

**NGONYAMA 140MW SOLAR
PV FACILITY – DEALESVILLE,
FREE STATE PROVINCE**

June 2023

ENVIRONMENTAL MANAGEMENT PROGRAMME

EMPr-01

Ref: 14/12/16/3/3/2/852/AM6



Details of Role Players

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ACRONYMS AND ABBREVIATIONS

- BMP Best Management Practices
- DEA - Department of Environmental Affairs
- ECO - Environmental Control Officer
- EPRP Emergency Preparedness and Response Plan
- EMPr - Environmental Management Programme
- EIA - Environmental Impact Assessment
- ElAr - Environmental Impact Assessment Report
- IFC - International Finance Corporation
- ISO - International Organization for Standardization
- NEMA - National Environmental Management Act
- MW - Megawatt
- PV - Photovoltaic
- PPE - Personal Protective Equipment
- SAHRA - South African Heritage Resource Agency

DECLARATION OF INDEPENDENCE

The independent Practitioner

I, **Zander Liebenberg**, declare that I –

- act as the independent Environmental Practitioner for the Environmental Management Programme
- this report covers the Environmental Impacts and proposed Mitigation measures only and no other scope of work was requested for this study and the information should be interpreted with caution
- do not have and will not have financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2010;
- have no and will have any vested interest in the proposed activity proceeding;
- undertake to disclose, to the competent authority any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2010;
- BioBlue accepts no responsibility for the accuracy of any third-party data used in the production of this report.



Signature of Author (EAP) – Zander Liebenberg EAPASA Registered

Date: June 2023

1 INTRODUCTION AND PROJECT BACKGROUND

The Environmental Management Programme (EMP) sets out a formal system by which the project will plan, management and implement mitigation measures that will avoid or reduce the significance of impacts related to the health, safety and security and environment.

This EMP is prepared as part of the requirements of the 2014 EIA Regulations promulgated under the National Environmental Management Act (NEMA, Act 107 of 1998).

Ngonyama Solar (Pty) Ltd. received and amended Environmental Authorization (EA) on the 22nd of March 2023 under reference number, 14/12/16/3/3/2/852/AM6, and it is stipulated in paragraph 14 and 16 that the proponent needs to submit an updated EMP for approval. The initial EMP was compiled by the CSIR and submitted as part of the Environmental Impact Assessment Process.

The proposed Ngonyama Solar PV facility will comprise the following infrastructure:

- **140Mw Solar Arrays mounted on Horizontal Single Axis Tracking and**
- **Underground 11, 22 or 33 kV cables.**
- **Building Infrastructure**
 - Offices
 - Ablution facilities
 - Operational control centre; and
 - Warehouse / workshop
- **Associated Infrastructure**
 - Access roads and internal gravel roads
 - Fencing and security
 - Operation and Maintenance Area
 - Laydown Area
 - Stormwater Channels
 - Water Pipelines
- **Electricity Infrastructure**
 - Two 132/22 kV collector substations
 - One 275/132 kV Main Transmission Station (MTS)
 - 132 kV overhead transmission lines connecting the collector substation to the MTS
 - 275 kV transmission line looping into existing 275 kV Eskom transmission line

Table 1: Farm Portions and SG Codes

Farm	21SG Code
RE of Farm Doornhoek 37	F00400000000003700000
Portion 4 of the Farm Sterkfontein 639	F00400000000063900004
RE of Farm Cornelia 1550	F00400000000155000000
RE of Farm Modderpan 750	F00400000000075000000
RE of Farm Palmietfontein 140	F00400000000014000000
Portion 3 of Farm Brakfontein 636	F00400000000063600003

The EMPr is intended as a “living” document and should continue to be updated regularly. The aim of this report is to establish an Environmental Management Programme (EMPr) that would serve as a management tool that will be used to ensure that the impacts of the construction and operational phases of the project are prevented or minimized and that the positive benefit of the project is enhanced.

2 ENVIRONMENTAL MANAGEMENT PROGRAMME

2.1 OBJECTIVES OF THE EMPr

This EMPr will provide the actions for the management of identified environmental impacts resulting from the proposed development and a detailed outline of the implementation programme to minimise and/ or eliminate the anticipated negative environmental impacts. The EMPr will also provide strategies to be used to address the roles and responsibilities of environmental management personnel on site, and a framework for environmental compliance and monitoring. The aim of this document is to ensure the establishment of an environmentally sustainable project and ensure environmental compliance to all applicable legislation and authorizations.

The EMPr is a dynamic document that can be subject to influences and changes that may arise during the project process and thus the document needs to be able to evolve with the project to ensure good environmental practice during all the project phases. The management measures contained within this document is based on the possible impacts identified during the EIA process.

The objectives of the EMPr:

- To ensure compliance with guidelines from the regulatory authority, national legislation, international best practices, rules, other applicable laws applicable to the project on all relevant points.
- To follow the general requirements under the ISO 14001 standard.
- To provide feedback for continual improvement in environmental performance.
- To respond to unforeseen events.
- To identify the required mitigation measures that could reduce the potential impacts to minimal levels and to manage these possible impacts associated with the development.
- To set out the specific actions that need to be taken to assist in mitigating the environmental impacts of the proposed project.
- Establish management structures to address the concerns and complaints of I&APs with regards to the project.
- Specify time periods for certain aspects of the project that need to be implemented.

Table 2: The environmental objectives and targets for the project

Aspect	Objective	Target / Goal
Best practice environmental management	Effective implementation of EMP to ensure best practice environmental management.	• 100% compliance with measurable management and mitigation measures outlined in the EMP. • Zero reported environmental incidents.
Environmental complaints	Minimise environmental complaints and adequately address any environmental complaints in a timely manner.	• Zero community complaints regarding dust and noise. • 100% compliance with complaints response timeframes outlined in the EMP. • 100% compliance with timeframes outlined within EMP for complaint investigations and close-outs.

Aspect	Objective	Target / Goal
Incidents	Minimise, avoid and appropriately manage all environmental incidents.	• Zero reported environmental incidents. • 100% compliance with incident reporting, investigations and implementation of corrective action timeframes.
Non-conformance	Minimise, avoid and appropriately manage all environmental non-conformances.	• Zero reported environmental non-conformances. • 100% compliance with timeframes for the investigation and implement of corrective actions.
Audit and inspection	Undertake environmental site audits and inspections in a timely manner.	• 100% compliance with timeframes for environmental audits and inspections. • 100% compliance with timeframes for implementation of identified corrective actions.

2.2 MITIGATION HIERARCHY

This EMPr strives to recommend avoidance, management, mitigation and monitoring actions towards enhancing positive impacts, and avoiding damage or loss of ecosystems and services that they provide, and where they cannot be avoided, to reduce and mitigate potential impact. Offsets to compensate for loss of habitat are regarded as last resort, after all efforts have been made to avoid, reduce and mitigate.

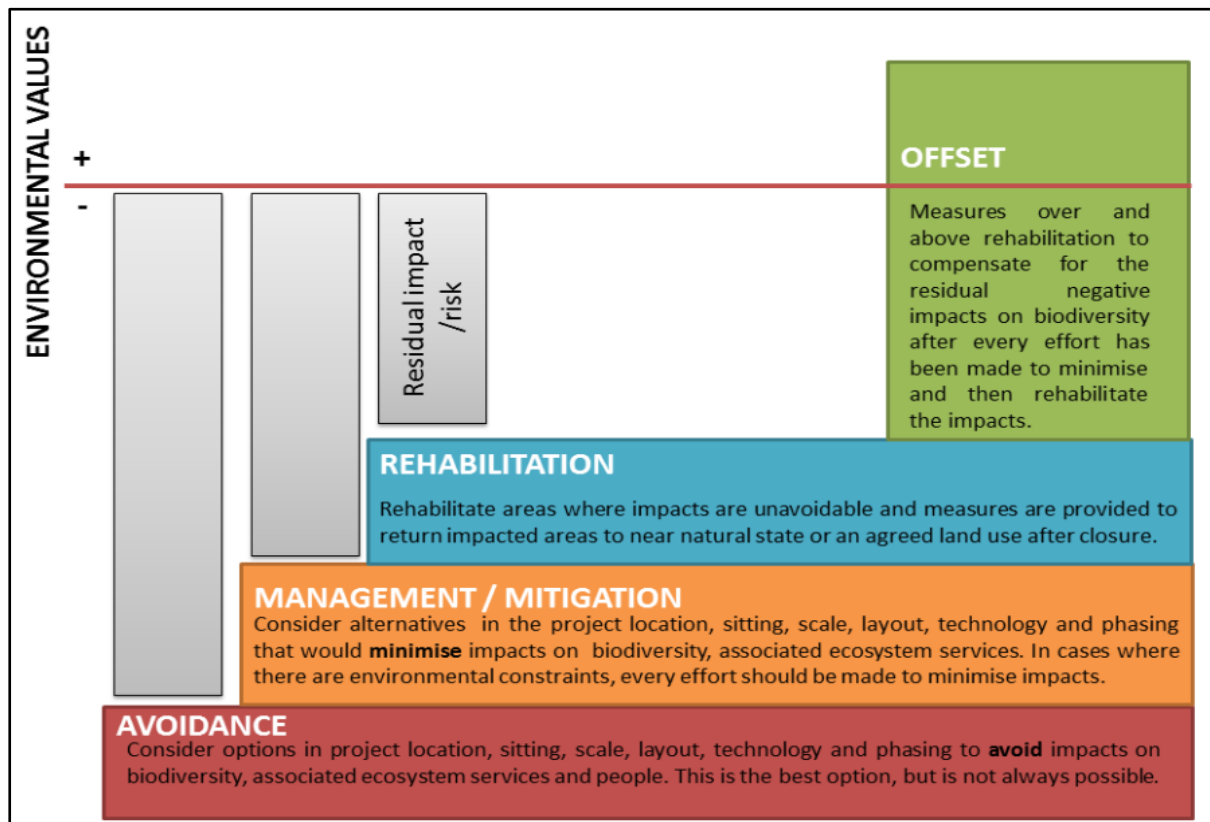


Figure 1: Mitigation Hierarchy

2.3 LEGAL REQUIREMENTS

The applicant and the contractor must identify and comply with all South African National and Provincial environmental legislation, including associated regulations and all local by-laws relevant to the project.

The EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations of 2014. The EMPr will comply with Section 24N of NEMA and will be undertaken as per the legislative requirements as follows:

- Provide details of the EAP who undertook the EMPr and the expertise as well as a curriculum vitae of the EAP to prepare an EMPr thereof.

- Provide a detailed description of the aspects of the proposed development that are covered by the EMPr as identified by the project description;
- Produce a map which superimpose the proposed development, its associated structures and infrastructure on the environmental sensitivities of the preferred development site, indicating areas that should be avoided including buffers;
- Provide a description of the impact management objectives including management statements identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process of this Basic Assessment Report for all the phases of the proposed development.
- Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; and
- Comply with any prescribed environmental management standards or practices.

2.4 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Zander Liebenberg completed his Hons. Degree at the North-West University in Potchefstroom in 2012 and has been working in the environmental consultancy field for 7 years. He has been involved in numerous Environmental assessment projects and Water-use License applications and is a registered member of EAPASA, SACNASP and IEMA (UK).

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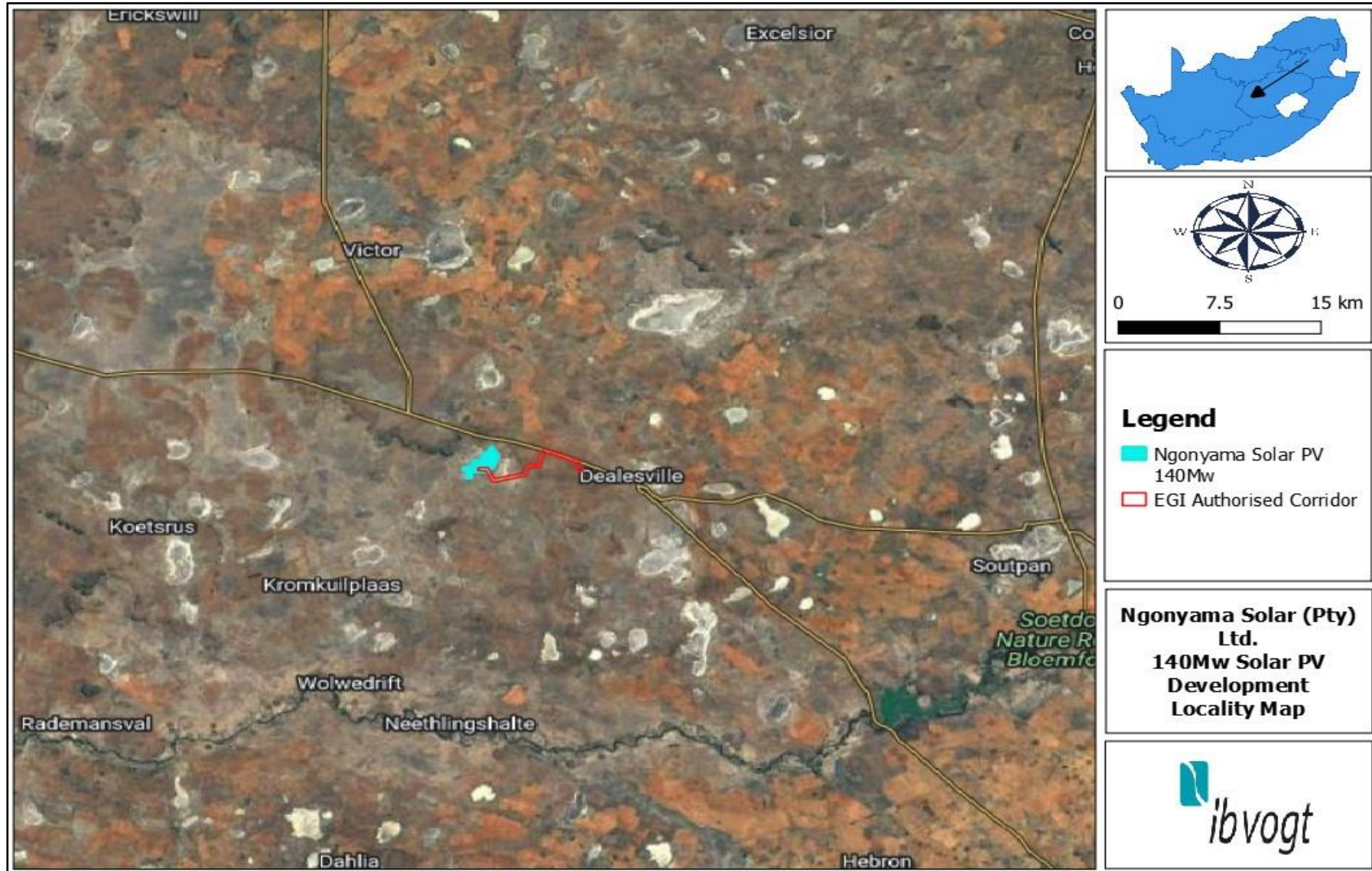


Figure 2: Ngonyama Solar PV Development – Locality Map

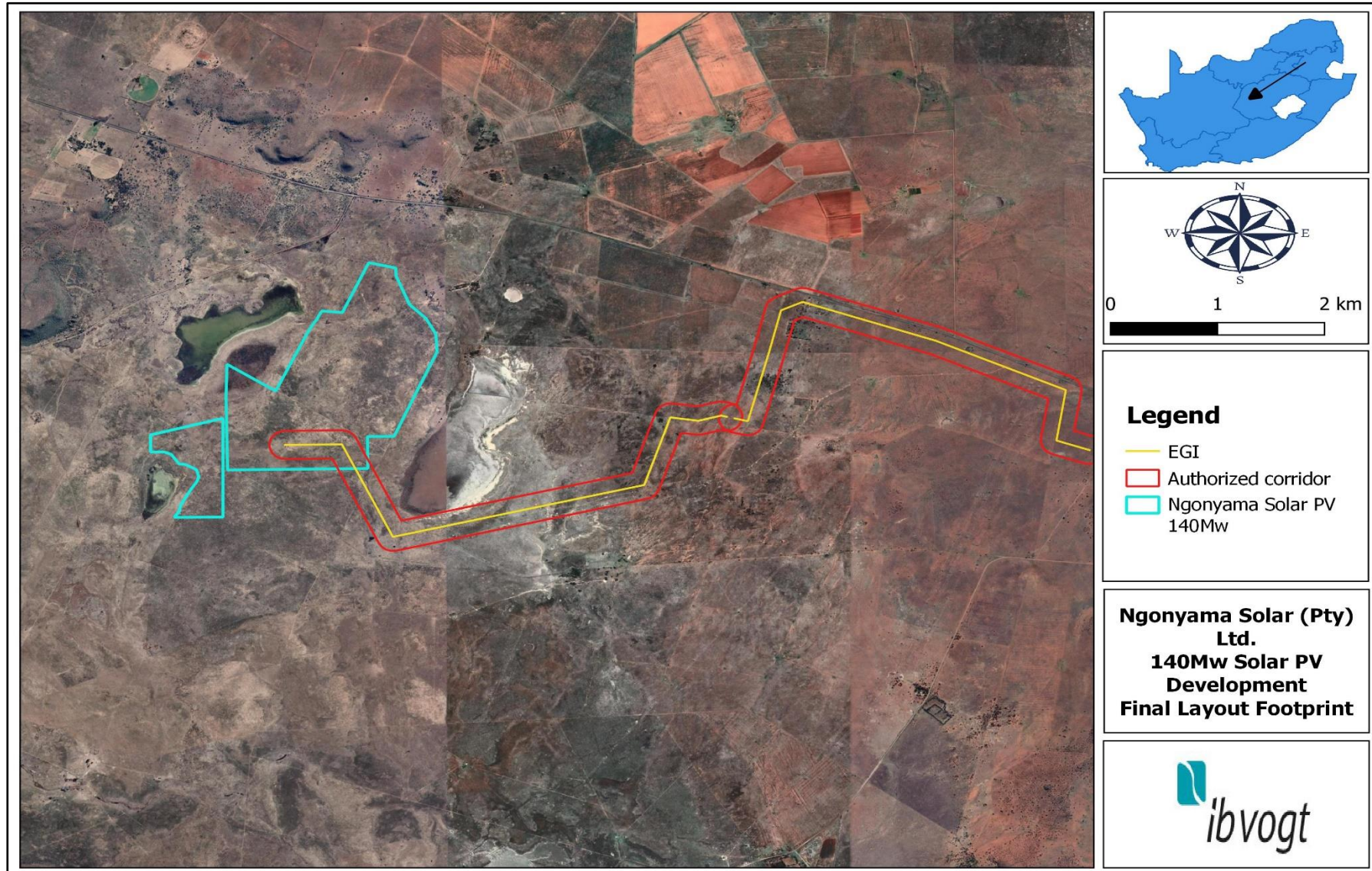


Figure 3: Ngonyama Solar – Final Layout Footprint



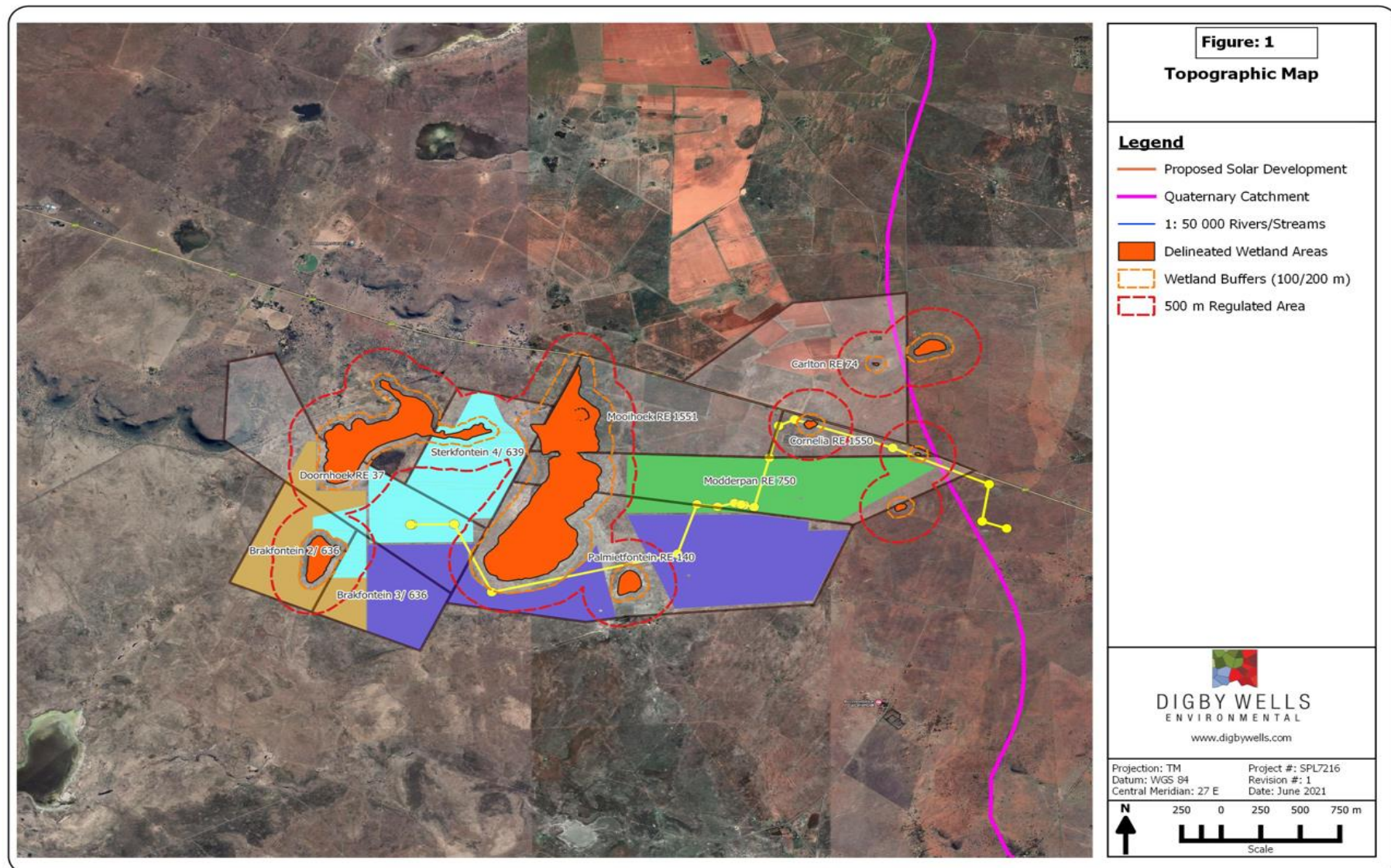


Figure 5: Environmental Sensitivities in the vicinity of the proposed Solar Projects

2.5 STRUCTURE OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME

This document is divided into the three phases of development that needs to be monitored, namely the Construction Phase, the Operational Phase and the Decommissioning Phase.

2.5.1 Development / Planning Phase

This section of the document provides guidelines and management measures that need to be adhered to during the development and site establishment phase. . The inputs from various specialists have been included in this phase to ensure that the project could be sustainable in the long run. The specifications within this section should form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfaction of the Environmental Control Officer (ECO).

2.5.2 Construction Phase

This section of the document provides guidelines and management measures that need to be adhered to during the construction or establishment phase. The inputs from various specialists have been included in this phase to ensure that the project could be sustainable in the long run. The specifications within this section should form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfaction of the Environmental Control Officer (ECO).

2.5.3 Operational and Maintenance Phase

This section of the document provides management measures for the operational and maintenance phases of the project. These measures need to be adhered to by the applicant to ensure the sustainable continuation of the project. Environmental Awareness training for employees that will be involved with the project will also ensure that the whole structure of the company is aware of the requirements stipulated within the EMPr and management actions that need to be taken.

2.5.4 Decommissioning Phase

Some mitigation measures for the decommissioning phase have been established, however as the EMPr is a dynamic document that needs to evolve with the project, thus once appropriate decommissioning land-use has been approved, the mitigation measures for this phase will be compiled and submitted for approval.

Site specific rehabilitation measures will need to be established as part of the re-vegetation process.

3 DETAILED ENVIRONMENTAL MANAGEMENT PROGRAMME

This document stipulates the requirements to be implemented by the applicant as per the recommendations compiled within the Environmental Impact Assessment Process and the various specialist studies conducted.

The provisions of the EMPr are binding on the Applicant during the life of the project. It is essential that the requirements contained within this document be understood, implemented, and adhered to throughout the construction and operational phases.

Parties (I&APs), State Departments and other stakeholders are afforded a period of 30 days, for each draft report (Draft EMPr and Draft BAR), to comment on the content of that draft report. The comments received from I&APs, State Departments and other Stakeholders are incorporated into a CRR which forms part of each final report, the final report inclusive of the CRR will be submitted to the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) for decision making.

3.1 DEVELOPMENT / PLANNING PHASE

The key impacts identified for the development phase of the proposed project, as mentioned above, are listed below:

3.1.1 Possible Impacts Identified

- Impact to Archaeological and palaeontological resources (none expected)
- Impact to natural and cultural landscape
- Impacts to Flora and Fauna
- Impacts to wetlands, pans and associated buffer zones
- Social impact associated with an influx of people

3.2 CONSTRUCTION PHASE

The key impacts identified for construction phase of the proposed project, as mentioned above, are listed below:

3.2.1 Possible Impacts Identified

- Damage or destruction of palaeontological resources.

- Impact of site clearing to archaeological heritage resources.
- Avifauna habitat destruction during site clearance.
- Loss of Avifauna diversity due to disturbance and barrier effects due to establishment of the facility.
- Clearance of vegetation for the construction of roads and Solar Array.
- Soil disturbance and spread of alien species.
- Sedimentation of wetlands due to soil destabilisation.
- Erosion of soil.
- Water pollution.
- Socio-economic impacts.

Table 3: Development / Planning Phase

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Impact to palaeontological and heritage resources (none expected)	Clearance of vegetation and site establishment could lead to damage of archaeological sites if the correct management actions are not implemented.	Achieve a layout that minimizes the potential later impacts to palaeontological resources.	- A palaeontologist should inspect the pre-construction geotechnical report to evaluate potential impacts to the Eccca Formation and the need for any further work. - Once construction commences then all aspects of the project should be carried out within the approved footprint so as to avoid impacts to sites not falling within the study area. - Appointed palaeontologist should monitor any excavations of >60cm deep into Eccca bedrock in order to record and/or sample any fossils that might be revealed. Avoidance: - Avoid heritage resources identified by demarcating a 20m buffer area around all identified sites. ECO to work with contractor during site establishment. Pre-	Site Management Contractor ECO Appointed Palaeontologist Frequency: - Palaeontologist to be appointed before commencement. - Archaeologist to be appointed should avoidance of sites not be possible. - ECO and appointed Site personnel to

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			construction site walk through and buffer area establishment to be done. • Ensure that no activity takes place outside of the authorized construction footprint. • Should any objects of archaeological or palaeontological remains be found during establishment activities, work must immediately stop in that area and the ECO must be informed. Mitigation: (When avoidance is not possible) • Appoint a professional archaeologist to excavate and collect samples of artefacts from the Stone Age site, and map and record historical ruins. This should happen 6 months prior to construction to allow the archaeologist time to obtain a permit and conduct the work and receive comment from SAHRA.	conduct site walk through as part of Early Works before commencement – aim is to demarcate buffer zones and the site boundary.
Destruction of Avifauna and Fauna habitat	• Encroachment into adjacent natural areas could lead to	• Minimise the risk of Avifaunal and	Identification, Avoidance / Mitigation: • Preconstruction walk through of the site needs to be conducted in order to locate	Contractor Site Management ECO

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
during site clearance	impacts on Avifauna and fauna diversity and population integrity.	Fauna habitat destruction. - Minimise disturbance footprint. - Create Environmental awareness among all employees and role players on the project.	species of conservation concern that can be translocated as well as comply with permitting conditions. - Demarcate the approved site footprint to ensure that disturbance is kept to a minimum. - Conduct vegetation removal in a phased approach, it would be beneficial to demarcate it phase. - Provide preconstruction environmental induction for all construction staff and visitors on site to ensure that basic environmental principles are adhered to.	Appointed Ornithologist / Ecologist Frequency: - The ECO and Ecologist need to be appointed to conduct a preconstruction walk through to identify any species of conservation concern that require a permit to be relocated. - Preconstruction environmental induction to be done by the ECO and Site

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				Management before commencement of establishment. Site Management to conduct induction for every new employee or contractor.
Disturbance of Fauna and Flora on site by clearance of vegetation for the construction of roads	Loss of Red data plant species or impact on fauna species of conservation concern.	Identify and confirm the presence / absence of sensitive species.	Identification, Avoidance / Mitigation: - Preconstruction walk through of the facility in order to locate species of conservation concern that can be translocated as well as comply with permitting conditions. - Five species of conservation concern has been noted by the specialist (Bat-eared fox, Aardvark, Cape Fox and Steenbok). Special care must be taken not to harm these animals and sightings must be recorded.	Contractor Site Management ECO Ecologist Frequency: The ECO and Ecologist need to be appointed to conduct a preconstruction walk through to

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			○ No animals must be fed on site. ○ Enforce strict speed limits of 30km/h on site. ○ Vehicles must only drive on designated roads once these have been established. ○ If any of these animals are seen near the construction site, it must be recorded, and the ECO must be informed of the location. ○ Avoid the use of large construction vehicles at night. • Clearly demarcate the construction site, parking and other project aspects before commencement. • Clearly demarcate the stipulated buffer zones before commencement of construction and avoid these sensitive areas.	identify any species of conservation concern that require a permit to be relocated. • The ECO, Site Management and Contractor need to conduct a preconstruction walk through and demarcate all the required buffer zones that need to be implemented.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Impacts on Fauna and Flora during site preparation		- Minimise disturbance footprints and impacts on resident fauna species. - Relocate flora species of concern before commencement of construction. Needs to comply with permitting conditions.	Identification, Avoidance / Mitigation: - Adhere to existing roads. - Clearly demarcate the construction site and sensitive area buffer zones. - Avoid the Very High ecologically sensitive areas depicted in the specialist report. - Provide adequate waste removal skips to prevent attraction of rats and other alien scavenging species to the sites. - No poisons are to be used on site for the control of vermin, (insects, rodents, small scavenging carnivores), unless these are environmentally friendly and can be locally contained (do not use poisons that fauna will carry off-site before taking affect or poisons known to bio-accumulate in the environment).	Contractor Site Management ECO Frequency: - Preconstruction walk through to demarcate all the sensitive area buffer zones. - Construction and site teams to adhere to existing roads daily. - Site Management and contractor must monitor the avoidance of buffer zones on a daily basis.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Impacts on Fauna, Flora and adjacent areas during site preparation		- Minimise the risk of soil erosion and effectively manage dust on site. - Reduce risk to protected species.	Management / Mitigation: - Control dust on site during the establishment activities. Roads and construction camp sites must be watered when required. - Use gravel collected on site to improve roads and reduce dust emissions. - Monitor wind and weather conditions to identify a threshold point for proceeding or suspending works accordingly. - Raise awareness amongst workers regarding the potential dust emitting activities and ensuring they are properly trained to handle the proper control procedures.	Contractor Site Management ECO Frequency: - Speed limits must be strictly adhered to and this must be monitored on a daily basis. - Dust control must be monitored on a daily basis, And watering is required when Site Management deems dust generation to be excessive and affecting workers

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			○ Dust monitoring must be done on a monthly basis – Record of particle matter measurements. • Speed limits must be strictly adhered to. • If the following animals are encountered the ECO must be contacted: ○ Aardvark ○ Bat-eared Fox ○ Cape Fox ○ Steenbok	or adjacent natural habitat. • Dust control intervals will become more frequent during the dry season.
Soil disturbance and spread of alien and weed species	• Proliferation of alien and weed species on site could lead to spread of these species into the adjacent natural areas and impact on the integrity and functioning of the natural habitat.	• Minimise soil disturbance and possible loss of valuable topsoil.	Avoidance / Mitigation: • A responsible person must be appointed to monitor the occurrence of alien and weed species on site. • Vehicles and equipment should be cleared of plant material before gaining access to the site. • Alien species and weeds should be removed before clearance activities commence.	Contractor Site Management ECO Frequency: • A responsible person must be appointed that will lead a team to remove large

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				stands of alien species and weeds before commencement of clearance activities if found on site. • Vehicles must be checked for plant material every time before entering the site. • Monitoring of alien species and weeds must be done on a weekly basis.
Fencing of accessed controlled areas	• Fencing could create barriers for animals such as snakes and tortoises	• Avoid creating impassable barriers to small animals and	Avoidance / Mitigation: • Construct all fences (electric and normal) with a bottom strand not lower than 30cm	Contractor Site Management Frequency:

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
	and could lead to animals being injured.	resultant habitat fragmentation. Avoid electrocution of small animals.	of the ground, in order for tortoises and snakes to pass safely.	A responsible person must be appointed to monitor the fences on a bi-weekly basis.
Sedimentation of wetlands due to soil destabilisation	Encroachment into the wetland buffer areas could lead to long-term impacts on the functionality and integrity of the wetlands.	- Minimise the risk of erosion and sedimentation of wetlands. - To continue to allow the flow of water within the wetland system. - Prevent the loss of the integrity and functioning of the wetland system.	Avoidance / Mitigation / Management: - Vegetation and soil must be retained in position for as long as possible and removed immediately before construction/earthworks commences. - Rehabilitation of roads leading into the pans. - The wetland buffer areas must be clearly demarcated before commencement of construction. A 100m to 200m wide buffer around the pans within the project area. No vehicles, waste material or infrastructure to be placed in the catchment of the pans.	Contractor Site Management ECO Frequency: - The ECO and Site Management must ensure that the buffer areas are demarcated before commencement. - Pre-establishment induction must be

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			• Vehicles are not allowed to traverse the pans. • Contours and other management measures, such as berms and canals, should be implemented to ensure that runoff from storm events is minimized. Silt traps and culverts should be regularly maintained and cleared to ensure effective drainage. • Stormwater management plan must be adhered to at all times and construction should strictly stick to the planned system.	done for all site personnel. • Contractor and site management must monitor the adherence to the buffer zones on a daily basis. • Stormwater Management infrastructure and management measures must be inspected weekly. • The ECO must inspect the buffer zones during the monthly audit.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Water and Soil Pollution	Continuous impacts on the soil and water resources in the vicinity of the site could lead to long-term degradation of the water resources, functionality and ecosystem services.	- Minimise the risk of soil and water contamination. - If a spill occurs the proper safety precautions are in place to minimize the impact and employees are properly trained.	Management / Mitigation: - Vehicles must be regularly serviced and maintained. This must only be done at a designated area that are bunded. - Spill kits must be available around the site and employees must be trained how to conduct effective spill clean-up. - Construction vehicles and equipment should also be refuelled on an impermeable surface. - Install drip trays for any engines that stand in one place for an excessive length of time. - Diesel fuel and oil storage should be within a bunded area with an impermeable surface. - Soil that has been contaminated by hazardous materials such as oil residue shall be treated with oil absorbent such as	Contractor Site Management ECO Frequency: - Spill Kits must be on site and employees should also received training before commencement. - The ECO, Contractor and Site Management must plant the construction camp and other areas before commencement. These areas and

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			Drizit or similar and this material must be removed to an approved waste site.	buffer zones must then be demarcated. Vehicle inspection should be done by drivers on a daily basis.
Social impact associated with an influx of people		Limit impacts associated with the presence of workers and work seekers including those associated with negative impacts on social structures and increased 'social ills' such as increased crime levels, increased	Management: - Establish a Monitoring Forum for the project. The Forum should be established before the construction phase commences and should include key stakeholders, including representatives from the local community, local councillors and the contractor. The role of the Forum would be to monitor the project and the implementation of the recommended mitigation measures. - Develop a Code of Conduct, in consultation with representatives from the	Site Management ECO Frequency: - Site Management to establish the forum during the planning phase. - Site Management must submit minutes of meetings or

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
		alcohol and drug use.	Monitoring Forum, for the project. The Code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and residents. For example, access on land that is not part of the development will not be allowed (no short cuts by workers going from home to site over land that is not part of the project).	grievances to the ECO on a weekly basis if new information is available.

Table 4: Construction Phase

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Damage or destruction of palaeontological resources		Minimise the risk of significant palaeontological	A palaeontologist should inspect the pre-construction geotechnical report to evaluate potential impacts to the Ecc	Contractor ECO Appointed Palaeontologist

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
		resources being disturbed.	Formation and the need for any further work. - Once construction commences then all aspects of the project should be carried out within the approved footprint so as to avoid impacts to sites not falling within the study area. - Appointed palaeontologist should monitor any excavations of >60cm deep into Eccca bedrock in order to record and/or sample any fossils that might be revealed.	Frequency: - Palaeontologist should be appointed as part of the planning phase before construction commences. - Contractor must monitor construction footprint area weekly, ECO to audit on a monthly basis.
Impact of site clearing to	Clearance of vegetation and site establishment could	Minimise the risk of significant archaeological sites	Avoidance: Avoid heritage resources identified by demarcating a 20m	Contractor Site Management

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
archaeological heritage resources	lead to damage of archaeological sites if the correct management actions are not implemented.	and/or graves being disturbed.	buffer area around all identified sites. ECO to work with contractor during site establishment. Pre-construction site walk through and buffer area establishment to be done. • Ensure that no activity takes place outside of the authorized construction footprint. • Should any objects of archaeological or palaeontological remains be found during construction activities, work must immediately stop in that area and the ECO must be informed. • The ECO must inform SAHRA and contact an archaeologist / palaeontologist depending on the nature of the find, to assess the importance of the find. No work	ECO Appointed Archaeologist Frequency: • ECO and Site Management to establish buffer zones before commencement. • Site Management must monitor integrity of buffer zones on a weekly basis and ECO to audit monthly. • Eco to be informed immediately

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			can resume in that area without approval of the ECO and SAHRA. - If the newly discovered heritage resource is considered significant, a Phase 2 assessment may be required. A permit from the responsible heritage authority will be needed. Mitigation: (When avoidance is not possible) - Ensure that all heritage resources requiring mitigation are implemented prior to the start of construction. - Appoint a professional archaeologist to excavate and collect samples of artefacts from the Stone Age site, and map and record historical ruins. This should happen 6 months prior to	should any archaeological objects be found and ECO to establish way forward and contact Archaeologist.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			construction to allow the archaeologist time to obtain a permit, conduct the work and receive comment from SAHRA.	
Impact of site clearance of graves	Clearance of vegetation and site establishment could lead to damage of archaeological sites if the correct management actions are not implemented.	Avoid / mitigate potential impacts to archaeological features and grave sites.	Avoidance: - Avoid all graves with a minimum buffer of 5m, but ideally establish a 20m buffer where possible. Mitigation: - Ensure that all construction and operation activities take place within the authorised construction footprint so as to minimise the possible damage to graves or heritage resources that have not been identified. - Ensure that employees and contractors remain within the designated development areas.	Site Management Contractor ECO Frequency: - ECO and Site management to establish buffer zones during the planning phase. - Site Management to monitor footprint areas and buffer zones on a weekly basis.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				ECO to audit monthly.
Destruction of Avifauna habitat during site clearance		Minimise the risk of avifaunal habitat destruction	Identification, Avoidance / Mitigation: - Preconstruction walk through of the facility in order to locate species of conservation concern that can be translocated as well as comply with permitting conditions. - If species are spotted on or near the construction activities, then the ECO must be informed, and the necessary steps taken to safely translocate the species.	Site Management ECO Appointed Ornithologist / Ecologist Frequency: - ECO and Ecologist to conduct a preconstruction walk through during the planning phase. - If species are spotted on or near the site during

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				construction, then the ECO must be contacted immediately and a way forward will be communicated.
	Encroachment into adjacent natural areas could lead to impacts on avi-fauna diversity and population integrity.	- Minimise disturbance footprint. - Rehabilitate disturbed areas and ensure that buffer areas are maintained. - Create Environmental Awareness among all employees and	Avoidance: - Keep the footprint of the disturbed area to the minimum approved layout. - Adhere to existing and approved roads. Management / Mitigation: - Rehabilitate and re-vegetate open areas to limit erosion. - Conduct vegetation removal in a phased approach.	Contractor Site Management Rehabilitation Specialist ECO Frequency: Site Management and Contractor to ensure that

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
		role players on the project.	- Site remediation should be implemented using indigenous, local plant species: <i>Cynodon dactylon</i> <i>Digitaria eriantha</i> <i>Eragrostis plana</i> <i>Themeda triandra</i> - Removal of vegetation must be followed closely by rehabilitation of the disturbed areas. - Provide preconstruction environmental induction for all construction staff and visitors on site to ensure that basic environmental principles are adhered to.	existing roads are used daily. - Site Management and Contractor to monitor the footprint area weekly. - A responsible person must be appointed to monitor rehabilitation every two weeks. ECO to audit monthly.
Loss of Avi-fauna diversity due to disturbance and barrier effects due to	Encroachment into adjacent natural areas could lead to impacts on Avi-fauna diversity	Mitigate potential transformation, fragmentation and destruction of Avi-fauna habitat.	Mitigation: The construction footprint, including laydown yards, roads and buildings must be kept to a	Contractor Site Management ECO

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
establishment of the facility	and population integrity. Loss of habitat for resident species caused by construction, operation and maintenance of PV.		minimum. So as to not disturb birds or destroy available habitat. - Completely avoid Very High ecologically sensitive areas depicted within the specialist report. - Removal of vegetation during the construction phase will be minimised to reduce the risk of excessive open areas occurring. - Adhere to existing roads, and if new roads are constructed, these must not cross sensitive areas such as the pans or drainage lines.	Frequency: - Demarcate construction footprint, construction camp and laydown yards before construction. ECO, Contractor and Site Management to plan and demarcate. - Demarcate buffer zones during planning phase. - Site Management and Contractor

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				must manage the removal of vegetation on a weekly basis.
	Disturbance could also contribute to habitat fragmentation effect during the operational phase of the project, since certain bird species will be displaced from the site and forced to find alternative territories.	Minimise impacts on resident Avi-fauna species and possible fatalities.	Monitoring: - Monitor bird fatalities. The monitoring plan must indicate what species are affected and at what time/season these occur. Should follow Birdlife SA recommendations. - Implement an Avi-fauna monitoring program as per Birdlife SA recommendations. - An alien vegetation management plan must be implemented.	Contractor Site Management ECO Frequency: - Contractor and Site Management must appoint a responsible person to monitor bird fatalities on a weekly basis. - Alien vegetation and weeds must

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				be monitored on the site on a weekly basis. ECO to audit on a monthly basis.
Disturbance of Fauna and Flora on site by clearance of vegetation for the construction of roads	Loss of Red data plant species or impact on fauna species of conservation concern.	Identify and confirm the presence / absence of sensitive species.	Identification, Avoidance / Mitigation: - Preconstruction walk through of the facility in order to locate species of conservation concern that can be translocated as well as comply with permitting conditions. - Pre-construction environmental induction should be done for all construction staff and visitors on site to ensure that basic environmental principles are adhered to. - Removal of vegetation must be followed closely by rehabilitation,	Contractor Appointed Ecologist / Fauna and Flora specialist. ECO Frequency: - ECO and appointed specialists to conduct preconstruction walk through. - Preconstruction environmental induction to be

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			if possible, within 3 months of disturbance.	conducted by the ECO, Contractor and Site Management.
	- Loss of Red data plant species or impact on fauna species of conservation concern. - Impact on population integrity.	- Minimise disturbance footprint. - Rehabilitation and re-vegetation of disturbed areas to required standards	Avoidance: - Minimise removal of vegetation during construction to the authorised footprint area. - When new roads are constructed, these must not cross sensitive areas such as the ridges or drainage lines. - Five fauna species of conservation concern has been noted by the specialist (Bat-eared fox, Aardvark, Cape Fox and Steenbok) Special care must be taken not to harm these animals. Sightings of these animals must be recorded. Management / Mitigation:	Contractor Site Management Ecologist / Rehabilitation Specialist ECO Frequency: Contractor and Site Management to monitor vegetation removal on a weekly basis.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			Rehabilitation activities must commence as soon as possible.	- All staff to be made aware of species of conservation concern and all staff to report to Site Management if species are sighted – ECO to be informed. - Rehabilitation activities must be monitored by Site Management every two weeks and ECO to audit monthly. Ecologist to sign-

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				off when finalized.
Impacts on Fauna and Flora during site preparation and construction		- Minimise disturbance footprint and impacts on resident fauna species. - Relocate flora species of concern before commencement of construction. Needs to comply with permitting conditions.	Avoidance: - Adhere to existing roads. - Clearly demarcate the construction site and various project aspects as well as sensitive area buffer zones. - Avoid the Very High ecologically sensitive areas depicted in the specialist report. - Provide adequate waste removal skips to prevent attraction of rats and other alien scavenging species to the sites. - No poisons are to be used on site for the control of vermin (insects, rodents, small scavenging carnivores), unless these are environmentally friendly and can be locally contained (do not use	Site Management Contractor ECO Frequency: - ECO and Site Management to demarcate construction site and various project aspects and established buffer zones preconstruction. - Waste Removal skips to be monitored on a weekly basis by

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			poisons that fauna will carry off-site before taking affect or poisons known to bio-accumulate in the environment).	Site Management.
		- Minimise the risk of soil erosion and effectively manage dust on site. - Reduce risk to protected animals.	Management / Mitigation: - Control dust on site during the construction activities. Roads and construction sites must be watered when required. Speed limits must be strictly adhered to. - Improve growth conditions through decreasing run-off, increasing infiltration strategic placement of stormwater infrastructure to limit potential soil erosion. - If the following animals are encountered the ECO must be contacted: - Aardvark - Bat-eared Fox	Contractor Site Management ECO Frequency: Site Management and Contractor to monitor dust generation on site on a daily basis and water the construction area and roads as needed.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			○ Cape Fox ○ Steenbok • No animals may be harmed or fed on site.	• Site Management and Contractor to appoint responsible person to monitor any signs of erosion on a weekly basis. • ECO will audit monthly.
Soil disturbance and spread of alien species	• Proliferation of alien and weed species on site could lead to spread of these species into the adjacent natural areas and impact on the integrity and functioning of the natural habitat.	• Minimise soil disturbance and possible loss of valuable topsoil.	Avoidance: • Keep the footprint of the disturbed area to the minimum and designated areas. • Adhere to existing and designated roads.	Contractor Site Management ECO Frequency: • Responsible person to be appointed to

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				conduct weekly monitoring events for proliferation of weed and alien species. ECO to audit management of site on a monthly interval.
	Proliferation of alien and weed species on site could lead to spread of these species into the adjacent natural areas and impact on the integrity and functioning of the natural habitat.	Proper removal of alien vegetation to reduce the risk of spreading alien and weed species on site and to adjacent natural areas.	Mitigation: - Any proclaimed weed or alien species that germinates during the contract period shall be cleared by hand before flowering. - Remove alien vegetation, preferably as juveniles, with caution to prevent the spread of seeds and therefore the plants.	Contractor Site Management ECO Frequency: Preconstruction environmental

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			• A responsible person must be appointed to monitor the occurrence of alien and weed species on site and implement the stipulations within management plan. • Imported fill material should be monitored during and after construction for the presence of weed species, any such species should be removed immediately. • Vehicles and equipment should be cleared of plant material before gaining access to the site. • Limit the use of chemicals (pesticides and herbicides) and do not spray in windy conditions. Pesticides may impact on pollinators and lead to a decline in species diversity and densities.	induction to be conducted for all staff. • Responsible person to be appointed to implement alien and invasive species management plan on a weekly basis. • Site Management and Contractor to ensure that vehicles and equipment are cleared of plant material before

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				entering site daily.
Fencing of accessed controlled areas	Fencing could create barriers for animals such as snakes and tortoises and could lead to animals being injured.	- Avoid creating impassable barriers to small animals and resultant habitat fragmentation. - Avoid electrocution of small animals.	Avoidance / Mitigation: - Construct all fences (electric and normal) with a bottom strand not lower than 30cm of the ground, in order for tortoises and snakes to pass safely. - A responsible person must be appointed to monitor the fences on a bi-weekly basis.	Contractor ECO Frequency: - Demarcation to be done preconstruction. - Responsible person to monitor fences bi-weekly.
Sedimentation of wetlands due to soil destabilisation	Encroachment into the wetland buffer areas could lead to long-term impacts on the functionality and integrity of the wetlands.	- Minimise the risk of erosion and sedimentation of wetlands. - To continue to allow the flow of water	Avoidance: Vegetation and soil must be retained in position for as long as possible and removed immediately before construction/earthworks commences.	Contractor ECO Frequency: Buffer areas must be demarcated before

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
		within the wetland system. Prevent the loss of the integrity and functioning of the wetland system.	- Remove all stock animals from the affected farms until re-vegetation has been done to an acceptable level. - Rehabilitation of roads leading into the pans. - The wetland buffer areas must be clearly demarcated before commencement of construction. A 100m to 200m wide buffer around the pans within the project area. No vehicles, waste material or infrastructure to be placed in the catchment of the pans. - Vehicles are not allowed to traverse the pans. - Backfill must be compacted to form a stabilised and durable blanket. - Re-vegetation of disturbed areas must be undertaken with site	construction commences. - Site Management and Contractor to monitor integrity of the buffer zones on a weekly basis. - Alien and invasive management monitoring to be conducted weekly. - Stormwater structures must be inspected by site personnel every two weeks

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			indigenous species and in accordance with the instructions issued by the Environmental Control Officer (ECO). Areas where soil compaction or ruts developed should be rehabilitated. • The underground cable routes must be inspected on a weekly basis for the proliferation of any invasive species. • All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds. It should also only be stored for the minimum amount of time necessary. • Contours and other management measures, such as berms and canals, should be implemented to	or directly after a rain event. • ECO to audit monthly.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			ensure that runoff from storm events is minimized. Silt traps and culverts should be regularly maintained and cleared to ensure effective drainage. • Stormwater management plan must be adhered to at all times and construction should strictly stick to the planned system. • Inform employees to be vigilant against any activity that will have a harmful effect on wetlands on and off-site. No persons should enter the wetland areas without permission. • The natural flow of water, which will be in the form of rainfall events to the depression on site should not be hampered or obstructed in any way.	

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Water and Soil Pollution	Continuous impacts on the soil and water resources in the vicinity of the site could lead to long-term degradation of the water resources, functionality and ecosystem services.	- Minimise the risk of soil and water contamination. - If a spill occurs the proper safety precautions are in place to minimize the impact and employees are properly trained.	Management / Mitigation: - Vehicles must be regularly serviced and maintained. This must only be done at a designated area that are bunded. - Spill kits must be available around the site and employees must be trained how to conduct effective spill clean-up. - Construction vehicles and equipment should also be refuelled on an impermeable surface. - Install drip trays for any engines that stand in one place for an excessive length of time. - Diesel fuel and oil storage should be within a bunded area with an impermeable surface. - Soil that has been contaminated by hazardous materials such as oil	Contractor ECO Frequency: - Contractor must ensure that vehicles and equipment are efficiently maintained. Drivers to inspect on a daily basis. - Drip trays must be available for every vehicle. - Fuel and oil storage facilities to be inspected weekly by Site Management.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			residue shall be treated with oil absorbent such as Drizit or similar and this material must be removed to an approved waste site. • Sufficient number of chemical toilets must be available and strategically placed around the site. These chemical toilets must be regularly serviced. • No uncontrolled discharges from the construction crew camps to any surface water resources shall be permitted. • An Emergency Plan must be in place in the event of an accidental spillage near the wetland system.	• Chemical toilets must be serviced as recommended and inspection must be done weekly. • All employees must go through an induction session to discuss the Emergency Response plan and other management plans before commencement of construction. Toolbox talks to be held monthly.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Increase in hard surface due to compaction and concrete mixing			Management / Mitigation: - Concrete mixing must only be done in designated areas or within a bunded area to avoid any possible spillages and pollution. - Concrete and tar shall only be mixed on mixing trays and in areas which have been specially demarcated for this purpose. - After all concrete and tar mixing is complete, all waste shall be removed from the batching / mixing areas and disposed of at an approved dumpsite. - Stormwater shall not be allowed to flow through the batching area.	Site Management Contractor ECO Frequency: - Contractor to manage and monitor concrete mixing areas daily during operation. - Site Management to monitor waste removal from site on a monthly basis. - Contractor and Site Management to

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				monitor Stormwater infrastructure every two weeks or after a rain event.
Increase in littering	Litter could enter the natural areas and negatively affect the fauna and flora species.	Clean and well-maintained construction areas and not litter in the surrounding natural areas.	Management / Mitigation: - Store all litter carefully so it cannot be washed or blown into any water resources or natural areas. - Provide bins for construction workers and staff at appropriate locations, particularly where food is consumed. - The construction site must be cleaned daily, and litter removed. Responsible persons must be appointed to monitor this. - Conduct on-going staff awareness programs so as to	Contractor Site Management ECO Frequency: Site Management and Contractor to monitor waste management on site weekly and environmental awareness sessions to be held monthly.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			reinforce the need to avoid littering.	
Groundwater abstraction	Over-abstraction of water resources could lead to impacts on water availability for adjacent water users and water availability in the region.	Minimise the risk of groundwater over-abstraction leading to permanent lowering of groundwater level.	Monitor: If groundwater is abstracted for the project, monitor the production borehole water levels, flow rates and quality.	Contractor Geohydrologist ECO Frequency: - Bi-annual monitoring of the borehole water levels by Site Management. - Quarterly groundwater quality monitoring by Site Management.
Agriculture and soil potential – Soil	Erosion could lead to losses of valuable	Minimise the risk of soil erosion.	Management / Mitigation:	Contractor Site Management

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
erosion and loss of topsoil as a result of site clearance and construction activities	topsoil and hamper re-vegetation during rehabilitation that could in turn lead to excessive dust generation and impacts on adjacent natural areas. Erosion will also cause loss and deterioration of soil resources and result in lowering of land-use capability during project operational phase and after decommissioning.	Proper topsoil management.	- Implement an effective stormwater management system to control run-off on site. - The system must effectively collect and safely disseminate any run-off water from all hardened surfaces, and it must prevent any potential down slope erosion. - Strip topsoil and stockpile for use during rehabilitation. - During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. - Any subsurface spoils from excavations must be disposed of where they will not bury the topsoil of agricultural land.	ECO Frequency: - Stormwater Infrastructure to be inspected every two weeks or after a rain event, by Site Management and Contractor. - Topsoil stockpiles to be inspected monthly.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Dust generation during construction activities	- Excessive dust generation could lead to impacts on adjacent natural habitat and agricultural activities. - Degradation of veld vegetation can occur beyond the direct footprint of the development due to dust deposition.	Mitigate potential impacts that may occur beyond the footprint due to dust deposition.	Management / Mitigation: - Control dust generation during construction activities by implementing standard construction site dust control measures of damping down the construction area and roads where and when required. - Implement standard construction site dust control measures: - Watering of roads and active construction areas. - Enforce strict speed limits on site. - Re-vegetate disturbed areas as soon as possible.	Contractor Site Management ECO Frequency: - Site Management and Contractor to monitor dust generation on site on a daily basis and water the construction area and roads as needed. - Speed Limits to be monitored daily.
Construction Camp Areas		Employees must undergo	Management / Mitigation:	Contractors Site Management

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
		environmental awareness training and must be informed about site and construction camp management.	- No open fires are allowed at construction sites. Plant material can be used as mulch or for compost. Thicker branches can be used for firewood by the workers and community. - Solid waste may not be burned on site. It must be kept in scavenger and weatherproof bins from where it must be removed to a registered landfill site. - Fire belts to be made around the development. - Fire extinguishers should be placed strategically for easy access. - Ablution facilities must be serviced on a regular basis by an approved contractor.	ECO Frequency: - Contractor, ECO and Site Management to conduct environmental awareness training before commencement of construction. - Contractor to monitor site camp activities weekly. - Contractor and Site Management to monitor waste

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				skips on a weekly basis.
Visual intrusion on existing views of sensitive visual receptors		Minimise visual intrusion by managing all aspects of construction (clearance of vegetation, management of ablutions and eating facilities, minimisation of waste etc.)	Avoidance: - Construction after sunset should be avoided where possible. Management / Mitigation: - Implement a phased approach to preparation and construction of the solar field in a practical sense to minimise the area of soil exposed and duration of exposure. - The contractor will maintain good housekeeping on site to avoid litter and minimise waste. - Vegetation material from vegetation removal will be mulched and spread over fresh	Contractor Site Management ECO Frequency: Contractor and Site Management must monitor the phased approach of vegetation clearance and construction boundaries weekly.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			soil disturbances to aid in the rehabilitation process. - Plans must be put in place to minimise fire hazards. - Clearly demarcate and monitor construction boundaries. - Demarcate and strictly control construction camps, parking and storage areas. - Night lighting of the construction sites should be minimised within requirements of safety and efficiency. - A lighting plan that documents the design, layout and technology used for lighting purposes should be prepared, indicating how nightscape impacts will be minimised.	- Contractor and Site Management to monitor site "housekeeping" on a weekly basis. - ECO to audit monthly.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			- Low-pressure sodium light sources should be used to reduce light pollution. - Light fixtures should not spill beyond the project boundary.	
Expenditure related impacts on aspects such as jobs		Maximise positive impacts associated with expenditure on the construction and operation of the project.	Management: - Maximise positive impacts through tendering, procurement and employment policies. - Set targets for use of local labour and maximise opportunities for the training of unskilled and skilled workers. - Use of local sub-contractors where possible.	Project Developer Contractor
Social impact associated with an influx of people		Limit impacts associated with the presence of workers and work seekers including those	Management: Implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.	Project developer Contractor Site Management

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
		associated with negative impacts on social structures and increased 'social ills' such as increased crime levels, increased alcohol and drug use.	Make necessary arrangements to enable workers from outside the area to return home over weekends and or on a regular basis during the construction phase.	
Impacts on surrounding landowners and environment		- Limit impacts on surrounding landowners associated with potential for: - Further deterioration of local roads. - Increased risk of crime such as stock theft.	Management: - Manage and monitor the movement of workers on and off the site. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis. - Ensure the proper disposal of waste, especially plastics. Strategically place waste bins	Project Developer Contractor ECO Frequency: - Contractor to implement effective transport plan for workers. - Contractor and Site

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			around the site and remove central waste skips on a regular basis. • An agreement must be in place, with adjacent landowners, before actions are taken outside normal daylight hours and on Sundays and Public Holidays. • Construction activities that is required to be conducted after hours should be done with minimal noise and disturbance.	Management to monitor waste disposal and recycling on a weekly basis.

3.3 OPERATIONAL AND MAINTENANCE PHASE

3.3.1 Possible Impacts Identified

- Alteration of the cultural and natural landscape by built elements.
- Bird collisions with PV panels and associated infrastructure.
- Impacts of access control and fencing to plants and animals.
- Sedimentation of wetlands due to soil destabilisation.
- Soil Erosion.
- Water Pollution.
- Impacts on surrounding land owners.
- Rubble littering

3.4 DECOMMISSIONING PHASE

Some mitigation measures for the decommissioning phase have been established, however as the EMP is a dynamic document that needs to evolve with the project, thus once appropriate decommissioning land-use has been approved, the mitigation measures for this phase will be compiled and submitted for approval.

Site specific rehabilitation measures will need to be established as part of the re-vegetation process.

Table 5: Operational and Maintenance Phase

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Alteration of the cultural and natural landscape by built elements.		Reduce visual contrast of infrastructure to the cultural landscape.	Mitigation: Use neutral, earthy-coloured paint on the built elements of the development as to reduce the visual contrast in the landscape.	Site Management Maintenance Contractor Frequency: Site Management and Maintenance Contractor to manage development on a weekly basis.
Damage to off-site graves by staff		Avoid / mitigate vandalism and destruction of off-site graves.	Avoidance / Mitigation: Ensure the development footprint is fenced and that staff are not allowed off site.	Site Management Maintenance Contractor Frequency: Maintenance teams to undergo an environmental awareness induction every three months.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
				Site Management to inspect buffer areas on a monthly basis.
Bird collisions with PV panels and other infrastructure		Minimise the risk of bird collisions, injuries and fatalities.	Mitigation and Monitoring: - Monitor bird fatalities – the monitoring plan must indicate what species are affected and at what time / season these occur and should follow Bird life SA recommendations. - Preferred habitat and areas of congregation must be noted. - Motivate the need for powerlines to be adequately marked with anti-collision devices and bird-	Site Management Maintenance Contractor Ornithologist as advisor ECO Frequency: - Bird Fatalities must be monitored every two weeks during the first year of operation. - If concern is noted with regards to fatalities, an ecologist must be appointed and a site assessment conducted. - Anti-collision devices to be monitored quarterly

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			friendly designs to prevent electrocution. Install deterrents/flappers on all required sections. - It is recommended that the standard Eskom Bird Perch to be fitted to all pole tops to further provide safe perching space well above dangerous infrastructure. - Utilize underground cabling as far as possible.	or in the event that bird fatalities increase.
Electrocution of birds in substation/switching stations		Minimize the possibility of electrocution of birds at substations or switching stations and reducing fatalities.	Mitigation: Regular maintenance of these facilities is required and the	Site Management Maintenance Contractors

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			removal of any nesting sites.	Frequency: - Maintenance should be done as per established maintenance management plan. - Facilities must be inspected for possible bird nests being built every two weeks.
Impacts of access control and fencing to plants and animals		Allow movement of grazing animals. Minimise the impacts of habitat fragmentation.	Management/Mitigation: - Employ veld management measures. - Veld management measures can be achieved by allowing gaps in fencing for animal species to move between grazing areas, during prescribed times of the year.	Site Management Maintenance Contractor Landowners / Farmers as advisors ECO Frequency: A veld management plan should be established during the construction phase and discussed with adjacent

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			Any electric fencing must have a bottom strand not lower than 30cm to the ground, in order for tortoises and snakes to pass safely.	landowners for implementation during the operational phase. Quarterly monitoring can be conducted of the veld and fence lines.
Sedimentation of wetlands due to soil destabilisation	Encroachment into the wetland buffer areas could lead to long-term impacts on the functionality and integrity of the wetlands.	Minimise the risk of erosion and sedimentation of wetlands that could lead to the degradation of the wetland system and loss of functionality.	Management/Mitigation: - Implement and maintain a stormwater management system according to stipulations by the civil engineers. - Prevent diversion of water after heavy rainfalls from outside the pan catchment being diverted into the pan system. - The natural flow of water should	Site Management Maintenance Contractors ECO Frequency: - Stormwater infrastructure must be inspected on a monthly basis during the rainy season. - Site Management to inspect the integrity of the buffer zones and signs of possible erosion on a monthly basis

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			however not be hampered or obstructed to reach the pan system. • Employees and maintenance teams must be informed to be vigilant against any activity that will have harmful effects on the wetland systems. • No vehicles or persons may enter the wetland areas unless approved by the ECO for official purposes. • A responsible person must be appointed to monitor the buffer areas and	during the first year, thereafter it can be conducted quarterly. • Weed and Invasive species should be monitored monthly during the first year of operation and thereafter it can be conducted quarterly.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			stormwater infrastructure for any signs of erosion or other possible problems. Maintenance of alien vegetation and weeds over the entire project site and buffer area.	
Degradation of aquatic ecosystems	Encroachment into the wetland buffer areas could lead to long-term impacts on the functionality and integrity of the wetlands.	Monitor potential changes in aquatic ecology and ensure that any possible negative impacts can be mitigated.	Monitoring/Mitigation: Conduct a habitat assessment during the wet season (October to March), after construction ceased, to determine if habitat deterioration is occurring. 15% deviation from	Site Management Maintenance Contractors Appointed Aquatic Ecologist ECO Frequency: Annual monitoring until signed sign-off by ecologist

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			baseline conditions to be investigated further. Standard water quality monitoring must be done, started with a baseline before construction commences.	Water Quality monitoring, monthly during construction when water is available and then annually.
Road and Route Maintenance		Roads will remain structurally stable and not result in siltation of the wetland areas.	- Monitor all roads around the proposed developments to ensure no erosion occurs and that the accompanying sediment loads are not washed into the wetlands. - Inspect culverts for accumulation of debris on a regular basis.	Site Management Maintenance Contractors Frequency: Continuous process of good environmental practice. Roads and culverts must be inspected on a Quarterly basis or after heavy rain events.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Soil Erosion and loss of agriculture potential as well as habitat degradation and loss of agricultural land-use		- Minimise the risk of soil erosion and negative impacts on natural habitat and grazing areas. - Maximise the project area's land-use by allowing for grazing of small stock units between the panels that would also assist in natural vegetation management.	Management/Mitigation: - Implement an effective system of stormwater run-off control using bunds and ditches, where it is required (at points where water accumulation might occur). - The system must effectively collect and safely disseminate any run-off water from all hardened surfaces, and it must prevent any potential downslope erosion. - Set up the facility and the agreements with landowners in such way that facilitates grazing of small stock within the	Site Management Maintenance Contractors ECO Frequency: Site Management and Maintenance Contractors must monitor the site area for possible signs of erosion monthly for the first year, thereafter Quarterly.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			panel areas during the operational phase.	
Groundwater abstraction	Over abstraction of groundwater resources could lead to permanent lowering of the groundwater level.	Minimise the risk of over abstraction of groundwater resources and impacts on adjacent water users.	Monitoring /Management: - Groundwater abstraction must be metered as per stipulations of the authorised Water-use License. - Monitor production borehole water levels and water quality.	Site Management ECO Frequency: - Site Management must monitor abstraction levels on a weekly basis. - Water Quality must be monitored on a bi-annual basis unless a possible incident has occurred which requires further measures.
Soil and surface water pollution from general activities	The quality of the aquifer and available surface water resources could be reduced and impact	The topsoil layer and water resources will be protected and kept in a functioning state to provide the required ecosystem services	Management/Mitigation: Vehicles and equipment need to be inspected on a regular basis and maintained in a good working order to reduce	Site Management Maintenance Contractors Frequency: Site Management and Contractors must inspect vehicles daily

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
	the site as well as downstream users		the probability of leakage of fuels and lubricants. • Ensure the continuation of Environmental Awareness Training and that employees are aware of the importance of water security and functioning wetlands. • Fuel storage areas must be bunded with adequate capacity to contain any accidental spillage. • Vehicles must only be washed, serviced and re-fuelled within designated areas. • Drip trays must be available at all parking areas.	and ensure that all equipment is in good working order. • Inspect any Fuel, oil and other hazardous storage areas on a weekly basis.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Storm water runoff generation	Storm water systems will be maintained, water run off will be managed.	The topsoil layer and water resources will be protected and kept in a functioning state to provide the required ecosystem services	Regular cleaning and maintenance of the following: - Cleaning of stormwater piped systems. - Maintaining the stormwater ponds, this includes vegetation, inlet and outlets, - clearing and cleaning of outlets - Maintenance of roads and berms. - If any potentially contamination liquids are spilled in the stormwater channels they must be cleaned up.	Site Management Maintenance Contractors ECO Frequency: - Stormwater Infrastructure must be inspected on a Quarterly basis or after a heavy rain event. - Spill kits must remain available on site during the operational phase.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Landscape Impact on rural agricultural landscape		Minimise visual landscape impact	Management/Mitigation: - Ensure that structures remain as non-reflective as possible, and buildings remain as unobtrusive as possible by implementing proper maintenance. - Maintenance of access roads should not cause further disturbance and damage to the surrounding landscape.	Site Management Maintenance Contractors ECO Frequency: - Site Management and Maintenance Contractors to maintain the site in good working order and according to stipulated standards. - ECO to conduct annual audit during the first two years at least.
Visual intrusion on the views of sensitive visual receptors		Minimise visual intrusion and landscape degradation	Management/Mitigation: Maintain rehabilitated surfaces until a self-sustaining stand of vegetation is established and visually adapted to	Site Management Maintenance Contractors ECO

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			the undisturbed surrounding vegetation. - No new disturbed footprints should be created during the operational phase without approval by the Environmental Officer. - Dust and weed control should form part of the maintenance activities during the operational phase. - Road maintenance activities should avoid damaging or disturbing vegetation.	Frequency: - Rehabilitated areas must be monitored and managed for the first two years or until rehabilitation has been signed off by the ECO or appointed specialist. - Roads and other dust generating areas should be managed and maintained by Site Management.
Night Lighting impacts		Minimise impacts to the regional nightscape	Management/Mitigation: A Lighting plan that documents the design, layout and technology	Site Management Maintenance Contractors ECO

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			used for lighting purposes should be prepared, indicating how the nightscape impacts will be minimised during the operational phase. • The lighting plan should include a process for promptly addressing and mitigating complaints about potential lighting impacts. • Low-pressure sodium light sources should be used to reduce light pollution. • Timer switches or motion detectors (within safety requirements) should be used to control lighting in areas that are not occupied continuously.	Frequency: • Site Management should address any complaints from adjacent landowners in the same week as they were received. • Lights and timer switches to be inspected monthly.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Socio-economics - Expenditure related impacts on aspects such as jobs		- Maximise positive impacts associated with expenditure on the construction and operation of the project. - Maximise positive impacts associated with project's contribution to socio-economic and enterprise development initiatives.	Management: - Maximise positive impacts through procurement and employment policies. - Set targets for use of local labour and maximise opportunities for the training of unskilled and skilled workers. - Use local sub-contractors where possible. - Liaison with local municipalities and other stakeholders involved in socio-economic development in order to ensure that any projects are integrated into wider strategies and plans with	Project Developer Maintenance Contractors Frequency: - Yearly auditing on the achievement of socio-economic benefit goals. - Ongoing liaison and bi-annual meetings with stakeholders.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			regard to socio-economic development.	
Social impact associated with an influx of people		Limit impacts associated with the presence of workers and work seekers including those associated with negative impacts on social structures.	Management/Monitoring: Implement and apply the Code of Conduct established for the project prior to its commencement with assistance from the stakeholder monitoring forum for the project.	Site Management Frequency: Ongoing monitoring and with bi-annual forum meetings.
Impacts on tourism		Limit impacts on tourism and recreation	Implement avoidance, management and monitoring provided by the visual, ecological and agricultural specialist recommendations (i.e. implement all other	See Visual, Ecological and Agricultural specialist recommendations

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			actions proposed in the EMPr.	

Table 6: Decommissioning Phase

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
Loss of Agricultural land use		To ensure that the farm portions can be utilised for agricultural activities and job creation after decommissioning.	Mitigation: The rehabilitation plan to be developed for the decommissioning of the site should be compiled with the aim to utilise the farm portions for agricultural activities.	Site Management Contractors ECO Ecologist
Soil Erosion and Loss of topsoil		To ensure that the site does not deteriorate after decommissioning activities have been completed.	Avoidance / Mitigation: The site rehabilitation must be monitored quarterly for at least 2 years after completion of rehabilitation and a veld management plan must be established.	Project Developer Farmers ECO Frequency: Quarterly monitoring
The removal of infrastructure could		Minimise the possibility of occurrence of soil	Mitigation and Monitoring:	Site Management Contractors

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
expose soil and increase the possibility of surface runoff mobilising soils into the pan interior.		erosion on the project site area that could lead to sedimentation of the pans.	- Remove stock animals before commencement of decommissioning activities and maintain absence until rehabilitation has been completed. - Rehabilitate roads on site to prevent the creation of preferential flow paths. - Continue implementing the maintenance and monitoring of alien vegetation and weed species on site. - Maintain the Stormwater management infrastructure and aim to implement more natural stormwater management measures.	ECO Frequency: Quarterly monitoring of decommissioning activities until sufficient rehabilitation has been achieved and signed off by the Department.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
The disassembly of infrastructure may result in impacts to vegetation and fauna species	Areas that have not been adequately rehabilitated could lead to proliferation of alien vegetation and weed species as well as loss of valuable agricultural land.	To limit the impact to the site construction area.	Mitigation: - Special care must be taken not to impact or destroy rehabilitated areas. - All hard surfaces must be removed from site. - All disturbed areas must be rehabilitated to close to its natural state to allow for the continuation of agricultural activities.	Site Management Contractors ECO Frequency: - Site Management to monitor disassembly on a weekly basis. - Rehabilitated areas must be monitored Quarterly until sign off.
Visual intrusion on the views of sensitive visual receptors		The aim is to rehabilitate the site back to pre-construction state and to ensure that agricultural activities can continue.	The decommissioning phase will potentially cause similar visual impacts as that during the construction phase and as such similar mitigation measures apply – The successful completion of this phase should leave the project site in a similar condition, visually, as	Site Management Contractors ECO Frequency: Rehabilitation must be monitored on a Quarterly basis until sign off by the Department.

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			before the construction commenced.	
Decommissioning and disassembly of modules		•	• Dispose of waste and debris in a lawful manner so it does not harm the environment. • Waste handling must focus on minimisation of the overall waste as well as the recycling of any reclamation waste. • Non-hazardous waste • Hazardous waste • Reclamation waste • Non-hazardous waste must be delivered to a special licensed facility for recycling or disposal. • All broken non-hazardous PV panels will be recycled in a	Site Management Contractors ECO Frequency: • Site Management and Contractors need to establish a dedicated area where wastes will be segregated during the decommissioning phase. A responsible person must be appointed to manage this area on a daily basis. • Site Management to monitor handling of waste and

ASPECT	CUMULATIVE IMPACTS	IMPACT MANAGEMENT OUTCOMES	MITIGATION MEASURES / MANAGEMENT ACTIONS	IMPLEMENTATION RESPONSIBILITY AND TIMING
			dedicated recycling site. Steel must be stored in segregated stockpiles in laydown areas to be recycled.	management of waste storage areas on a weekly basis. Certificates of collection and disposal must be available on site for inspection.

4 IMPLEMENTATION OF THE EMPR

4.1 ROLES AND RESPONSIBILITIES

Environmental Incident Register:

An environmental register must be compiled and kept on site at all times and be freely accessible to the whole team. This register must be utilised to record all environmental incidents that occur as a result of the operational aspects on site. The register must contain the following:

- Complaints from neighbouring farmers and businesses and any environmental incidents on site.
- Actions taken to remedy the incident.

Monthly Toolbox talks must be held with all the employees to that must include:

- Environmental issues
- Health and Safety
- Incidents and mitigation measures

Table 7: Roles and Responsibilities

Role	Responsibilities
Project Developer	The Project Developer is the 'owner' of the project and, as such, has the following responsibilities: • Be familiar with the recommendations and mitigation measures of this EMPr; • Ensure that the conditions of the Environmental Authorization issued in terms of NEMA are fully adhered to; • Ensure that other necessary permits or licenses are obtained and complied with; • Appoint the ECO and the Lead Contractor.
ECO	Responsibilities of the ECO are to: • Oversee the implementation of the EMPr during the construction and operational phases, monitoring environmental impacts. • Record-keeping and monitoring of compliance with conditions of the Environmental Authorization.

Role	Responsibilities
	• Ensure compliance to the plans included in the EMPr following approval of the Final EMPr. These plans are: ○ Alien invasive management plan ○ Plant rescue and protection plan ○ Re-vegetation and habitat plan ○ Open space management plan ○ Erosion management plan ○ Monitoring system to detect any leakage or spillage of hazardous substances. ○ Environmental Awareness Plan
	Construction Phase: • The ECO must monitor site activities on a monthly basis to ensure adherence to the specifications contained in the EMPr, using a monitoring checklist that is to be prepared by the ECO at the start of the construction phase. • The ECO will be in contact with the on-site EO or Site supervisor on a daily/weekly basis for support. • The ECO will prepare monthly reports for discussion with client and contractors and for submission to the Department. • The ECO has the authority to stop operations on the site if it is deemed that the activity has or will cause significant damage and/or harm the environment. • Should modifications to this document be required, these must be agreed to by all parties concerned.
	Operational Phase: • The ECO must oversee implementation of the EMPr during the operational phase in a supportive role to the client and site management. • Ensure that the necessary environmental monitoring takes place as specified. • Update the EMPr and ensure that records are kept of all monitoring activities.
	Decommissioning Phase: • Oversee the implementation of the EMPr for the decommissioning phase; and

Role	Responsibilities
	Conduct an environmental inspection on completion of decommissioning and 'sign-off the site rehabilitation process.
Site Management / EPC Contractor – Project Management	Responsibilities: - Ensure that all activities are carried out in accordance with the requirements for this EMP. - Perform regular inspection of working sites, to ensure all activities are being performed in accordance with the requirements of this EMP. - Keep records of water usage and reports on water according to the requirements of the local/national regulations. - Ensure that all staff receives the necessary training in relation to water and spill management. - Ensure all subcontractors behaviour is in line with the EMP. - Provide monthly and annual environmental reports about the water management on-site. - Report on all risks and non-compliances with this plan and incidents. - Train all subcontractors including their management on the EMP.
Contractor	The Contractor and its sub-contractors are responsible for overall execution of the activities envisioned in the construction phase, including implementation and compliance with the recommendations and conditions specified in this EMP. Furthermore, the Contractor's responsibilities are to: - Ensure that all appointed contractors and sub-contractors are aware of this EMP and their responsibilities in relation to the plan. - Meet on-site with the Project Developer's ECO prior to the commencement of construction activities to confirm the construction procedure and designated activity zones. - Ensure that each subcontractors employ an ECO (or have a designated ECO function) to monitor and report on the daily activities on-site during the construction period. - Implement the overall construction programme, project delivery and quality control for the construction of the solar project.

Role	Responsibilities
	- Oversee compliance with the Health, Safety and Environmental Responsibilities specific to the project management related to project construction. - Promote total job safety and environmental awareness by employees, contractors and sub-contractors and stress to all employees and contractors and sub-contractors the importance that the project proponent attaches to safety and the environment. - Ensure that safe, environmentally acceptable working methods and practices are implemented, and that sufficient plant and equipment is made available properly operated and maintained, to facilitate proper access and enable any operational to be carried out safely. - Ensure that all appointed contractors and sub-contractors repair, at their own cost, any environmental damage as a result of a contravention of the specifications contained in the EMPr, to the satisfaction of the Project Developer's ECO. - Implement the Traffic, Transportation and Road Maintenance Management Plan set out in this EMPr. - Implement the Stormwater Management Plan set out in this EMPr.

5 PROPOSED MONITORING SCHEDULE

MONITORING ASPECT	FREQUENCY			
	Daily	Weekly	Monthly	Quarterly
Weed and invasive species control			x	
Erosion Control			x	
Waste Management		x		
Safety	x			

MONITORING ASPECT	FREQUENCY			
Hazardous Substances		x		
Maintenance	x			
Water			x	x

The ECO will monitor their programme implementation for the proposed development on a monthly basis during the construction phase. This will include, but not be limited to, the monitoring of:

Weed and invasive species control:

During the construction phase the construction site areas should be monitored for weed and invasive species on a monthly basis to ensure that no invasive or weed species proliferate during the construction activities that could result in these species spreading into adjacent natural and wetland areas.

- Responsible person must be appointed to monitor the construction areas.
- Weed species must be removed manually as far as possible and minimize the use of pesticides.
- Monthly monitoring registers must be kept at the site office.

Erosion Control:

As vegetation clearance will form part of the construction phase, it is very important to inspect the construction sites for any signs of erosion on a monthly basis. The Topsoil stockpiles must be inspected to ensure that the stockpiles remain intact and that no valuable topsoil is lost. The vegetation clearance footprint must be kept as small as possible to ensure that areas susceptible to erosion can be managed effectively.

- Responsible person must be appointed to monitor the construction site for any signs of erosion on a monthly basis.
- Areas that are susceptible to erosion must be monitored on a weekly basis and after rain events.

Hazardous Substances:

Hazardous substances such as oil, fuel and cement must be stored within enclosed or banded areas to ensure that any spillages can be contained in that area and avoid any possible pollution of soil or water resources.

- The enclosed / bunded storage areas must be inspected on a weekly basis by the responsible person appointed during the construction and operational phases.
- A register must be kept of maintenance done and any environmental accidents on site.
- Certificates must be kept when hazardous substances such as oil is taken off site to a registered site on a regular required basis.

Maintenance:

Maintenance on all construction vehicles, equipment and other infrastructure must be done on a daily basis as required to ensure that all equipment on site are functioning optimally and that they don't lead to any contamination of soil and water resources.

Water:

Water resources need to be protected and it is necessary to monitoring water quality, where applicable, on a monthly basis as well as the volume of water abstracted on a weekly basis.

- Registers must be kept on site indicating the monthly water quality monitoring results as well as the volumes abstracted.

****Refer to Management Plans below for other monitoring requirements.**

SCORE	COMPLIANCE RATING	EXPLANATION
5	Compliant	All EMPr requirements have been met
4	Substantial Compliance	Most of the requirements have been met
3	Broad Compliance	50% of the requirements have been met
2	Partial Compliance	Only partially compliant with the requirements
1	Non-Compliance	None of the requirements have been met

6 ENVIRONMENTAL AWARENESS PLAN

The successful implementation of the stipulations contained within this EMPr and the granted Environmental Authorization is dependent on the adequate distribution of the requirements of the said conditions to all stakeholders, contractors and site management. The Environmental awareness plan will assist the contractors and site management to familiarise all the members of their respective teams with the required conditions within the EMPr and EA.

6.1 PROJECT SITE INDUCTION

Prior to commencement on site, all personnel that will enter the various, fenced site areas need to undergo site induction that will cover the awareness of quality, safety and environmental issues and will need to be comprised of the following:

- The importance of all employees and subcontractors to conform with the environmental policy and procedures and their roles in implementing the policy procedures.
- The stipulations within the EMPr and EA that need to be adhered to.
- Environmental risks that were identified as high and which management measures must be implemented.
- Incident reporting requirements.
- Emergency procedures.
- Sediment and erosion control.
- Waste management.

6.2 GENERAL ISSUES AND CONCERNS

- Employees must report on concerns around the site that they have seen such as leaking pipes, spills and the clean-up procedures implemented.
- Employees and Management need to keep an open and continuous communication system.

6.3 WHAT IS AN ENVIRONMENTAL IMPACT

- An Environmental Impact is the result, either good or bad of a man's actions on the natural environment. This results in one or many changes in the environment and may also affect the availability of resources and the environment's capacity to function.

6.4 PROCEDURE FOR CLEAN-UP OF HAZARDOUS SUBSTANCES

- Evaluate the situation and if possible, stop the source of the spill.
- Determine the nature of the spilled material.
- Put on the appropriate protective gear and isolate the affected area.
- Use the appropriate absorbent / neutralizer.
- Remove the spilled substances with the appropriated spill kit.
- Decontaminate affected surfaces with a mild detergent and water.
- If a spill has occurred on soil, the soil must be removed and treated before the area is rehabilitated.
- EMPLOYEES MUST REPORT TO SITE MANAGEMENT AND IT MUST BE NOTED IN THE ENVIRONMENTAL INCIDENT REGISTER

6.5 PROCEDURE FOR MAINTENANCE AND INFRASTRUCTURE MANAGEMENT

- Only service Machinery and vehicles in designated areas.
- Regularly check all vehicles and machinery for fuel and oil leaks.
- Inform the site manager of any damage or leaking vehicles and machinery so that repairs can be scheduled.
- Store machinery, vehicles and materials in demarcated areas.
- Only refuel vehicles in a bunded area or with Drip Trays present.
- Immediately clean any accidental fuel and oil spills – do not hose spills into natural areas.

6.6 MANAGEMENT OF ALIEN INVASIVE PLANTS

- An Alien and Invasive Management Plan will be established for the specific sites focusing on the areas of concern.
- Determine the characteristics of the species and calculate the severity of the impact and the amount of effort needed to control it.
- Employees must continuously monitor the entire site and especially the pipeline / underground cable areas that run near the various wetland areas for any signs of establishment of invasive plant species.
- The plants must be controlled and eradicated from site.

6.7 INCIDENT INVESTIGATION PROCEDURE

The Incident Investigation Procedure document has been established to protect the site, staff and associated personnel and vendors by preventing or having zero incidents at the project site. The project, hazards, and risks associated with them vary from planning, construction, commissioning, and maintenance. However, by encouraging immediate, efficient incident and investigation reports, that site/personnel who have had an incident can save others by sharing their experiences to take preventive and corrective action to avoid future occurrences.

Whether or not an incident should be investigated depends on the type and severity of the incident taking into consideration time, task, working conditions, and so on to find a root cause. All incidents should be investigated by the project site management and associated parties.

Incident Management Cycle:



6.7.1 Environmental Event:

An environmental event is an unintended incident because of natural or non-natural hazards that may cause harm or potential harm to an environmental receptor (air, water, land, wildlife, damage to heritage items, etc.) Examples are not limited to:

- Spills of fuels, oils, chemicals, and other hazardous materials.
- Contamination of waterways or land.
- Unauthorized damage or interference to threatened species, endangered ecological communities, or critical habitats;
- Unauthorized clearing or clearing beyond the extent of the project boundary or premises;
- Any breach of environmental (International, national, and/or local) legislation.
- Illegal dumping of waste.

6.7.2 Incident Reporting:

- All incidents/near misses to be reported to HSE representative/supervisor/site manager immediately by provided incident report template/form.
- All incidents resulting in lost time injury (LTI) must be reported immediately to the HSE representative/supervisor/site manager and without due delay reported to EPC project manager and ESG.
- The HSE representative/supervisor/site manager completes the incident report form.
- The site manager has the responsibility to ensure the incident report is accurate, on time and forwarded to EPC project management and ESG.
- Only the ESG and/or EPC Project Manager report incidents to CEO/top management and only after establishing all facts.

Flow Chart Site:



6.8 WATER CONSERVATION

South Africa is a water scarce country, and we need to implement water conservation methods on project scale to ensure that each operation is run sustainably.

Water Conservation methods:

- Rainwater Harvesting
 - Jojo Tanks connected to the site camps and office buildings through the gutters. This basic method will lessen the water demand from other water resources.
- Water Pollution
 - One of the primary sources of water pollution is spills from vehicles and equipment that are not regularly maintained.

6.8.1 Water Consumption and Quality Monitoring:

- Process water pipelines should be inspected on a weekly basis
- All water utilized within the operations should be metered and recorded in a database to ensure that the licensed volume is not exceeded.
- Water Quality monitoring should be conducted on a Quarterly basis, except in the event of an incident occurring close to water resources:

- Immediate water sampling must be done, and the Environmental Consultants must be notified.

7 MANAGEMENT PLANS

7.1 EMERGENCY PREPAREDNESS RESPONSE PLAN

The Emergency Preparedness Response Plan sets out a formal system by which the project will define and plant mitigative measures to prevent and reactive actions and procedures to respond to emergency situations of all kinds. It is applicable during the Construction and Operational Phase of the Project.

Objective: Whenever an emergency occurs, the first priority is always to save lives. The second priority is the stabilization of the incident. The main objectives in developing and implementing the following EPRPs are:

- Prevent fatalities and injuries.
- Reduce damage to material and equipment.
- Protect the environment and the community.
- Accelerate the resumption of normal operations.

Refer to ib-Vogt Emergency Preparedness and Response Plan document.

7.2 ALIEN INVASIVE MANAGEMENT PLAN

Objective: Avoid the establishment and spread of alien invasive species during all phases of the development.

- Vegetate and irrigate open areas to limit erosion but take care not to promote erosion by irrigating without proper planning.
- All encountered alien plant species recorded on site should be removed.
- Remove all alien vegetation, preferably as juveniles, with caution to prevent the spread of seeds and therefore the plants.
- Monitor the site continuously for the establishment of alien plant species during the operational and maintenance phase.
- Monitor the site for any alien plants on a quarterly basis for one year after closure and rehabilitation.

Table 8: Alien plant control mechanisms for key invasive species

Species	Control Mechanism
<i>Agave Americana</i>	Chemical control with triclopyr (-amine salt) 90/270g/L SL.
<i>Caesalpinia gilliesii</i>	Mechanical control for juveniles in the form of hand-pulling. Adults can be cut to stumps and treated with an herbicide: Clopyralid / triclopyr (-amine salt)
<i>Eucalyptus camuldulensis</i>	Mechanical control for juveniles in the form of hand-pulling. Adults can be cut to stumps and treated with an herbicide: Clopyralid / triclopyr (-amine salt)
<i>Opuntia ficus-indica</i>	Monosodium methanearsonate (MSMA) can be used in addition to glyphosate 359g/L

7.3 PLANT RESCUE AND PROTECTION PLAN

Objective: Avoid and mitigate potential impacts to listed and protected plant species and their habitats.

- Preconstruction walk through of the facility in order to locate species of conservation concern that can be translocated as well as comply with permitting conditions.
 - The ECO must work together with the ecologist to compile a plant rescue and translocation plan to be implemented during the site establishment phase if required.
- Minimise removal of vegetation during construction and operation will be minimised to reduce the risk of excessive open areas occurring.
- All disturbed sites must be rehabilitated.
- Remediation must be completed by qualified personnel with the correct equipment in the correct season (wet season).

7.4 RE-VEGETATION AND HABITAT REHABILITATION PLAN

Objective: Re-vegetate open areas and rehabilitate disturbed areas.

- Removal of vegetation must be followed closely by rehabilitation by specialists qualified in the specific vegetation type's remediation.
- Vegetate and irrigate open areas to limit erosion and dust.
- Improving growth conditions through decreasing run-off, increasing infiltration and increasing the build-up of organic material to reduce soil erosion risk.
- Site remediation should be implemented using indigenous, local plant species, e.g.
 - *Cynodon dactylon*
 - *Digitaria eriantha*

- *Eragrostis plana*
- *Heteropogon contortus*
- *Themeda triandra*
- Remediation must be completed by qualified personnel with the correct equipment in the correct season (wet season).
- Removal of vegetation must be followed closely by rehabilitation within 3 months of disturbance.

7.5 MANAGEMENT OF DUST AND AIR EMISSIONS

The air quality of the site is generally good and is typical of that found in a rural setting in the area due to the relatively low population and distance from industrial pollution sources.

The permissible levels of air pollutants in emissions, the WHO offers guidelines for air quality. Standards for ambient air pollution outdoor in the table below:

Table 9: Standards for ambient air pollution

Issue	WHO Air Quality Guideline ($\mu\text{g}/\text{m}^3$)	
Ambient air parameters	Ambient air pollutants threshold According to WHO	
Exposure period	24h	1year
Carbon monoxide $\mu\text{g}/\text{m}^3$ (max. Daily 8 hr. Mean)	4	N/A
Sulfur dioxide $\mu\text{g}/\text{m}^3$	40	N/A
Nitrogen dioxide $\mu\text{g}/\text{m}^3$	25	10
Particulates PM10 $\mu\text{g}/\text{m}^3$	45	15
Fine Particles PM2.5 $\mu\text{g}/\text{m}^3$	15	5
Total Suspended Particles $\mu\text{g}/\text{m}^3$	230	80

During the construction phase contractors have to ensure the following:

- Minimize fugitive dust emissions.
- Minimize exhaust emissions from vehicles and equipment such as temporary generators.

Impacts of dust emissions from unpaved roads and gaseous emissions from vehicles and electricity generators will be local and can be temporarily significant at site entrances, requiring control and good management of delivery logistics at peak construction times.

Proposed mitigation measures:

- Use gravel collected on site to improve roads and reduce dust emissions.
- Spraying of roads with water for dust control.
- Implement all measures as recommended in the Traffic Management Plan.
- Monitor wind and weather conditions to identify a threshold point for proceeding or suspending works accordingly.
- Raising awareness among workers regarding the potential dust emitting activities and ensuring they are properly trained to handle the proper control procedures.

7.5.1 Monitoring and Performance Indicators

Table 10: Performance Indicators – Dust / Air Emissions

Item	Objective	Target	PI
Unnecessary emissions	Avoid unnecessary emissions	100% vehicles/equipment maintenance certifications	Number of vehicles/equipment without maintenance certification
Grievances	Monitor impairment through dust/emissions	0 dust/emissions complaints	Number of dust/emissions complaints from workers and residents of nearby villages

Table 11: Associated activities related to dust and air emissions.

Item	Objective	Target
Record/logbook of particle matter measurements (once a month)	Consistent record keeping and performance of associated dust and air emissions' measurements	Control of air emissions and pollution on site.
Frequency of measurements exceeding the threshold (Suspended particulates TSP) on site.	Identification of frequency of levels of air emissions and pollution exceeding threshold.	

7.6 TRAFFIC, TRANSPORTATION AND ROAD MAINTENANCE MANAGEMENT PLAN

Construction teams and Site Management must also adhere to document ESG-ESMS-08 – Traffic Management Plan.

- It sets out a formal system by which the project will plan, manage, implement control and mitigation measures that will improve Road Traffic Safety and reduce the risks related to the health, safety and environment.

Objective: Effectively manage additional traffic generation, transportation and maintenance of existing roads.

- Adhere to existing roads and road rules associated with them (for instance speed limits).
- Obtain permits from relevant administrative authority in the event of abnormal load transportation to and from site.
- Strictly regulate speed limit of construction vehicles.
- Demarcate and strictly control parking areas so that vehicles are limited to specific areas only.
- Ensure that roadworthy and safety standards are implemented for construction vehicles.
- Implement clear and visible signalling to indicate the movement of vehicles and when turning onto or off access roads to ensure safe access to and from the site.
- Maintain the pre-construction condition of public roads being utilised by construction vehicles. Pre-construction condition of roads should be supported by photographic evidence for record-keeping.

7.7 STORMWATER MANAGEMENT PLAN

Objective: Manage stormwater runoff to prevent adverse impacts to terrestrial and aquatic ecosystems.

- Implement an effective system of stormwater run-off control using bunds and ditches, where it is required (at points where water accumulation might occur).
- The system must effectively collect and safely disseminate any run-off water from all hardened surfaces, and it must prevent any potential down slope erosion.
- Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the stormwater run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.

7.8 FIRE RESPONSE PLAN

7.8.1 Fire Prevention and Emergency Response Preparation

All contractors are obliged to contribute to the prevention of fires through their behaviour. Verbal and written instructions and directions from Site Management, Emergency Response Manager or Internal or External Response Team regarding fire prevention must be observed. On order to reduce the risk of fire and to be prepared for fire emergencies.

- Keep the site tidy.

- Store equipment and reduce fire load as much as possible, e.g. by daily waste disposal and regular collection of waste by waste disposal company.
- For welding works follow Safe Work Method Statements
- Only smoke in designated smoking areas and do not dispose cigarette butts on the ground.
- Comply with regional fire safety regulations.
- Train fire wardens, or ensure they are trained and hold fire and evacuation drills.
- Construct firebreaks around the site/footprint area before any other construction begins.
- Prohibit open fires.
- Designate cooking areas for staff where fire hazard will be insignificant.
- Educate staff as to proper fire safety.
- Place firefighting equipment at appropriate locations on site and ensure staff are aware of such equipment and associated procedure.

For more detailed requirements to be followed and implemented on site refer to the Emergency Preparedness and Response Plan.

7.9 EROSION MANAGEMENT PLAN

Objective: Prevent soil erosion and rehabilitate eroded areas.

- Vegetate and irrigate open areas to limit erosion.
- Loosen all hard surfaces from site to reduce run-off.
- Strip available topsoil from entire area and stockpile for re-spreading during rehabilitation.
- Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.
- During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.
- Any subsurface spoils from excavations must be disposed of where they will not bury the topsoil of potential agricultural land.

7.10 SPILLAGE AND SOIL MANAGEMENT

Objective: Prevent and monitor accidental leakages and spillages.

- All vehicles and other equipment (generators etc.) must be regularly serviced to ensure they do not spill oil. Vehicles should be refuelled on paved (impervious) areas. If liquid product is being transported it must be ensured this does not spill during transit.
- Emergency measures and plans must be put in place and rehearsed in order to prepare for accidental spillage.
- Diesel fuel storage tanks must be above ground in a bunded area.
- Engines that stand in one place for an excessive length of time must have drip trays.
- Vehicle and washing areas must also be on paved surfaces and the by-products removed to an evaporative storage area or a hazardous waste disposal site (if the material is hazardous).
- Establish an effective record keeping system for accidental leakage/spillage incidents.

7.10.1 Spill Kit

A mobile spill kit shall be located on site and whenever possible near the fuel storage, maintenance, and repair area to deal with any spill. If the plot land consists of sand, this can be used to absorb all spills.

This mobile spill kit should contain the following:

- Sand/absorbent granules
- Bucket and shovel
- PPE equipment (goggles, gloves, rubber boots, warning tape and signage)
- Special waste bin
- Disposable bags and ties
- Absorbent cushions, pads, boom sock, and mats
- Compilation of SDS's.
- In some instances, a respirator may need to be utilized.

7.10.2 Spill Response

The following process will generally be followed by onsite personnel in the event of a minor spill of a Dangerous or Hazardous Materials:

- Only personnel trained on spillage response shall clean up the spill.
- Ensure the safety of yourself and others within the area.
- If safe to do so, shut down/isolate the spillage source.

- Report the incident to your supervisor. The supervisor then reports the incident according to the Incident Investigation Procedure (see HSE Library) and then this document is forwarded to the Local HSE Partner and Site Management.
- If this is a serious or major spill, follow the provisions of EPRP - Emergency Preparedness and Response Plan.
- Make sure that you are aware of the hazard associated with the spilled material. If not, see the SDS first.
- Contain the contaminant of spillage using, spill kits, sand, or other available measures if safe to do so.
- Prevent the spill from entering drainage lines or permanent water sources using spill kits.
- All the technicians are required to wear appropriate PPE when handling the spills in accordance with the SDS sheets.
- For spills of Dangerous or Hazardous Materials that present a combustion risk:
 - Identify potential ignition sources in the surrounding area
 - Secure potential sources of ignition either by removal or isolation
 - Shut down non-essential plant in the immediate area
 - Stop hot work in the immediate area
 - Do not hose the affected area down
 - Do not smoke or cause sparks adjacent to spills
 - Clean-up of the contaminant is a priority once the area has been secured and deemed safe to do so
- Remain at the scene until made safe:
 - Provide further help if required
 - If there is a witness to the incident, provide information to the Local HSE Partner for the incident report

7.1.1 PROTECTION OF HYDROLOGICAL FEATURES MEASURES

Objective: Prevent water contamination.

- All water supplied for human consumption throughout the project should comply with the SANS 241:2015.
- Ensure that the use of groundwater should not compromise availability to other users e.g. agricultural and domestic use.
- Exclude wetlands and the associated buffers:

- Upon completion of this EMP the project developer has optimised their project footprints to avoid ecologically sensitive areas identified by the specialist (pans, hillslope seep, with 100-200m buffers as specified).
- Implement and maintain a stormwater management system that prevents heavy rainfalls outside the pan catchment being diverted into the pan system.
- Measures need to be put in place to ensure that the groundwater is not contaminated.
- If groundwater is abstracted for the project, monitoring of the production borehole water levels, flow rates and quality will be required. This is best done under the guidance of a registered geohydrologist.
- Inform the Department of Water and Sanitation immediately in the event of any surface water or groundwater contamination.

7.12 HAZARDOUSE WASTE

This section details the approach for managing the hazardous waste present at the site, and the mitigation measure/actions identified for hazardous waste management. Hazardous waste should always be segregated from non-hazardous waste. If generation of hazardous waste cannot be prevented its management should focus on the prevention of harm to health, safety, and the environment.

The following preventive measures are applied to all the hazardous wastes and personnel has to be trained accordingly:

- Understanding potential impacts and risks associated with the management of any generated hazardous waste during its complete life cycle.
- Ensuring that contractors handling, treating, and disposing of hazardous waste are reputable and legitimate enterprises, licensed by the relevant regulatory agencies and following good international industry practice for the waste being handled
- Ensuring compliance with applicable local and international regulations and standards (e.g. IFC)
- Hazardous storage areas at the construction site must be on sealed areas, and have appropriate roofing, to protect the materials from solar radiation and prevent leaching into the ground.
- Appropriate secondary containment structures should be capable of containing the larger of 110% of the largest tank or 25% of the combined tank volumes;
- Appropriate secondary containment measures to collect spills (e.g. catch basin) must be provided to tanks and containers, including fill piping.
- Materials and volume of containment basin must be properly selected and calculated.

- Storage areas must be located with consideration of the natural drainage system.
- All drainage valves of secondary containment must be kept closed and, in case of rainwater presence, opened only after checking for the absence of chemicals/oils in water prior to discharge.
- Hazardous wastes and/or their containers must be identified and labelled.
- Gas cylinders must be stored in a dedicated ventilated area, vertically, grounded, protected from any risk of fall, protected from direct sunlight and heat sources.
- To avoid risk of explosion, fuel and combustible gas cylinders must be stored in separate locations and all sources of ignition must be prohibited from the areas near flammable storage tanks.
- Warning signs to inform employees or visitor of the potentially hazardous environment they are approaching with the installation of, for instance, no smoking signs, flammable area, intrinsically safe zone, etc.
- SDS, if not present at the storage area, must be readily accessible to all workers and written in their local language or languages.
- Hazardous wastes must be segregated according to their chemical-physical compatibility.
- Access roads and pathways to the storage areas must be free of obstacles, signs must be posted advising the type of hazardous waste stored, including pictograms and risk phrases.
- Appropriate protection (e.g., bollards) should be installed to protect hazardous waste storage from moving vehicles/plant.

7.13 WASTE MANAGEMENT PLAN

Objective: Promote proper waste disposal, waste reduction, re-use, and recycling opportunities.

- Ensure an adequate and sustainable use of resources.
- Ensure that waste generated during this phase is taken to an appropriate registered landfill.
- Waste separation is encouraged and therefore receptacles should be labelled to reflect the different waste types. All operational waste (concrete, Steel, rubble) to be removed from the site and waste hierarchy of prevention, as the preferred option, followed by reuse, recycling and recovery must be implemented, where possible.
- All liquid waste (used oil, paints, lubricating compounds and grease) to be packaged and disposed of by appropriate means.

Refer to Waste Management Plan established for the site as more detailed guideline to be followed.

In accordance with all applicable legislation, the project's Waste Management and Liquid Effluent Procedure prioritizes the minimization of the production of waste materials, the efficient use of natural resources and the maximization to reuse and recycling in accordance with the waste hierarchy.

The lack of order and cleanliness increases the risk of accidents in general (e.g. falls to the same and different levels, cuts, etc.) therefore, during the work, general principles of order and cleanliness should be addressed such as:

- Dispose waste and debris in a lawful manner so it does not harm the environment.
- Dispose waste and debris in a manner to avoid accidents and reduce risks of injury.
- Re-use and recycle waste whenever practical and dispose of appropriately.
- Segregate and deposit waste in enabled containers.
- Ensure that all containers shall be clearly marked and approved for the specific use.
- Maintain site in a clean and tidy state to reduce the attraction of pest species, impact on the local environment and negative impacts on visual amenity.
- Use materials produced with a recycled content where applicable.
- Organize work so that time is available to sort and clean.
- Dispose of regulated waste (e.g., waste oil) in accordance with national legislative requirements and environmental best practice (Also refer to ib Vogt spill management plan).
- All waste that cannot be reused shall be removed from the site and disposed of at appropriately licensed facilities in accordance with local regulations.
- Encourage site personnel to separate waste streams to maximise recycling opportunities.
- Ensure that no waste is burned or buried on site.
- Provide securely covered, clearly labelled segregated waste and recycling bins at strategic locations adjacent or close to the site construction site office(s) and amenities area.
- Inspect site bins weekly for capacities, correct segregation and coverage.

Decommissioning phase:

- Dispose of waste and debris in a lawful manner so it does not harm the environment.
- Waste handling must focus on minimisation of the overall waste as well as the recycling of any reclamation waste.
- Non-hazardous waste

- Hazardous waste
- Reclamation waste
- Non-hazardous waste must be delivered to a special licensed facility for recycling or disposal.
- All broken non-hazardous PV panels will be recycled in a dedicated recycling site.
- Steel must be stored in segregated stockpiles in laydown areas to be recycled.