
PROPOSED PHOTOVOLTAIC FACILITY ON A SITE WEST OF KAKAMAS, NORTHERN CAPE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the Final Basic Assessment Report
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PROJECT DETAILS

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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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Kyoto Protocol: The Kyoto Protocol calls for developed countries to reduce their green house gas emissions during the commitment period (2008 - 2012) by 5.2% compared to 1990 levels. Developing countries, like South Africa, do not have a limit on their emissions.

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 cell: Semiconductors which absorb solar radiation to produce electricity

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).

Renewable energy feed-in tariff: REFITs are used to promote renewable energy and have been adopted in over 36 countries worldwide. The establishment of the REFIT in South Africa provides the opportunity for an increased contribution towards the sustained growth of the renewable energy sector, and to promote competitiveness between renewable and conventional energies in the medium and long-term. Under the National Energy Regulator Act (Act No. 40 of 2004), the Electricity Regulation Act (Act No. 4 of 2006), and all subsequent relevant amendment acts, the National Energy Regulator of South Africa (NERSA) has the mandate to determine the prices at and conditions under which electricity must be supplied by licence.

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
CHAPTER 1 PURPOSE & OBJECTIVES OF THE EMP	1
CHAPTER 2 PROJECT DETAILS	4
2.1 Activities and Components associated with the Proposed PV facility	5
CHAPTER 3 STRUCTURE OF THIS EMP	19
OBJECTIVE: Description of the objective in order to meet the overall goals	19
3.1. Project Team	20
CHAPTER 4 MANAGEMENT PLAN: PLANNING & DESIGN	21
4.1. Goal for Planning and Design	21
4.2. Objectives	21
OBJECTIVE: Ensure that the design of the facility responds to the identified environmental constraints and opportunities	21
OBJECTIVE: Ensure the mitigation and possible negation of visual impacts associated with the planning of the proposed facility	22
CHAPTER 5 MANAGEMENT PLAN: CONSTRUCTION	24
5.1. Overall Goal for Construction	24
5.2. Institutional Arrangements: Roles and Responsibilities for the Construction Phase of the PV facility	24
OBJECTIVE: To establish clear reporting, communication and responsibilities in relation to environmental incident.....	24
5.3. Objectives	26
OBJECTIVE: Site establishment and securing the site	26
OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase	28
OBJECTIVE: Avoid the potential impacts on family structures and social networks associated with presence of construction workers from outside the area	30
OBJECTIVE: 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	32
OBJECTIVE: Avoid and or minimise the potential impact on current and future farming activities in adjacent areas to the site during the construction phase.....	33
OBJECTIVE: To minimise traffic related impacts.....	33
OBJECTIVE: To minimise the potential impact on safety and security	35
OBJECTIVE: Noise control	38
OBJECTIVE: Management of dust and emissions to air	39
OBJECTIVE: Control loss of/disruption to indigenous vegetation.....	41
OBJECTIVE: Control the establishment and spread of alien invasive plants.....	41
OBJECTIVE: Limit impacts on threatened Ludwig’s Bustard and Kori Bustard.....	43
OBJECTIVE: Limit impacts on protected tree species	43

OBJECTIVE: Limit damage to watercourses	44
OBJECTIVE: Avoid and or minimise the potential risk of increased veld fires during the construction phase	45
OBJECTIVE: Control runoff and soil erosion and degradation	46
OBJECTIVE: Protection of sites of heritage value.....	48
OBJECTIVE: Management and possible negation of visual impacts associated with the construction of the proposed facility	49
OBJECTIVE: Appropriate handling and storage of chemicals, and waste	51
OBJECTIVE: Ensure disciplined conduct of on-site contractors and workers	53
5.4. Detailing Method Statements	55
OBJECTIVE: Ensure all construction activities/practices/procedures are undertaken with the appropriate level of environmental awareness to minimise environmental risk, in line with the specifications of the EMP.....	55
5.5. Awareness and Competence: Construction Phase of the PV facility.....	56
OBJECTIVE: 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.....	56
5.6. Monitoring Programme: Construction Phase of the PV facility	57
OBJECTIVE: Monitor the performance of the control strategies employed against environmental objectives and standards	57
CHAPTER 6 MANAGEMENT PLAN : REHABILITATION OF DISTURBED AREAS	59
6.1. Overall Goal for the Rehabilitation of Disturbed Areas	59
6.2. Objectives	59
OBJECTIVE: Ensure appropriate rehabilitation of disturbed areas following any executions such that residual environmental impacts are remediated or curtailed	59
CHAPTER 7 MANAGEMENT PLAN FOR the PV FACILITY: OPERATION	61
7.1. Overall Goal for Operation	61
7.2. Objectives	61
OBJECTIVE: Maintenance of rehabilitated areas	61
OBJECTIVE: Management and possible negation of visual impacts associated with the operation of the proposed facility	62
OBJECTIVE: Appropriate handling and management of hazardous substances and waste	64
OBJECTIVE: Maximise local employment and business opportunities associated with the operation phase	65
OBJECTIVE: Maximise the potential tourism opportunities during the operational phase and highlight the benefits of renewable energy projects	67
OBJECTIVE: Enhance capacity building and skills development within the local communities	68
OBJECTIVE: Promote local procurement	69
OBJECTIVE: Minimise the potential impact on safety and security	69
7.2 Monitoring Programme: Operational Phase of the PV Facility	70

OBJECTIVE: Monitor the performance of the control strategies employed against environmental objectives and standards 71

CHAPTER 8 MANAGEMENT PLAN: DECOMMISSIONING 72

8.1. Site Preparation 72

8.2 Disassemble and Replace Existing Infrastructure 72

8.3 Monitoring Programme 75

Appendices:

Appendix A: Guideline for integrated management of construction waste

PURPOSE & 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 of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced”¹. 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 help 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 (site clearing and site establishment) through those incurred during the construction activities themselves (erosion, noise, dust) to those incurred during site rehabilitation (soil stabilisation, revegetation) and operation.

The EMP has been developed as a set of environmental specifications (i.e. principles of environmental management for the proposed PV facility), 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). During its lifecycle, projects journey through four distinctive phases, i.e. construction, rehabilitation, operation, and decommissioning. The EMP is accordingly separated into measures dealing with the various project phases.

The EMP has the following objectives:

- » To outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation, and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the PV facility.
- » To ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.

¹ Provincial Government Western Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

- » To identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- » To propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
- » To facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the Environmental Impact Assessment (EIA) process.

The mitigation measures identified within the EIA process are systematically addressed in the EMP, ensuring the minimisation of adverse environmental impacts to an acceptable level.

INCA Kakamas Solar must ensure that the implementation of the project complies with the requirements of any environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development and the implementation of the EMP through its integration into the contract documentation. Since this EMP is part of the EIA process undertaken for the proposed PV facility, it is important that this document be read in conjunction with the Basic Assessment Report and Environmental Authorisation (once issued). 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 RoD, the stipulations in the RoD shall prevail over that of the EMP, unless otherwise agreed by the authorities in writing. Similarly, any provisions in current legislation overrule any provisions or interpretations within this EMP.

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 Contractor's obligations in this regard include the following:

- » Ensuring that employees 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 must be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- » Ensuring that, prior to commencing any site works, all employees and sub-Contractors have attended an Environmental Awareness Training course. The

course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.

- » Providing basic training in the identification of archaeological sites/objects, and any protected flora and fauna that may be encountered on/off the site.
- » Ensuring awareness of any other environmental matters, which are deemed necessary by the Environmental Control Officer (ECO).

This EMP for construction and operation activities 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 is a dynamic document, which must be updated when required. It is considered critical that this draft EMP be updated to include site-specific information and specifications as required throughout the life-cycle of the facility. This will ensure that the project activities are planned and implemented taking sensitive environmental features into account.

PROJECT DETAILS

CHAPTER 2

INCA Kakamas Solar (Pty) Ltd (a subsidiary of INCA Energy) is proposing the establishment of a PV facility for the purpose of commercial electricity generation on an identified site located 2.5 km west of Kakamas in the Northern Cape Province. The proposed project will have maximum generating capacity of **10 MW** which will be evacuated into the national electricity grid via the Taaiput Substation, as part of a power purchase agreement with Eskom and the South African Treasury (refer to Figure 1).

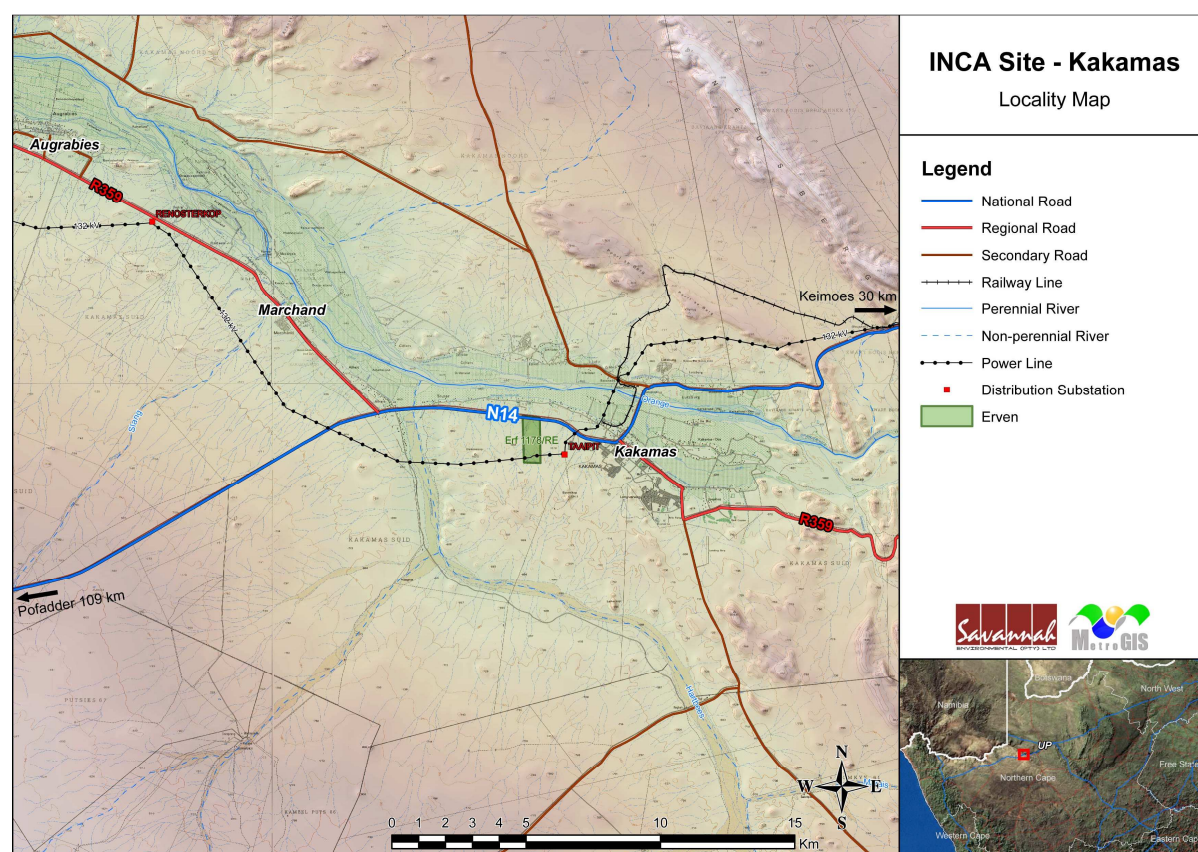


Figure 1: Locality map showing the proposed development site in relation to the town of Kakamas in the Northern Cape Province

The proposed development site is located approximately 2.5 km west of Kakamas, within the Kai Garib Local Municipality on the remaining portion of Farm 1178 (Kakamas Suid Nedersetting) (refer to Appendix C). The site covers an extent of approximately 109 ha and is zoned agricultural but is currently fallow / vacant². The N14 national road traverses the study area from east to west, while the R359 arterial road extends to the north west and south east. A number of secondary roads are also present in the area. Urban and built up areas in the vicinity of the development site include *Marchland*, *Augrabies*, *Kakamas*, *Langverweg Lutzburg*, *Cillie* and *Taaiput*.

² This is supported by the lack of surface water and farm houses / dwellings present on the site.

In terms of the findings of the Basic Assessment Report, various planning, construction, and operation-related environmental impacts were identified, including:

- » Ecological disturbances in terms of loss of natural indigenous vegetation, impacts on threatened flora and fauna, loss of protected tree species, impacts on on-site pans and the establishment and spread of alien invasive plants.
- » Geological impacts in terms of soil degradation and erosion.
- » Potential impacts on heritage resources.
- » Disturbance to sense of place, visual aesthetics.
- » Positive and negative socio-economic impacts.

No absolute no-go areas have been identified for the proposed PV facility.

This EMP has been developed based on the findings of the EIA, and must be implemented to protect sensitive on-site and off-site features through controlling construction and operation activities that could have a detrimental effect on the environment, and through avoiding or minimising potential impacts.

2.1 Activities and Components associated with the Proposed PV facility

The main activities/components associated with the proposed PV facility are detailed in the following table.

Table 2.1: Activities associated with Planning, Construction, Operation, and Decommissioning of the proposed PV Facility

Main Activity/Project Component	Components of Activity	Details
Planning		
Conduct technical surveys	<ul style="list-style-type: none"> » <i>Geotechnical survey</i> – the geology identified in the specialist studies undertaken as part of this Basic Assessment Process 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 (i.e. for the substation), and the extent of earthworks and compaction required in the establishment of the internal access roads. The geotechnical examination will include surface and subsurface exploration, soil sampling, and laboratory analysis. » <i>Site survey</i> - in order to finalise the design layout of the solar arrays, the substation, and other associated infrastructure. The micro-siting footprint will consider any environmental sensitivity identified during the Basic Assessment Process and will need to be confirmed in line with the Environmental Authorisation issued for the facility. 	<ul style="list-style-type: none"> » All surveys are to be undertaken prior to initiating construction.

Main Activity/Project Component	Components of Activity	Details
Construction		
Establishment of internal access roads	<ul style="list-style-type: none"> » The N14 national road traverses the study area from east to west, while the R359 arterial road extends to the north west and south east. A number of secondary roads are also present in the area. Access to the site already exists via a tar road located south of the site. Supplementary internal gravel access road of approximately four metres wide will be constructed around the site for maintenance purposes. 	<ul style="list-style-type: none"> » Access track construction would normally comprise of compacted rock-fill with a layer of higher quality surfacing stone on top. The strength and durability properties of the rock strata at the proposed site are not known at this stage. This will need to be assessed through the geotechnical study to be conducted. » It has not yet been determined whether these proposed internal access roads will be comprised of gravel tracks or whether access track construction would comprise of compacted rock-fill with a layer of higher quality surfacing stone on top. Should the latter be required, the strength and durability properties of the rock strata at the proposed site would need to be assessed during the geotechnical surveys. » Depending on the results of these studies, it may be possible, in some areas, to strip off the existing vegetation and level the exposed ground surface to form an access track surface.
Undertake site preparation and establishment of laydown areas	<ul style="list-style-type: none"> » Site preparation activities will include clearance of vegetation at the footprint of the PV panels, and ancillary infrastructure, establishment of laydown areas and internal access roads, and excavations for foundations (i.e. substation and workshop area). » Once the required equipment has been transported to site, a dedicated equipment construction camp and laydown area will need to be established adjacent to the workshop area. The equipment construction camp 	<ul style="list-style-type: none"> » These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site. » Site preparation will be undertaken in a systematic manner to reduce the risk of erosion on open ground. In addition, site preparation will include search and rescue of floral species of concern (where required), as well as identification and excavation of any sites of cultural/heritage value (where required).

Main Activity/Project Component	Components of Activity	Details
	<p>serves to confine activities and storage of equipment to one designated area to limit the potential environmental impacts associated with this phase of the project. The laydown area will be used for the assembly of the PV panels and the general placement/storage of construction equipment.</p> <ul style="list-style-type: none"> » The storage of fuel for the on-site construction vehicles and equipment will need to be secured in a temporary bunded facility within the construction camp to prevent leakages and soil contamination. 	
Transport of components and equipment to site	<ul style="list-style-type: none"> » The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the establishment of the substation and power line. 	<ul style="list-style-type: none"> » The equipment will be transported to the site using appropriate national, provincial, and local roads. » Some of the substation components <i>may</i> be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)³ by virtue of the dimensional limitations (i.e. the transformer). In some instances, these dimensional characteristics may require alterations to the existing road infrastructure (e.g. widening on corners), and protection of road-related structures (i.e. bridges, culverts, etc) because of abnormal loading.
Establishment of PV panels	<ul style="list-style-type: none"> » The support structures will be comprised of galvanised steel tubing and will be buried into the ground to a depth of approximately 1500 mm. An aluminium tube approximately 1000 mm high and approximately 20 mm in diameter will be fixed to the grounded stake, to which the PV panel will be affixed. 	<ul style="list-style-type: none"> » The PV panels will be sited a certain distance away from each other to avoid shading. This separation distance will be determined in the final design phase of the project. » The PV panels will be constructed in individual 'strings' each with its own dedicated inverter. The rationale behind this layout is that if one 'string' should require maintenance or

³ A permit will be required for the transportation of these abnormal loads on public roads.

Main Activity/Project Component	Components of Activity	Details
		<p>should it break down, then the generation capabilities of the whole facility will not be compromised. Each 'string' will be sited a certain distance away from each other to prevent shadows falling in an easterly direction from shading adjacent panels (i.e. to the west).</p>
Construct substation	» Substation, workshop, and storage areas.	<p>» The on-site substation required to facilitate the connection between the PV facility and the Eskom Grid would be constructed in the following simplified sequence:</p> <ul style="list-style-type: none"> » <i>Step 1</i> - survey of the site » <i>Step 2</i> - site clearing, levelling and construction of access road » <i>Step 3</i> - construction of terrace and substation foundation » <i>Step 4</i> - assembly and installation of equipment (i.e. including the transformer); » <i>Step 5</i> - connection of conductors to equipment; and » <i>Step 6</i> - rehabilitation of disturbed areas and protection of erosion sensitive areas.
Connection of PV panels to the substation	» The PV panels will be connected to the on site substation via underground cabling (where practical).	» The installation of these underground cables will require the excavation of trenches of approximately 40 cm – 1000 cm deep within which they can then be laid.
Connect substation to the grid	» The overhead power line will connect to the Eskom grid at the existing Taaiput Substation which is located in close proximity (700 m) east of the site.	» The centre line of the servitude cleared for the power line will be used for erecting the towers, where after the stringing process of the cabling between the on-site substation and the evacuation point can be carried out.
Undertake site rehabilitation	» Areas requiring rehabilitation will include those areas disturbed during the construction phase and those that are not required for operation and maintenance	» Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area. Where relevant, disturbed areas must be

Main Activity/Project Component	Components of Activity	Details
	purposes.	rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved. All temporary facilities, equipment, and waste materials will be removed from site. Erosion control measures (i.e. drainage works and anti-erosion measures) should be used in sensitive areas (i.e. steep slopes, hills, and drainage lines), to minimise loss of topsoil and control erosion. Any access points and/or access roads which are not required during the operational phase must be closed as part of the post-construction rehabilitation.
Operation		
Operation	<ul style="list-style-type: none"> » PV panels » Associated infrastructure 	<ul style="list-style-type: none"> » The photovoltaic panels are designed to operate continuously, unattended and with low maintenance for approximately 20 years. The electricity that is generated from the PV panels will be converted from DC to AC by the inverters and stepped up by the transformer at the on-site substation. Thereafter the power will be evacuated via the short power line linking into the Taaiput Substation. » Each component within the PV facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions, or maintenance activities (i.e. cutting of grass on the site, cleaning the PV panels etc).
Maintenance & Security	» Maintenance during the life cycle of the facility would include emergency repairs, routine panel maintenance, and cleaning.	<ul style="list-style-type: none"> » It is anticipated that a full-time security, maintenance, and control room staff will be required on-site. » The panels will be cleaned during the night whereby large

Main Activity/Project Component	Components of Activity	Details
	» 24 hour security.	dusters or compressed air would be used. When necessary, the panels would have to be cleaned with distilled water transported to the site. » Security measures on site would involve security personnel on site (full-time).
<i>Decommissioning</i>		
Site preparation	» Preparation of the site. » Mobilisation of decommissioning equipment.	» Depending on the economics of the development following the operational period, the plant will either be decommissioned or the operational phase will be extended. If it is deemed financially viable to continue, existing components may need to be disassembled and replaced with more appropriate technology/ infrastructure available at that time.
Disassemble panels	» The panels will be disassembled and removed.	» If the decision is made to decommission the facility the components of the plant will be disassembled and removed. Thereafter they will be reused and recycled (where possible) or disposed of in accordance with regulatory requirements.

STRUCTURE OF THIS EMP

CHAPTER 3

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

- » Planning and design activities
- » Construction activities
- » Operation activities
- » Decommissioning activities

These chapters set out the procedures necessary for INCA Kakamas Solar to achieve environmental compliance. For each of the phases of implementation for the photovoltaic plan project, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The management programme 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 environmental management programme 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 in order to meet the overall goals

Project component/s	List of project components affecting the objective, i.e.:		
	<ul style="list-style-type: none"> » PV panels » Access roads » Substation » Ancillary infrastructure 		
Potential Impact	Brief description of potential environmental impact if objective is not met		
Activity/risk source	Description of activities which could impact on achieving objective		
Mitigation: target/objective	Description of the target; include quantitative measures and/or dates of completion		
Mitigation: Action/control	Responsibility	Timeframe	
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures	Time periods for implementation of measures	
Performance indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the management plan.		

Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods and reporting.
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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.
- » 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:

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The Savannah Environmental team have extensive knowledge and experience in environmental impact assessment and environmental management, having been involved in EIA processes over the past ten (10) years. They have managed and drafted EMPs for other power generation projects throughout South Africa, including numerous renewable energy facilities.

**MANAGEMENT PLAN FOR THE PROPOSED PV FACILITY:
 PLANNING & DESIGN**

CHAPTER 4

4.1. Goal for Planning and Design

Overall Goal for Planning and Design: Undertake the planning and design phase of the photovoltaic plan 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 concerns and that these are appropriately addressed through design and planning (where appropriate).
- » Ensures that the best environmental options are selected for the project, including the power line alignment and substation site.
- » Enables the photovoltaic plant construction activities to be undertaken without significant disruption to other land uses in the area.

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

4.2. Objectives

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

From the specialist investigations undertaken for the proposed PV facility development site, no absolute 'no go' areas were identified.

Project component/s	Project components affecting the objective: <ul style="list-style-type: none"> » PV panels » Ancillary infrastructure » Access roads » Power line
Potential impact	Design fails to respond optimally to the identified environmental considerations
Activities/risk sources	<ul style="list-style-type: none"> » Site layout » Power line route
Mitigation: target/objective	To ensure that the design of the facility responds to the identified environmental constraints and opportunities

Mitigation: Action/control	Responsibility	Timeframe
Consider design level mitigation measures recommended by the specialists, especially with respect to visual aesthetics, as detailed within the Basic Assessment Report, the relevant appendices and the Environmental Authorisation. These recommendations are to be supplemented by information collected during any pre-construction surveys.	Engineering Design Consultant INCA Kakamas Solar	Tender design & design review stage
A detailed geotechnical investigation is required for the final design phase.	INCA Kakamas Solar	Design phase
Compile a comprehensive stormwater management plan for hard surfaces as part of the final design of the project.	INCA Kakamas Solar	Design phase
Access roads within the site to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.	Engineer	Planning, Pre-construction and construction
Balance technical and financial considerations against environmental constraints and opportunities in finalising the design of key elements.	INCA Kakamas Solar	Tender design & design review stage

Performance indicator	<ul style="list-style-type: none"> » Design meets objectives and does not degrade the environment » Design and layouts respond to the mitigation measures and recommendations in the EIA report.
Monitoring	<ul style="list-style-type: none"> » 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 ECO prior to the commencement of construction.

OBJECTIVE: Ensure the mitigation and possible negation of visual impacts associated with the planning of the proposed facility

Project component/s	<ul style="list-style-type: none"> » PV plant » Ancillary infrastructure (i.e. substation, power line, and access roads).
Potential impact	<ul style="list-style-type: none"> » Primary visual impact of the core facility due to the presence of the power lines and access roads in the landscape as well as the visual impact of lighting at night.
Activities/risk sources	<ul style="list-style-type: none"> » The viewing of the above mentioned by observers on or near the site as well as within the region.
Mitigation:	<ul style="list-style-type: none"> » Optimal planning of infrastructure so as to minimise visual impact.

target/objective

Mitigation: Action/control	Responsibility	Timeframe
Plan internal access roads with due cognisance of the topography.	INCA Kakamas Solar, and/or design consultant	Planning
Consult a lighting engineer in the planning and placement of light fixtures for the turbines, the PV plant and the ancillary infrastructure.	INCA Kakamas Solar, and/or design consultant	Planning.

Performance indicator	» Roads are appropriately planned such that there is no degradation or erosion and lighting impact is minimal.
Monitoring	» Not applicable.

MANAGEMENT PLAN FOR THE PROPOSED PV FACILITY: CONSTRUCTION

CHAPTER 5

5.1. Overall Goal for Construction

Overall Goal for Construction: Undertake the construction phase of the PV facility in a way that:

- » Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
- » Enables the construction activities to be undertaken without significant disruption to other land uses in the area, in particular concerning farming practices, traffic and road use, and effects on local residents.

5.2. Institutional Arrangements: Roles and Responsibilities for the Construction Phase of the PV facility

As the project proponent, INCA Kakamas Solar must ensure that the implementation of the PV 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 this EMP, and the implementation of the EMP through its integration into the contract documentation. INCA Kakamas Solar will retain various key roles and responsibilities during the construction of the PV facility. These are outlined below.

OBJECTIVE: To establish clear reporting, communication and responsibilities in relation to environmental impact

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Environmental Control Officer and Contractor for the construction phase of this project are as detailed below.

The **Project Manager** will:

- » Ensure of all specifications and legal constraints specifically concerning the environment are highlighted to the Contractor(s) so that they are aware of these.
- » Ensure that INCA Kakamas Solar 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 Basic Assessment for the project, the EMP, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.

The **Site Manager** (INCA Kakamas Solar's on-site Representative) will:

- » Be fully knowledgeable with the contents of the Basic Assessment.
- » 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 Environmental Control Officer, 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.

The **Environmental Control Officer** (ECO) will be responsible for monitoring, reviewing, and verifying compliance by the Contractor with the environmental specification. Accordingly, the ECO will:

- » Be fully knowledgeable with the contents with the Basic Assessment.
- » Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- » Be fully knowledgeable with the contents of 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: 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 this 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).

5.3. Objectives

In order to meet the goal detailed in Section 5.1 above, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE: Site establishment and securing the site

Site establishment is the first activity which is to be undertaken within the construction phase. The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the Contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager.

Project component/s	Project components affecting the objective: » PV panels » Ancillary infrastructure » External/internal access roads » Substation
Potential impact	» Hazards to landowners and public » Security of materials
Activities/risk sources	» Open excavations/diggings (foundations and cable trenches) » Movement of construction vehicles in the area and on-site
Mitigation: target/objective	» To secure the site against unauthorised entry » To protect members of the public/landowners/residents

Mitigation: Action/control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor	Erection: during site establishment Maintenance: duration of contract
Where necessary to control access, fence and secure area.	Contractor	Erection: during site establishment Maintenance: for duration of contract
Fence and secure Contractor's equipment camp.	Contractor	Erection: during site establishment Maintenance: duration of contract
Identify disturbance areas and restrict construction activity to these areas.	ECO Contractor	Pre-construction and construction
Establish the necessary ablution facilities with chemical toilets. Provide adequate sanitary facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site.	Contractor	Erection: during site establishment Maintenance: duration of contract
Ablution or sanitary facilities should not be located within 100 m from a 1:100 year flood line including water courses, wetlands or within a horizontal distance of less than 100 m, whichever is applicable.	Contractor	During site establishment, construction and maintenance
Supply adequate numbers of waste collection bins in appropriate locations on the site where construction is	Contractor	Erection: during site

Mitigation: Action/control	Responsibility	Timeframe
being undertaken.		establishment Maintenance: for duration of Contract within a particular area
All unattended open excavations shall be adequately demarcated and/or fenced. Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.	Contractor	Erection: during site establishment Maintenance: for duration of contract

Performance indicator	<ul style="list-style-type: none"> » No unnecessary environmental impacts associated with site established. » Site is secure. » No unauthorised entry. » No members of the public/ landowners injured.
Monitoring	<ul style="list-style-type: none"> » An incident reporting system will be used to record non-conformances to the EMP » ECO to monitor all construction areas on a continuous basis until all construction is completed; immediate report backs to site manager in terms of non-conformances recorded.

OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase

Based on information from other projects of this nature the proposed PV facility plant is likely to employ approximately 20 - 30 full time employees over a 25 - 30 year period. Based on other renewable projects approximately 3 - 6% of the posts are expected to be managerial, 12 - 18% engineers, 35 - 40% technicians and 40 - 50% craftsmen. The proposed facility will therefore create potential employment opportunities in the Northern Cape Province and the Kai! Garib Municipality. However, given that the solar energy sector in South Africa is relatively new, it may be necessary to import the required operational and maintenance skills from other parts of South Africa or even overseas. However, it will be possible to increase the number of local employment opportunities through the implementation of a skills development and training programme linked to the operational phase. Such a programme would support the strategic goals of promoting local employment and skills development contained in the Kai! Garib IDP.

Given the location of the proposed facility, the majority of permanent staff is likely to reside in the towns of Upington, Keimoes or Kakamas. In terms of accommodation options, a percentage of the permanent employees may purchase houses in one of these towns, while others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the monthly wage bill earned by permanent staff would be spent in the regional and local economy, which will benefit local businesses in these towns. The benefits to the local economy will extend over the operational lifespan of the project.

The local hospitality industry in Upington, Keimoes, or Kakamas is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc) who are involved in the company and the project but who are not linked to the day-to-day operations.

Project component/s	Construction and establishment activities associated with the establishment of the PV facility, including infrastructure etc.
Potential impact	The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/risk sources	<ul style="list-style-type: none"> » The employment of outside contractors to undertake the work and who make use of their own labour will reduce the employment and business opportunities for locals. » Employment of local labour will maximise local employment opportunities.
Mitigation: target/objective	Employment of low-skilled workers from the local area.

Mitigation: Action/control	Responsibility	Timeframe
Attempt to employ a minimum of 80% of the low-skilled workers are sourced from the local area. This should also be made a requirement for all contractors. INCA Kakamas Solar should also develop a database of local BEE service providers.	INCA Kakamas Solar, and Contractors	Pre-construction, and construction phase
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase to ensure that 80% target is met.	INCA Kakamas Solar	Pre-construction, and construction phase
Skills audit to be undertaken to determine training and skills development requirements.	INCA Kakamas Solar	Pre-construction, and construction phase
Develop a database of local BEE service providers and ensure that they are informed of relevant tenders and job opportunities.	INCA Kakamas Solar	Pre-construction, and construction phase
Identify potential opportunities for local businesses.	INCA Kakamas Solar	Pre-construction, and construction phase

Performance	» Employment and business policy document that sets out local
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indicator	employment and targets completed before construction phase commences. » 80% of semi and unskilled labour locally sourced. » Database of potential local BEE services providers in place before construction phase commences. » Skills audit to determine need for training and skills development programme undertaken within 1 month of commencement of construction phase.
Monitoring	» INCA Kakamas Solar, and/or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

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

There are a relatively small number of farmsteads that could be affected by the proposed facility. However, there are a number of potentially vulnerable farming activities in the area, such as livestock farming. In addition, the presence of construction workers also poses a potential risk to family structures and social networks in the area. The most vulnerable communities include the communities of Kakamas and Keimoes. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on the local community.

Given the relatively small labour force (i.e. approximately 100) during the construction phase, of which approximately 20 - 25 could be sourced from the local area, the potential risk to local family structures and social networks is regarded as low.

Project component/s	» Construction and establishment activities associated with the establishment of the PV facility, including infrastructure, etc.
Potential impact	» The presence of construction workers who live outside the area and who are housed in local towns can affect family structures and social networks.
Activity/risk source	» The presence of construction workers can impact negatively on family structures and social networks, especially in small, rural communities.
Mitigation: target/objective	» 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.

Mitigation: Action/control	Responsibility	Timeframe
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Mitigation: Action/control	Responsibility	Timeframe
Attempt to ensure that a minimum of 80% of the low-skilled workers are sourced 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 Upington, Keimoes, and Kakamas.	INCA Kakamas Solar, and contractors	Tender phase
Identify local contractors who are qualified to undertake the required work.	INCA Kakamas Solar	Tender phase
Develop a Code of Conduct to cover the activities of any construction workers housed on the site.	INCA Kakamas Solar, and contractors	Construction phase
Ensure that all construction workers attend a briefing session before they commence activities. The aim of the briefing session is to inform them of the rules and regulations governing activities on the site as set out in the Code of Conduct.	INCA Kakamas Solar, and contractors	Construction phase
Ensure that construction workers who are found guilty of breaching the Code of Conduct are dismissed. All dismissals must be in accordance with South African labour legislation.	Contractors	Construction phase
Where feasible, provide opportunities for workers to go home over weekends.	Contractors	Construction phase
On completion of the construction phase all construction workers must be transported back to their place of origin within two days of their contract ending. The costs of transportation must be borne by the contractor.	Contractors	Construction phase

Performance indicator	<ul style="list-style-type: none"> » Employment policy and tender documents that sets out local employment and targets completed before construction phase commences. » Local sourcing of semi and unskilled labour locally sourced. » Local construction workers employed have proof that they have lived in the area for five years or longer. » Tender documents for contractors include recommendations for construction camp. » Code of Conduct drafted before commencement of construction phase. » Briefing session with construction workers held at outset of construction phase.
Monitoring	<ul style="list-style-type: none"> » INCA Kakamas Solar and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: 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

Project component/s	Construction and establishment activities associated with the establishment of the PV facility, including infrastructure etc.
Potential impact	<ul style="list-style-type: none"> » Impact on safety of farmers and communities (increased crime etc) » Potential loss of livestock due to stock theft by construction workers » Damage to farm infrastructure, such as gates and fences.
Activity/risk source	<ul style="list-style-type: none"> » The presence of construction workers on the site can pose a potential safety risk to local farmers and communities and may also result in stock thefts. » The activities of construction workers may result in damage to farm infrastructure.
Mitigation: target/objective	To avoid and or minimise the potential impact on local communities and their livelihoods.

Mitigation: Action/control	Responsibility	Timeframe
The housing of construction workers on the site should be limited to security personnel.	INCA Kakamas Solar, and Contractor	Pre-construction, construction
Inform all workers of the conditions contained in the Code of Conduct.	INCA Kakamas Solar, and Contractor	Pre-construction, construction
Dismiss all workers that do not adhere to the code of conduct for workers. All dismissals must be in accordance with South African labour legislation.	Contractors	Pre-construction, construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc.	Contractors	Pre-construction, construction

Performance indicator	<ul style="list-style-type: none"> » Code of Conduct developed and approved prior to commencement of construction phase. » All construction workers made aware of contents of Code of Conduct prior to commencement of activities on site.
Monitoring	<ul style="list-style-type: none"> » INCA Kakamas Solar and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Avoid and or minimise the potential impact on current and future farming activities in adjacent areas to the site during the construction phase

Project component/s	Construction phase activities associated with the establishment of the PV facility and associated infrastructure.
Potential impact	The footprint of the PV facility and associated infrastructure will result in a loss of land that will impact on farming activities on the site.
Activity/risk source	The adjacent areas to the PV facility and associated infrastructure.
Mitigation: target/objective	To minimise the loss of land taken up by the PV facility and associated infrastructure and to enable farming activities to continue where possible, specifically grazing.

Mitigation: Action/control	Responsibility	Timeframe
Minimise the footprint of the PV facility and the associated infrastructure.	INCA Kakamas Solar	Pre-construction phase
Rehabilitate disturbed areas on completion of the construction phase.	ECO, and Contractors	Construction and post construction phase

Performance indicator	<ul style="list-style-type: none"> » Meeting/s held with farmers during construction phase. » No impact on farming activities in surrounding areas.
Monitoring	<ul style="list-style-type: none"> » ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: To minimise traffic related impacts

The construction phase of the project will be the most significant in terms of generating traffic impacts, resulting from the transport of equipment, materials, and construction crews to the site and the return of the vehicles after delivery of materials. Potential impacts associated with transportation and access relate to works within the site boundary (i.e. the PV facility and ancillary infrastructure).

Even though the traffic related impacts are expected to be of a moderate significance it warrants mitigation to limit any possible negative impacts on the local roads and intrusion on the movements of the property owners and communities making use of the N14 and the existing tar road located south of the site on a daily basis. Approximately ten construction vehicles such as excavators, trucks, graders, compaction equipment, cement trucks, etc) would be used.

Vehicles transporting goods and materials would most likely make use of the N14 and the existing tar road located south of the site.

Employees would be transported from their residences to the site and back on a daily basis. Transportation of workers would result in an additional daily increase in heavy vehicles (e.g. buses) on the local roads. Concerns in this regard relate to the safety of other road users, pedestrians, and animals.

Project component/s	<ul style="list-style-type: none"> » External access roads » Transportation of equipment and project components to site
Potential impact	<ul style="list-style-type: none"> » Impact of heavy construction vehicles on road surfaces » Risk of accidents involving people and animals » Deterioration of road conditions (both surfaced and gravel road) due to the load frequency and the current condition of the gravel roads
Activities/risk sources	<ul style="list-style-type: none"> » Construction vehicle movement » Speeding on local roads » Transportation of project components to site » Site preparation and earthworks » Foundations or plant equipment installation » Mobile construction equipment movement on-site » If the present conditions are left untreated the road could become be unsafe for the transportation of people and materials
Mitigation: target/objective	<ul style="list-style-type: none"> » To minimise impact of traffic associated with the construction of the facility on local traffic » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction » To minimise impacts on road surfaces » To ensure all vehicles are roadworthy and all materials/equipment are carried appropriately and within any imposed permit/licence conditions » The internal roads need immediate remedial measure to repair and improve their riding conditions. » Furthermore a maintenance programme needs to be implemented to mitigate the recurrence of these conditions

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 construction phase.	INCA Kakamas Solar, and ECO	Pre-construction
The movement of construction vehicles through the local area should be limited to off-peak periods (if possible) to minimise adverse impacts	Contractor	Construction
Signs should preferably be erected near the construction site, warning residents, and visitors about the hazards around the construction site and the	Contractor	Construction

Mitigation: Action/control	Responsibility	Timeframe
presence of heavy vehicles.		
Strict vehicle safety standards should be implemented and monitored.	Contractor, and ECO	Construction
Construction vehicles should keep to the speed limits on external roads and should not exceed the speed limit as defined by the ECO on site.	Contractor, and ECO	Construction
A designated access (or accesses) to the proposed site must be created to ensure safe entry and exit.	Contractor	Pre-construction
No deviation from approved access routes within the site must be allowed.	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	Pre-construction
Any traffic delays as a result of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
Keep hard road surfaces as narrow as possible.	Contractor	Duration of contract
Improve road drainage, blade roads to remove corrugation, add gravel wearing course. Implement maintenance programme for period of construction.	Local roads authorities, and INCA Kakamas Solar	Pre-construction and construction

Performance indicator	<ul style="list-style-type: none"> » Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » Access to private property not impacted by construction activities. » No traffic related accidents are experienced as a result of the construction activities. » Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).
Monitoring	<ul style="list-style-type: none"> » Project proponent and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: To minimise the potential impact on safety and security

Even though no construction workers are expected to be accommodated on site, 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. Materials and goods would be stored on site in some type of storage facility for the duration of the construction period, and this in itself can lure criminals to the area. Property owners in the area already experience high incidences of livestock theft. The negative impacts associated with the inflow of workers could, however, be limited should a local labour force be used.

Safety at and around the construction site should be ensured by limiting any fire risks, fencing off the construction area to avoid unauthorised access and by employing security personnel.

Construction related accidents are also always a concern when construction activities are undertaken. Local doctors and ambulance facilities for accidents would be used and it is anticipated that there would be sufficient capacity for minor emergencies.

Project component/s	<ul style="list-style-type: none"> » PV facility » Associated infrastructure
Potential impact	<ul style="list-style-type: none"> » Increased crime » Veld fires
Activities/risk sources	<ul style="list-style-type: none"> » Safety of individuals and animals are at risk » Theft of livestock » Theft of construction material » On-site accidents
Mitigation: target/objective	<ul style="list-style-type: none"> » Maximise employment of local labour » Implement strict security measures at the construction site.

Mitigation: Action/control	Responsibility	Timeframe	
Employing local community members could minimise the potential for criminal activity or perceived perception of an increase in criminal activity due to the presence of an outside workforce.	Contractor	Pre-construction	
Screening of workers that apply for work could be useful to lessen perceived negative perceptions about the outside workforce.	Contractor	Pre-construction	
Construction workers should be easily identifiable by wearing uniforms and even identity tags.	Contractor	Construction	
Local community members and property owners should be informed of the presence of the outside workforce, the construction schedule, and movement of workers.	INCA Solar	Kakamas	Construction
Care should be taken to avoid conflict between the local communities and the "outside" workforce.	INCA Solar, Contractor	Kakamas and	Pre-construction and construction
Property owners, their workers, as well as local communities should be motivated to be involved in crime prevention and by reporting crimes.	INCA Solar, Contractor	Kakamas and local communities	All phases of project
The construction site should be fenced and access to the area strictly controlled.	INCA Solar, Contractor	Kakamas and	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.	INCA Solar, Contractor	Kakamas and	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.	INCA Solar, Local Municipality, and local communities	Kakamas	Construction
Employees should be trained in fire fighting techniques, and appropriate equipment should be provided on site.	INCA Solar	Kakamas	Construction
Contact details of emergency services should be clearly	INCA	Kakamas	Construction

Mitigation: Action/control	Responsibility	Timeframe
displayed on site	Solar/ Contractor	

Performance indicator	<ul style="list-style-type: none"> » No criminal activities and theft of livestock are reported to be linked with the construction force. » No fires occur as a result of construction activities. » No on-site accidents occur.
Monitoring	<ul style="list-style-type: none"> » Project proponent, and appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: Noise control

Various construction activities would be taking place during the development of the facility and there exists a risk that some of these activities could have a noise impact on surrounding residents.

Project component/s	<ul style="list-style-type: none"> » Construction of infrastructure. » Movement of vehicles. » Activities of construction crews.
Potential impact	<ul style="list-style-type: none"> » Increased noise levels at potentially sensitive receptors.
Activity/risk source	<ul style="list-style-type: none"> » Any noisy construction activities.
Mitigation: target/objective	<ul style="list-style-type: none"> » Minimise the generation of disturbing or nuisance noises, where possible. » Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors. » Ensuring compliance with Noise Control Regulations.

Mitigation: Action/control	Responsibility	Timeframe
Establish a line of communication and notify all stakeholders and potentially sensitive receptors of the means of registering any issues, complaints, or comments.	ECO	All phases of project
Notify surrounding landowners about noisy work to take place at least 2 days before the activity is to start. The following information to be presented in writing: <ul style="list-style-type: none"> » Description of activity to take place » Estimated duration of activity » Working hours » Contact details of responsible party 	ECO	Duration of construction At least 2 days, but not more than 5 days before activity is to commence
Ensure that all construction equipment is maintained and fitted with the required noise abatement	ECO	Weekly inspection

Mitigation: Action/control	Responsibility	Timeframe
equipment.		
Where possible, construction work should be undertaken during normal working hours (06h00 – 18h00), from Monday to Saturday. If agreements can be reached (in writing) with the surrounding (within a 1000m distance) potentially sensitive receptors, these working hours can be extended.	Contractor	As required

Performance indicator	No noise complaints are registered.
Monitoring	N/A

OBJECTIVE: Management of dust and emissions to air

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

Project component/s	» Construction and establishment activities associated with the establishment of the PV facility and associated infrastructure.
Potential impact	<ul style="list-style-type: none"> » Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility. » Release of minor amounts of air pollutants (for example NO₂, CO and SO₂) from vehicles and construction equipment.
Activities/risk sources	<ul style="list-style-type: none"> » Clearing of vegetation and topsoil. » Excavation, grading, scraping. » Transport of materials, equipment and components on internal access roads. » Re-entrainment of deposited dust by vehicle movements. » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces. » Fuel burning vehicle engines.
Mitigation: target/objective	<ul style="list-style-type: none"> » To ensure emissions from all vehicles are minimised, where possible, for the duration of the construction phase. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase.

Mitigation: Action/control	Responsibility	Timeframe
Roads must be maintained to a manner that will ensure that dust from road or vehicle sources is not visibly excessive. Ensure that damage to roads is repaired on completion of construction phase.	Contractor	Site establishment; construction
An 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 covered with tarpaulins.	Contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the ECO.	Contractor, and ECO	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable once construction is completed in an area.	Contractor	Completion of construction
Construction vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract
If monitoring results or complaints indicate inadequate performance against the criteria indicated, then the source of the problem must be identified, and existing procedures or equipment modified to ensure the problem is rectified.	Contractor	Duration of contract

Performance indicator	<ul style="list-style-type: none"> » No complaints from affected residents or community regarding dust or vehicle emissions from construction activities. » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring	<p>Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods:</p> <ul style="list-style-type: none"> » Visual daily inspections of dust generation by construction activities throughout the construction phase. » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged. Complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE: Control loss of/disruption to indigenous vegetation

Project component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential impact	» Loss of indigenous natural vegetation due to construction activities.
Activities/risk sources	» Construction.
Mitigation: target/objective	» Minimal loss of natural vegetation.

Mitigation: Action/Control	Responsibility	Timeframe
» The construction impacts must be contained to the footprint/servitude of the infrastructure.	Contractor, and ECO.	Construction
» Limit unnecessary impacts on surrounding natural vegetation, e.g. driving around in the veld; use access roads only.	Contractor, and ECO.	Construction
» Where possible, situate infrastructure within or close to existing disturbance.	Contractor, and ECO.	Construction

Performance indicator	» Minimum loss of natural vegetation outside of the exact footprint of the proposed project.
Monitoring	» Before construction, demarcate footprint of proposed infrastructure and construction area and ensure that construction impacts are contained within this area.

OBJECTIVE: Control 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, riverbanks 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.

Alien invasive plants should be controlled on site throughout the life-cycle of the facility. Currently, the site contains very little alien vegetation. It is important to maintain this situation and not allow alien species to become established on site.

Project	» Any infrastructure or activity that will result in disturbance to natural
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Component/s	areas.
Potential impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species.
Activities/risk sources	» Construction. » Inappropriate environmental management.
Mitigation: target/objective	» No alien plants within the project control area.

Mitigation: Action/Control	Responsibility	Timeframe
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible once construction is completed. » Do not import soil from areas with alien plants.	Contractor	Construction, and rehabilitation
Establish and implement an ongoing monitoring programme to detect and quantify any alien species that may become established on site and identify the problem species (as per Conservation of Agricultural Resources Act and the Biodiversity Act).	Contractor	Construction, and operation
Immediately control any alien plants that become established using registered control methods.	Contractor	Construction, and operation

Performance indicator	» No alien species on site or within the power line servitude.
Monitoring	» Ongoing monitoring of area by ECO during construction. For each alien species note the number of plants and aerial cover of plants within project area and immediate surroundings. » 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: Limit impacts on threatened Ludwig's Bustard and Kori Bustard

Project component/s	» Any infrastructure that may affect the two Bustard species.
Potential impact	» Loss of single individuals of threatened animals.
Activities/risk sources	» Construction / operation.
Mitigation: target/objective	» Limit loss of individuals of two threatened bird species

Mitigation: Action/Control	Responsibility	Timeframe
If any individuals are found to occur on site, construction activities should only begin outside of the breeding season of affected species.	Contractor, and ECO	Construction, and operation
Suitable measures must be taken to make the power line more visible to flying birds.	Contractor, and ECO	Planning, construction, and operation

Performance indicator	No loss of threatened bird individuals as a result of the proposed project.
Monitoring	Monitoring of any bird mortality on a regular basis during operation of power line.

OBJECTIVE: Limit impacts on protected tree species

Project component/s	» Any infrastructure that may affect protected trees.
Potential impact	» Loss of single individuals or groups of protected trees. » Loss of single individual of threatened tree, <i>Aloe dichotoma</i> subsp. <i>dichotoma</i> (quiver tree).
Activities/risk sources	» Construction.
Mitigation: target/objective	» Limit loss of individuals of protected trees.

Mitigation: Action/Control	Responsibility	Timeframe
No construction activities must take place within 50 m of the potentially affected trees of <i>Aloe dichotoma</i> . The	Contractor, and ECO	Construction

Mitigation: Action/Control	Responsibility	Timeframe
individual trees are located at geographical co-ordinate South 28.77424 East 20.58481 and South 28.77428 East 20.58858.		
Where possible, position infrastructure so that individual trees are not affected.	Contractor, and ECO	Planning, construction
Educate personnel on the conservation value of the species and the need to prevent disturbance to any individuals.	Contractor, and ECO	Pre-Construction
If plants are to be destroyed (in the case that no other options are available) then a permit is required (National Environmental Management: Biodiversity Act). In such a case, measures must be taken to translocate individuals into adjacent natural areas where they will not be disturbed further.	Contractor, and ECO	Construction

Performance indicator	» No loss of trees OR permit obtained for affected trees.
Monitoring	» None required.

OBJECTIVE: Limit damage to watercourses

Project component/s	» Any infrastructure or activity that will result in disturbance to watercourses.
Potential impact	<ul style="list-style-type: none"> » Damage to watercourses 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 watercourse as a natural system.
Activities/risk sources	» Construction activities.
Mitigation: target/objective	» No avoidable damage to watercourses within project area

Mitigation: Action/Control	Responsibility	Timeframe
For any new construction, cross watercourses perpendicularly to minimise disturbance footprints.	Contractor, and ECO	Construction
Rehabilitate any disturbed areas as quickly as possible.	Contractor, and ECO	Construction and rehabilitation
Control stormwater and runoff water.	Contractor, and ECO	Construction, and operation

Mitigation: Action/Control	Responsibility	Timeframe
Obtain a permit from DWA to impact on any wetland or water resource.	Contractor, and ECO	Construction
Control stormwater and runoff water to avoid erosion impacts on watercourses: Construction of infrastructure must not cause the width of the watercourse to be narrowed or the general morphology to be altered.	Contractor, and ECO	Construction
Cross watercourses at or close to existing disturbances.	Contractor, and ECO	Construction
Adequate culvert and/or bridge structures are required to ensure that construction impacts do not permanently affect channel structure and morphology.	Contractor, and ECO	Planning and Construction
No structures should be permanently positioned within the bed of watercourses.	Contractor, and ECO	Planning and Construction
Power line towers must be positioned a minimum of 50 m outside the outer boundary of any watercourse.	Contractor, and ECO	Construction

Performance indicator	No impacts on water quality, water quantity, wetland vegetation, natural status of watercourses outside of footprint of infrastructure.
Monitoring	<ul style="list-style-type: none"> » Habitat loss in watercourses should be monitored before and after construction. » The ECO and environmental manager should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE: Avoid and or minimise the potential risk of increased veld fires during the construction phase

The vegetation in the study area may be at risk of fire. The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

Project component/s	<ul style="list-style-type: none"> » PV facility » Associated infrastructure
Potential impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences.
Activities/risk sources	» The presence of construction workers and their activities on the site can increase the risk of veld fires.
Mitigation: target/objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/control	Responsibility	Timeframe
Ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	INCA Kakamas Solar, and Contractor	Duration of construction
Fire breaks should be established and maintained, where appropriate.	INCA Kakamas Solar	Duration of contract
Provide adequate fire fighting equipment onsite.	INCA Kakamas Solar, and Contractor	Duration of construction
Provide fire-fighting training to selected construction staff.	Contractor	Duration of construction
Compensate farmers / community members at full market related replacement cost for any proven losses, such as livestock, damage to infrastructure etc for losses associated with fires resulting from negligence or non-compliance.	Contractor	As required

Performance indicator	<ul style="list-style-type: none"> » Designated areas for fires identified on site at the outset of the construction phase. » Fire fighting equipment and training provided before the construction phase commences. » Fire breaks established and maintained.
Monitoring	<ul style="list-style-type: none"> » Appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Control runoff and soil erosion and degradation

The soil resource on the site needs to be conserved as far as possible to minimise the cumulative impact on the local environment. A set of strictly adhered to mitigation measures are required to effectively limit the impact on the environment. The disturbance areas where human impact is likely are the focus of the mitigation measures laid out below.

Project component/s	<ul style="list-style-type: none"> » PV panels. » Access roads. » Sealed surfaces (e.g. roofs, concrete surfaces, compacted road surfaces, paved roads / areas). » All other infrastructure.
Potential impact	<ul style="list-style-type: none"> » Degradation of soil. » Degradation of local geology. » Soil erosion.

Activities/risk sources	<ul style="list-style-type: none"> » Water and wind erosion of cleared and excavated areas. » Excavation, mixing, dumping, stockpiling and compaction of soil. » Concentrated discharge of water from construction activity. » Site preparation and earthworks. » Foundations or plant equipment installation. » Mobile construction equipment movement on site.
Mitigation: target/objective	<ul style="list-style-type: none"> » Minimise degradation of rock and soil by construction activity. » Conserve topsoil by stockpiling and re-using in disturbed areas. » Minimise erosion of soil from site during construction. » Minimise deposition of soil into drainage lines.

Mitigation: Action/control	Responsibility	Timeframe
Identify disturbance areas and restrict construction activity to these areas.	ECO, and Contractor	Pre-construction and 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	Pre-construction and construction
Erosion features must be immediately stabilised with appropriate erosion control measures, if they develop.	Contractor	Construction
Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. Limit the height of stockpiles as far as possible to reduce compaction.	Contractor	During site establishment and any activity related to earthworks as well as the duration of construction
Rehabilitate any disturbed areas immediately after construction in that area is complete in order to stabilise landscapes.	Contractor	Post-construction
Any stockpiles must be protected against wind and water erosion (e.g. surrounded by shade cloth fences or damped down on a regular basis).	Contractor	Duration of contract
Erosion control measures: » Run-off attenuation on slopes (sand bags, logs), silt fences, stormwater catch-pits, shade nets, or temporary mulching over denuded areas.	Contractor, or ECO	Erection: before construction Maintenance: duration of contract
Vehicular traffic must be controlled during construction, confining access and roadways, where possible, to proposed or existing road alignments.	Contractor	Duration of contract
As far as possible, access to the facility construction site should be restricted to a single access point.	Contractor	Duration of contract
Internal access roads should be kept to a minimum. Use existing roads wherever possible.	Contractor	During site establishment

Mitigation: Action/control	Responsibility	Timeframe
Movement of vehicles on-site is to be on approved and formalised access roads only, which shall be adequately maintained throughout construction. Where temporary tracks are required these are to be ripped and rehabilitated as soon as use of the track in an area is no longer required.	Contractor	Duration of contract

Performance indicator	<ul style="list-style-type: none"> » Limited level of soil erosion around site. » Limited level of increased siltation in drainage lines. » Limited level of soil degradation. » Acceptable state of excavations, as approved by ECO. » No activity in restricted areas.
Monitoring	<ul style="list-style-type: none"> » Ongoing monitoring of area by ECO during construction. » An incident reporting system will record non-conformances.

OBJECTIVE: Protection of sites of heritage value

A low density of stone tools was identified on the development site which have been evaluated to have a very low significance. As no other sites, features or objects of cultural heritage significance were identified in the study area there would be no impact resulting from the proposed development.

However, it is possible that sites will be uncovered during excavation activities associated with construction. If at any stage during the construction phase any archaeological artefact is observed, it would be vital to stop the work immediately and report this occurrence to the South African Heritage Resources Association (SAHRA) and/or a registered professional archaeologist as soon as possible so that appropriate mitigation measures can be implemented.

Project component/s	<ul style="list-style-type: none"> » PV facility. » Access roads. » Power line. » All other infrastructure.
Potential impact	<ul style="list-style-type: none"> » Heritage objects or artefacts found on site are inappropriately managed or destroyed.
Activity/risk source	<ul style="list-style-type: none"> » Site preparation and earthworks. » Foundations or plant equipment installation. » Mobile construction equipment movement on site.
Mitigation: target/objective	<ul style="list-style-type: none"> » To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation.

Mitigation: Action/control	Responsibility	Timeframe
Provide training to construction personnel regarding identification of heritage resources.	Contractor	Construction
If a heritage object is found, work in that area must be stopped immediately, and appropriate specialists brought in to assess to site, notify the administering authority of the item/site, and undertake due/required processes.	INCA Kakamas Solar, Contractor, and Heritage specialist	Duration of contract

Performance indicator	<ul style="list-style-type: none"> » Zero disturbance outside of designated work areas. » All heritage items located are dealt with as per the legislative guidelines. » A record is kept of all instances of accidental disturbance of heritage material, as well as post construction review of impacts on landscape context.
Monitoring	<ul style="list-style-type: none"> » Supervision of all clearing and earthworks by the ECO throughout construction phase.

OBJECTIVE: Management and possible negation of visual impacts associated with the construction of the proposed facility

The construction phase of a project is potentially the phase that causes the most disturbances. There will be a noticeable increase in heavy vehicles utilising the external access roads. This may cause a visual nuisance to other road users and land owners in the area. Furthermore, in this environment, dust from construction work is also likely to represent a significant visual impact.

Project component/s	<ul style="list-style-type: none"> » Construction site. » Movement of construction vehicles.
Potential impact	<ul style="list-style-type: none"> » Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing.
Activity/risk source	<ul style="list-style-type: none"> » The viewing of the above mentioned by observers on or near the site.
Mitigation: target/objective	<ul style="list-style-type: none"> » Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate works areas.

Mitigation: Action/control	Responsibility	Timeframe
Reduce the construction period through careful planning and productive implementation of resources.	INCA Kakamas Solar, and/or Contractor	Construction
Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise	INCA Kakamas Solar, and/or Contractor	Plannikng and Construction

Mitigation: Action/control	Responsibility	Timeframe
vegetation clearing.		
Restrict the activities and movement of construction workers and vehicles on site to the immediate construction site and existing access roads.	INCA Kakamas Solar, and/or Contractor	Construction
Ensure that rubble, litter, and disused construction materials are managed and removed regularly.	INCA Kakamas Solar, and/or Contractor	Construction
Ensure that all infrastructure and the site and general surrounds are maintained in a neat and appealing way.	INCA Kakamas Solar, and/or Contractor	Construction
Reduce and control construction dust using approved dust suppression techniques.	INCA Kakamas Solar, and/or Contractor	Construction
As far as possible, restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	INCA Kakamas Solar, and/or Contractor	Construction
Rehabilitate all disturbed areas, construction areas, road servitudes, and cut and fill slopes to acceptable visual standards.	INCA Kakamas Solar, and/or Contractor	Construction and rehabilitation

Performance indicator	<ul style="list-style-type: none"> » No complaints regarding visual intrusion associated with construction activities. » Vegetation cover on and near the site is intact with no evidence of degradation or erosion.
Monitoring	<ul style="list-style-type: none"> » Ensure that mitigation measures are implemented during construction to minimise visual impacts on surrounding communities. » An incident reporting system will be used to record non-conformances to the EMP. » Monitoring of vegetation clearing during construction. » Monitoring of rehabilitated areas post construction.

OBJECTIVE: Appropriate handling and storage of chemicals, and waste

The construction phase of the PV facility may involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents. The main wastes expected to be generated by the construction of the facility and will include general solid waste. A guideline for integrated management of construction waste is included as Appendix A of this EMP.

Project component/s	» Storage and/or handling of chemicals, hazardous substances, and waste.
Potential impact	<ul style="list-style-type: none"> » Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers. » Inefficient use of resources resulting in excessive waste generation. » Pollution of the surrounding environment through inappropriate waste management practices. » Litter or contamination of the site or water through poor waste management practices. » Pollution of water and soil resources.
Activity/risk source	<ul style="list-style-type: none"> » PV panel construction activities. » Building construction activities. » Packaging and other construction wastes. » Hydrocarbon use and storage. » Spoil material from excavation, earthworks, and site preparation.
Mitigation: target/objective	<ul style="list-style-type: none"> » Ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. » Ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons. » Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste handling, storage, and disposal. » Avoid environmental harm from waste disposal.

Mitigation: Action/control	Responsibility	Timeframe
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
In the event of a major spill or leak of contaminants, the relevant administering authority must be	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
immediately notified as per the notification of emergencies/incidents.		
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Soil contaminated/ polluted as a result of a major spill must be removed from the site and disposed of at a licensed hazardous waste disposal facility. Soils contaminated/ polluted through minor spills can be treated on site provided they are contained and have not penetrated the soil surface.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not take place on-site outside of designated areas (except for emergencies). If repairs of vehicles must take place on site, 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 bunded area and on a sealed surface.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor ECO	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with 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
Construction contractors must provide specific detailed waste management method statements to deal with all waste streams.	Contractor	Pre-construction
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste. 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.	Contractor	Duration of contract
Where 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

Mitigation: Action/control	Responsibility	Timeframe
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
No waste may be buried or burnt on site.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste and surplus dangerous goods 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
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

Performance indicator	<ul style="list-style-type: none"> » No chemical spills outside of designated storage areas. » No water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any complaints from the community will be logged. » Complaints will be investigated and, if appropriate, acted upon. » Observation and supervision of waste management practices throughout construction phase. » Waste collection to be monitored on a regular basis. » Waste documentation completed. » An incident reporting system will be used to record non-conformances to the EMP

OBJECTIVE: Ensure disciplined conduct of on-site contractors and workers

In order to minimise impacts on the surrounding environment, Contractors must be required to adopt a certain Code of Conduct and commit to restricting construction

activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation (once issued), the Basic Assessment Report, and this EMP, as well as the requirements of all relevant environmental legislation.

Project component/s	» All components and activities occurring during the construction phase.
Potential impact	» Pollution/contamination of the environment. » Disturbance to the environment.
Activity/risk source	» Contractors are not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment.
Mitigation: target/objective	» To ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/control	Responsibility	Timeframe
The terms of this EMP and the Environmental Authorisation (once issued) will be included in all tender documentation and Contractors contracts.	INCA Kakamas Solar	Tender process
Construction workers must undergo appropriate environmental awareness training prior to commencing activities on site. A register of this training must be kept.	Contractor	Duration of construction
An ECO must be permanently on site throughout the construction phase.	INCA Kakamas Solar	Duration of construction
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no abluting will be permitted outside the designated area. These facilities must be regularly serviced by appropriate contractors.	Contractor, and sub-contractor/s.	Duration of contract
Cooking/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 said individual may disturb flora or fauna outside of the demarcated construction area/s.	Contractor, and sub-contractor/s.	Duration of contract
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	Contractor, and sub-contractor/s.	Construction
On completion of the construction phase all	Contractor, and sub-	Construction

Mitigation: Action/control	Responsibility	Timeframe
construction workers must be transported back to their place of origin within two days of their contract ending. The costs of transportation must be borne by the contractor	contractor/s.	
Performance indicator	<ul style="list-style-type: none"> » Compliance with specified conditions of Environmental Authorisation, (once issued), Basic Assessment Report and EMP » No complaints regarding contractor behaviour or habits » Code of Conduct drafted before commencement of construction phase. » Briefing session with construction workers held at outset of construction phase. 	
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of Contractor practices throughout construction phase. » A complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP 	

5.4. Detailing Method Statements

OBJECTIVE: Ensure all construction activities/practices/procedures are undertaken with the appropriate level of environmental awareness to minimise environmental risk, in line with the specifications of the EMP

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.

5.5. Awareness and Competence: Construction Phase of the PV facility

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

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this 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.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.

- » Basic training in the identification of archaeological sites/objects, paleontological sites, and protected flora and fauna that may be encountered on the site.
- » Awareness of any other environmental matters, which are deemed necessary by the ECO.
- » Ensuring that appropriate communication tools are used to outline the environmental "do's" and "don'ts" (as per the environmental awareness training course) to employees.
- » Records must be kept of those that have completed the relevant training.
- » Refresher sessions must be held to ensure the contractor's staff are aware of their environmental obligations.

5.6. Monitoring Programme: Construction Phase of the PV facility

OBJECTIVE: 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, INCA Kakamas Solar 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, and will conduct monitoring activities. The ECO must have the appropriate experience and qualifications to undertake the necessary tasks. The ECO will report non-compliances to the Site Manager and/or any other monitoring body stipulated by the regulating authorities.

**MANAGEMENT PLAN FOR THE PROPOSED PV FACILITY:
 REHABILITATION OF DISTURBED AREAS**

CHAPTER 6

6.1. Overall Goal for the Rehabilitation of Disturbed Areas

Overall Goal for the Rehabilitation of Disturbed Areas: 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

6.2. Objectives

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

OBJECTIVE: Ensure appropriate rehabilitation of disturbed areas following any executions 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 maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

Project component/s	<ul style="list-style-type: none"> » PV facility » Power line servitude » Access roads (i.e. those not required for operation and maintenance)
Potential impact	<ul style="list-style-type: none"> » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention » Infestation of alien plant species
Activity/risk source	<ul style="list-style-type: none"> » Temporary access roads/tracks » Other disturbed areas/footprints
Mitigation: target/objective	<ul style="list-style-type: none"> » Ensure and encourage site rehabilitation of disturbed areas » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed

Mitigation: Action/control	Responsibility	Timeframe
All temporary facilities, equipment, and waste materials must be removed from site as soon as practically possible after construction is complete.	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 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
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.	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.	INCA Kakamas Solar in consultation with rehabilitation specialist	Post-rehabilitation
Ongoing alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	INCA Kakamas Solar in consultation with rehabilitation specialist	Post-rehabilitation

Performance indicator	<ul style="list-style-type: none"> » All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities » Topsoil replaced on all areas and stabilised » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites » Completed site free of erosion and alien invasive plants
Monitoring	<ul style="list-style-type: none"> » On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented » On-going alien plant monitoring and removal should be undertaken on an annual basis

MANAGEMENT PLAN FOR THE PV FACILITY: OPERATION

CHAPTER 7

7.1. Overall Goal for Operation

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

- » Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
- » Ensures the operation activities are 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 and other receptors in terms of visual impacts.

7.2. Objectives

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

OBJECTIVE: Maintenance of rehabilitated areas

In order to ensure the long-term environmental integrity of the site following construction, maintenance of the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established.

Project component/s	<ul style="list-style-type: none"> » PV facility. » Access roads. » Ancillary buildings. » Power line servitude.
Potential impact	<ul style="list-style-type: none"> » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.
Activity/risk source	<ul style="list-style-type: none"> » Foundations. » Access roads. » Other disturbed areas.
Mitigation:	<ul style="list-style-type: none"> » Ensure and encourage site rehabilitation of disturbed areas.

target/objective

Mitigation: Action/control	Responsibility	Timeframe
Appoint an environmental manager during operation whose duty it will be to minimise impacts on surrounding sensitive habitats.	INCA Kakamas Solar	Operation

Performance indicator	» Successful rehabilitation of disturbed areas
Monitoring	» On-going alien plant monitoring and removal should be undertaken on an annual basis

OBJECTIVE: Management and possible negation of visual impacts associated with the operation of the proposed facility

The rural visual quality and wide open views surrounding the site will be transformed for the entire operational lifespan of the PV facility (i.e. ~20 years). The following is a summary of impacts remaining, assuming mitigation as recommended is exercised:

- » The potential visual impact of the facility on users of national, arterial, and secondary roads in close proximity to the proposed facility will be of high significance.
- » The anticipated visual impact on residents of urban areas, farms, and homesteads in close proximity to the proposed facility will be of high significance.
- » Within the greater region, the potential visual impact on sensitive visual receptors (i.e. Users of roads and residents of towns, farms, and homesteads) will be of moderate significance.
- » In terms of ancillary infrastructure, the anticipated visual impact of the substation, the new power line and the internal access roads will be of low significance in close proximity to the proposed facility.
- » Similarly, visual impacts related to lighting will be of moderate significance.
- » The anticipated visual impact of construction is also expected to be of moderate significance.
- » In terms of secondary visual impacts, the significance of the anticipated impact on the visual character and sense of place of the region will be of moderate significance, while the anticipated impact on tourist routes, tourist destinations, and tourism potential will be of low significance.
- » These anticipated visual impacts are not considered fatal flaws from a visual perspective, considering the relatively contained area of potential visual exposure and the low occurrence of visual receptors. Furthermore, the anticipated visual impact is not likely to detract from the regional tourism appeal or the numbers of

tourists travelling along the N14 or the tourism potential of the area. These receptors will be exposed to the proposed facility for a very short period of their journey, and it is unlikely that the facility will be visible from many tourist destinations.

Project component/s	» PV plant and ancillary infrastructure (i.e. substation, power line, and access roads).
Potential impact	<ul style="list-style-type: none"> » Potential scarring and erosion due to the unnecessary removal of vegetation. » Visual impact of facility » Degradation and vegetation rehabilitation failure. » Lighting from the facility.
Activity/risk source	» The viewing of the above mentioned by observers on or near the site.
Mitigation: target/objective	<ul style="list-style-type: none"> » Minimal disturbance to vegetation cover in close vicinity to the proposed solar energy facility. » Well maintained and neat facility. » Minimised impacts from lighting

Mitigation: Action/control	Responsibility	Timeframe
Limit access to the development site to existing access roads, where possible.	INCA Kakamas Solar, and Operators	Operation
Rehabilitate all disturbed areas to acceptable visual standards and monitor rehabilitated areas, and implement remedial action as and when required.	INCA Kakamas Solar, and Operators	Operation and maintenance
Maintain the general appearance of the facility in an aesthetically pleasing way.	INCA Kakamas Solar, and Operators	Operation
Ensure appropriate maintenance of lighting to minimise impacts on surrounding areas	INCA Kakamas Solar	Operation

Performance indicator	<ul style="list-style-type: none"> » Vegetation cover that remains intact with no erosion. » Well maintained and neat facility.
Monitoring	<ul style="list-style-type: none"> » Monitoring of rehabilitated areas. » Monitoring of site maintenance by environmental manager

OBJECTIVE: Appropriate handling and management of hazardous substances and waste

The operation of the PV facility may involve the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general solid waste, hazardous waste and liquid waste.

Project component/s	<ul style="list-style-type: none"> » PV facility » Associated buildings
Potential impact	<ul style="list-style-type: none"> » Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices
Activity/risk source	<ul style="list-style-type: none"> » PV panels
Mitigation: target/objective	<ul style="list-style-type: none"> » To comply with waste management guidelines » To minimise production of waste » To ensure appropriate waste disposal » To avoid environmental harm from waste disposal

Mitigation: Action/control	Responsibility	Timeframe
Hazardous substances must be stored in sealed containers within a clearly demarcated designated area.	INCA Kakamas Solar	Operation
Storage areas for hazardous substances must be appropriately sealed and banded.	INCA Kakamas Solar	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.	INCA Kakamas Solar	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 banded area. Should any accidental spillage take place, it will be cleaned up according to specified standards regarding bioremediation.	INCA Kakamas Solar	Operation and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	INCA Kakamas Solar	Operation and maintenance
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	INCA Kakamas Solar Waste management contractor	Operation
Used oils and chemicals: » Appropriate disposal must be arranged with a	INCA Kakamas Solar	Operation

Mitigation: Action/control	Responsibility	Timeframe
licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations.		
It must be ensured that volumes of any hazardous waste stored on site do not exceed 30m ³ . Should this volume be exceeded, a waste license will be required to be obtained.	INCA Kakamas Solar	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Contractor	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	INCA Kakamas Solar	Operation
Hazardous waste must be disposed of at an appropriately licensed landfill.	Contractor	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	INCA Kakamas Solar	Operation

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

OBJECTIVE: Maximise local employment and business opportunities associated with the operation phase

The proposed solar energy facilities are not labour intensive, however several permanent employment opportunities will manifest during the operational phase. Typically the personnel would include a coordinator (electrician), some general workers,

and security personnel (i.e. required on site on a permanent basis). The local team, under supervision of the remote control system, will undertake the maintenance. As indicated above the employees' functions would revolve around the general maintenance of the facility and site.

Therefore, long-term direct job opportunities for locals 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.

Project component/s	» Day to day operational activities associated with the PV facility, including maintenance etc.
Potential impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised
Activities/risk sources	» The operational phase of the PV facility will create approximately 30 full time employment opportunities.
Mitigation: target/objective	» In the medium to long term employ as many locals as possible to fill the 30 full time employment opportunities.

Mitigation: Action/control	Responsibility	Timeframe
The entire workforce should be based in local towns of Upington, Keimoes and Kakamas. INCA Kakamas Solar should commit to implementing a 5-year training and skills development and training programme. The initial local content target is 30%, however, after 5 years the objective is to have all the employment opportunities taken up by locals.	INCA Kakamas Solar, and Contractor	Construction phase
Identify local members of the community who are suitably qualified or who have the potential to be employed full time.	INCA Kakamas Solar, and Contractor	Construction phase

Performance indicator	» 5 year training and skills development programme developed and designed before construction phase completed. » Potential locals identified before construction phase completed.
Monitoring	» INCA must monitor indicators listed above to ensure that they have been met for the operational phase.

OBJECTIVE: Maximise the potential tourism opportunities during the operational phase and highlight the benefits of renewable energy projects

Caution must be taken to ensure that the development of renewable energy projects do not affect the tourism potential of the province. However, based on the findings of the Basic Assessment, the proposed facility is not likely to impact on the tourism sector in the area or the province. The significance of this issue is therefore rated as low negative. In some instances the plant may also attract tourists to the area. However, the significance of this potential benefit is also rated as low.

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. The establishment of a clean, renewable energy facility will therefore reduce, albeit minimally, South Africa's reliance on coal-generated energy. The overall contribution to South Africa's total energy requirements of the proposed PV facility is relatively small. However, the 10 MW produced will help to offset the total carbon emissions associated with energy generation in South Africa. Given South Africa's reliance on Eskom as a power utility, the benefits associated with an IPP based on renewable energy are regarded as an important contribution.

Project component/s	» Operational phase of the project.
Potential impact	» The proposed PV facility has the potential to provide Kai! Garib Municipality with an attraction that would improve its attraction to tourists. The development also has the potential to promote the benefits of renewable energy projects.
Activity/risk source	» The establishment of a PV facility has the potential to create and attraction for visitors to the area. The development also has the potential to promote the benefits of renewable energy projects.
Mitigation: target/objective	» To enhance the potential tourism and renewable energy opportunities associated with the proposed PV facility.

Mitigation: Action/control	Responsibility	Timeframe
Liaise with representatives from the Kai! Garib Municipality and tourism organisations to raise awareness of the proposed PV facility.	INCA Kakamas Solar	Construction, and operation phase

Performance indicator	» Meeting with Kai! Garib Municipality and local tourism organisations during the construction phase.
Monitoring	» INCA Kakamas Solar must monitor indicators listed above to ensure that they have been met for the operational phase.

OBJECTIVE: Enhance capacity building and skills development within the local communities

During the operational phase, specific and general capacity building and skills training would be required to ensure that the employees are familiar with the operations of the facilities and safety procedures. The project proponents have e.g. indicated that the global team coordinator (electrician) would undergo a one month focused international training programme overseas.

Capacity building and skills training as part of the operation of the solar energy facilities will enable individuals to enhance their existing skills. In addition, those who would want to leave the facility to seek work at similar projects would have an enhanced skills base, to enable them to find work at other PV facility projects in the Northern Province, (e.g. the Solar Park project near Upington) and possibly at those proposed within the Gamagara Local Municipality.

Project component/s	» PV facility
Potential impact	» Positive contribution to the capacity of individuals involved with the project, and equipping them with transferable skills
Activity/risk source	» Inefficient training or lack of capacity building and skills training
Mitigation: target/objective	» Capacity building and skills training should be continuously undertaken during the operational phase of the project.

Mitigation: Action/control	Responsibility	Timeframe
INCA Kakamas Solar and contractors should create conditions that are conducive for the involvement of entrepreneurs, small businesses, and SMMEs during the operational phase.	INCA Kakamas Solar, and Contractors	Operation
INCA Kakamas Solar should invest in improving the quality of life of employees and their families through the provision of capacity building and skills training programmes.	INCA Kakamas Solar	Operation

Performance indicator	The skills of the local community are developed.
Monitoring	INCA Kakamas Solar should be able to demonstrate that the above indicators are implemented.

OBJECTIVE: Promote local procurement

Apart from the technical components it is expected that some local procurement of goods, materials and services could occur which would result in positive economic spin-offs. This aspect, however, would be dependent on the outcome of a competitive tender process.

Project component/s	» PV facility
Potential impact	» Potential positive economic spin-offs, increased income, and expansion of other local economic sectors.
Activity/risk source	» No procurement of local goods, materials, and services due to unavailability of those in the area.
Mitigation: target/objective	» Maximise the use of local goods, materials, and services.

Mitigation: Action/control	Responsibility	Timeframe
Where possible, ensure local sourcing of materials to assist in providing more economic and employment opportunities for the local people.	INCA Kakamas Solar	Operation

performance indicator	» Local procurement of goods, materials, and services do take place.
monitoring	» INCA Kakamas Solar should be able to demonstrate that they have aimed to achieve the above indicators as far as possible.

OBJECTIVE: Minimise the potential impact on safety and security

Criminal activities increase with the added movement of people in the area. Crime may thus increase as a result of the proposed development. Property owners surrounding the proposed developments are thus most at risk, especially concerning the theft of livestock.

Should children or other individuals gain unauthorised access to the sites it could create safety risks. The site should thus be properly fenced and access controlled and managed by security guards to avoid such a situation. The project proponents indicated that the entire solar facility will be fenced, and security cameras, as well as security personnel would be functioning on site on a permanent basis which could limit the safety and security risks.

Project component/s	» PV facility
Potential impact	» Increased safety and security risks due to presence of facility
Activity/risk source	» Insufficient fencing of the site and perceptions of increased criminal activity in the area. Increased risk of fires and operational accidents.
Mitigation: target/objective	» Minimise the safety and security risks

Mitigation: Action/control	Responsibility	Timeframe
Site access should be strictly controlled.	INCA Kakamas Solar	Operation
Fire fighting and emergency services should be available on site.	INCA Kakamas Solar	Operation
Normal operational safety guidelines should be adhered to.	INCA Kakamas Solar	Operation
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.	INCA Kakamas Solar Security personnel	Operation
Procedures and measures to prevent, and in worst cases, attend to fires should be developed in consultation with the surrounding property owners.	INCA Kakamas Solar Surrounding property owners	Operation
Employees should receive training in fire fighting techniques and appropriate fire-fighting equipment should be available on site	INCA Kakamas Solar	Operation
The developer should be part of the local fire protection association.	INCA Kakamas Solar	Operation
Appropriate fire breaks should be implemented and maintained in accordance with the relevant legislation.	INCA Kakamas Solar	Operation
Contact detailed of emergency services should be clearly displayed on site.	INCA Kakamas Solar	Operation

Performance indicator	<ul style="list-style-type: none"> » Site access is appropriately controlled. » Security personnel are on site on a continuous basis. » Fire fighting equipment and vehicles are available on site and fire breaks are implemented and maintained. » A fire emergency plan is put in place. » Normal operational safety guidelines are implemented
Monitoring	» Project proponent must monitor indicators listed above and should be able to demonstrate that the mitigation measures are implemented.

7.2 Monitoring Programme: Operational Phase of the PV Facility

OBJECTIVE: 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, INCA Kakamas Solar 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 Environmental Manager will ensure compliance with the EMP, and will conduct monitoring activities. The manager must have the appropriate experience and qualifications to undertake the necessary tasks. The Environmental Manager will report non-compliances to the Facility Manager and/or any other monitoring body stipulated by the regulating authorities.

MANAGEMENT PLAN FOR THE PV FACILITY: DECOMMISSIONING

CHAPTER 8

The infrastructure which will be utilised for the proposed PV facility is expected to have a lifespan of up to 20 years (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 infrastructure with more appropriate technology/infrastructure available at that time. Considerations during the construction phase (as detailed in Chapter 6) are also applicable here. It must be noted that decommissioning will need to comply with environmental legislation relevant at the time, which may require the undertaking of additional studies.

8.1. Site Preparation

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

8.2 Disassemble and Replace Existing Infrastructure

All 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

Project component/s	» Decommissioning phase of the PV facility.
Potential impact	» Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life, stress, depression etc. However, the number of people affected is relatively small. Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.
Activity/risk source	» Decommissioning of the PV facility.
Mitigation: target/objective	» To avoid and or minimise the potential social impacts associated with decommissioning phase of the PV facility.

Mitigation: Action/control	Responsibility	Timeframe
INCA Kakamas Solar should ensure that retrenchment packages are provided for all staff who stand to lose their jobs when the facility is decommissioned Retrenchments should comply with South African Labour legislation of the day.	INCA Kakamas Solar	Decommissioning.

Performance indicator	South African Labour legislation at the relevant time.
Monitoring	Retrenchments should comply with South African Labour legislation of the day.

OBJECTIVE: Management and possible negation of visual impacts associated with the decommissioning of the proposed facility

Project component/s	» PV plant » Ancillary infrastructure (i.e. substation, power line, and access roads).
Potential impact	» Visual impact of residual visual scarring and vegetation rehabilitation failure.
Activity/risk source	» The viewing of the above mentioned by observers on or near the site.
Mitigation: target/objective	» Infrastructure required for post decommissioning use of the site and rehabilitated vegetation in all disturbed areas.

Mitigation: Action/control	Responsibility	Timeframe
Remove infrastructure not required for the post-decommissioning use of the site.	INCA Kakamas Solar and/or Operator	Operation
Rip and rehabilitate access roads not required for the post-decommissioning use of the site.	INCA Kakamas Solar and/or Operator	Operation
Monitor rehabilitated areas, and implement remedial action as and when required.	INCA Kakamas Solar and/or Operator	Operation

Performance indicator	Site with intact vegetation on and near the facility.
Monitoring	Monitoring of rehabilitated areas.

OBJECTIVE: To avoid and or minimise the potential impacts associated with the decommissioning phase

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of the proposed facility the decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 25 - 30 years post commissioning. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning.

In addition, the social impacts associated with final decommissioned are likely to be limited due to the relatively small number of permanent employees (20-30) affected. The potential impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be Low (negative).

Project component/s	» Decommissioning phase of the PV facility
Potential impact	» Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life, stress, depression etc. » However, the number of people affected (60 - 80) is relatively small. Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.
Activity/risk source	» Decommissioning of the PV facility.
Mitigation: target/objective	» To avoid and or minimise the potential social impacts associated with decommissioning phase of the PV facility.

Mitigation: Action/control	Responsibility	Timeframe
Retrenchments should comply with South African Labour legislation of the day.	INCA Kakamas Solar	Decommissioning

Performance indicator	» South African Labour legislation relevant at the time.
Monitoring	» INCA Kakamas Solar and Department of Labour.

8.3 Monitoring Programme

OBJECTIVE: 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, INCA Kakamas Solar 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.