high pH) construction materials such as concrete, cement, grouts, etc. could enter drainage lines.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Construction of infrastructure.</li> <li>» Fuelling, usage and maintenance of construction vehicles.</li> <li>» Cement batching and usage.</li> <li>» Labourer using ablution facilities.</li> <li>» Use of any chemicals or hazardous materials during construction.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» No damage to drainage lines within the project area.</li> <li>» No incidents related to spills of chemicals and hazardous materials.</li> <li>» No misconduct of construction workers (i.e. ablution activities, washing).</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Construction of infrastructure at least 50 m from drainage lines.	Contractor	Construction
Location of chemical toilets at least 100 m outside of the 1:100 year floodline.	Contractor	Construction
Strict use and management of all hazardous materials used on site.	Contractor	Construction
Strict management of potential sources of pollution (i.e. hydrocarbons from vehicles and machinery, cement during construction, etc.).	Contractor	Construction
Strict control over the behaviour of construction workers restricting activities to within demarcated areas.	Contractor	Construction
Ensure hard-engineered erosion-control structures are maintained and rehabilitated using appropriate indigenous vegetation.	Contractor	Construction
Any stormwater within the site must be handled in a suitable manner, i.e. separate clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trapping sediments	Developer / Operator	Planning, design and operation

Mitigation: Action/Control	Responsibility	Timeframe
and reduce flow velocities.		
<b>Performance Indicator</b>	» No permanent infrastructure within drainage lines.	
<b>Indicator</b>	» No impacts on drainage lines as a result of activities on site.	
<b>Monitoring</b>	» On-going monitoring of area by ECO during construction.	

**OBJECTIVE: 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 (i.e. into the drainage lines)
- » Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of the drainage lines.
- » 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.

<b>Project Component/s</b>	» PV panels. » Power line. » Ancillary buildings. » Access roads.
<b>Potential Impact</b>	» Soil and rock degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
<b>Activities/Risk Sources</b>	» 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.
<b>Mitigation: Target/Objective</b>	» 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
Identify disturbance areas and restrict construction	Contractor	Before and

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
activity to these areas.		during construction
Rehabilitate disturbance areas as soon as possible when construction in an area is complete.	Contractor	During and after construction
Access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.	Engineer, ECO, and Contractor	Design and construction
Where access roads cross natural drainage lines, culverts must be designed to allow free flow and regular maintenance must be carried out.	Engineer, ECO, and Contractor	Design, before and during construction
Dust control on construction site (i.e. wetting of denuded areas).	Contractor	Construction
Minimise removal of vegetation which adds stability to soil.	ECO/Contractor	Construction
Soil conservation: Stockpile topsoil for re-use in rehabilitation phase, protect stockpile from erosion	Contractor	Before and during construction
Erosion control measures (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, shade nets, or temporary mulching over denuded area as required).	Contractor, and ECO	Erection: Before construction Maintenance: Duration of contract
Control depth of excavations and stability of cut faces/sidewalls.	Engineer, ECO, and Contractor	Before construction and Maintenance Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No activity outside demarcated disturbance areas.</li> <li>» Acceptable level of activity within disturbance areas, as determined by the ECO.</li> <li>» Acceptable level of soil erosion around site, as determined by the ECO.</li> <li>» Acceptable level of increased siltation in drainage lines, as determined by the ECO.</li> <li>» Acceptable state of excavations, as determined by the ECO.</li> <li>» No activity in restricted areas.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Monthly inspections of the site by the ECO.</li> <li>» Monthly inspections of sediment control devices.</li> <li>» Monthly inspections of surroundings, including drainage lines.</li> <li>» Immediate reporting of ineffective sediment control systems.</li> </ul>

- » An incident reporting system will record non-conformances.

**OBJECTIVE: Protection of heritage resources**

The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. Large-scale excavations for foundations will damage archaeological sites, as will road construction activities.

Archaeological or other heritage materials occurring in the path of any surface or sub-surface disturbances associated with any aspect of the development are highly likely to be subject to destruction, damage, excavation, alteration, or removal. The objective should be to limit such impacts to the primary activities associated with the development and hence to limit secondary impacts during the medium and longer term working life of the facility.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV panels.</li> <li>» Substation.</li> <li>» Power line.</li> <li>» Ancillary buildings.</li> <li>» Access roads.</li> </ul>
<b>Potential Impact</b>	» Heritage objects or artefacts found on site are inappropriately managed or destroyed
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Site preparation and earthworks</li> <li>» Foundations or plant equipment installation</li> <li>» Mobile construction equipment movement on site</li> <li>» Power line and access roads construction activities.</li> </ul>
<b>Mitigation: Target/Objective</b>	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas (which will not be surveyed in detail by a heritage specialist).	Contractor in consultation with Specialist	Pre-construction
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	ECO/specialist	Pre-construction
Project employees and any contract staff will	NetWorx S28	Duration of

Mitigation: Action/control	Responsibility	Timeframe
maintain, at all times, a high level of awareness of the possibility of discovering heritage sites.	Energy/ Contractor	contract
If a heritage object is found, work in that area will 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.	NetWorx S28 Energy, and Contractor in consultation with Specialist	Duration of contract
Apply for sampling permits from SAHRA for work on any archaeological sites identified as needing intervention.	NetWorx S28 Energy in consultation with Specialist	Pre-construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Zero disturbance outside of designated work areas.</li> <li>» All heritage items located are dealt with as per the legislative guidelines.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation of excavation activities by ECO throughout construction phase.</li> <li>» Supervision of all clearing and earthworks.</li> <li>» Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported.</li> <li>» Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites.</li> <li>» An incident reporting system will be used to record non-conformances to the EMP.</li> </ul>

**OBJECTIVE: Minimisation of visual impacts associated with construction**

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as road users (i.e. in light of the existing power line and other proposed solar facilities in the area).

The placement of lay-down areas and temporary construction camps 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.

The primary visual impact of the facility and ancillary infrastructure, including the power line, is not possible to mitigate. The functional design of the structures

cannot be changed in order to reduce visual impacts. Secondary impacts anticipated as a result of the proposed facility (i.e. visual character, sense of place and tourism potential) are not possible to mitigate.

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

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Reduce the construction period through careful planning and productive implementation of resources.	NetWorx S28 Energy, or contractor	Planning
Plan the placement of lay-down areas and temporary construction accommodation in order to minimise vegetation clearing.	NetWorx S28 Energy, or contractor	Planning
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	NetWorx S28 Energy, or contractor	Construction
Ensure that rubble, litter, and disused construction materials are managed and removed regularly.	NetWorx S28 Energy, or contractor	Construction
Ensure that all infrastructure and the site and general surrounds are maintained in a neat a manner.	NetWorx S28 Energy, or contractor	Construction
Reduce and control construction dust using approved dust suppression techniques.	Contractor	Construction
As far as possible, restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Contractor	Construction
Rehabilitate all disturbed areas, construction areas, roads, and servitudes to acceptable visual standards.	Contractor	Construction

<b>Performance Indicator</b>	» 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.
<b>Monitoring</b>	» Monitoring of vegetation clearing during construction.

» Monitoring of rehabilitated areas post construction.

**OBJECTIVE: Appropriate handling and management of waste**

The main wastes expected to be generated by the construction of the PV plant will include general construction waste, hazardous waste (i.e. fuel), and liquid waste (including grey water and sewage)

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.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV panels.</li> <li>» Power line.</li> <li>» Ancillary buildings.</li> <li>» Access roads.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Inefficient use of resources resulting in excessive waste generation.</li> <li>» Litter or contamination of the site or water through poor waste management practices.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Packaging.</li> <li>» Other construction wastes.</li> <li>» Hydrocarbon use and storage.</li> <li>» Spoil material from excavation, earthworks, and site preparation.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To comply with waste management legislation.</li> <li>» To minimise production of waste.</li> <li>» To ensure appropriate waste storage and disposal.</li> <li>» To avoid environmental harm from waste disposal.</li> <li>» A waste manifests should be developed for the ablutions showing proof of disposal of sewage at appropriate water treatment works.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	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	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
scrap), and contaminated waste as required. Location 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.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	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.	Contractor	Duration of contract
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	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.	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.	Contractor	Duration of contract
Regularly serviced chemical toilets facilities will be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction
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 on site.	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.	Contractor	Duration of construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints received regarding waste on site or indiscriminate dumping.</li> <li>» Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately.</li> </ul>
------------------------------	--

	» Provision of all appropriate waste manifests for all waste streams.
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation and supervision of waste management practices throughout construction phase.</li> <li>» Waste collection will be monitored on a regular basis.</li> <li>» Waste documentation completed.</li> <li>» 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.</li> <li>» An incident reporting system will be used to record non-conformances to the EMP.</li> </ul>

**OBJECTIVE: Appropriate handling and storage of chemicals, hazardous substances**

The construction phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents.

<b>Project Component/s</b>	» Storage and handling of chemicals, hazardous substances.
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Release of contaminated water from contact with spilled chemicals.</li> <li>» Generation of contaminated wastes from used chemical containers.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Vehicles associated with site preparation and earthworks.</li> <li>» Construction activities of area and linear infrastructure.</li> <li>» Hydrocarbon use and storage.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons.</li> <li>» To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons.</li> </ul>

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract
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.	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
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.	Contractor	Duration of contract
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	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.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substation must be removed from site by licensed contractors.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately banded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	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.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	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.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No chemical spills outside of designated storage areas.</li> <li>» No unattended water or soil contamination by spills.</li> <li>» No complaints received regarding waste on site or indiscriminate dumping.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction</li> </ul>

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 EMP.

### 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 EMP 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:

- » 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.

The Contractor may not commence the activity covered by the Method Statement until it has been approved, 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.

#### **6.4 Awareness and Competence: Construction Phase**

**OBJECTIVE: Ensure 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 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 Contractors 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.
- » Ensuring that a copy of the EMP is readily available on-site, and that all site staff are aware of the location and have access to the document.
- » Employees will be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- » Employees must undergo training for the operation and maintenance activities associated with a PV plant and have a basic knowledge of potential environmental impacts and how they can be minimised and mitigated.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course.
- » The course should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Awareness of any other environmental matters, which are deemed 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.
- » Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution.

- » 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.

## 6.5 Monitoring Programme: Construction Phase

**OBJECTIVE: 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 EMP, but also to monitor any environmental issues and impacts which have not been accounted for in the EMP 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, NetWorx S28 Energy will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project 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.

The ECO will ensure compliance with the EMP, will conduct monitoring activities, and will report any non-compliance or where corrective action is necessary to the Site Manager and/or any other monitoring body stipulated by the regulating authorities. The ECO must have the appropriate experience and qualifications to undertake the necessary tasks.

**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: 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.

<b>Project Component/s</b>	» Area and linear infrastructure.
<b>Potential Impact</b>	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Temporary construction areas.</li> <li>» Temporary access roads/tracks.</li> <li>» Power line servitudes.</li> <li>» Other disturbed areas/footprints.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Ensure and encourage site rehabilitation of disturbed areas.</li> <li>» Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.</li> </ul>

Mitigation: Action/Control	Responsibility	Timeframe
All temporary facilities, equipment, and waste materials must be removed from site.	Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor	Following completion of construction

Mitigation: Action/Control	Responsibility	Timeframe
		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.	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.	Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked.	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.	Contractor	Following completion of construction activities in an area
A rehabilitation plan should be drawn up that specifies the rehabilitation process and should be approved by the ECO.	Contractor, NetWorx S28 Energy and ECO	Pre-construction
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.	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.	NetWorx S28 Energy in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as steep slopes, hills, and drainage lines is necessary.	NetWorx S28 Energy in consultation with rehabilitation specialist	Post-rehabilitation
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	NetWorx S28 Energy in consultation	Post-rehabilitation

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
	with rehabilitation specialist	
<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities.</li> <li>» Topsoil replaced on all areas and stabilised where practicable or required after construction and temporarily utilised areas.</li> <li>» Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites.</li> <li>» Completed site free of erosion and alien invasive plants.</li> </ul>	
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented during the operational lifespan of the facility.</li> <li>» On-going alien plant monitoring and removal should be undertaken on an annual basis.</li> </ul>	

**MANAGEMENT PROGRAMME: OPERATION**

**CHAPTER 8**

**Overall Goal:** Ensure that the operation of the PV plant 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 facility in a way that:

- » Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
- » Enables the PV plant 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 operational EMP.

**8.1. Objectives**

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

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

Indirect impacts on vegetation and 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.

<b>Project component/s</b>	<ul style="list-style-type: none"> <li>» Areas requiring regular maintenance.</li> <li>» Route of the security team.</li> <li>» Areas disturbed during the construction phase and subsequently rehabilitation at its completion.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Disturbance to or loss of vegetation and/or habitat.</li> <li>» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the</li> </ul>

	requirement for on-going management intervention.
<b>Activity/Risk Source</b>	» Movement of employee vehicles within and around site.
<b>Mitigation: Target/Objective</b>	» 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.	NetWorx S28 Energy	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	NetWorx S28 Energy	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	NetWorx S28 Energy	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.	NetWorx S28 Energy in consultation with Specialist	Annual monitoring until successful re-establishment of vegetation in an area

<b>Performance Indicator</b>	» No further disturbance to vegetation or terrestrial faunal habitats. » Continued improvement of rehabilitation efforts.
<b>Monitoring</b>	» Observation of vegetation on-site by facility manager and environmental manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

**OBJECTIVE: Protection of avifauna**

During the operation of the facility, the threat of collision with the power line is the biggest potential threat to avifauna, particularly sensitive, collision prone species that may occur in the study area. The threat of electrocution while perching on the power line and associated infrastructure serves as a threat to certain sensitive species, depending on the power line structures implemented.

<b>Project Component/s</b>	» Power line.
----------------------------	---------------

<b>Potential Impact</b>	» Collision and electrocution events with the overhead power line.
<b>Activities/Risk Sources</b>	» Operation of the power line without mitigation measures. .
<b>Mitigation: Target/Objective</b>	» Maintain a low number of collision, and electrocution events.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Ensure bird-friendly tower designs are implemented to minimise the risk of electrocutions	NetWorx S28 Energy	Construction
Notes of electrocution and collision events must be sent to a qualified Ornithologist for the recommendation of further mitigation measures if necessary.	ECO and avifauna specialist	Operation

<b>Performance Indicator</b>	» Minimal collision or electrocution events.
<b>Monitoring</b>	» Observation of electrocution or collision events with the power line. » Monitor power line servitudes for mortalities.

**OBJECTIVE: Minimisation of visual impacts**

The primary visual impact of the facility and its ancillary infrastructure, including the power line, is not possible to mitigate. The functional design of the structures cannot be changed in order to reduce visual impacts.

<b>Project Component/s</b>	» PV panels » Power line. » Access roads.
<b>Potential Impact</b>	» Visual impact of facility degradation and vegetation rehabilitation failure. » Lighting influences from the facility on surrounding areas.
<b>Activity/Risk Source</b>	» The proposed facility. » Power line.
<b>Mitigation: Target/Objective</b>	» To minimise potential for visual impact. » To ensure a well maintained and neat facility.

<b>Mitigation: Action/Control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Maintain the general appearance of the facility in an aesthetically pleasing way.	NetWorx S28 Energy	Operation.
Monitor rehabilitated areas, and implement remedial action as and when required.	NetWorx S28 Energy	Operation.

Mitigation: Action/Control	Responsibility	Timeframe
Use of light fixtures and the fitment of covers and shields will be designed to contain rather than spread light.	NetWorx S28 Energy	Operation and maintenance

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Well maintained and neat facility with intact vegetation on and near the facility.</li> <li>» Lighting impact and visual intrusion is minimal and no complaints received from settlements or homesteads.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Monitoring of rehabilitated areas.</li> </ul>

### OBJECTIVE: 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.
- » Degradation of the natural soil profile due to pollution.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» PV panels.</li> <li>» Power line.</li> <li>» Ancillary buildings.</li> <li>» Access roads.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Soil degradation.</li> <li>» Soil erosion.</li> <li>» Increased deposition of soil into drainage systems.</li> <li>» Increased run-off over the site.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Poor rehabilitation of cleared areas.</li> <li>» Rainfall - water erosion of disturbed areas.</li> <li>» Wind erosion of disturbed areas.</li> <li>» Concentrated discharge of water from construction activity.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Ensure rehabilitation of disturbed areas is maintained.</li> <li>» Minimise soil degradation (i.e. wetting).</li> <li>» Minimise soil erosion and deposition of soil into drainage lines.</li> <li>» Ensure continued stability of embankments/excavations.</li> </ul>

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	NetWorx Energy	S28 Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, and shade nets).	NetWorx Energy	S28 Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Acceptable level of soil erosion around site, as determined by the site manager.</li> <li>» Acceptable level of increased siltation in drainage lines, as determined by the site manager.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Inspections of site on a bi-annual basis.</li> <li>» Water management plan</li> </ul>

### OBJECTIVE: Minimise dust and air emissions

During the operational phase, limited gaseous or particulate emissions are anticipated from exhaust emissions (i.e. from operational vehicles), and from the augmentation plant. Windy conditions and the movement of vehicles on site may lead to dust creation.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Hard engineered surfaces.</li> <li>» On-site vehicles.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Dust and particulates from vehicle movement to and on-site.</li> <li>» Release of minor amounts of air pollutants (for example NO<sub>2</sub>, CO and SO<sub>2</sub>) from vehicles and the augmentation plant.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Re-entrainment of deposited dust by vehicle movements.</li> <li>» Wind erosion from unsealed roads and surfaces.</li> <li>» Fuel burning vehicle and construction engines.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» To ensure emissions from all vehicles are minimised, where possible.</li> <li>» To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements.</li> </ul>

Mitigation: Action/Control	Responsibility	Timeframe
Roads must be maintained in a manner that will ensure that nuisance to the community from dust is not visibly excessive.	NetWorx Energy	S28 Operation
Appropriate dust suppressant must be applied to the roads as required to minimise/control airborne dust.	NetWorx Energy	S28 Duration of contract
Speed of vehicles must be restricted, as defined by the Environmental Manager.	NetWorx Energy	S28 Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Vehicles and equipment must be maintained in a road-worthy condition at all times.	NetWorx S28 Energy	Duration of contract

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints from affected residents or community regarding dust or vehicle emissions.</li> <li>» Dust suppression measures implemented for where required.</li> <li>» Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager.</li> <li>» 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.</li> <li>» An incident reporting system must be used to record non-conformances to the EMP.</li> </ul>

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

The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

<b>Project Component/s</b>	» Operation and maintenance of the PV plant and associated infrastructure.
<b>Potential Impact</b>	» 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 PV plant infrastructure.
<b>Activities/Risk Sources</b>	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
<b>Mitigation: Target/Objective</b>	» 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.	NetWorx S28 Energy	Operation
Provide fire-fighting training to selected operation and maintenance staff.	NetWorx S28 Energy	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	NetWorx S28 Energy	Operation
Fire breaks should be established where and when	NetWorx S28	Operation

Mitigation: Action/Control	Responsibility	Timeframe
required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Energy	
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.	NetWorx Energy	S28 Operation
Contact details of emergency services should be prominently displayed on site.	NetWorx Energy	S28 Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» Fire fighting equipment and training provided before the operational phase commences.</li> <li>» Appropriate fire breaks in place and maintained.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» NetWorx S28 Energy must monitor indicators listed above to ensure that they have been met.</li> </ul>

**OBJECTIVE: Maximise local employment and business opportunities**

The facility is expected to be operational for more than 25 years during therefore, long-term direct job opportunities for locals could exist, although limited. However, in an area with such high unemployment figures, these limited opportunities should still be seen as a positive impact on the quality of life of those benefiting from the employment.

Some local procurement of goods, materials and services could occur which would result in positive economic spin-offs. These opportunities for local service providers to render services to the proposed facility could include maintenance of the guardhouse, gardening at the guardhouse, cleaning services, security services and maintenance or replacement of general equipment

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Day to day operational activities associated with the PV facility, including maintenance etc.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» The opportunities and benefits associated with the creation of local employment and business should be maximised.</li> </ul>
<b>Activities/Risk Sources</b>	<ul style="list-style-type: none"> <li>» Locals are not employed where the skills exist.</li> <li>» Local procurement is not undertaken if possible.</li> <li>» Local businesses are not supported.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» In the medium to long term employ as many locals as possible to fill the full time employment opportunities.</li> </ul>

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.	NetWorx S28 Energy	Operation
Identify local members of the community who are suitably qualified or who have the potential to be employed full time.	NetWorx S28 Energy	Operation
The skill requirements should be communicated to the local community leaders and community based organisations.	NetWorx S28 Energy	Operation
Local sourcing of materials, general services to assist in providing economic, and employment opportunities for the local people.	NetWorx S28 Energy	Operation

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» An employee list drawn up indicating the percentage of locals employed.</li> <li>» Local procurement is undertaken.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» NetWorx S28 Energy should be able to demonstrate that the above indicators are implemented.</li> </ul>

### OBJECTIVE: Appropriate handling and management of waste

The operation of the 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, and liquid waste.

<b>Project Component/s</b>	<ul style="list-style-type: none"> <li>» Substation.</li> <li>» Operation and maintenance staff.</li> <li>» Workshop.</li> </ul>
<b>Potential Impact</b>	<ul style="list-style-type: none"> <li>» Inefficient use of resources resulting in excessive waste generation.</li> <li>» Litter or contamination of the site or water through poor waste management practices.</li> <li>» Contamination of water or soil because of poor materials management.</li> </ul>
<b>Activity/Risk Source</b>	<ul style="list-style-type: none"> <li>» Transformers and switchgear for the substation.</li> <li>» Ancillary buildings.</li> </ul>
<b>Mitigation: Target/Objective</b>	<ul style="list-style-type: none"> <li>» Comply with waste management legislation.</li> <li>» Minimise production of waste.</li> <li>» Ensure appropriate waste disposal.</li> </ul>

- » 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.	NetWorx Energy	S28	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	NetWorx Energy	S28	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.	NetWorx Energy	S28	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.	NetWorx Energy	S28	Operation and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	NetWorx Energy	S28	Operation and maintenance
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	NetWorx Energy / waste management contractor	S28	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	NetWorx Energy / waste management contractor	S28	Operation
Used oils and chemicals: » 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	NetWorx Energy	S28	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	NetWorx Energy	S28	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	NetWorx Energy	S28	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of	NetWorx Energy	S28	Operation

Mitigation: Action/Control	Responsibility	Timeframe
licensed contractors.		

<b>Performance Indicator</b>	<ul style="list-style-type: none"> <li>» No complaints received regarding waste on site or indiscriminate dumping.</li> <li>» Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately.</li> <li>» Provision of all appropriate waste manifests.</li> <li>» No contamination of soil or water.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>» Waste collection must be monitored on a regular basis.</li> <li>» Waste documentation must be completed and available for inspection</li> <li>» An incidents/complaints register must be maintained, in which any complaints from the community must be logged.</li> <li>» Complaints must be investigated and, if appropriate, acted upon.</li> <li>» Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the ECO.</li> <li>» All appropriate waste disposal certificates accompany the monthly reports.</li> </ul>

**MANAGEMENT PROGRAMME: DECOMMISSIONING CHAPTER 9**

The solar infrastructure which will be utilised for the proposed PV plant is expected to have a lifespan of >25 years (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.*

**9.1. 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.

**9.2 Disassemble and Replace Infrastructure**

Disassembled components will be reused, recycled, or disposed of in accordance with regulatory requirements.

**OBJECTIVE: Avoid and or minimise the potential impacts associated with the decommissioning phase**

<b>Project Component/s</b>	» Decommissioning phase of the PV plant.
<b>Potential Impact</b>	» Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life. » Decommissioning is similar to the construction phase in that it will also create temporary employment opportunities.
<b>Activity/Risk Source</b>	» Decommissioning of the PV plant.
<b>Mitigation: Target/Objective</b>	» To avoid and or minimise the potential social impacts associated with decommissioning phase of the PV plant.

<b>Mitigation: Action/control</b>	<b>Responsibility</b>	<b>Timeframe</b>
Retrenchments should comply with current South African Labour Legislation.	NetWorx S28 Energy	Decommissioning

<b>Performance Indicator</b>	Relevant South African Labour Legislation.
<b>Monitoring</b>	No occurrences of dismissals not in-line with South African Labour Legislation.

## **FINALISATION OF THE EMP**

## **CHAPTER 10**

---

The EMP is a dynamic document, which must be updated to include any additional specifications as and when required. It is considered critical that this draft EMP be updated to include site-specific information and specifications following the final walk-through survey by specialists of the power line, and development site. This will ensure that the construction and operation activities are planned and implemented considering sensitive environmental features.